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COUNTY COUNCIL

Pu'u Kukui Watershed Preserve

Water Resource Committee
Response to Chairperson's
Questions 3/15/18
Meeting 3/20/18

Pomaika'i Kaniaupio-Crozier
Maui Land & Pineapple Co. Inc.

Maui County Council Water Resource Committee meeting March 20, 2018

Question 1: Provide a list of your funding sources, including monies received from the county or the state, for invasive species eradication.

As seen in the table below DWS funding over the last several years have fluctuated. FY19 pre-approval award is \$286,203. This leaves a funding gap in our base operation expenses and inhibits our ability to respond to new threats such as Rapid 'Ōhi'a Death or deploy new conservation management methodologies such as hydromulching with native seeds. At this time we would like to be considered for an award increase to \$350,000 for FY19.

Maintaining a fully functional upper watershed ecosystem will provide for on-going daily recharge to the west Maui aquifer and ensure the availability of freshwater for current and future fresh water demands by municipal, commercial, and residential users. Given the current climate change projections by NOAA of drought conditions on the horizon (rain may decrease by 50 percent during El Nino years), it becomes even more important to protect these higher recharge areas such as Pu'u Kukui Watershed for future use.

Name	State/Federal/County/Government/Private/Non-Profit	Amount of Leveraged Funds				
		FY15	FY16	FY17	FY18	FY19
Dept. of Water Supply (Tri-Isle RC&D)	County Funding	\$225,000.00	\$200,000.00	\$300,000.00	\$300,000.00	\$286,203.00
DLNR -Natural Area Preserve Program	State Funding	\$262,274.00	\$283,676.00	\$283,676.00	\$193,000.00	\$200,720.00
Forestry Stewardship Program	State Funding	\$39,290.00	\$40,000.00	\$50,937.50	\$50,937.50	\$36,342.20
US Fish and Wildlife Services			\$55,000.00			
Other	In-kind/Community/Foundations	\$7,900.00	\$14,997.62	\$31,949.74	\$20,000.00 *	\$100,000.00 **
Maui Land & Pineapple Co., Inc.	Private Funding	\$120,000.00	\$120,000.00	\$120,000.00	\$120,000.00	\$120,000.00
*Forecasted **Pending						

List of all Pu'u Kukui Watershed Preserve funding from FY15 to pre-award FY19.



Question 2: Provide a list of your funding sources, including monies received from the county or the state, for invasive species eradication.

The goal of the Pu'u Kukui Watershed Preserve is to actively manage and maintain the native biodiversity of both flora and fauna that make up the intact native forest to provide current and future drinking water source and supply for the Maui County Department of Water Supply.

PKW supports the DWS mission of supplying fresh drinking water for current and future use by protecting the Preserve's intact native forest in four overarching efforts:

1. *Ungulate Control*
2. *Invasive Plant Control*
3. *Biodiversity Protection & Research*
4. *Public Outreach and Education*

Active Management List
Aca Con - <i>Acacia confusa</i> (Formosa Koa)
Albezia sp.
Axi Axi - <i>Axis axis</i> (Axis Deer)
Bus Asi - <i>Buddleja asiatica</i> (Dog tail)
Cli Her - <i>Clidemia hirta</i>
Cya Coo - <i>Cyatea cooperi</i> (Australian Tree Fern)
Oln Tes - <i>Olneya tesota</i> (Iron wood)
Pan Max - <i>Megathyrus Maximus</i> (Guinea grass)
Psi Cat - <i>Psidium cattleianum</i> (Strawberry Guava)
Shi Ter - <i>Schinus terebinthifolius</i> (Christmas Berry)
Spa Cam - <i>Spathodea campanulata</i> (African Tulip Tree)
Sus Scr - <i>Sus scrofa</i> Linnaeus (Wild Boar)
Tib Her - <i>Tibouchina herbacea</i>
Ver Lit - <i>Verbena litoralis</i> (Vervain)



