

## Waihee Fish Passage Project FINAL REPORT

Project Title: Waihee Fish Passage Project  
Grant/Cooperative Agreement No.: 122009J019  
Federal Agency: Department of the Interior Fish and Wildlife Services  
Project period: 10/1/2009 to 9/30/2013

### PROJECT SUMMARY

The purpose of this project was to modify an abandoned stream gage to re-establish the migratory pathway for native Hawaiian gobi (oopu) to the upper reaches of Waihee Stream on the island of Oahu. [Note: Hawaiian diacritical markings are not used in this report.]

### INTRODUCTION

In 2003, The Honolulu Board of Water Supply (BWS) formed a partnership with Kualoa-Heeia Ecumenical Youth Project (KEY) to form the Waihee Ahupuaa Initiative (WAI) with the mission to protect the natural resources of the area. Over the years, the partnership has grown to include Hui o Koolaupoko (HOK) and continues to have active participation from the Department of Land and Natural Resources- Division of Aquatic Resources (DAR) and Commission on Water Resource Management (CWRM), U.S. Fish and Wildlife Service (FWS), and interested community members.

In 2007, WAI identified an abandoned stream gage structure on BWS property that appeared to be an obstruction to the migration of oopu in Waihee Stream. The structure was built in 1935 by the U.S. Geological Survey (USGS) to measure the amount of water in the stream. It was taken out of service in 1982 after a replacement gage was constructed downstream. Over the decades, the stream bed has widened causing the surface of the stream to lower and expose the base of the structure walls. The walls became undercut which created an overhang between the stream surface and the structure.

According to the DAR *Atlas of Hawaiian Watersheds and Their Aquatic Resources- Island of Oahu*, the following list identifies the Hawaiian gobi (oopu) species that may benefit from the fish passage project:

- *Stenogobius hawaiiensis* (oopu naniha) lower reach
- *Eleotris sandwicensis* (oopu akupa) lower reach
- *Awaous guamensis* (oopu nakea) lower and middle reaches
- *Lentipes concolor* (oopu alamoo) middle reach
- *Sicyopterus stimpsoni* (oopu nopili) middle reach

Prior to the start of the project, no oopu were observed upstream of the project site. This confirmed that the structure posed as a barrier for oopu migration to the upper stream reaches. Oopu are able to scale vertical surfaces; however, they are not able to climb surfaces with angles beyond ninety degrees. Oopu are amphidromus, meaning a portion of their life cycle occurs in the ocean, but most of their life is spent in the fresh water streams. They lay their eggs in the stream and the larvae float downstream out to the ocean usually during heavy rainy or storm conditions. The fishes spend time in the ocean until they come across a fresh water signal. This triggers a metamorphosis where their features transform from

saltwater to freshwater. The process occurs within 24 hours and they must find their way back to a fresh water stream or they will die.

## PROJECT DESCRIPTION

WAI discussed various options, weighing pros and cons, before deciding on a simple design to repair and modify a section of the undercut structure wall. Around the same time, FWS formed the Hawaii Fish Habitat Partnership (HFHP), which provided funding towards projects to restore fish habitat. HFHP was interested in the Waihee Fish Passage Project and BWS received a grant to do the project.

The permitting process took longer than anticipated. After waiting for over a year with no response from the State Department of Health, Clean Water Branch regarding the Water Quality Certification Application waiver, the Army Corps of Engineers issued a verification for the project in July 2012. In order to take advantage of the modest stream flow and low rainfall period, the project was slated to begin a few weeks later. BWS crews along with staff from KEY, HOK, FWS, DAR, Koolau Mountain Watershed Partnership, and volunteers from the community all pitched in to help with the construction project. Phase I took place August 2012 and Phase II occurred in June 2013.

