Lualualei Naval Magazine/Waianae Kai Forest Reserve Fire  
June 4-June 11, 2012  
MEMORANDUM FOR RECORD

Compiled June 26, 2012 to document agency response required for the fire, the damage to State and Federal natural resources, safety concerns, and lessons learned to improve fire plans and responses.

Summary
The fire started at approximately 12:40 p.m. Monday June 4th in Lualualei Naval Magazine near the intersection of Radford St. and Kolekole Road in the Waianae Mountains, Oahu at an elevation of 200 ft. The cause of the fire was undetermined according to Federal Fire investigators. The size of the fire, its rapid spread, and the proximity to rare endangered plants prompted OANRP to respond by providing helicopter support for water drops and aerial reconnaissance, and assisting with maps of threatened natural resources and acreage burned.

The fire burned through approximately 1100 acres of dry fuels dominated by Panicum maximum, Leucaena leuephala, Prosopis pallida, and other alien grasses. The weather over the course of the week was mainly dry (40-85% rH), hot (>80 degree F) and windy (5-25+mph) out of the northeast. These conditions favored an extremely rapid spread of fire through the dry, light fuels of Lualualei Valley and into heavier fuels in Waianae Kai Valley Forest Reserve particularly late on Monday afternoon, Monday evening and early Tuesday morning. Fire was declared fully contained by State Division of Forestry and Wildlife personnel on June 11, 2012.

The fire also burned through remnant native shrubland, native cliff communities and small remnant patches of native dry forest. In the remnant native shrubland and cliff community dividing Lualualei and Waianae Valley, the only known population of a federally listed endangered species (Chamaesyce kuwaleana) was significantly damaged by fire. Significant portions of its designated critical habitat also burned. At least 57 individuals of C. kuwaleana were killed by the fire (out of an estimated remaining population of 250 individuals). Of those 57, about 10 individuals were located on the Lualualei side and the remainder burned on the Waianae Valley side. A small population of another endangered species, Spermolepis hawaiiensis was not apparently damaged although we failed to locate it during our damage assessment. This species is an annual and not likely to be seen in the dry summer months. The fire posed a threat to the dry native vegetation communities mentioned above which include a number of other rare and federally listed endangered species at higher elevations to the northwest of the fire in Waianae Kai Valley and along the crestline dividing Waianae from Schofield West Range. The fire also significantly damaged several farms in Waianae Valley and directly threatened two housing areas in Lualualei and Waianae Valley (coming within 20 yards of some homes). Munition storage bunkers in Lualualei were apparently undamaged. Estimated total costs to property and natural resources from fire damage, and agency staffing costs are unknown at this time. Previous fires of comparable size, duration, and level of response cost around $150,000. Calculated costs to Oahu Army Natural Resources Program (OANRP) as follows:

<table>
<thead>
<tr>
<th>Cost Type</th>
<th>Amount</th>
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<tbody>
<tr>
<td>Staffing costs:</td>
<td>$2500</td>
</tr>
<tr>
<td>Helicopter fuel costs:</td>
<td>$1200</td>
</tr>
<tr>
<td>Helicopter time costs:</td>
<td>$10,500</td>
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<tr>
<td><strong>Total cost:</strong></td>
<td><strong>$14,200</strong></td>
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Background
Fire is the largest threat to dry forest and dry shrubland ecosystems in Hawaii which are often now dominated by invasive grass such as *Panicum maximum*. The endangered plant taxa threatened by this large fire included *Spermolepis hawaiiensis*, *C. kuwaleana*, *Tetramolopium filiforme*, *Cenchrus agrimonioides* var. *agrimonioides*, *Nototrichium humile*, *Neraudia angulata* var. *dentata*, *Dubautia herbstobatae*, *Gouania vitifolia*, *Hesperomannia arbuscula*, *Schiedea hookeri*, and *Alectryon macrococcus* var. *macrococcus*. With the exception of *Spermolepis hawaiiensis*, *Chamaesyce kuwaleana*, and *Schiedea hookeri*, the remaining species are all stabilization taxa in the Makua Military Reservation Implementation Plan (MIP) and these populations represent a significant portion of the known remaining naturally occurring individuals. Fortunately, no MIP populations were affected. The Oahu Army Natural Resource Program works to conserve these MIP species in four small fences built by OANRP in Waianae Kai Valley. Other rare plant and snail populations are also located below and at the crestline area to the east of the fire in Schofield West Range. Fences in Waianae Kai Forest Reserve are located in the northwestern portion of the valley.