Watch list			
DLNR Hawaii Invasive Species Council recommendation			
NAME	REGULATORY STATUS	NAME	REGULATORY STATUS
Plants		Oriental Bittersweet (<i>Celastrus orbiculatus</i>)	
Albizia (<i>Falcataria moluccana</i>)		Pampas Grass (<i>Cortaderia jubata</i> , <i>selloana</i>)	Hawaii Noxious Weed List
Australian Tree Fern (<i>Cyathea cooperi</i>)		Plume Poppy (<i>Bocconia frutescens</i>)	Hawaii Noxious Weed List
Banana Poka (<i>Passiflora tarminiana</i>)	Hawaii Noxious Weed List	Poison Devil's Pepper (<i>Rauvolfia vomitoria</i>)	
Barbados Gooseberry (<i>Pereskia aculeata</i>)		Princess Tree (<i>Paulownia tomentosa</i>)	
Bingabing (<i>Macaranga mappia</i>)		Purple Toadflax (<i>Linaria purpurea</i>)	
Bishop Wood (<i>Bischofia javanica</i>)		Rubbervine (<i>Cryptostegia</i> sp.)	
Black Wattle (<i>Acacia mearnsii</i>)	Hawaii Noxious Weed List	Ruby grass (<i>Melinis nerviglumis</i>)	
Blessed Milk Thistle (<i>Silybum marianum</i>)		Scotch Broom (<i>Cytisus scoparius</i>)	
Bodhi Tree (<i>Ficus religiosa</i>)		Season Vine (<i>Cissus verticillata</i>)	
Bronze-Leaved Clerodendrum (<i>Clerodendrum quadriloculare</i>)		Smoke Bush (<i>Buddleja madagascariensis</i>)	
Butterfly bush (<i>Buddleja davidii</i>)		Spanish Broom (<i>Spartium junceum</i>)	
Cane Tibouchina (<i>Tibouchina herbageae</i>)	Hawaii Noxious Weed List	Spiked Pepper (<i>Piper aduncum</i>)	Hawaii Noxious Weed List
Cape Ivy (<i>Delaria odorata</i>)		Stranvaesia Photinia (<i>Photinia davidiana</i>)	
Cattail (<i>Typha latifolia</i>)		Strawberry Guava (<i>Psidium cattleianum</i>)	
Cherokee Rose (<i>Rosa laevigata</i>)		Sweet Autumn Clematis (<i>Clematis terniflora</i>)	
Chinese Tallow Tree (<i>Sapium sebiferum</i>)		Tibouchina Genus (<i>Tibouchina</i> sp.)	Hawaii Noxious Weed List
Christmas Berry (<i>Schinus terebinthifolius</i>)		Tree of Heaven (<i>Ailanthus altissima</i>)	
Cissus (<i>Cissus repens</i>)		Tumbleweed/ Russian thistle (<i>Salsola kali</i>)	Hawaii Noxious Weed List
Cogon Grass (<i>Imperata cylindrica</i>)	Hawaii Noxious Weed List	Wax Myrtle (<i>Morella cerifera</i>)	
Common Rush (<i>Juncus effusus</i>)		Vertebrates	
Cotoneaster (<i>Cotoneaster pannosus</i>)		Axis Deer (<i>Axis axis</i>)	
Dahoon Holly (<i>Ilex cassine</i>)		Barn Owl (<i>Tyto alba</i>)	Hawaii Injurious Wildlife
Devil Weed (<i>Chromolaena odorata</i>)	Hawaii Noxious Weed List	Brown Tree Snake (<i>Boiga irregularis</i>)	Hawaii Injurious Wildlife
False Kava (<i>Piper auritum</i>)		Coqui (<i>Eleutherodactylus coqui</i>)	Hawaii Injurious Wildlife
Feathertop Grass (<i>Pennisetum villosum</i>)		Feral cats (<i>Felis catus</i>)	
Feathery Senna (<i>Senna artemisioides</i>)		Jackson's Chameleon (<i>Chameleo jacksonii</i>)	Hawaii Injurious Wildlife
Fire Tree (<i>Morella faya</i>)	Hawaii Noxious Weed List	Mongoose (<i>Herpestes javanicus</i>)	Hawaii Injurious Wildlife
Fireweed (<i>Senecio madagascariensis</i>)	Hawaii Noxious Weed List	Red-masked Parakeet (<i>Aratinga erythrogenys</i>)	Hawaii Injurious Wildlife
Flame Vine (<i>Pyrostegia venusta</i>)		Red-vented Bulbul (<i>Pycnonotus cafer</i>)	Hawaii Injurious Wildlife
Florida Blackberry (<i>Rubus argutus</i>)		Red-whiskered Bulbul (<i>Pycnonotus jocosus</i>)	Hawaii Injurious Wildlife
