NOAA Coral Reef Conservation Program
Final Report

I. Project Information

A. NOAA Grant Number: NA11NOS4820006
B. Project Title: Rain Garden Design, Installation and Signage at Pohaku Beach Park, West Maui
C. PI and Staff: Lauren Campbell, Chair, Surfrider Foundation Maui Chapter
D. Award Period:1/22/2014 – 1/22/2015
E. Award Amount: $10,750.00

II. Executive Summary

Pohaku Beach Park is a heavily used beach park located in Kahana, on the island of Maui. In addition to its popularity as a local, weekend gathering spot, Pohaku is also a highly acclaimed surf spot and gathering spot for basking Hawaiian green sea turtles. Pohaku Beach Park is located directly between a roadway and the Pacific Ocean, and is split into two distinct sides: the North Side that drains the adjacent roadway and parking lot, and the South Side that drains the adjacent roadway, parking lot, and most notably, a public shower. Without appropriate drainage, unfiltered pollution runs from the park's adjacent hardscapes directly into the ocean and onto the near shore reef. The park is also currently covered in turf grass, which requires heavy amounts of watering, and a drainage pipe runs directly from the public shower to the ocean.

In order to address the issue of unfiltered pollution draining directly into the ocean at Pohaku Beach Park, Surfrider Foundation Maui Chapter planned, designed and installed two separate rain gardens, one on each side of the park, to capture and filter polluted runoff from the roadway, parking lots and public shower.

On September 6, 2014, Surfrider Foundation Maui Chapter, along with local community groups, individuals, and school children, successfully replaced turf grass in the park's north and south sides with gardens comprised of compost, mulch, and native plants. The south garden is about 286 sq. ft, while the north garden is 466 sq. ft. The design is straightforward, efficient and beautiful: slowing down, spreading out and sinking water into planted swales so it can be filtered and absorbed by soil, plants and mulch. Throughout the installation, Surfrider Foundation worked closely with the community to enhance public awareness about the issues of reef decline and urban runoff, as well as the importance of ocean friendly gardens.

III. Purpose

A. Management problem addressed

Coral reefs in West Maui, and around the world, are in rapid decline. Large scale efforts, particularly in West Maui, have therefore been launched to work collaboratively in addressing some of the primary factors contributing to reef decline. Urban runoff is the number one source of ocean pollution. Minimizing the amount of polluted urban runoff that reaches the ocean would therefore greatly enhance the heath of near shore reef ecosystems. Rain gardens are one such solution to diverting polluted runoff away from oceans, and have been identified both locally and nationally as an effective means to manage polluted runoff from discreet areas.

In the case of Pohaku Beach Park, there is a significant amount of impervious surface, and very little space between the park and the ocean. On the south side of the park, polluted runoff from the parking area, roadway and public beach shower runs untreated to the ocean. On the north side of the park, polluted runoff from both the parking area and adjacent roadway also runs untreated into the ocean. Installation of two separate rain gardens, one to address runoff from the southern portion of the park and another to address runoff from the northern portion of the park, would capture and filter the polluted runoff. In addition, the park's impervious landscape is composed primarily of turf grass, a non-native grass that requires a high degree of watering.

Installation of two rain gardens at Pohaku Park helps directly decrease the amount of unfiltered, polluted runoff that drains from the adjacent hardscapes into the ocean. As such, the gardens help enhance the health of the near shore coral reefs and contribute to better water quality in the near shore area. Overall, the project serves to directly address the issue of reef decline in West Maui, while also serving to educate about urban runoff.

B. Overarching goal(s) and objective(s) of the project

The Pohaku Beach Park rain garden design and installation project was comprised of two major goals: 1) a *physical* goal that included the installation of two rain gardens (and signage) at Pohaku Park; 2) a *social* goal that sought to enhance community awareness about the issues of urban runoff and reef decline, and further involve the community in addressing these issues.

Together, these two goals (physical and social), sought to achieve the greater goal of directly decreasing the amount of unfiltered, polluted runoff that reaches the near shore ocean environment adjacent to Pohaku Beach Park. Diverting polluted runoff would further contribute to greater reef health and enhanced water quality in the near shore, ocean area.

The project sought to, first and foremost, install rain gardens so as to capture and filter runoff from adjacent, impervious areas, thereby minimizing the amount of polluted urban runoff that flowed untreated to the ocean. In addition to directly enhancing the health of the near shore reef area and associated surf break, the project also sought to enhance the community's awareness of the impact of urban runoff and the role of proper (proactive) landscaping techniques. The rain garden project at Pohaku Beach Park garnered community support and volunteer contribution, while also directly addressing the issues of reef decline, water quality and urban runoff.