Figure 1: Map showing the extent of the burn and proximity to rare and endangered MIP resources in Waianae Kai and Schofield Barracks West Range. 250.34 acres of Waianae Kai Forest Reserve burned.
June 4th, 2012

<table>
<thead>
<tr>
<th>Staff</th>
<th>Time</th>
<th>Total Hours</th>
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<tbody>
<tr>
<td>Parker Paredes</td>
<td>1:00 pm</td>
<td>n/a</td>
</tr>
<tr>
<td>Matt Keir</td>
<td>6:00-6:30 pm</td>
<td>0.5</td>
</tr>
<tr>
<td>Mike Walker</td>
<td>5:30-7:30 pm</td>
<td>2.0</td>
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<thead>
<tr>
<th>Company &amp; Pilot</th>
<th>Time</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AirOne (Lincoln Ishii)</td>
<td>~3:00-6:00 pm</td>
<td>~3.0 Flat time, All water drops</td>
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</tbody>
</table>

**Sequence of Events**

1240: Navy Federal Fire reports and responds to the fire near one of their storage bunkers at Radford St. on Lualualei Naval Magazine.

1300: OANRP staff (Parker Paredes) observes the fire from the crestline of the Waianae Mountains at Puu Hapapa and reports the fire to Army Range Control.Army Wildland Fire also notified. Parker also gives his report to other OANRP staff, Dan Sailer and Matt Keir.

1500: During an OANRP helicopter sling load operation at Puu Hapapa, pilot John Fryer from Airborne Aviation reports that the fire appears to be spreading out of control. At some point around this time, Navy Federal Fire personnel request additional support from HFD and Air One bucketing operations begin with one or two helicopters.

1700: Dense smoke in Lualualei and Waianae Valley hinders bucketing operations and evacuations begin in nearby affected housing and farming areas. Fire spreads very rapidly in several directions across large front.

1700-1900: OANRP staff station themselves at Kolekole Pass as lookouts, various personnel are notified of the fire, and a response plan is made for Tuesday. OANRP was notified that Airborne Aviation was being released from the fire on Kauai and would be able to free up both helicopters for fire fighting on Oahu on Tuesday. The fire continues to spread upwind into higher elevations as a large backing fire along the border dividing Lualualei and Waianae Kai Valley as well as makai and downwind toward farms and residences.

**Fire Behavior**

Numerous spot fires, rapid spread through light, flashy fuels, and strong gusty winds quickly spread the fire out of the initial ignition area of about 5 acres to approximately 500 acres in a matter of 6 hours. The fire spread in a generally west/north west direction across a broad front from 200 ft. in elevation to as much as 1400 ft. in elevation. Fire intensity varied from high intensity areas of complete burns with about 40 foot flame lengths to large areas with incomplete burns due to low intensity fire and low flame lengths.

**Safety Concerns**

Dense smoke and cliff terrain apparently made the initial attack by HFD helicopters very difficult. Residential areas and farms were evacuated on Monday night due to the dense smoke and fire threat which came within 20 yards of some homes and burned several farms.
**Tuesday, June 5th**

<table>
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<tr>
<th>Staff</th>
<th>Time</th>
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<tr>
<td>Dan Sailer</td>
<td>7:00 am – 8:00 pm</td>
<td>15</td>
</tr>
<tr>
<td>Mike Walker</td>
<td>7:00 am – 8:00 pm</td>
<td>15</td>
</tr>
<tr>
<td>Scott Yamasaki (Army Wildland Fire)</td>
<td>9:00 am – 10:00 am?</td>
<td>?</td>
</tr>
<tr>
<td>Jane Beachy</td>
<td>10:00 am - 12:00 pm</td>
<td>2</td>
</tr>
<tr>
<td>Sonja Bigalke-Bannan</td>
<td>Varied w/ other duties</td>
<td></td>
</tr>
<tr>
<td>Julia Lee</td>
<td>1:00 – 3:00 pm</td>
<td>2</td>
</tr>
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Among the DOFAW crew were: Dave Smith, Marigold Zoll, Aaron Lowe, Chelsea Arnott, Susi Iott, Terrence Noguchi, Mark Maxy, and Chris Miller. M. Zoll is DOFAW Incident Commander (IC).