Fountain Grass (<i>Pennisetum setaceum</i>)	Hawaii Noxious Weed List	Rodents	
French Broom (<i>Genista monspessulana</i>)		Rose-ringed Parakeet (<i>Psittacula krameri</i>)	Hawaii Injurious Wildlife
Giant Reed (<i>Arundo donax</i>)		Snakes	Hawaii Injurious Wildlife
Glory Bush (<i>Tibouchina urvilleana</i>)	Hawaii Noxious Weed List	Ungulates	Hawaii Injurious Wildlife
Gorilla Ogo (<i>Gracilaria salicornia</i>)		Veiled Chameleon (<i>Chameleo calypratus</i>)	Hawaii Injurious Wildlife
Gorse (<i>Ulex europaeus</i>)	Hawaii Noxious Weed List	Invertebrates	
Himalayan Blackberry (<i>Rubus discolor</i>)		Africanized Honeybee (<i>Apis mellifera scutellata</i>)	Hawaii Injurious Wildlife
Himalayan Ginger (<i>Hedychium gardnerianum</i>)		Apple Snail (<i>Pomacea canaliculata</i>)	
Himalayan Raspberry (<i>Rubus ellipticus</i>)	Hawaii Noxious Weed List	Argentine Ant (<i>Linepithema humile</i>)	
Hiptage (<i>Hiptage benghalensis</i>)		Big-headed Ant (<i>Pheidole megacephala</i>)	HDOA Pest for Control
Hookweed (<i>Hypnea musciformis</i>)		Black Twig Borer (<i>Xylosandrus compactus</i>)	HDOA Pest for Control
Ivy Gourd (<i>Coccinia grandis</i>)	Hawaii Noxious Weed List	Coconut Rhinoceros Beetle (<i>Oryctes rhinoceros</i>)	Hawaii Injurious Wildlife
Jerusalem thorn (<i>Parkinsonia aculeata</i>)		Coffee Berry Borer (<i>Hypothenemus hampei</i>)	Hawaii Injurious Wildlife
Kappaphycus Algae (<i>Kappaphycus</i> sp.)		Erythrina Gall Wasp (<i>Quadrastichus erythrinae</i>)	
Long-thorn Kiawe (<i>Prosopis juliflora</i>)	Hawaii Noxious Weed List	Fruit Flies	
Maile pilau (<i>Paederia foetida</i>)		Little Fire Ant (<i>Wasmannia auropunctata</i>)	Hawaii Injurious Wildlife
Mangrove, Red (<i>Rhizophora mangle</i>)		Mosquitos	
Medinilla Genus (<i>Medinilla</i> sp.)		Naio Thrips (<i>Klambothrips myopori</i>)	
Melastoma Genus (<i>Melastoma</i> sp.)	Hawaii Noxious Weed List	Nettle Caterpillar (<i>Darna pallivitta</i>)	Hawaii Injurious Wildlife
Mexican feather grass (<i>Nassella tenuissima</i>)	Federal Noxious Weed	Rat Lungworm (<i>Angiostrongylus cantonensis</i> – parasitic nem)	Hawaii Department of Health
Mexican Flame Vine (<i>Pseudogynoxys chenopodioides</i>)		Red Imported Fire Ant (<i>Solenopsis invicta</i>)	Hawaii Injurious Wildlife
Miconia (<i>Miconia calvescens</i>)	Hawaii Noxious Weed List	Small Hive Beetle (<i>Aethina tumida</i>)	Hawaii Injurious Wildlife
Molucca Raspberry (<i>Rubus sieboldii</i>)	Hawaii Noxious Weed List	Snowflake Coral (<i>Carijoa riisei</i>)	
Mule's Foot Fern (<i>Angiopteris evecta</i>)		Tropical Fire Ant (<i>Solenopsis geminata</i>)	
Mullein (<i>Verbascum thapsus</i>)	Hawaii Noxious Weed List	Varroa Mite (<i>Varroa destructor</i>)	Hawaii Injurious Wildlife
Mysore Raspberry (<i>Rubus niveus</i>)	Hawaii Noxious Weed List	Pathogens and Diseases	
New Zealand Flax (<i>Phormium tenax</i>)		Banana bunchy top virus (<i>Babuvirus banana bunchy top virus</i>)	HDOA Pest for Control
Night Blooming Jasmine (<i>Cestrum</i> sp.)		'Ōhi'a rust (<i>Puccinia psidii</i>)	
Nile Tulip (<i>Markhamia lutea</i>)		Rapid 'Ōhi'a Death, ROD (<i>Ceratocystis fimbriata</i>)	
		West Nile Virus (<i>West Nile Virus</i>)	

