

In some years, live herbaceous fuel moisture remains above 60 percent year-round. In the drier years on record, live herbaceous fuel moisture was calculated to fall below 60 percent in late June or early July, without recovery until the October green-up period. Makua will be closed to ball ammunition and blanks when live herbaceous fuel moisture at the Makua Range weather station is calculated by the interagency WIMS to fall below 50 percent. In the drier years on record, live herbaceous fuel moisture was calculated to fall below 50 percent between mid July and early September, but remained above 50 percent year-round in wetter years. Weapons that are likely to ignite wildland fires are proposed for use during periods of low fire danger, when the burning index (a fire danger index related to wind speed and relative humidity) is lower.

The assigned Army Wildland Fire Incident Commander and the senior Range Control officer staffing Makua during live-fire training are both responsible for ensuring that all weapons restrictions and fire suppression staffing guidelines are followed. Range Control personnel, the Army Fire Chief, the Army Wildland Fire Management Officer, and the Army Wildland Fire Incident Commander providing fire suppression staffing at Makua all have the duty and responsibility to shut down the range to training activities not in conformance with the restrictions listed in this Project Description. The Army will stop training in Makua and will reinitiate consultation with the Service if the military does not act in conformance with the Army regulations including range safety guidelines and the additional restrictions and guidelines described in this Project Description.

All weapons will be targeted at points within the south lobe of the firebreak road. A limited number of weapons will be fired from the North Firing Point in the north lobe of the firebreak road. The rest of the weapons will be fired from designated areas within the south lobe of the firebreak road. A log of the time and location of each round landing outside the south lobe of the firebreak road will be maintained by the wildland firefighters stationed on the observation tower during live-fire training exercises. A copy of these records will be provided to the Service quarterly.

2.6 Training Scenarios

2.6.1 Combined Arms Live-Fire Maneuver Training

The following scenario describes a typical combined arms live-fire exercise (CALFEX) and is defined by the integration of different arms, such as infantry, aviation, artillery, engineers, and others, to achieve a combined effect on the enemy greater than if each weapon system were used individually. A CALFEX at Makua will be conducted at the platoon or company level and 50 CALFEXs will be conducted each year. Each exercise is carried out over several days and can occur either during the day or night. Nighttime training activities may consist of the same activities that are conducted during the day. Night live-fire training will not occur until after fire suppression issues have been finalized by the Army and approved by the Service. Table PD 3 presents the estimated quantities of ammunition to be used by the Army for 50 company-level CALFEXs. A typical company-level CALFEX would include a maneuver ground force of dismounts with small arms weapons (M4, M16A1/A2, M249 SAW, M240B machine gun, M203 grenade launcher). Table PD 2 presents the small arms and other weapons that could be used during a typical CALFEX. If the Army proposes incorporation of a weapon not listed on Table PD 2, then the Service will review the weapon request prior to use at Makua to ensure that its use

Table PD 3. Estimate of Munitions to be Expended at Makua during CALFEXs.

Weapons System	One Daytime and Nighttime CALFEX (Assuming Night-Time Live-Fire Training)	50 CALFEXS' (Assuming Year-Round Training)	Estimated Average Months of Training per Year (Based on Live Herbaceous Fuel Moisture Restrictions)	Estimated Number of Years of Weapons System Use (Based on Endangered Species Expedited Stabilization and Fuelbreak Construction Requirements)	Estimated Total Number of Rounds to be Fired in 30 Year Life of Biological Opinion (Assuming Night Live-Fire Training)
M24 sniper weapon 7.62 mm rifle	17	850	11.2 months/year	30 years	5,712
9 mm pistol	0	0	11.2 months/year	30 years	0
M249 SAW 5.56 mm machine gun	6,120	306,000	11.2 months/year	30 years	2,056,320
M 16A2 5.56 mm rifle	20,196	1,009,800	11.2 months/year	30 years	6,785,856
M4/M4A 1 5.56 mm machine gun	4,692	234,600	11.2 months/year	30 years	1,576,512
M240B 7.62 mm machine gun	2,040	102,000	11.2 months/year	30 years	685,440
M2 .50-caliber machine gun	170	8,500	11.2 months/year	30 years	57,120
M1 tracer	Unknown	Unknown	6 months/year	15 years	Unknown
MK 19 40 mm machine gun	68	3,400	9.9 months/year	25 years	16,830
M203 40 mm grenade launcher	388	19,400	9.9 months/year	30 years	115,236
Kiowa helicopter with .50-caliber machine gun	1,360	68,000	11.2 months/year	30 years	456,960
Fragmentation grenades	34	1,700	9.9 months/year	30 years	10,098
Smoke grenades	12	600	9.9 months/year	30 years	3,564
Engineer support with Bangalore torpedo	3	150	9.9 months/year	30 years	891
MI 8A1/A2 Claymore mine	9	450	9.9 months/year	30 years	2,673
2 lbs. C4	3	150	9.9 months/year	30 years	891
Shape charge, 40 lbs. C4	Not applicable	36	9.9 months/year	30 years	214
Shape charge, 15 lbs. C4	Not applicable	80	9.9 months/year	30 years	475
Cratering charges	Not applicable	24	9.9 months/year	30 years	143
60 mm mortar (inert)	46	2,300	9.9 months/year	30 years	13,662
60 mm HE mortar	37	1,850	9.9 months/year	30 years	10,989
81 mm HE mortar	49	2,450	9.9 months/year	30 years	14,553
120 mm HE mortar ⁴	Unknown	Unknown	9.9 months/year	30 years	Unknown
M19, 105 mm HE howitzer	121	2,420	9.9 months/year	30 years	35,937
155 mm HE howitzer ³	324	9,720	9.9 months/year	30 years	96,228
AT-4/M 136, SMAW: 84 mm anti-tank rockets	3	150	6 months/year	25 years	450
2.75-caliber rockets	56	2,800	6 months/year	15 years	5,040
Javelin	2	100	6 months/year	15 years	180
Inert TOW missiles	2	100	6 months/year	May be zero years	May be zero

¹Each company-level CALFEX includes both a daytime and nighttime iteration. Estimate of munitions is based on actual training data. Nighttime live-fire training will not occur unless nighttime helicopter fire suppression is authorized.

²Some of the M 16A2 rounds are SRTA rounds.

³For CALFEXs at Makua, the 155 mm howitzer and the 105 mm howitzer are interchangeable weapons. Both weapons will not be used during the same CALFEX. The number of rounds presented for 50 CALFEXs is the estimated maximum number of rounds to be expended during a training year. Summer CALFEXs will often not include all weapons due to live herbaceous fuel moisture limitations.

⁴Although the 120 mm HE mortar is planned for future use at Makua, no allocations for the weapon have been made at this time.

⁵The ammunition expenditures presented in this table represent a typical company-level CALFEX. The actual expenditures for an individual CALFEX or training year will fluctuate and can be higher or lower than the numbers in this table. Also, for an individual CALFEX, additional rounds of a smaller caliber mortar or artillery weapon may be substituted for the estimated rounds of a larger weapon; the total number of rounds for the smaller weapon will not exceed the combined estimated rounds for both weapons. For example, additional rounds of the 60 mm HE mortar can be fired if the 81mm HE mortar is not used during a given exercise, but the total number of 60 mm rounds fired during that exercise will not exceed 86 (49 + 37).

is compatible with the specifications in this Biological Opinion. Indirect fire and aviation units will support troop units conducting a typical CALFEX. Indirect fire support would include the company and battalion mortars (two 60 mm mortars, two 81 mm mortars, and the 120 mm mortar), as well as the platoon 105 mm artillery (three howitzers); 155 mm howitzers would be used interchangeably with the 105 mm weapons. Vehicles and aircraft that would be used during training include the following: up to six Humvees used on existing roads, 2.5-ton or 5-ton cargo trucks (two), UH-60 Blackhawk helicopters (up to six), OH-58D Kiowa Warrior helicopters (up to three), CH-47 Chinook helicopters (two), Strykers (up to five), any wheeled vehicle in the Army inventory, and Unmanned Aerial Vehicles.