<table>
<thead>
<tr>
<th>Company &amp; Pilot</th>
<th>Time</th>
<th>Total Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>AirOne (Chief Steve Aiu)</td>
<td>8:00- 5:00 pm</td>
<td>~9.0 Flat time, All water drops</td>
</tr>
<tr>
<td>AirTwo (n/a)</td>
<td>8:00- 10:00 am</td>
<td>2.0 (maintenance issue)</td>
</tr>
<tr>
<td>NPA Airborne Aviation (John Fryer): OANRP contract</td>
<td>9:00 am -5:30 pm</td>
<td>6.5 (given Koolau work for USGS)</td>
</tr>
<tr>
<td>0PA Airborne Aviation (Jim Huff's): DOFAW contract</td>
<td>~10:30 am- 6:30 pm</td>
<td>8</td>
</tr>
<tr>
<td>CH-53 Sea Stallion (Navy/Marines)</td>
<td>Varied (off and on fire throughout day)</td>
<td></td>
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</table>

**Sequence of Events**

HFD and FFD worked aggressively throughout the previous night to hold fire perimeter along southern, western, and northern flanks. HFD IC during evening operations is Chief Camara. Fire had burned to its largest extent for the most part on Monday night into Tuesday morning due to unusually strong evening trade winds around 9 pm. Evacuation of farms continued and HPD closed access roads into the back of Waianae Valley. HFD had elevated its response to Level 3 meaning approximately half of the entire HFD’s resources on Oahu were committed to the fire and HFD paramedic response services were curtailed.

0800  DOFAW agrees to contract 0PA for fire operations and OANRP uses NPA fire operations. NPA involved in USGS Koolau operation till 0850.

0830  Jane Beachy sent to Kolekole Pass as lookout for southeastern flank of fire which threatened Puu Kumakalii area Monday night.

0850- 0905 Airborne Aviation NPA ship with pilot J. Fryer begins aerial reconnaissance flight with Mike Walker (OANRP), Marigold Zoll (DOFAW), and Scott Yamasaki (Army Wildland Fire). Actively burning areas restricted primarily to mauka edge of fire in Waianae Kai Forest Reserve and near end of Waianae Valley Road in the Kaala Farm area. NPA helicopter leaves for USGS job and then begins bucketing operations at approximately 0930 after refueling at Dillingham and picking up his bucket.
1000 M. Walker, D. Sailer, M. Zoll and Dave Smith arrive at the Incident Command Center at Kaupuni Park in Waianae Valley for fire size up and briefing with HFD to coordinate air response with HFD and the Navy. Overall HFD IC during Tuesday daytime operations is Chief Lawton. Park is large enough to accommodate landing of CH-53 and two Hughes 500 helicopters. DOFAW does not deploy any ground forces other than lookouts as most DOFAW crew is still on Kauai. Aaron Lowe and Chelsea Arnott from DOFAW provide logistical support. Susi Iott also from DOFAW manages 0PA ship.

1000-1800 Chief Aiu (HFD) directs air operations. HFD Air One buckets along western perimeter closest to farms and housing in Waianae Valley as well as Lualualei as needed. CH-53 buckets in Lualualei and more mauka perimeter closer to Kaala Farms throughout the day, drawing water from ocean. NPA and OPA from Airborne Aviation concentrate bucketing along northwestern perimeter in Waianae Kai Forest Reserve to stop fire from further advancing into forested area and at highest elevation along boundary between Lualualei and Waianae Valleys. The swimming pool at Waianae Camp closer to the fireline services the small helicopters in addition to the water buoy at the park.

1100-1500 U.S. Airforce and a contractor conduct a training operation at the IC with a fixed wing Cessna plane (that circled the fire at a high altitude) to provide real time thermal and visual imagery.

FFD continues firefighting in Lualualei to protect nearby housing and bunkers. Army Wildland Fire resources are not requested by Navy Fed Fire and do not respond for the remainder of the fire.