Question 3: For the same three-year period, provide a list of organizations that received funding or compensation from your watershed partnership for invasive species eradication efforts and the amounts paid or provided for each organization.

All invasive species prevention, eradication, and outreach is done in house by PKW staff as well as volunteers and community members (in-kind).

Date	Activity	Man hours	Volunteer Hours	Partner Hours
2015	Fence Work Construction	1077		
	Fence Work Maintenance	274		
	Weed Control	36		
	Ungulate Control	1077		
	Transect and Threat Monitoring	340		
	Predator Control	92		
	2016	Fence Work Construction	1515	
Fence Work Maintenance		430		40
Weed Control		476	440	20
Ungulate Control		880		
Transect and Threat Monitoring		500		40
Predator Control		0		191
2017		Fence Work Construction	1240	
	Fence Work Maintenance	490	20	260
	Weed Control	2070	5022	548
	Ungulate Control	680	20	10
	Transect and Threat Monitoring	250	20	40
	Predator Control	90	30	221

This is not a comprehensive list of all activities funded by the DWS but a snap shot of work directly pertaining to this question.

Though invasive species eradication is an important aspect to watershed management it is also important to manage our resources on an ahupua'a and moku level. It takes 25 years for an Ohi'a tree to capture one single raindrop, it drip though its roots, get filtered through dikes, and recharge our aquifer. The effort and funding that we invest today provides for our children and grandchildren. PKW takes this holistic approach to Ahupua'a management and prioritizes reforestation, preserving our intact ecosystems, invasive species exclusion, eradication, and providing access to these resources so that there is reciprocity between kanaka and 'āina/honua.



In 2017 we made a concerted effort to engage the community in restoration efforts and highlight the partnership we have with Maui County, DLNR, other watershed partnerships, and the community. This project took on the kuleana of planting a forest for our mo'opuna (grandchildren). In conjunction with the Polynesian Voyaging Society and Hokule'a's Malama Honua Voyage and Mahalo Sail around the state, Pu'u Kukui Watershed Preserve organized the Ola O Maui Nui Event in which 500 people came to Pu'ukukui to plant 2.5 acres of Hawaiian Mesic Forest in three hours. The Pu sounded, everyone planted, and a forest was born.