Training units arrive at Makua and bivouac in designated areas near the road. Their ammunition is stored at the ammunition supply points in the vicinity of the exercise and is guarded throughout the exercise. Soldiers subsist on packaged meals-ready-to-eat or delivered hot foods, and they use portable toilets. Planning and instruction generally lasts two days. Unit personnel practice their exercise without live fire and conduct other tasks associated with preparing for the actual live-fire exercise. Pop-up targets and blast simulators are sometimes placed in the training area to replicate enemy contact.

Unit leaders (captains, lieutenants, and sergeants) receive briefings from the 25th ID G3 Training, Range Division and from USAG-HI DPW Environmental Division staff on the locations of threatened and endangered species and habitat, locations of known cultural resource sites, fire hazards, and fire prevention measures and procedures. Where necessary, the scenario is modified to reduce the risk of fire and other damage to the environment. The unit leaders then brief every Soldier in the unit on the importance of protecting endangered species and habitat, cultural sites, and preventing wildfires.

On days three and four, unit personnel conduct their actual training exercise. On day three, only blank ammunition is fired, and mortars and artillery are aligned, calibrated, and fired. Training exercises conducted on both days typically last approximately three hours and begin at dawn. The company generally moves with three platoons of approximately 30 to 40 Soldiers (or nine squads of five to 10 Soldiers, plus personnel operating machine guns and support personnel) toward the objectives. Soldiers in the lead platoon fire their rifles and machine guns at the objective or target. The mortar section fires 60 mm mortars at the objective, while the lead platoon moves toward it. When the lead platoon makes contact with the objective, the platoon leader moves squads to a position of advantage and, by spreading out Soldiers to ensure they can hit every target, gains fire superiority over the “enemy.”

Most exercises present advancing platoons with the problem of trench lines, mine fields (simulated), and concertina-wire obstacles. Confronted with these situations, platoons must

practice the skills required to enter and clear a trench line, to conduct a company deliberate attack, to conduct a platoon and squad attack, to knock out a bunker, and to conduct an initial breach of a mine field/obstacle. Some simulated minefields will be cleared with the aid of engineers attached to the company. Bangalore torpedoes may be used to blast routes through such locations. Objective Deer is used to teach some of these primary tasks. The lead platoon guards the objective with machine guns while two other platoons advance toward Objective Deer via a creek bed. A simulated minefield and a concertina-wire obstacle usually protect the westernmost entrance. The company commander will order the engineer squad to reduce the obstacle with a bangalore torpedo designed to focus the blast in a cutting line that explodes mines, cuts wire, and allows Soldiers to walk over the site. Several bangalore torpedoes may be combined to clear a wider path.

After the minefield and wire obstacle have been cleared, the Soldiers run through the breach to the trench complex. Two Soldiers move into the trench and fire down its length to engage any enemy present. The squads and platoon follow, and as each lead Soldier comes to a turn in the trench line, other Soldiers provide shield. The unit Soldiers continue down the trench to the first bunker or room, where four-person fire teams clear the bunkers with fragmentation hand grenades. The lead Soldier guards the opposite approach, and the remaining three Soldiers position themselves close to the door in a “stack.” The lead Soldier tosses a grenade in, and the three Soldiers rush the room following detonation, pointing their rifles at different prearranged locations in the bunker, covering any “enemy” remaining. Soldiers continue clearing the trench in this manner.

Upon seizing their objectives, units must prepare for any counterattack. A company commander may direct the emplacement of claymore mines (small, command-detonated antipersonnel mines) in front of the unit. If artillery is employed in the scenario, the company commander may distribute its fire in advance of an attack or direct its fire toward a target to suppress counterattack. The commander may also direct the company’s anti-armor section to position its missile launchers to prevent any enemy tanks from overrunning the just-taken objective (e.g., the trench line). Once the enemy counterattacks and is repelled by the company, the exercise is over.

At the end of a CALFEX training, units remove any target equipment they may have provided, gather brass casings from spent rounds, remove litter, and otherwise make every effort to restore the range to its condition prior to their use. Explosive ordnance disposal specialists will destroy all identified unexploded ordnance. Ordnance normally is destroyed where it is found, whether it resulted from the training being conducted or from earlier exercises. Unexploded rounds are removed or destroyed at the conclusion of a training exercise.

These procedures are designed to ensure that training conducted at Makua will not increase the amount of unexploded ordnance on the site and may reduce it, if possible. Occasionally, the explosive ordnance disposal specialists are not available to dispose of unexploded ordnance immediately after a training exercise. In this case, unexploded ordnance will be disposed of once the specialists are available and prior to use of the area for new training. Excess propellant charges from mortars and artillery is burned in a burn pan in the open field south of the helipads. Any ash generated from powder burn operations is removed from the burn pan and collected in a

208-liter (55-gallon) drum. When the drum is full, the ash is tested to determine if it meets Environmental Protection Agency criteria as a hazardous waste. The ash is ultimately removed from the site and is disposed of in accordance with Environmental Protection Agency regulations.

The company-level CALFEX is the maximum level of training proposed at Makua due to the range's limited suitable maneuver training land. To minimize the potential for wildfires, various portions of CALFEXs and other live-fire training will only be conducted during Green or Yellow fire danger rating periods, pursuant to restrictions in Table PD 2 weapons table. CALFEXs conducted at Makua will not include aerial bombardment (dropping bombs from aircraft), use of tracked armored vehicles, or training on Makua Beach.

2.6.2 Live-Fire Training

Live-fire training includes basic weapons marksmanship ranges, grenade training, urban/village assault and entrenched enemy training, small unit live fire and maneuvers, artillery and mortar firing, infantry demolition training, and use of mines and bangalore torpedoes. Live fire normally entails an individual gunner, a crew of a weapon system, or a collective unit firing at predetermined targets from designated firing positions on a range facility. The individual Soldier qualifies with an assigned weapon and then progresses through squad, platoon, and company-level live-fire exercises. The requirement for live-fire training varies depending on individual and unit mission, weapons assigned, and ammunition available. Each Soldier must demonstrate proficiency on the assigned weapon system once or twice per year. Unit Commanders must ensure that live-fire training meets readiness standards. Weapons proficiency, or qualification, is scored and recorded for each individual or crew and is reported collectively by unit. No live-fire training takes place outside of established ranges or surface danger zones. The firing of blank ammunition, including blank munitions up to .50-caliber, is not considered live fire. However, because hot casings and residues related with the firing of blanks have the potential to ignite wildland fires, Makua will be staffed with ground and helicopter firefighting resources in accordance with the staffing guide when blanks are being fired.

Live-fire exercises require several iterations of training. The ultimate goal of each live-fire exercise, regardless of unit size, is to execute the exercise at night, under limited visibility. A unit conducting a live-fire exercise will initially rehearse its action by conducting a dry walk-through with no ammunition (first iteration). It will then conduct a full-speed exercise using blank ammunition (second iteration). Providing this is done to standard, the unit then will execute a daytime live-fire exercise (third iteration). Nighttime live-fire exercises add a new dimension to the battlefield and require additional iterations. In general, after a unit has successfully completed daytime live-fire exercises, it will conduct a nighttime blank fire rehearsal (fourth iteration), before finally culminating in a nighttime live-fire exercise (fifth iteration). While this describes a five-day scenario, the Army can compress the schedule in various ways. Due to the current limitations on munitions and fire suppression aircraft safety considerations at Makua, units do not currently conduct nighttime live-fire exercises; however, nighttime live-fire exercises are essential in ensuring that units are combat ready. Nighttime live-fire training will only be conducted after night-flying fire suppression helicopter staffing guidelines have been developed by the Army and approved by the Service.

2.7 Military Operations on Urbanized Terrain

Military operations on urbanized terrain training occurs on Objective Deer and provides troops with the opportunity to train in a realistic urban environment (e.g., using bunkers and other man-made structures) and to experience as much realistic stress as possible. Training may include limited use of short-range training ammunition, which uses a plastic ball projectile. Although short-range training ammunition is classified for live-fire training in accordance with AR 385-63, the maximum range of this ammunition is only 275 to 640 m (879 to 2,247 ft), depending on the caliber used. Short-range training ammunition may be used at Makua in conjunction with other live-fire ammunition.