IV. Approach

A. Detailed description of the work that was performed (by objective)

As previously stated, the project was comprised of both a *physical* goal (installing two rain gardens) and a *social* goal (enhancing community awareness and involvement).

Objective 1: Installation of the two rain gardens at Pohaku Beach Park to address the issue of urban runoff:

The installation of two rain gardens at Pohaku Beach Park included extensive design work, coordination of materials and supplies, coordination of volunteers, an 8 hour community installation event and on-going maintenance. The Chapter worked with a local landscape architect (Scott Lancaste of *One If By Land*

Environmental Design LLC to design appropriate gardens that would not only capture, but also filter, polluted runoff from the roadway, parking lots and public shower. Design work included extensive site surveys, infiltration testing, soil testing and an evaluation of the drainage areas.

In total, the South Garden is about 286 sq. ft, while the North Garden is 466 sq. ft. The design is straightforward, efficient and beautiful: slowing down, spreading out and sinking water into planted swales so it can be filtered and absorbed by soil, plants and mulch.

Once complete, designs were submitted to the County of Maui Park Department for approval allowing Surfrider Foundation Maui Chapter to move forward with the project. In addition, Surfrider Foundation Maui Chapter submitted an SMA Exemption application to the County of Maui Planning Department. The SMA Exemption was approved, and through the permitting process, it was also determined that a complete archeological survey was not required.

Appropriate supplies and materials were purchased and/or donated by local companies. Surfrider Foundation Maui Chapter Project Coordinators worked together to coordinate the delivery of mulch, compost and gravel, as well as secure native plants, work tools and irrigation supplies. In addition, Surfrider Foundation Maui Chapter worked closely with West Maui Kumuwai to generate public involvement and interest in the project. For example, Surfrider Foundation Maui Chapter assisted in the development of press releases, event flyer, social media updates, email notices and other event notice materials.

A community installation event was scheduled for September 6, 2014, and lasted from 8:30AM – 4:30PM. The day prior to installation, Surfrider Foundation Maui Chapter Project Coordinators and Scott Lancaste worked with EKO Compost, Riedel Construction and Truth Excavation to coordinate the delivery of mulch, compost and gravel to the site, as well the initial excavation of the two gardens. Excavation prior to the installation event was necessary in order to complete the event within a single day.

On a Saturday morning, September 6th, 30 volunteers gathered at the Park to assist with the installation. Activists from Surfrider were joined by experienced volunteers with sister non-profits West Maui Kumuwai (http://westmauikumuwai.org/) and West Maui Ridge 2 Reef. Volunteers successfully replaced turf grass in the North and South gardens with compost, mulch and native plant species. The unfiltered drainage pipe of the South side was also plugged, which further allowed all water from the shower to be directed through the garden before reaching the ocean.

During the event, Surfrider Foundation Maui Chapter worked closely with Scott Lancaste to lead volunteers in the actual installation of the gardens. Throughout the day, Surfrider Maui Project Coordinators provided hands-on training to volunteers regarding the proper method in creating rain gardens. Education about rain garden design, installation and importance was also incorporated into the event. Photo documentation of the event was also conducted (see Appendix 1).

Volunteers first worked to loosen and dig out the soil in the central areas of the garden, and used the loosened soil to build berms around the garden's perimeter. The loosened soil will allow runoff to more effectively filter down into the soil, while the berms create a depressed "ponding area" where runoff can be retained while it percolates into the ground, instead of "sheeting" off directly into the ocean. Once the berms had been properly constructed, and the basin dug out to the appropriate depth, elevation measurements were taken to ensure proper drainage. Compost was then mixed with the loosened soil to create the

foundation from which the plants would take root. Simultaneously, gravel was laid upon a permeable weed barrier at the main drainage points to the each garden. These gravel swales direct runoff to the garden without causing erosion. After compost had been properly applied to the loosened soil, volunteers planted native plant species, such as ohelo kai and ma'o. Native plants were used in the rain gardens as they are more adapted to tolerate periodic inundation. In addition, native plants require less maintenance, take up some of the storm water and pollutants, are acclimated to local growing conditions, provide habitat and food for native species, and improve the aesthetics of the garden. Once the native plants were planted, a layer of mulch was applied to the garden's surface. The mulch filters out many of the pollutants found in storm water and physically protects the underlying soil. Drip irrigation was then installed to ensure that the new plant receive proper watering while they establish.