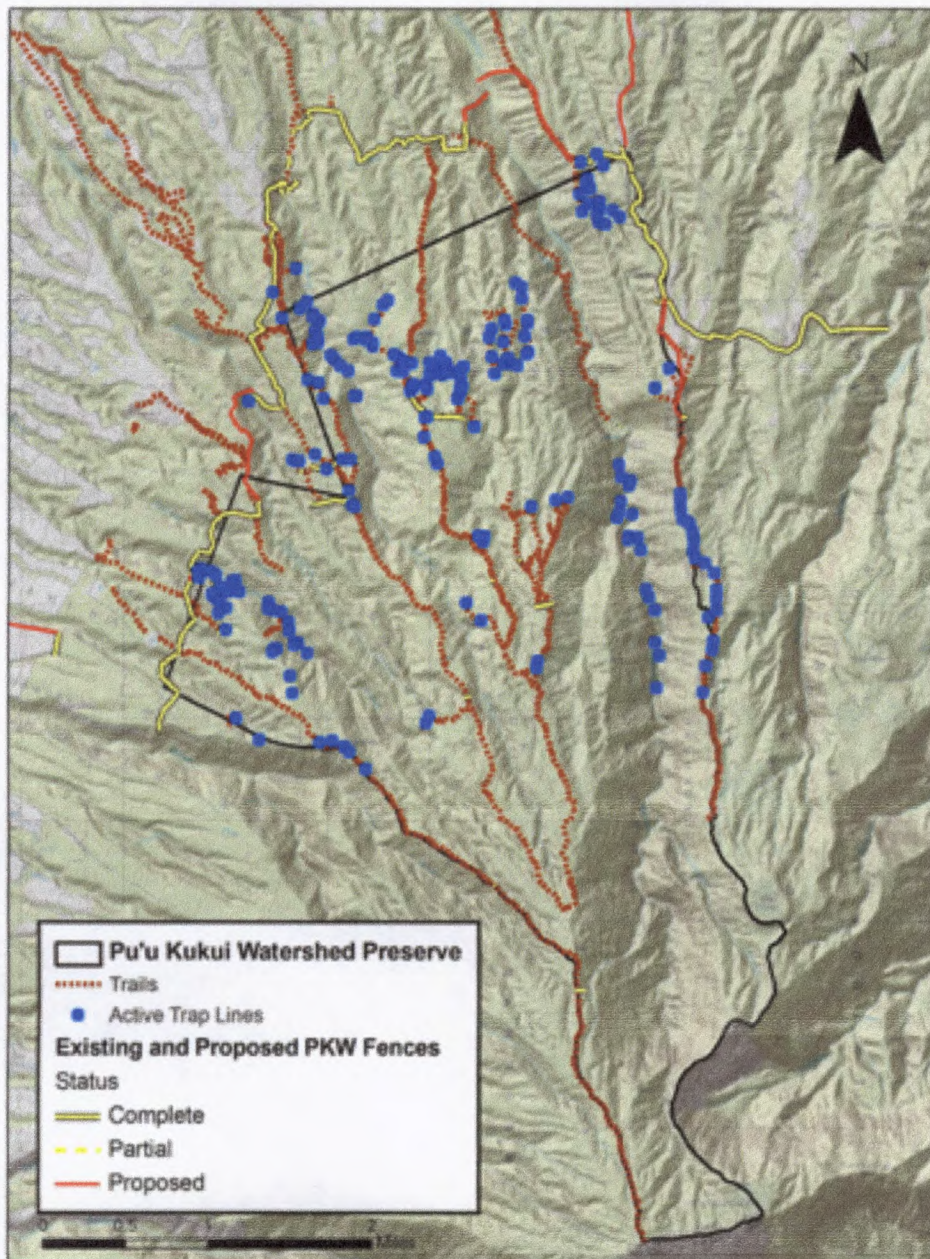
Keiki planting a canoe" (Koa tree). photo by Herb Coyle



500 volunteers plant 2.5 acres of Hawaiian Mesic Forest in Honolua. Colored flaggings correspond to a native tree species. photo by Herb Coyle

Question 4: For Question No. 3, provide a brief description of the work done or services rendered.

PKW staff control ungulates primarily through fencing and trapping. Fencing is the first line of defense by preventing ungulates from entering the preserve and degrade the water shed by uprooting vegetation, causing erosion, and transporting weeds. The second line of defense is trapping to control ungulates. Approximately 2,400 traps are maintained in the preserve. Traps are checked at regularly timed intervals to ensure the traps continue to be effective. PKW staff responds accordingly to new signs of ungulate activity by increasing the number of traps in the management unit. Collecting data and maintaining a database of traps enables us to track ungulate activity and captures. All trap locations and captures are mapped.