1000 HFD AirTwo ship leaves given 100 hour maintenance requirement and battery issue.
1030 0PA with pilot Jim Huffs arrives from Kauai and begins bucketing operations. Fueling for NPA is approved at Wheeler Army Airfield. OPA refuels at Dillingham throughout the day. NPA fuels at Wheeler twice.
1200 Jane Beachy departs Kolekole Pass lookout, replaced by Julia Lee at 1300.
1345 NPA departs for another job (USGS Koolau operation).
1510 NPA returns and conducts an aerial reconnaissance with M. Walker and D. Sailer.
1521 NPA resumes bucketing.
1530 Julia Lee departs Kolekole lookout area at remaining hotspots at higher elevations are no solely on Waianae Kai valley side.
1530 HFD AirOne also departs due to a mechanical issue (running hot), leaving 3 helicopters on scene.
1530-1900 Susi Iott (DOFAW)/M. Walker (OANRP) coordinate water drops with HFD ground personnel.
1730 NPA departs as pilot J. Fryer reaches his duty day restriction. 0PA and CH-53 continue bucketing.
1800 Tradewinds increase and a flareup occurs near Waianae Camp, 0PA brought from Waianae Kai forest area to assist in wildland/urban interface area.
1845 0PA departs back to Dillingham. CH-53 continues bucketing until 1900.
1900 DOFAW/OANRP conducts debriefing at end of operational period.
Safety Concerns

- Radio communication between HFD and contract ships was problematic. HFD would request drops with Mike W. (OANRP) and he would then relay instructions to DOFAW and 0PA. All helicopters could talk with each other. DOFAW often had difficulty at times talking with 0PA on Tactical 1 frequency.
- HFD AirOne helicopter apparently began running hot at 1530 and departed for Honolulu.
- Initially no traffic/crowd control from HPD at Kaupuni Park.
- HFD AirOne had a close call with the basketball backboard and fence as their bucket and line came close to hitting it.
- At 1800 a flareup occurred near the housing area by Waianae Camp, fortunately HFD tankers were close by and 0PA was also still available to assist with bucketing.
- Throughout early Tuesday morning and into Tuesday night fire repeatedly came close (e.g. 150 yards) to crossing the firebreak along streams and dirt roads in Waianae Valley but was stopped by aggressive response by HFD and air support. Holding this perimeter was critical to preventing the fire from burning out of control again across the western 2/3rds of Waianae Valley.

Fire Behavior

In general, fire activity during Tuesday daylight hours significantly decreased throughout the day because of air operations, lighter winds, and generally overcast conditions with higher humidity at times (particularly during afternoon hours). Fire perimeter changed significantly during the course of the day as about 40 additional acres burned on Tuesday in the area above Kaala Farms. Active burning with some 20 ft.+ flame lengths in heavier fuels (satin leaf, olive, silky oak, and wiliwili trees) was restricted to the mauka forested areas in the Waianae Kai Forest Reserve and the haole koa scrubland/Kaala Farm area directly below. An evening flareup occurred in alien grass/shrubland near Waianae Camp. OANRP could not see most of the bucketing activity in the Waianae Kai Forest Reserve from our vantage point at the park. Fire behavior was unknown in the makai portion of Lualualei. Mauka portions of Lualualei had largely burned out with only smoldering hotspots in blackened areas by 1600. Burning trash piles, tires, and farm structures also contributed to flare-ups in the agricultural saddle area between Lualualei and Waianae Valley.

Wednesday, June 6th

<table>
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<tr>
<th>Staff</th>
<th>Time</th>
<th>Total Hours</th>
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<tbody>
<tr>
<td>Dan Sailer</td>
<td>3:00 pm – 8:00 pm</td>
<td>5</td>
</tr>
<tr>
<td>Sonja Bigalke-Bannan</td>
<td>Varied with other duties</td>
<td></td>
</tr>
</tbody>
</table>

Among the DOFAW crew were: Dave Smith, Marigold Zoll, Aaron Lowe, Chelsea Arnott, Susi Iott, Terrence Noguchi, Mark Maxy, Chris Miller, Ryan Peralta, Jason Misaki, Fred Bannan, Sid Kawahakui, Sean Demello, Michelle Jones, and Reuben Mateo. R. Peralta is DOFAW IC.
### Sequence of Events

0800 – 1800 A large number of DOFAW and HFD personnel conducted fire suppression along northwestern flank in Waianae Kai Forest Reserve extending several hundred meters down below Kaala Farm area. The objective was to continue holding the fireline at the stream by putting out all hotspots along the fire perimeter in this area and to continue to protect Kaala Farm and neighboring structures. R. Mateo (DOFAW) also worked throughout the day improving the old dirt roads directly west of the stream as an additional fire break using heavy equipment.