A short-term (8 week) irrigation and maintenance plan was instituted following the completion of the gardens. Surfrider Executive Board Member Andrew O'Riordan is responsible for carrying out short-term irrigation and maintenance plan. The plan is as follows:

- Week 1: Continued daily drip line irrigation at 20minutes/day, for first 7 days
- Weeks 2 and 3: Irrigation 5 days each week at 20minutes/day
- Weeks 4 and 5: Irrigation 3 days each week at 20minutes/day
- Weeks 6 and 7: Irrigation 1 day each week at 20minutes/day
- Weeks 8 through start of rainy season: Periodically check (weekly) until the rainy season for issues with drainage, plant establishment, etc.
- Necessary weeding and the replacement of unsuccessful plants will occur in concurrence with irrigation during the first 8 week period. Per observation, a weeding party will be held (to number ~5 people) once every 2-4 weeks during the first 8 weeks.

In addition to the short-term irrigation and maintenance plan, Surfrider Maui also developed a long term maintenance plan. Surfrider Maui plans to revisit the site with a local school group within the first 12 weeks of installation. The school group will plan a monthly visit to the park, in coordination with Surfrider personnel, to pull weeds and check on other aspects of the garden. In addition, Surfrider personnel will visit the site once every two weeks for the first six months to report on garden progress and/or issues. After the first 6 months, the Surfrider Executive Committee will make a site visit to the gardens and develop a continued maintenance plan moving forward.

Objective 2: Enhance community awareness about the issues of urban runoff and reef decline, and further involve the community in addressing these issues.

Education was a major component of the project, and included actions such as hands-on educational training at the event, as well as designing informative signage to be installed at the project site. Surfrider Foundation Maui Chapter collaborated with a wide variety of community groups, which also allowed the project to connect with a broad and diverse collection of community members.

Surfrider Foundation Maui Chapter utilized the work day event to educate participating community members about the environmental impact of urban runoff, and the way that rain gardens work to address this impact. At the lunch break, Surfrider Maui's Ocean Friendly Garden's Coordinator, Josh Hamlin, gave a presentation on the importance of rain gardens and the impact of urban runoff on water quality and reef health. His presentation included discussion of watersheds, diagrams of how rain gardens function in the landscape and photos depicting healthy coral reefs. In addition, Surfrider Maui provided educational

materials and brochures about Surfrider's Ocean Friendly Gardens Program to participants throughout the event.

Surfrider Foundation Maui Chapter has also designed and fabricated interpretive signage to be placed at the entrance of both the north and south gardens. The signs have been developed in a format similar to those installed at Wahikuli Wayside Park, and depict the flow of water as it runs off of impervious surfaces and into the rain garden. The signs highlight the three major factors of a rain garden: **Conservation** of water and resources, increasing the **Permeability** of surfaces and **Retention** of water so as to slow, spread, and sink runoff before it reaches the ocean.

Pohaku Beach Park is popular with local residents, surfers, and visitors. These signs will therefore help educate a diverse subset of park and beach users about the environmental impact of urban runoff and community-based solutions to address ocean pollution.

A detailed blog post about the project was also posted on both the Surfrider National website, as well as the Surfrider Foundation Maui Chapter site.

Overall, the project connected multiple environmental groups with community members in a grassroots effort to address the issue of urban runoff, water quality and reef decline. Middle-schoolers from Sacred Hearts School, for example, not only played an important role during garden installation, but were also educated about the importance of the project. These students have forged not only a better understanding of the connections between the land and sea, but also developed a stronger sense of commitment to the project site itself. The involvement of community members, especially those of the next generation, is an important step of any environmental initiative. It is expected that those who participate will educate fellow community members, as well as take a more active role addressing the issues that are impacting our ocean.

Finally, by working with local county agencies, in particular the Maui County Parks Department, Surfrider Foundation Maui Chapter was able to begin helping pave the way for future projects. The Pohaku Park rain garden project is only the second such project completed on the island of Maui. As such, permitting and other issues arise as local governing agencies are not accustomed to these types of projects. The success of the Pohaku Park rain gardens further familiarizes permitting agencies with similar types of projects, while also increasing the County's awareness of managing polluted runoff and ocean and land stewardship.