Question 5: For the requests below, please provide a matrix summarizing your eradication efforts for the prior three years. Include in the matrix the following information:

- a. For each invasive species addressed by your program, indicate the number of infestations reported to you.
- b. For each infestation, indicate the date you were notified of the infestation, the location and approximate size of each infestation, and the population of the infestation and area of coverage.
- c. For each infestation, indicate the eradication method used— that is, whether a mechanical or chemical method was used.
- d. Whenever mechanical methods were used, describe the method, personnel employed, hours expended, and period of treatment.
- e. Indicate the person or persons who supervised the chemical application; their certification or license with the State of Hawaii to apply pesticides or herbicides, if applicable; whether restricted pesticides or herbicides were used; and the name of the person or persons applying the chemicals.
- f. For each infestation, indicate the date treatment began and was completed at each site. Indicate if the infestation and treatment are ongoing.
- g. For each infestation, indicate whether the infestation has been completely resolved and if so, the date it was resolved.



Summit of Pu'ukukui

(DWS FY summaries)	Removal Method		2015	2016	2017
Ungulate Fence instalation and Construction		meters	241	513	650
Ungulate fence monitoring and maintenance		meters	19,351	19,864	20,514
Psi Cat - <i>Psidium cattleianum</i> (Strawberry Guava)	Handsaw	removed	50	11	293
Tib Her - <i>Tibouchina Herbacea</i>	Hand (manual)	removed	2500	220	2072
Ver Lit - <i>Verbena litoralis</i> (Vervain)	Hand (manual)	removed			50
Cli Her - <i>Clidemia Hirta</i>	Hand (manual)	removed	40	1522	526
Oln Tes - <i>Olneya tesota</i> (Iron wood)	Chainsaw	removed			350
Aca Con - <i>Acacia confusa</i> (Formosa Koa)	Handsaw/Chainsaw	removed			110
Albezia sp.	Handsaw/Chainsaw	identified		11	12
Spa Cam - <i>Spathodea campaunulata</i> (African Tulip)	Handsaw	removed			9
Pan Max - <i>Megathyrsus Maximus</i> (Guinea grass)	Weedeater/herbicide	acres	20	23	27
Bus Asi - <i>Buddleja asiatica</i> (Dog tail)	Hand	removed			6
Shi Ter - <i>Schinus terebinthifolis</i> (Christmas Berry)	Hand/Handsaw	removed			5
Cya Coa - <i>Cyatea Cooperi</i> (Australian Tree Fern)	Machete	removed	2	4	
Pha Tan - <i>Phacelia Tanacetifolia</i>	Hand	removed			12
Cin Bur - <i>Cinnamomum burmannii</i>	Handsaw/Chainsaw	removed			11
<i>Andraogon virginicus</i>	Handsaw/Weedeater	removed			6
<i>Pasidium guajava</i>	Handsaw	removed			2
<i>Zingiber zerumbet</i>	Machete	removed			1
Sus Scr - <i>Sus scrofa</i> Linnaeus (Wild Boar)	Trap/Snare	removed	32	84	129
Traps Checked		traps	2057	2057	2057
Axi Axi - <i>Axis axis</i> (Axis Deer)		removed			
Total Glyphosate used YTD		gallons	5	6.7	7
Total Pre-Emergent used YTD		gallons			1.1
Manual weed Control, (Staff)		man hrs	36	476	2070
Manual weed Control, (Volunteer)		man hrs		440	5022
Manual weed Control, (Partner)		man hrs		20	548

All management activities are ongoing and supervised by Conservation Manager Pōmaika'i-Kaniaupio Crozier including chemical application and storage. Pu'u Kukui maintains a crew of 7 staff and looks forward to continuing management efforts with the support of Maui County and the Department of Water Supply. Mahalo for all that you do for our future generations