Fuels mostly consist of haole koa/guinea grass with Christmas berry/kukui/silky oak/satin leaf/wiliwili trees and aalii bushes burning at upper elevation.

Helibase is mostly moved to the BWS supply road lower water tank and adjacent landing zone in Waianae Kai Forest Reserve. Kapuana Park continues to serve as HFD/DOFAW Incident Command location.

Navy Federal Fire also continued largely mop up operations in Lualualei Valley throughout the day.

1300 R. Peralta requests that OANRP assist with air support using NPA to supplement bucketing operations.

1400 NPA piloted by J. Fryer begins bucketing and continues to 1730

1500 D. Sailer (OANRP) arrives to support air operations by NPA.

1630  NPA leaves to fuel at Wheeler and is denied fuel at WAA despite assurances early in the day that he was okay to fuel there. He fuels instead at Dillingham Airport. Later investigations by OANRP reveal that Directorate of Logistics personnel had incorrectly invalidated Airborne Aviations fueling agreement.

1730 NPA conducts aerial reconnaissance with DOFAW and HFD staff (R. Peralta, J. Misaki, and Capt.Terry Seelig).

1745 NPA departs for HNL.

1830 0PA completes bucketing and departs to Dillingham.

1900 DOFAW/OANRP conducts debriefing at Kaupuni Park.

### Safety Concerns

0PA pilot Jim Huffs did not like bucketing from the smaller, and shallower DOFAW water buoy located at the BWS tank. He primarily used the HFD buoy in Kaupuni Park. Low water pressure also prevented more rapid refilling. Other pilot, John F. did not mention having a problem with the dip pond.
DOFAW staff also reported that using the same radio channel for ground operations and ground to air communication was difficult at times given the amount of radio traffic.

Around 1700, the CH-53 ship got very close to dropping their water directly on DOFAW staff and fanned flames from their rotor wash.

**Fire Behavior**
By late afternoon, only small smoldering areas were occasionally visible from the helibase and operations had shifted to mop up actions. Bucketing by contract aircraft and the CH-53 throughout the day was very useful to douse hot spots in heavier fuels given the distance from any other water sources. Fire was declared 75% contained by DOFAW at end of operational period. HFD declared the fire fully contained and focused their air and ground efforts instead on a separate, unrelated brush fire lower down in Waianae Valley for the next several days. This other fire started in two separate locations on different days and burned several hundred acres over the holiday weekend.

**Thursday, June 7th to Monday, June 11th**
OANRP did not respond at all with staff or air support during this period as no support was requested by DOFAW. At the end of Thursday’s operational period R. Peralta reported that the fireline turned out to be much hotter than expected requiring extensive mop up operations and assistance by OPA bucket drops in the Waianae Kai Forest Reserve area. Mop up operations by DOFAW continued till Monday.

**Lessons Learned**
The very large and aggressive response by HFD and DOFAW on Monday through Wednesday prevented the fire from burning more of Waianae Valley both in the mauka forested areas and makai in the residential areas. Significant effort was also expended by DOFAW on Thursday through the following Monday to fully extinguish the fire and prevent any flare-ups.

A missing resource to help extinguish this fire was Army Wildland Fire as they were not requested by Navy Federal Fire personnel. Both the initial attack and HFD’s and DOFAW’s extended mop up operations would have undoubtedly greatly benefitted from their additional manpower and expertise given the terrain and size of the fire perimeter.

Any future large fires happening simultaneously on several islands or on the same island will likely again overextend agency air and DOFAW staff resources. Contingency planning is needed to minimize delays caused by the unavailability of helicopters and pilots and ensure adequate numbers of staff are trained and equipped for fire responses. A second unrelated large fire that started lower down in Waianae Valley during the Lualualei/Waianae Kai fire is another example of the degree of threat posed by fires during dry periods in leeward areas.