B. Project management: List of individuals and/or organizations performing the work.

1. Surfrider Foundation:
   Lauren Campbell – Project Coordinator/Grant Manager
   Josh Hamlin – Assistant Project Coordinator/Installation Event Site Coordinator
   Charlie Quesnel – Assistant Project Coordinator/Installation Event Site Coordinator
   Andrew O'Riordan – On-going maintenance
2. One If By Land – Scott Lancaste – Land Scape Architect/Installation Professional
3. West Maui Ridge to Reef – Tova Callendar - Watershed Coordinator – Project Partner
4. West Maui Kumuwai - Project Partner

V. Results

The Pohaku Beach Park rain garden project directly resulted in the installation of two rain gardens, which combined, will annually filter an estimated 30,000 gallons of polluted runoff. The south garden is about 286 sq. ft, while the north garden is 466 sq. ft. The gardens work to slow, spread and sink water into planted swales so that it can be filtered and absorbed by soil, plants and mulch. Thus, polluted water that once flowed directly to the ocean is now diverted and cleaned, and while also used to support newly planted native plant species.

Public outreach and education about urban runoff and the role of rain gardens was another important result of the project. The community installation event, for example, involved over 40 local volunteers and numerous project partners, from local permitting agencies to environmental organizations. Not only were volunteers an essential part of actually installing the gardens, but their exposure to the project represented an important educational component. Community members received a special overview about the function of rain gardens from Surfrider's Ocean Friendly Gardens Coordinator during the cleanup event. In addition, the public nature of the garden, combined with interpretive signage placed at the entrance to each garden, provides an ongoing educational tool for all visitors to the beach park. Finally, public education was enhanced through social media outlets, blog posts and local news write-ups.

Overall, the gardens represent an effective, community-based solution to manage polluted runoff from discrete areas. The project therefore also serves as an important tool for resource managers looking to enhance water quality, ocean ecosystems and coral reef health. The successful implementation of the Pohaku Beach Park rain gardens is expected to serve as a model for similar, future projects that may be undertaken at the grassroots, County and/or state level. The project also resulted in directly connecting with local government agencies, and thus exposing these agencies to the concept and process of rain gardens.

Finally, the project was able to build capacity within Surfrider Foundation Maui Chapter's organization. There are numerous steps towards the completion of a successful rain garden, from garden design to executing an actual project work day. Surfrider Maui is now more equipped to spearhead future rain garden projects and has gained extensive knowledge with regards to the planning, organization and dedication that a rain garden project requires.

VI. Applications

Outputs

Specific Outputs:

1. Installation of two (2) public rain gardens at Pohaku Beach Park - Together, these two gardens will filter approximately 30,000 gallons of polluted water each year. This is Surfrider Foundation's first rain garden project on the island of Maui and will be used as a model project for future community-based rain gardens.

2. Development of appropriate educational signage installed at project site – Signage depicts the flow of water across impervious surfaces and describes how rain gardens capture and filter this polluted runoff

3. Educational blog post describing project – The blog post has been posted on both the Surfrider National website and the Surfrider Foundation Maui Chapter website. The post correlates with media press about the project.

Outcomes

There are several outcomes of this project. Physical outcomes include the creation of two new rain gardens treating polluted runoff in the northern and southern portions of the park. This will allow for some incremental improvement in water quality. For example, the two gardens will annually filter an estimated 30,000 gallons of polluted runoff. In addition, new interpretive signage explaining the intention and functioning of the rain gardens provides a lasting educational benefit.

Installation of the Pohaku Beach Park Rain Gardens has not only enhanced the health of the adjacent ocean area, but has also resulted in a number of positive social outcomes. For example, the project is, first and foremost, community-based, and thus relies on volunteers to assist both during the initial installation, as well as during long-term garden maintenance. As such, the project increased the local community's investment in both the park and the ocean, and along with educational signage, has enhanced the community's understanding about runoff and environmentally friendly landscape techniques. The gardens serve as a daily and ongoing reminder to users of Pohaku Beach Park that the way we choose to manage our landscapes and water flow is an important aspect of keeping our oceans healthy.