## PROJECT SITE

The project site consisted of a staging area and a construction site. The staging area was within a 100ft of the construction site and was used to fill sandbags and mix the concrete. Plastic sheeting was placed on the ground with straw wattle underneath the perimeter of the plastic closest to the stream. Sand was unloaded on to the plastic and the sandbags were filled. Plastic sheeting was also used under the cement mixer to catch the material that fell during the mixing process. During the setup and construction days, all excess materials were taken off site at the end of the day. The construction site was contained within a sandbagged area to create a dry working area. The activities consisted of repairing the undercut structure walls and removing a small section of raised concrete edge on the overflow. The construction work was scheduled during modest stream flow and low rainfall periods.

The project area also included the pool downstream of the structure. Rocks on the downstream side of the pool were temporarily moved to lower the water level a few feet. This exposed the rock ledge formation immediately below the construction area, and created a dry working area where concrete was applied. Sandbags and impermeable material (i.e. plastic sheeting) were used to create a dam within the structure chute area. 8" plastic pipes were incorporated in the sandbag dam to direct water away from the construction area on the structure wall face. One set of pipes ran from the structure across the pool immediately below and emptied into the next pool downstream. Another length of pipe was inserted into the sandbag dam and emptied the remaining water in to the center of the pool, thereby preventing most of the stream from flowing down over the structure face. Untreated plywood was placed on uneven terrain to facilitate transport of the concrete to the construction site.

## PHASE I WORK

A portion of the structure wall was repaired by inserting concrete-rubble masonry (CRM) including concrete (Portland cement and sand), and cobble and rocks from the adjacent upland area in a section of the undercut area. The work was done by hand. The concreted area was kept dry for 4 days. About 6" of the raised edge on the concrete overhang was removed, which had prevented water from flowing

down that side face of the structure wall. The concrete was removed using a hand held target saw with concrete diamond blade and hand tools. Debris and loose construction materials were removed from the construction area at the end of the construction day and disposed of at the BWS base yard. The construction and staging areas were cleaned at the end of each day of activity to remove any debris. The construction area was cleaned again prior to removing the sandbags and pipes.

During construction, a severely eroded section along the side of the structure wall was re-examined. The area had become severely eroded within a year, and the cliff wall that the structure was built up against had eroded away leaving a three feet wide by seven feet tall gap on the side and behind the structure wall. Several large tree roots were exposed, and seepage from the dike rocks at the base of the cliff area was observed within the eroded area. WAI decided the gap between the structure wall and the cliff area should be filled to minimize further erosion. A piece of plywood was anchored in place and positioned so it would not incorporate the seepage behind the wall. Locally sourced rocks and concrete were alternately placed to partially fill in the void.

## PHASE II WORK

After assessing the Phase I work, WAI agreed that more work needed to be done to stabilize the structure. The surface of the chute/concrete lip area had deeply eroded pockets where water could wear a hole through the remaining concrete and the stream would by-pass the newly created fish passage. Also, there were concerns that the remaining undercut areas could compromise the stability of the structure.

In June 2013, another phase of construction began to repair these areas starting with preparing area behind the top of the structure wall by filling in the eroded areas with crushed gravel. More locally sourced rocks were stockpiled there to fill in the remaining undercut areas of the wall. The same site preparation was done as in Phase I with the sandbags, pipes and plastic, and the water level in the pool below the structure was lowered. A hazard was identified in the structure wall- two large rocks on the top of the wall were loose and were barely secured to the surrounding rocks in the wall. The rocks were easily dislodged and the portion of the wall was repaired before work began on the undercut areas. The undercut areas were filled in with CRM and the eroded areas in the chute/lip area were filled with concrete with rocks embedded on the surface.

Due to scheduling conflicts, the eroded area on the left side of the structure (partially filled during Phase I) and the cement cap on top of the crushed gravel (behind the structure walls) were not completed. Work to those areas may be done through the WAI partnership if it is deemed necessary.