2.8 Bivouac

Bivouac consists of setting up camp for rest, re-supply, maintenance, or to provide support. Bivouac sites vary depending on unit size and mission. The size of bivouac areas can range from 100 by 100 m (330 by 330 ft) for a squad (9 Soldiers) or platoon (35 Soldiers) to 300 by 300 m (984 by 984 ft) for a company size (120 Soldiers) bivouac. Depending on unit size, bivouac sites can contain a vehicle and weapons maintenance area, vehicle parking area, general supply area, munitions supply area, medical area, helicopter landing zones, and vehicle off-loading area. A bivouac site may consist of a series of tents, temporary structures, and equipment covered with camouflage nets. Bivouac is normally done on level or gently rolling areas that provide vehicle and/or aircraft access. Open fires are not allowed during bivouac, but cooking in special mobile kitchens (enclosed ovens) and use of tent heaters (enclosed) and generators is permitted. Munitions used in bivouac typically consist of grenade and artillery simulators and blank ammunition.

2.9 Sniper Training

Sniper training includes the use of a M24 sniper rifle and firing a 7.62 mm round at targets up to 1,000 m (3,281 ft) away. The M107 heavy sniper rifle that fires .50-caliber ammunition may also be used. Snipers frequently participate in CALFEXs at Makua. For stationary target practice, snipers would position themselves near Range Control while shooting toward targets in the south impact area.

2.10 Restrictions

No tracer ammunition will be used by snipers.

2.11 Air Assault and Aviation Support

When air assault is part of a CALFEX, Soldiers board helicopters and fly to the approved landing zones at Makua. The helicopters land, discharge their loads and fly off. Some vehicles and equipment may be rigged for external transport beneath the helicopters (a practice known as sling-loading), allowing the aircraft to transport both the Soldiers and their equipment to a given location at the same time.

During CALFEXs, OH58 (Kiowas), UH60 (Blackhawks), and CH47 (Chinooks) are used. The exercise typically involves two or three OH58s (two for firing and one for command and control). During the exercise, there is typically a ground rehearsal, a fly-by rehearsal, and then the actual close-air support firing exercise with the regular .50-caliber M-2 rounds. Over the five-day CALFEX, there will be up to five helicopter approaches during the non-live-fire day and up to five approaches during each of the daytime and nighttime live-fire iterations. In addition, two CH-47 Chinook helicopters will transport troops and equipment from Schofield Barracks to Makua. Fire suppression helicopters will also be assigned to Makua in accordance with the helicopter staffing guidelines specified in this Project Description. The command and control helicopter typically flies orbits (to conserve fuel) over the ocean at 600 m (2,000 ft) above sea level. Its distance from shore ranges from approximately 0.4 kilometers (km) (0.25 mi) up to 1.6 km (1 mi) offshore. At no time do they go beyond the jurisdictional waters of the United States.

2.12 Stryker Infantry Carrier Vehicle

The Stryker is a wheeled vehicle with a 350-horsepower engine and a weight of 19 to 20 tons. Up to five Strykers will operate primarily from stationary positions and only on existing roads or paved areas at Makua. There will be no off-road use of Strykers at Makua. Strykers will be used to fire MK 19 (40 mm), .50-caliber machine guns, and 120 mm mortars from the road into the impact area. Strykers also will be used as command and control vehicles. Potential use of Makua by Stryker Brigade Combat Team forces includes approximately six to nine annual company-level CALFEXs with some squad and platoon maneuver live-fire or non-live-fire training. Stryker vehicles will shoot at targets in Objective Deer, from interior roadways in the vicinity of Objective Coyote.

2.13 Unmanned Aerial Vehicles

The Shadow 200 is similar to a large radio-controlled model airplane. The aircraft weighs approximately 147 kilograms (kg) (325 pounds (lbs)), has a wingspan of 4 m (13 ft), and measures 3.4 m (11 ft) from nose to tail. It is a remote-controlled, gas-powered vehicle. Each system includes three unpiloted aircraft equipped with imagery sensors, a ground transport vehicle, two ground control stations mounted on vehicles, and launch, recovery, and support equipment pulled on trailers. Following the mission, it can be recovered in a small area with parachute deployment at low altitude. Recovery can be accomplished manually or with an optional auto recovery system, during which an air bag is deployed prior to touchdown to cushion the landing and protect the vehicle and payload. Unmanned aerial vehicles will only be launched and recovered in restricted or Class D airspace, which includes Makua Valley. The unmanned aerial vehicles will be used for up to nine hours each week, either during training exercises or independently. Unmanned aerial vehicles may take off at Makua and fly over the Makua action area without on-site or standby wildland fire suppression staffing. Unmanned aerial vehicles will not land in any area outside the south lobe of the firebreak road at Makua. Unmanned aerial vehicles may take off and land at Dillingham or Wheeler Army Airfield without fire suppression staffing.

2.14 Convoy Training

The Army uses convoy training to simulate ambushes and other enemy attacks on vehicle convoys. Convoy training will have effects similar to the CALFEX.

2.15 Standard Operating Procedures (SOPs)

The SOPs outline training precautions and fire minimization and suppression procedures that will be followed by Range personnel and Soldiers at Makua. They also provide procedures to protect biological and archaeological resources. No training will occur at Makua until the Service has determined that Range SOPs adequately reflect the updated weapons restrictions and fire suppression staffing requirements of this Biological Opinion. The following items in the SOPs are of particular importance in the protection of biological resources.

- 1) The unit's timeline schedule may be curtailed due to training restrictions being imposed as a result of unfavorable fire danger ratings.
- 2) All emergency (accidents, incidents and fires) will be immediately reported to Range Control.
- 3) Targets will not be moved or altered in any way. Special target requests will be coordinated at least four weeks prior to the first day of training.
- 4) Fire prevention/endangered species/cultural resource briefings have been completed.
- 5) The commander will use the Risk Management Process to identify hazards, assess hazards, make risk decisions, implement controls and supervise the action.
- 6) The commander judges the risks associated with the selected scenario and determines any prudent actions taken or modifications to the exercise.
- 7) All weapons systems will be addressed in the risk assessment.
- 8) The written Risk Assessment Process will continue to be updated during the planning, and coordination sequence. However, the process of assessing risks will continue during all phases of a live-fire training scenarios. Leaders will maintain current copy of the risk assessment during training.
- 9) All firers have a clear field of fire to the target. Firing will only be at designated observable targets.
- 10) Firing is stopped promptly when an unsafe act is observed/reported or when a round impacts outside the fire access road. Anyone can call cease-fire on a range for any safety concern.
- 11) If a fire starts, immediately cease training and follow fire suppression procedures as set forth in Annex A of the SOP.
- 12) Smoke grenades will only be used in areas cleared of debris/grass and will be placed in metal containers. Units are required to place grenades in metal pails or barrels provided by Range Control.
- 13) All incidents, accidents, fires, rounds fired out of impact or ammunition problems are immediately reported to Range Control.
- 14) The provisions outlined in the SOP are applicable to all fire managers, resource managers, range supervisors and range safety technicians, unit commanders, and all military personnel that utilize Makua for training, maintenance and other purposes. All other personnel entering Makua will be familiar with the contents of the SOPs. Deviation

- from the SOPs is unauthorized except by direct orders of the Commander, 25th Infantry Division (L) and Commander, USARHAW, in consultation with the Service.
- 15) The prevention of range fires is the responsibility of every Soldier, contractor, and civil servant working and training at Makua.
 - 16) Army personnel need to minimize fires from starting.
 - 17) Army personnel must quickly and safely extinguish fires by following the fire suppression procedures.
 - 18) Army personnel must stay within the perimeter firebreak roads except when directed to conduct work outside the firebreak roads to conduct fire suppression work. There are dangers of unexploded ordnance and biologically significant areas and management units outside of the roads. If entry outside of the perimeter firebreak roads is absolutely necessary during training, coordinate through the 25th Infantry Division (L), USARHAW, G3, Range Division, Hawaii, to obtain approval.
 - 19) All units will wash their vehicles prior to entering Makua. Additionally, Soldiers will clean their boots and personal gear of mud and or pests, brought from outside Makua, at the entrance to Makua prior to moving onto the range.