A lack of direct radio communication between HFD ground crews and Airborne Aviation pilots during a flareup made directing water drops difficult. This problem likely resulted from the fact
that Chief Aiu who was directing all air operations had to leave given a maintenance issue with his aircraft. OANRP and DOFAW personnel were tasked by the HFD IC to help direct the contract aircraft to support HFD ground crews, a task which they performed well at despite the difficulties of handling multiple radios and multiple requests for water drops from ground crews given the intensity of the flare up.

There was some miscommunication initially HFD junior personnel and Airborne Aviation pilots on Tuesday regarding the authorization to fuel from the HFD tender (gas truck). As OANRP and DOFAW staff arrived on scene on Tuesday, we were informed by our pilots the HFD had given their approval to fuel from the HFD tender as needed. OPA fueled once from the tender and later Chief Aiu questioned us as to who authorized the fueling since he was the only person who could authorize the fueling and did not do so. In the future, OANRP will continue to use Wheeler Army Airfield for fueling during an emergency response given its central location. The issue with the improperly voided fueling agreement at Wheeler AAF was resolved.

DOFAW/BWS existing firebreaks in Waianae Valley were located well away from this fire given the history of fires coming up from center and western sides of the valley. While fires had burned the saddle area between Lualualei and Waianae Valley’s before, this particular fire was much higher in elevation when it crossed into Waianae Kai Forest Reserve and came from the east. Additional pre-suppression actions are needed in the future to plan for this event again. Staff from Kaala Farms made the case that more farming in the the haole koa area that burned will help buffer the forested areas mauka and to the west.

A significant percentage of individuals of the only known location of an endangered plant species (*Chamaesyce kuwaleana*) burned in this fire. Steep cliffs prevented the fire from burning more of these plants. This example underscores the importance of genetic storage collections and establishing multiple populations of a species in naturally defensible locations given the unpredictability of large fires.

Figure 2: Fire burning out of control late Monday afternoon upward towards Puu Kumakalii at upper right of photo and into Waianae Kai Forest Reserve at center of photo. Note direction of smoke as this portion of the fire backed up the ridge dividing the two valleys at an elevation of about 1400 feet.
Figure 3: Aerial shot looking east on Tuesday afternoon. Note stream area and Kaala Farm at center of photo where HFD and DOFAW personnel held the fire from spreading into the grassland beyond. The fire came as close as 60 feet in some areas to reaching the other side of the natural fire break. *Chamaesyce kuwaleana* plants and critical habitat burning in upper right of photo.
Figure 4: Freshly burnt haole koa shrubland above Kaala farms looking east on Tuesday afternoon. Native aalii shrubland and remnant native dry forest area also burned near top of photo.
Figure 5: Lualualei Naval Magazine looking west. Ignition point of fire is near lower left of photo. Damaged farms are in the flat saddle area between the two valleys.
Figure 6: Locations of historic and current distribution of *C. kuwaleana*. The lower left population was recently observed at Puu Maunakuwale and was damaged in the fire. The area at the upper right dot was extensively burned and no plants were found. The middle location was largely unburned, but not visited during a recent damage assessment as the area is flanked by steep cliffs making access difficult. The rare *Panicum beecheyi* grass areas was also not visited but also significantly damaged by the fire.
Figure 7: Puu Maunakuwale area looking east towards Puu Kumakalii at crestline. Note the largely unburnt large Puu in the center of the photo protected by vertical cliff areas. Damaged plants were directly below the FWS and OANRP staff in the photo. Also note the somewhat intact native aalii shrubland at lower left that apparently recovered from a previous fire in 2003.

Figure 8: Habitat and a healthy *C. kuwaleana* plant in Puu Maunakuwale area looking west. Fire came within 50 feet of burning this core population. Note bare rock surrounding the plant acting as a natural protection from fire in the right hand photo.
Figure 9: Fire damaged *C. kuwaleana* plants below the northwestern flank of Puu Maunakuwale.
Figure 10: Waianae Kai Forest Reserve area damaged by fire. A number of native wiliwili trees burned in the center area of this photo.
Figure 11: Farms damaged by fire. During the damage assessment survey a week after the main fire was extinguished, another small brushfire started shortly after this photo was taken near the unburnt area in the righthand side of the photo, but was quickly extinguished by HFD.

Figure 12: Kaala Farms area at lower left and Waianae Kai Forest Reserve at upper right.