The project has also provided Surfrider Foundation Maui Chapter with the hands-on experience related to organizing and installing a rain garden. As such, we have increased our collective capacity and the likelihood that we will recreate this practice in other areas of the island. Community members participating in the project similarly have greater awareness and knowledge about rain gardens and land based pollution in general. The project also results in capacity building with partner organizations and general community through the hands on experience of building a rain garden. For example, Surfrider Foundation Maui Chapter has developed new and lasting relationships with diverse organizations such as West Maui Kumuwai, West Maui Ridge 2 Reef, CORAL, DAR and the County of Maui Parks Department. Even groups that did not directly aid in garden installation were instrumental to the overall success of the project. For example, Malama Maui Nui provided important equipment such as shovels and wheelbarrows. Local companies, such as EKO Compost and Lulu's Lahaina Grill, also provided in-kind contributions to the project. With the help of our media outlets and continued promotion through West Maui Kumuwai, the site will become a source of pride and ownership for the larger community.

The Pohaku Beach Park rain garden is, furthermore, the first rain garden project designed by a local, Maui-based landscape architect. Previous rain garden projects have utilized Oahu-based landscape architects. While these individuals are highly knowledgeable about rain gardens, working with a Maui-based design company supported the overall idea of "community-based". In addition, the design company, One If By Land, is now well poised to assist in future projects.

In addition, the County of Maui Parks Department staff has increased exposure to rain garden development and maintenance, as well as increased awareness of managing polluted runoff and ocean and land stewardship. This is an important relationship to establish as increasing the number of rain gardens installed on Maui will require continued involvement by the Parks Department. The successful implementation of the Pohaku rain gardens has provided a model example as an effective means to manage polluted runoff from discreet areas, while also paving the way for future community-based rain garden projects.

VII. Evaluation

The Pohaku Beach Park rain garden project was comprised of two major goals:

1) A *physical* goal that included the installation of two rain gardens (and signage) at Pohaku Park;
2) A *social* goal that sought to enhance community awareness about the issues of urban runoff and reef decline, and further involve the community in addressing these issues.

Both of these overarching project goals were achieved. With regards to Goal #1 (the *physical* goal), two separate rain gardens were installed at Pohaku Beach Park, one on the north side to capture polluted runoff from the adjacent road and parking lot, and a second on the south side to filter drainage from the public shower. Combined, the gardens will annually filter an estimated 30,000 gallons of polluted runoff. The rain gardens therefore assist in addressing the issue of urban runoff, and provide resource managers an efficient and community-based solution to localized, ocean pollution.

It should be noted that the square footage of the final North Garden area was increased by about 120 square feet from the original design. The original design, for example, estimated the North Garden at approximately 340 sq ft, while the final garden is approximately 466 sq ft. The increased square footage resulted from updated drainage and infiltration measurements, and was approved by the County before installation occurred.

In addition to directly mitigating polluted runoff, the project succeeded in achieving Goal #2 (the *social* goal) of enhancing community knowledge about polluted runoff and the role of rain gardens. First, the installation event was a hands-on learning experience for all involved, including both local residents as well as community groups. Participants were directly connected to the issue of urban runoff, and also received a demonstration on how rain gardens serve to mitigate ocean pollution. The event was followed up with blog posts, social media outreach and write-ups in the local newspaper. In addition, the public nature of the project, along with installation of interpretive signage, allows the rain gardens to serve as ongoing, public education tools.

Although both goals were fully achieved, there were a number of lessons learned throughout the rain garden design and installation process. For example, a more complete evaluation of the site limitations should be undertaken before installation begins. Both sites were located on top of an old highway, a fact not indicated on any maps or via permitting agencies. We were thus required to spend additional time digging out large, concrete slabs so as to ensure proper drainage.

Additionally, while the public was overall supportive of the project, outreach and public notices should have been posted at the park and in local media outlets before the event took place. Although social media outlets were utilized to encourage individuals to join the event, steps should have been taken to more fully educate the broader public about why the project would take place and what the installation would require (i.e. no access to the north side of the park during the event). The post-installation follow-up was much more comprehensive and supported by the interpretive signage.

Finally, Surfrider Maui has recognized the need for established pre- and post-coordinator meetings. The involvement of numerous organizations, along with permitting agencies and County departments, requires clear communication. In the future, we will be more aware of the potential miscommunications that may arise, and better understand the need to clarify individual roles before the installation event.

As it progresses into the rainy season, Surfrider Maui will continue to monitor the sites for proper drainage and evaluate the need for additional work. Moving forward, we will use the Pohaku Beach Park rain gardens as a model for resource managers to emulate for future projects and as an effective, community-based solution to localized ocean pollution.

Final Report Prepared by: ___Lauren Campbell___ Date submitted: ___10/20/2014_____

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