3. Wildland Fire Suppression and Fuels Management

The Integrated Wildland Fire Management Plan (2003a) was developed to reduce the risk and impact of wildland fires by limiting their occurrence, size, and severity while still providing for military training on all Army installations in Hawaii. The plan details fuels management, use of prescribed fire, training, fire prevention, and fire suppression response on Army lands.

Throughout this consultation, the Service and the Army referred to the Wildland Fire Management Plan (2003), the fire history at Makua (Beavers et al 1999), recommendations by Beavers for fuel treatments (Beavers 2006, 2007a), Army After Action Reviews, and interviews with local fire management experts in order to develop an updated fire protection system for Makua. The updates primarily include refinement of weapons restrictions, improved reliability of fire danger calculations, new and improved fuelbreaks and firebreaks, and refined fire suppression helicopter staffing requirements.

Activities with highest risk of igniting fires outside the firebreak road are restricted to periods when the grass fuels within the valley are greener and burn more slowly. Weapons more likely to ignite wildland fires are further restricted to periods of the day when wind speeds are lower and relative humidity is higher, when the grass fuels are less likely to ignite, and when fires will be easier to suppress. New fuelbreaks and firebreaks, and improved firefighter preplanning will provide for greater protection for the Kahanahaiki, Kaluakauila, and Ohikilolo management units in the event of a large fire. A staffing guide has been developed to ensure that adequate fire suppression resources are assigned to each live-fire training exercise at Makua. Staffing requirements vary by time of year and weapon system in use, in order to ensure that more suppression force is available during dry months or when the weapons being used are likely to ignite fires outside the firebreak road. Whenever a weapon or demolition is fired, Makua will be staffed, at minimum, by five National Wildlife Coordinating Group (NWCG)-qualified, pack tested, red carded wildland fire personnel with two Type 6 engines and one water tender. Aerial fire suppression resources will be assigned to exercises in accordance with helicopter staffing guidelines, which are dependent on live herbaceous fuel moisture, forecasted wind speed and

direction, and weapons system in use. More substantial fire suppression helicopter capability is assigned when grass is more cured, when wind speeds are higher, and when weapons with a higher risk of igniting fires are in use. In the event of a fire at any location, training is stopped immediately and the unit takes all appropriate actions to put out the fire.

The revised Makua Standard Operating Procedures section in the Wildland Fire Management Plan will outline the Fire Danger Rating System, revised weapons restrictions, new NWCG qualifications standards and helicopter staffing requirements, fire equipment requirements, new firebreak and fuelbreak installation and maintenance standards, fire reporting responsibilities, and fire prevention, detection and suppression standards, which will minimize the risk of resource damage due to training-related wildland fires at Makua, as summarized in this Project Description. The Standard Operating Procedures will also detail the fire prevention briefings that will be given to range users prior to commencement of training, notification lists in case of fire, operational decision charts for fires, and maps of endangered species, critical habitat, fuels, firebreaks, fuelbreaks, and vegetation. The portions of the Wildland Fire Management Plan pertaining to Makua, including the changes to the plan that resulted from this consultation, will be fully funded by the Army. The Standard Operating Procedures section of the Wildland Fire Management Plan and the range Standard Operating Procedures are currently being revised to fully incorporate all of the training, staffing, fire weather, weapons restrictions, and reporting requirements outlined in this Project Description.

3.1 Firebreaks and Fuelbreaks

Firebreaks and fuelbreaks have been designed to reduce the risk of fire spreading outside the south lobe of the firebreak road and to further protect exposed management units and areas of designated critical habitat. The north and south lobes of the training area are surrounded by a firebreak road, maintained as a passable road, cleared to bare mineral soil to a width of 6 m (20 ft). Fuelbreaks are swaths of less flammable vegetation, where fuel load or continuity is manipulated mechanically, or with prescribed fire, grazing, herbicide, or other means in order to stop or slow fire spread. The dimensions and maintenance schedule of each of the fuel treatment areas will vary due to accessibility, unexploded ordinance, topography, and vegetation response. Grass inside the southern lobe of the firebreak road is maintained to stubble height in Objectives Badger, Buffalo, Coyote, Deeds, Deer, Elk, and Wolf, where most weapons are targeted, and all flammable material is cleared from firing points and detonation areas pursuant to DA PAM 385-63 (2003, as updated).

New fuelbreak and firebreak specifications have been developed for several of the Makua Implementation Plan management units (Kaluakauila, Kahanahaiki, Pahole, Upper Kapuna, West Makaleha, Ohikilolo, and Lower Ohikilolo). With the exception of Lower Ohikilolo, which will be protected prior to the use of any weapon or prescribed fire at Makua, the new fire protection systems will be operational within five years or prior to the implementation of Column C in the Weapons Restrictions Table (see Table PD 2), whichever occurs earlier. Because mowing or aerial herbicide treatment is expected to produce a thick layer of dead grass that will take several years to decompose, aerial herbicide and mowing treatments will begin no later than two years after the completion of this Biological Opinion in order to ensure that the fuelbreak is operational within five years. Fuelbreak and firebreak construction will not detract from implementation of the Makua Implementation Plan. It is anticipated that the wildland fire

crew or contractors will be utilized to complete the fuel treatments that are farther than 3 m (10 ft) from endangered plants. Tracers, MK19, AT-4, SMAW, 2.75-caliber rocket, Javelin, and TOW will not be used at Makua unless the Kaluakauila, Kahanahaiki, Pahole, Upper Kapuna, West Makaleha, Ohikilolo, and Lower Ohikilolo fuelbreaks and firebreaks are completed and/or maintained as detailed in this Project Description. If, after five years from the date of this document, the fire protection systems are not completely installed and adequately maintained, use of all devices on Table PD 2, and prescribed burning at Makua will be suspended until the systems can be brought up to standard.

3.1.1 Fuel Treatments in South Lobe of Firebreak Road

Prior to implementation of Table PD 2, Columns B through E, the grass along a 60 m (197 ft) strip of vegetation just inside the south lobe of the firebreak road will be maintained at 30 cm (1 ft) height or less by mowing, grazing or other fuel manipulation, such as frequent herbicide treatments in conjunction with prescribed burning (Figure PD 6). This treatment will expand existing grass treatment areas within the south lobe of the firebreak road by 17 ha (43 ac). This fuelbreak, in conjunction with the existing 6 m (20 ft) mineral soil firebreak road, will provide ground fire suppression forces an area where they can more easily conduct burnouts or attack fires directly as they near the road. The spread of a large fire inside the south lobe of the firebreak road will be effectively halted, and the width of vegetation clearing is adequate to prevent the majority of spot fires from crossing the firebreak road, limiting the number of spot fire ignitions outside the impact area.