## RESULTS AND DISCUSSION OF PROJECT ACCOMPLISHMENTS

### SUMMARY AND CONCLUSIONS

On October 30, 2013, a stream survey was conducted by DAR staff. Four permanent plots that were installed prior to the project were remonitored- two downstream of the project site and two upstream of the project site. Oopu were observed in all of the monitoring plots. Two oopu (nakea) were observed above the project site, one at each of the upstream plots. One of the fishes was over 2" long. A few weeks prior to the stream survey, a KEY member and community resident observed oopu (nakea and

alamoo) above the project site. He said the nakea hung around the pools above the structure, while the alamoo quickly made its way upstream.

It was concerning to find many tiny armored and barbed catfish above the project site that ranged from ½ inch to 1 inch long. This shows that the armored/barbed catfish are also able to navigate up the newly repaired walls. WAI will discuss the possibility of utilizing students at KEY Project to help develop a trap to capture these invaders.

This project was truly a combined effort with BWS staff, WAI partners, and many volunteers contributing their time and efforts to make this project a success.

### LESSONS LEARNED

The project hit a small setback during Phase I of construction when vandals destroyed the setup of sandbags and pipes that were set up the day before construction. Fortunately, the BWS crews and volunteers repaired it quickly the next morning. In fact, it was built better and faster the second time and we were back on schedule to do the concrete work on the structure. A camera from a nearby BWS facility was repositioned to monitor the project site. BWS contracted a security guard to watch the site from 6pm to 6am over 4 nights. Volunteers monitored the site during the day time. Vandals struck again during Phase II before security was brought on to monitor the site. This time affecting the porta potty that was brought on-site during Phase II for volunteers to use.

In the future, projects requiring permits should factor in adequate time for the permitting process. At least one year should be included to the timeframe.

Washed beach sand instead of mason sand should be used in sandbags to reduce turbidity of the water.

### SUMMARY OF EXPENDITURES

A summary of expenditures is attached. The amount of volunteer and partner contributions exceeded the match for this grant through in-kind services.

### ASSOCIATED PERMITS OR LICENSES

- Department of the Army (DA) Permit or License: DA NWP 27 JD
- Commission of Water Resource Management: Ref# 2092.3 (SCAP not required)
- Office of Conservation and Coastal Lands: OA-10-109
- Hawaii State Historic Preservation Division: LOG: 2011.0351/ DOC:1102RS10

SUMMARY OF EXPENSES FOR WAIHEE FISH PASSAGE PROJECT  
 COOPERATIVE AGREEMENT 122009J019

DATE	EXPENSE	DESCRIPTION
4/9/2010	\$1,438.87	LABOR AND MILEAGE
6/15/2010	\$6,273.34	LABOR AND MILEAGE
3/9/2011	\$5,982.69	LABOR AND MILEAGE
12/31/2011	\$2,949.63	LABOR AND MILEAGE
9/14/2012	\$5,616.70	LABOR , MATERIALS AND SUPPLIES
11/23/2012	\$1,000.00	FILING FEE (DOH)
5/8/2013	\$2,417.35	LABOR, MILEAGE, MATERIALS
6/26/2013	\$972.00	MATERIALS AND SUPPLIES, LUA
7/10/2013	\$1,020.23	SUPPLIES
7/23/2013	\$2,290.00	SUPPLIES, SECURITY
8/1/2013	\$13,087.67	LABOR, MILEAGE, SUPPLIES
9/13/2013	\$1,951.52	LABOR, MILEAGE, SUPPLIES
TOTAL	\$45,000.00	

Structure before construction



Phase I- Stockpiling rocks at site



Phase I work- sandbags and pipes



Phase I - sandbags and pipes



Phase I - sandbags and pipes



Phase I - sandbags and pipes





Phase I –concrete curing



Phase I completed



Phase II – Holomua students/crew



Phase II – Preparing sandbags



Phase II- plan of action



Phase II- Sandbags and pipes



Phase II- group at end of the day.



Phase II- Repairing the wall



Phase II- Stockpiling rocks



Project completed



Post project stream survey



Post project stream survey