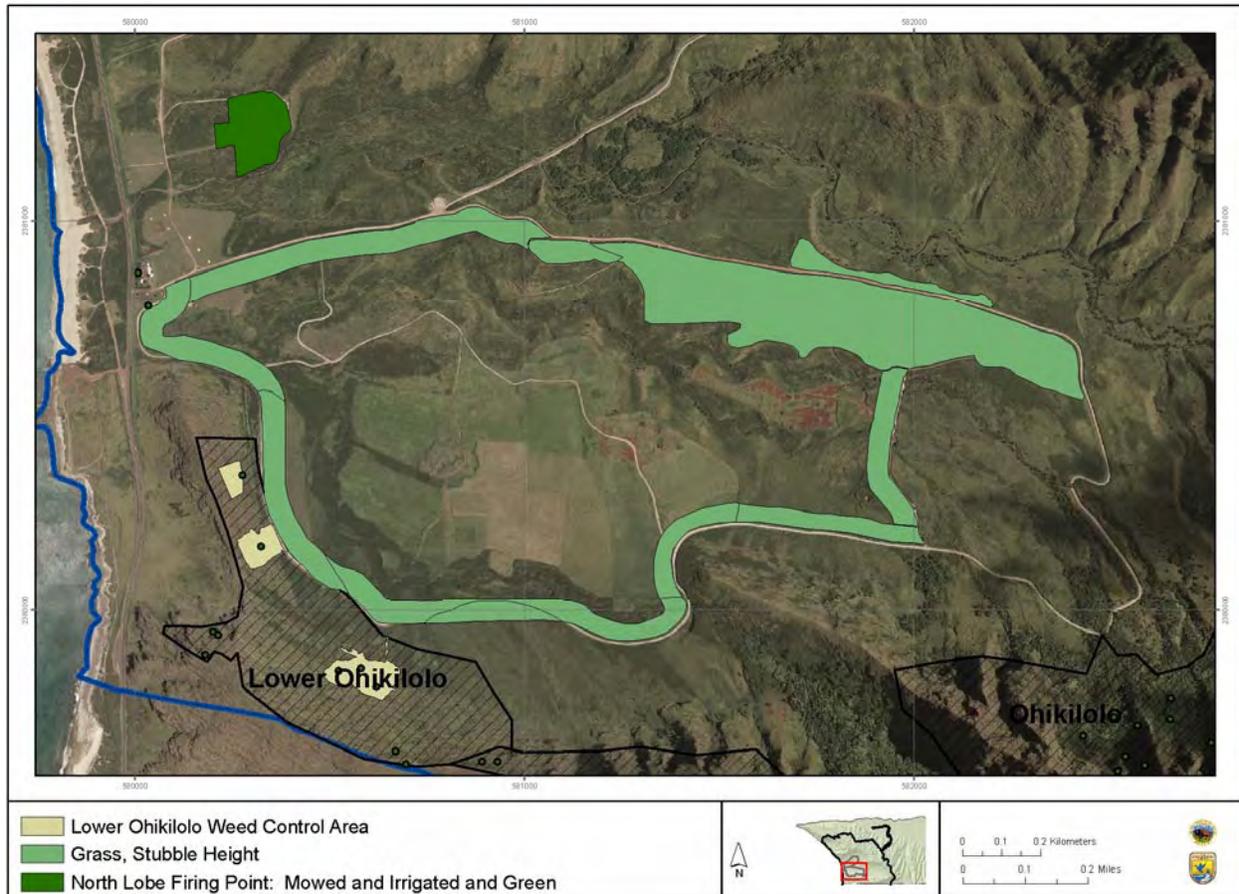


Figure PD 6. Minimum areas to be treated prior to implementation of Column B weapons restrictions and reduced on-site helicopter staffing for limited weapons.

3.1.2 Fuel Treatments in Lower Ohikilolo Management Unit

Within the Lower Ohikilolo Management Unit, all standing live and dead grass will be removed from within 2 m (6.6 ft) of all Makua Implementation Plan stabilization plants, and grass will be controlled with herbicide utilizing an adaptive management approach within the 3 ha (7 ac) weed control areas identified in the Makua Implementation Plan and shown in Figure PD 6. The objective is that the fuel within the weed control area will not support the spread of fire given winds less than 15 mph and one-hour fuel moisture of eight percent or higher. Cliff areas that are too steep to access will be excluded from treatments. Grass removal within 2 m (6.6 ft) of all stabilization plants will be completed prior to the use of any device listed in Table PD 2 and prior to any prescribed burning at Makua. Successful completion will be achieved when grass provides less than one percent cover within 2 m (6.6 ft) of all endangered plants. Fuel manipulation within the weed control area will be achieved through an adaptive management approach.

3.1.3 Fuel Treatments Protecting Pahole, Upper Kapuna, and West Makaleha

Eighty percent of the C-Ridge and East Rim management unit perimeters are protected by intact shrub and forest vegetation that is 200 m (656 ft) wide. Depending on fuel moisture conditions and the species composition of shrub or forest vegetation, fire rate of spread is between four and 400 percent slower in the shrub/forest than it is in the grass covered areas. The shrub/forest

vegetation on the slopes of the valley serve as a shaded fuelbreak, slowing fires so that fire suppression helicopters can contain them before they reach the management units. If small portions of this shaded fuelbreak area are burned, the Army will restore shrub vegetation to the burned portions of the fuelbreak and control grass in the burned areas so that grass cover does not exceed 20 percent in any square meter on the burned area. If larger areas of the shaded fuelbreak are burned, the Army will either restore shrub cover and control the grass on the burned area or install and maintain a strategic firebreak sufficient to halt the spread of fire into the management unit.

3.1.4 Fuel Treatments to be Completed Within Five Years or Prior to Implementation of Column C Weapons Restrictions

Within five years of the completion of this Biological Opinion, or prior to implementation of Column C weapons restrictions, additional fuelbreaks and firebreaks will be developed and maintained in order to afford additional protection to endangered species and critical habitats in the Kahanahakiki, Kaluakauila, and Ohikilolo management units. To the extent possible, the specifications for these fuel modifications are outlined in this Project Description. Fuelbreak placement or maintenance methodologies may be updated as new techniques are developed through research or as skills are developed through the adaptive management process. Modifications to fuelbreaks and firebreaks that provide protection equal to or greater than the protection afforded by the fuelbreaks and firebreaks proposed in this Project Description may be substituted for those provided in this Biological Opinion with the Service's concurrence. The Army will coordinate with the Service before altering fuelbreak or firebreak design or implementation protocols.

3.1.4.1 Kahanahaiki Management Unit

At the northwest corner of the Kahanahaiki Management Unit, near the Makua Ridge weather station, one of three alternative fire protection systems (Figure PD 7) will be established and maintained in working condition in order for Column C through E weapons restrictions to be applied at Makua. Four of the fires that escaped initial attack at Makua burned into the Kahanahaiki Management Unit at this location (1970, 1984, 1995, and 2003), converting the native shrub vegetation to grass. The area is on a south aspect with an average slope of 100 percent, and it is currently primarily grass-covered.

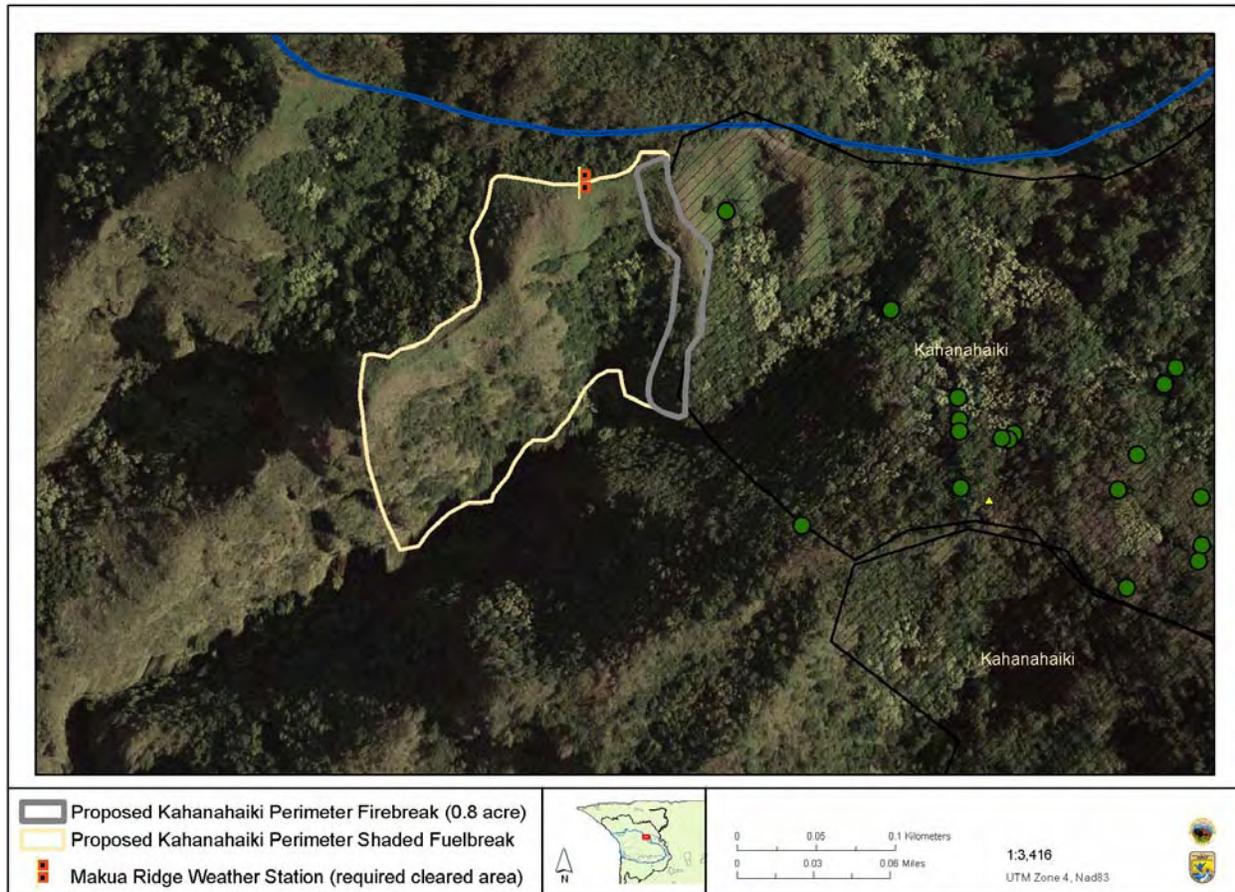


Figure PD 7. Kahanahaiki Management Unit firebreak and fuelbreak alternative treatment areas designed to prevent fires from continuing to breach the northern management unit perimeter.

The three alternative fire protection systems intended to prevent future fires from burning into this area of Kahanahaiki are:

- 1) A new 150-m long, 20-m wide, 0.3 ha (0.8 ac) firebreak will be established and maintained. The new firebreak will run along the outside of existing management unit perimeter fence line. The firebreak would be kept free (less than one percent cover) of live and dead grass and shrub fuels. The firebreak will be maintained with one or more methods, which may include herbicide, hand tools, shade fabric, or permanent barrier installation.
- 2) A new sprinkler system will be installed to deliver a spray of water to the 150-m long, 20-m wide (0.3 ha (0.8 ac) area running along the outside of the Kahanahaiki Management Unit fence line. The sprinkler system would be activated when the site is threatened by fire and would provide one-half inch of precipitation on the vegetated area per hour.
- 3) Grass will be controlled, and shrubs and trees will be reestablished on the 3-ha (7.3-ac) area within 200 m of the Kahanahaiki Management Unit perimeter (Figure PD 8) to

create a shaded fuelbreak. Grass cover will be reduced to less than 20 percent cover over each square meter (10.8 square feet) in the shaded fuelbreak.

The rest of the western edge of Kahanahaiki, and the elepaio critical habitat in this area will be protected from future wildfires utilizing an adaptive management approach. The approach initially selected is the use of aerial herbiciding and shrub seeding to create fuelbreaks to reduce the risk of fire in the management unit area. Two sites, one on the south aspect at the top of C-Ridge and another 40-m (131-ft) wide fuelbreak at the base of steep drainages on the northwest slopes of C-Ridge, were selected for aerial herbicide and shrub seeding treatment. A total of 2.6 ha (5.3 ac) of grass will be treated with aerial herbicide nine times per year. To prevent erosion, the sites will receive aerial seeding with shrub species. The northern site was targeted to prevent fires from spreading rapidly up three main gulches where Oahu elepaio critical habitat and many listed species occur.

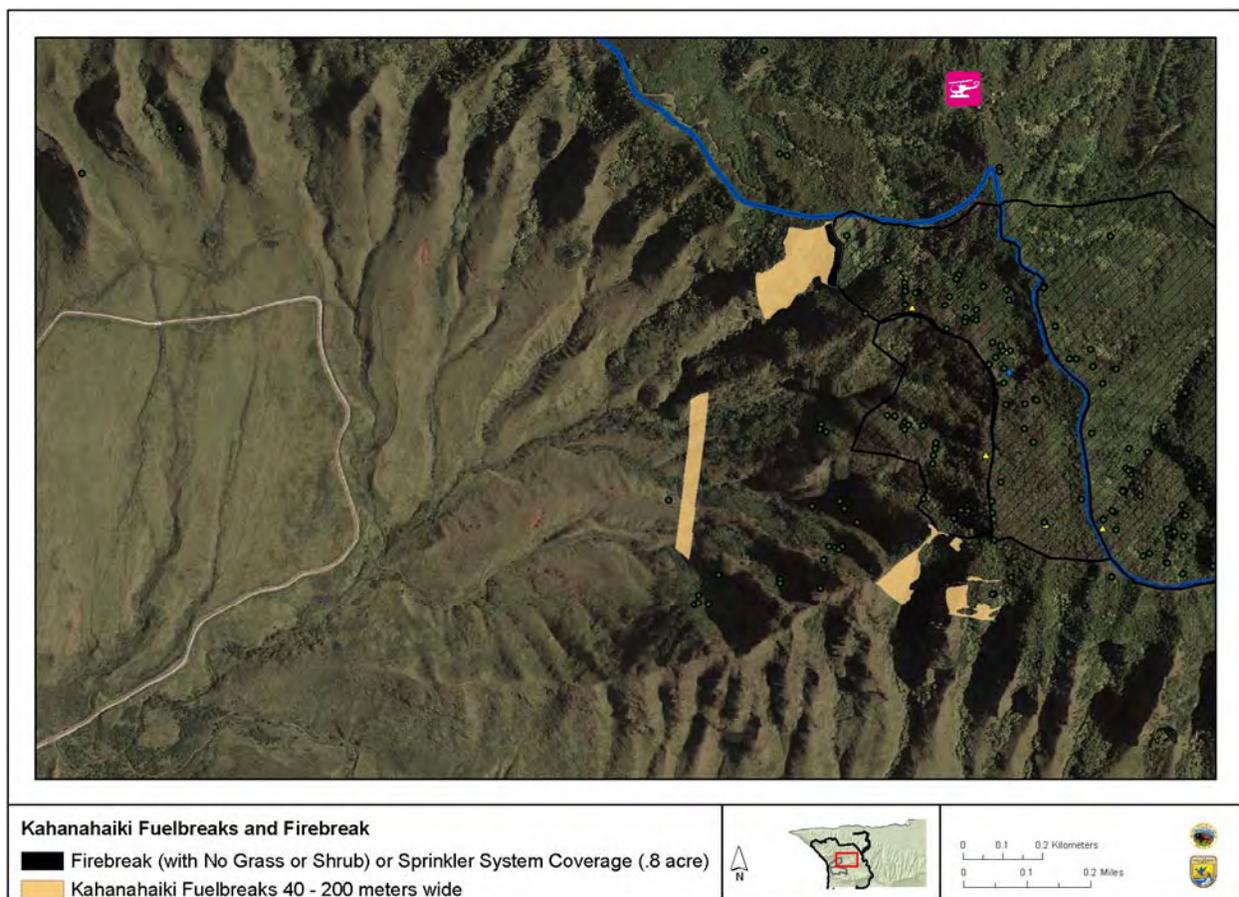


Figure PD 8. Kahanahaiki fuelbreaks and firebreak to reduce fire risk to endangered species and critical habitats from large fires burning outside the firebreak road.

3.1.4.2 Kaluakauila Management Unit and Punapohaku area

A combination of firebreaks and fuelbreaks will protect the Kaluakauila Management Unit. To prevent intense grass fires from burning into the forest, a 6-ha (15-ac), 20-m (66-ft) wide strategic fuelbreak with an integrated firebreak along the southern perimeter of the intact forest vegetation will be established and maintained (Figure PD 9). To be considered adequately

completed and maintained, all grass within each square meter of the designated fuelbreak area (see Figure PD 9) within 20 m (66 ft) of the current forest edge must be either less than 30 cm (1-ft) tall or must be less than 20 percent cover. A bare mineral soil firebreak, created with a combination of herbicide and hand tools, of sufficient width to halt the spread of fire in the adjacent fuels, will be integrated into the forest edge fuelbreak. It is anticipated that grass cutting and herbicide work will be conducted throughout the years following the completion of this Biological Opinion so that within five years, the current load of grass fuels is decomposed and the fuelbreak will be operational. The Army is currently seeking funding to restore the grass areas between the ridge and the forest to shrub vegetation. If areas of forest are restored, the 20-m (66-ft) wide fuelbreak, with integrated mineral soil firebreak, would be moved southward, so that restored forest areas will be protected by it. Helispots and permanent safety zones will be established and maintained so that during a large fire, the Kaluakauila forest edge fuelbreak will be safe and accessible for the rapid deployment and on-site patrol and staffing by wildland firefighters, including skilled fireline supervisors and red-carded Army Natural Resources Staff.

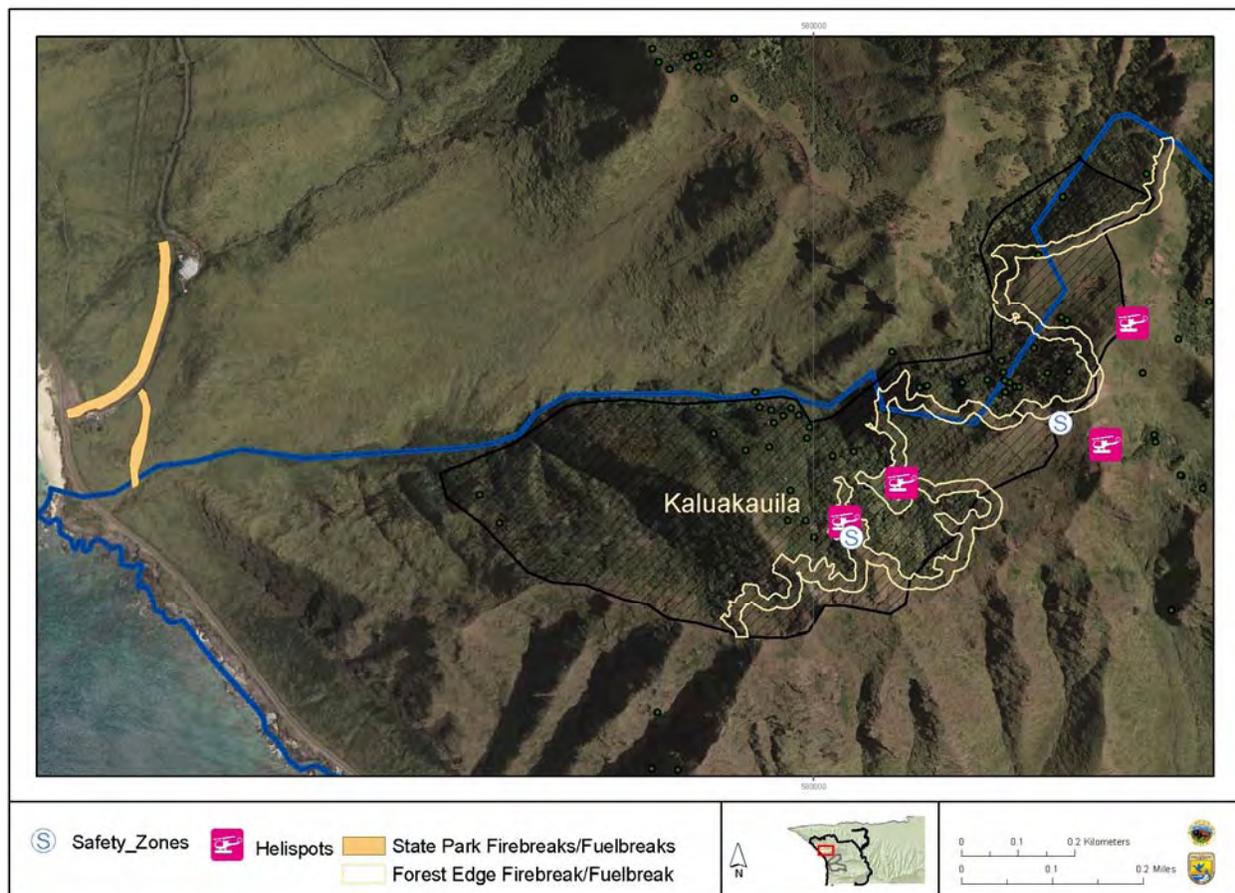


Figure PD 9. Kaluakauila Management Unit fuelbreaks, firebreaks, firefighter's safety zones, and helispots.

An existing road and a historic road on the State land adjacent to the north boundary of Makuā will be improved, given approval of the State, to prevent fires ignited in the vicinity of the public beach from burning into the Kaluakauila Management Unit. The historic road area will be

improved to provide for fire vehicle passage, and grass control conducted along the lower edge of an existing paved road in the Yokohama vicinity will increase the likelihood that firefighters will be able to prevent beach area fires from burning the Kaluakauila Management Unit (see Figure PD 9).

Within five years of the completion of this Biological Opinion, or prior to implementation of Column C weapons restrictions the Army will select and implement one of three alternative measures to further minimize fire impacts to endangered species occurring within and adjacent to the Kaluakauila Management Unit.

The three alternative measures intended to further minimize fire impacts in the Punapohaku area:

- 1) Complete 9 ha (23 ac) of fuel treatment along the interior of the northern portion of the north lobe of the firebreak road and treat 3 ha (8 ac) of area in a historically forested drainage to provide a continuous 60-m (197-ft) wide fuelbreak spanning the valley (Figure PD 10). The 20 m (65.6 ft) immediately inside the firebreak road will be kept shorter than 0.3 m (1 ft) and the total fuel load in the treatment area inside the firebreak road will be maintained at less than 3.5 tons/ac (to avoid spotting). The fuel treatment area inside the firebreak road will be kept cleared of shrubs taller than 0.6 m (2 ft). Fuel treatment may be completed by any means, including mowing, grazing, herbicide treatment, and prescribed burning. Within the portion of the fuelbreak extending from the firebreak road to the valley rim, areas larger than 30 m (98.4 ft) with grass cover greater than 20 percent will be removed with herbicide and aerial seeding with shrub and tree seeds to maintain grass cover less than 20 percent (see Figure PD 10). Approximately 60 percent of the shaded fuelbreak is currently dominated by dense shrub and forest vegetation and 40 percent of the area (3 ha; 7.4 ac) will require fuel treatment.
- 2) Reduce fuel loading on a landscape scale to provide an area for fire suppression resources to more efficiently suppress fires. The location and fuel treatment specifications will be finalized with the written approval of the Service. An example of reduced fuel loading treatment is intensive grazing of a 200-m (656-ft) wide fuelbreak in the vicinity of the north lobe of the firebreak road.
- 3) The Army will work with the Makua Implementation Team to develop protocols to ensure adequate protection for the *Bonamia menziesii*, *Chamaesyce celastroides* var. *kaenana*, *Euphorbia haeleleana*, *Nototrichium humile* and *Schiedea hookeri* growing within and adjacent to Kaluakauila Management Unit. It may be necessary to develop additional measures such as stabilization actions including genetic storage for vulnerable individuals. Strategies may include analysis of genetic variability to determine the extent of seed storage necessary in order to represent the genetic diversity of the plant populations.

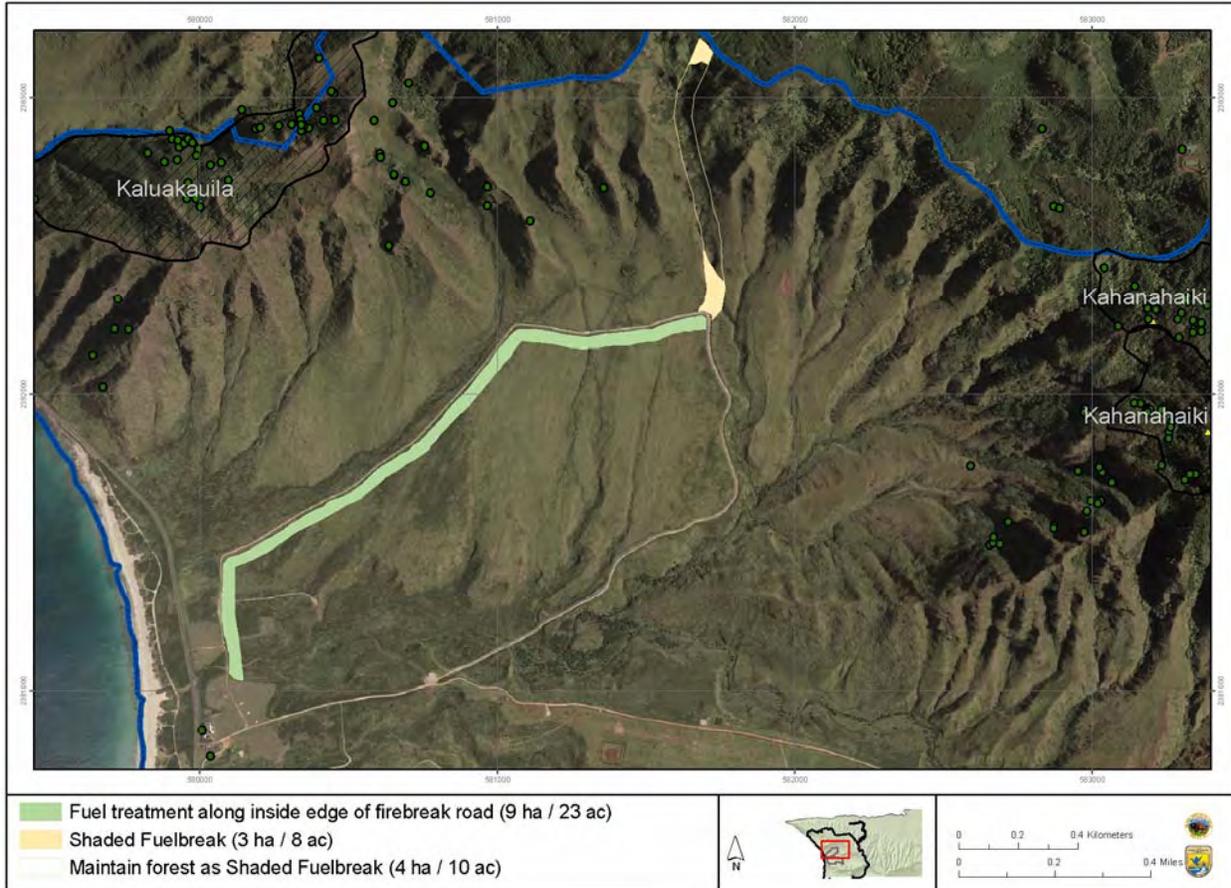


Figure PD 10. Fuel treatment alternative to minimize fire risk to endangered species in the Punapohaku area.

3.1.4.3 Ohikilolo Management Unit

The western tip of the Ohikilolo Management Unit will be protected from a fire burning from the north by a new 60-m (197-ft) wide fuelbreak (Figure PD 11). A grassy cliff area will be protected from fires with a combination of aerial herbicide and shrub seeding work. Work will begin within one year of the completion of this Biological Opinion so that within five years, the fuelbreak will be operational. Alternatives to this fuelbreak, which provide equal or greater protection to the 1,000 *Tetramolopium filiforme* plants in this vicinity, may be implemented instead, with the approval of the Service.

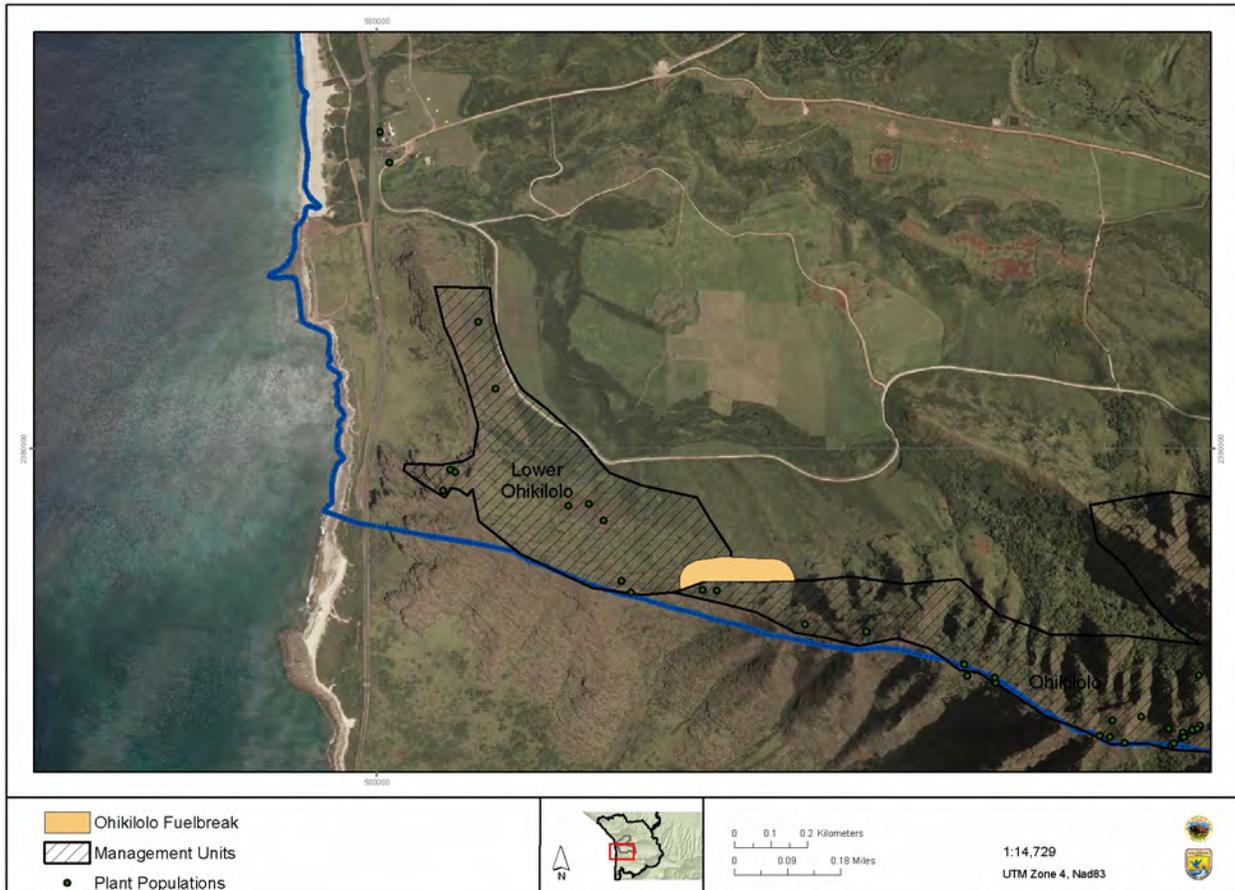


Figure PD 11. Ohikilolo strategic fuelbreak, approximate size and location.

3.2 Firefighting Personnel

A staffing protocol has been developed to ensure that adequate fire suppression resources are assigned to each live-fire training exercise at Makua. Staffing requirements vary by time of year and weapon system in use to ensure that adequate fire suppression force is assigned. During all training exercises when any weapon is being fired (including blanks) and during demolition exercises, Makua will be staffed, at minimum, by five NWCG-qualified, arduous level pack tested, red-carded wildland fire personnel with two Type 6 engines and one water tender. Assigned fire staff will include a minimum of one Type 4 NWCG-Qualified Incident Commander and two Engine Bosses (ENGB). Because the Army does not currently have staff to fill the ENGB positions, Engine Operators (NWCG Type 1 Firefighter with local engine experience) may be substituted for Engine Bosses until January 1, 2009. After January 1, 2009, use of personnel who have not completed NWCG prerequisites of training, experience, task book completion, and arduous level pack testing per PMS 310-1 National Interagency Incident Management System Wildland Fire Qualification System Guide January 2006 (as updated) will only be used to fill the five required NWCG-qualified firefighting staff positions at Makua in limited instances. Wildland firefighters who are unqualified for their assigned positions will demonstrate annual progress toward certification. No more than one of the five fire suppression personnel staffing Makua on any particular shift will be unqualified for their assigned position.