APPENDIX D Lana'i Species

Appendix D-2

# HAWAIIAN ISLANDS ANIMALS: Updated September 10, 2009

LISTED SPECIES, AS DESIGNATED UNDER THE U.S. ENDANGERED SPECIES ACT

		DISTRIBUTION						
Species status by island: E=endangered; T=threatened; (CH)=critical habitat designated; P=proposed. N.W. Hawaiian Islands: <u>Frigate; Kure; Laysan; M</u> idway; <u>Necker, Nihoa; PH</u> = Pearl & Hermes	STATUS	Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands, <u>Ka</u> ho'olawe, <u>Ni'ihau, or Q</u> ceanic

#### VERTEBRATES (39 Endangered + 4 Threatened = 43 taxa)

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#### LISTED MAMMALS (4 Endangered taxa)

Lasiurus cinereus semotus	Bat, Hawaiian hoary; 'Õpe'ape'a	E	x	x			x	x	
Megaptera novacangliae	Whale, humpback; Koholä	E	x	x	x	x	x	x	0
Monachus schauinslandi (CH)	Hawaiian monk seal; Tlio-holo-i-ka-uaua	E	x	x	x	x	x	x	N.W. islands
Physeter macrocephalus	Whale, sperm; Palaoa (uncommon)	E							0

#### LISTED BIRDS (33 Endangered + 1 Threatened = 34 taxa; 2 Proposed Endangered)

Acrocephalus familiaris kingi	Millerbird, Nihoa	E							Nihoa
Anas laysanensis	Duck, Laysan	E							M, L
Anas wyvilliana	Duck, Hawaiian; Koloa maoli	E	x	x			x	X	
Branta sandvicensis	Goose, Hawaiian; Nënë	E	x	x		x		x	
Buteo solitarius	Hawk, Hawaiian; 'lo	E	x						
Chasiempis sandwichensis ibidis (CH)	'Elepaio, O'ahu	E					x		
Corvus hawaiiensis	Crow, Hawaiian; 'Alalā	E	x						:
Fulica alai	Coot, Hawaiian; 'Alae ke'oke'o	E	x	x	x	x	x	x	
Gallinula chloropus sandvicensis	Moorhen, Common; Hawiian gallinule; 'Alae 'ula	E	x	x		x	x	x	
Hemignathus lucidus affinus	Nuku pu'u, Maui	E		x					
Hemignathus lucidus hanapepe	Nuku pu'u, Kaua'i	E						x	
Hemignathus munroi	Akia põlā'au	E	x						
Hemignathus procerus	'Akia loa, Kaua'i	E						x	
Himantopus mexicanus knudseni	Stilt, Black-necked; Hawaiian stilt; Ae'o	E	x	x	x	x	x	x	Ni'ihau
Loxioides bailleui (CH)	Palila	E	x						
Loxops caeruleirostris (pCH)	'Äkepa, Kauai; Akekee	PE						x	
Loxops coccineus coccineus	'Ākepa, Hawai'i	Е	x						
Loxops coccineus ochraceus	'Ākepa, Maui	E		x					

						DISTRIBUTI	ION	T	
Species status by island: E=endangered; T	"=threatened; (CH)=critical habitat designated; P=proposed.	STATUS	Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands, <u>Ka</u> ho'olawe, <u>Ni'ihau,</u> or <u>O</u> ceanic
N.W. Hawanan Islands: Frigate; Kure; Lay	Polyuli	E		x					
Melamprosops phaeosoma		E						x	
Moho braccatus	0'5, Kaua'i; '0'5 a'a	E		ļ				-	
Myadesxes lanaiensis ruxha	Thrush, Moloka'i; Oloma'o	E				X			
Myadestes myadestinus	Thrush, Large Kaua'i; Kāma'o	E						X	
Myadestes palmeri	Thrush, Small Kaua'i; Puaiohi	E						X	
Oeromystis bairdi (pCH)	Creeper, Kauai; Akikiki	PE						x	
Oreomystis mana	Creeper, Hawai'i	E	x						
Palmeria dolei	Honeycreeper, Crested; 'Ākobekohe	E		x					
Paroreomyza flammea	Creeper, Moloka'i; Käkäwahie	E				x			
Phoebastria albatrus	Albatross, Short-tailed	E							1/1
Paroreomyza maculata	Creeper, O'ahu; O'ahu 'Alauahio	E					x		_
Pseudonestor xanthophrys	Parrotbill, Maui	E		x					
Psittirostra psittacea	Ōʿū	E	x					x	
Pterodroma phaeopygia sandwichensis	Petrel, Dark-rumped; Hawaiian Petrel; 'Ua'u	E	x	x	x			X	
Puffinus auricularis	Shearwater, Newell's	Т	x				×	X	
Telespyza cantans	Finch, Laysan	E							L
Telespyza ultima	Finch, Nihoa	E				<u> </u>			Niñoa

LISTED REPTILES (2 End	angered + 3 Threatened = 5 taxa)		· · · · · · · · · · · · · · · · · · ·		1	1		1	O+all islands
Careita caretta	Turtle, Loggerhead sea; (incidental in Hawai'i)	Т	x	x	x	X	X	<u>^</u>	O Tur Islando
	Turtle Green sea: Honu	т	x	x	x	x	x	x	O+all islands
Chelonia mydas	ratie, oreen sea, none						x	x	O+all islands
Dermochelys coriaceae	Turtle, Leatherback sca; (incidental in Hawai'i)	Е	x	×	^	^			Quillistanda
Enstwood alum imbrigata	Turtle Hawksbill: 'Ea	E	x	x	x	x	x	X	0+all islands
Ereimochetys imoricata			+	+ <u>,</u>	x	x	x	x	O+all islands
Lepidochelys olivacea	Turtle, Olive ridley sea; (incidental in Hawai'i)		<u> </u>	^	<u> </u>		1	L	l

# INVERTEBRATES (55 Endangered +2 Threatened = 57 taxa)

#### LISTED SNAILS (41 Endangered + 1 Threatened = 42 taxa)

Achatinella abbreviata	Snail, O'ahu tree; Pupu kani oe	E		 	 x	 
Achatinella apexfulva	Snail, O'ahu tree; Pupu kani oe	E	<u> </u>		 X	

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			DISTRIBUTION						
Species status by island: E=endang	ered; T=threatened; (CH)∞critical habitat designated; P=proposed. re: Laysan: Midway: Necker: Nihoa: PH = Pearl & Hermes	STATUS	Hawai'i	Maui	Lâna'i	Molok¤'i	Oʻahu	Kaua'i	N.W. Islands, <u>Ka</u> ho'olawe, <u>Ni'ihau,</u> or <u>O</u> ceanic
Achatinella bellula	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella buddii	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella bulimoides	Snail, O'ahu tree; Pupu kanî oe	E			1		x		
Achatinella byronii	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella caesia	Snail, O'ahu tree; Pupu kani oe	-E					x		
Achatinella casta	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella cestus	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella concavospira	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella curta	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella decipiens	Snail, O'ahu tree; Pupu kani oc	E					X		
Achatinella decora	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella dimorpha	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella elegans	Snail, O'ahu tree; Pupu kani oe	Е					x		
Achatinella fulgens	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella fuscobasis	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella juddii	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella juncea	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella lehuiensis	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella leucorrhaphe	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella lila	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella livida	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella lorata	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella mustelina	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella papyracea	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella phaeozona	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella pulcherrima	Snail, O'ahu trce; Pupu kani oe	E					x		
Achatinella pupukanioe	Snail, O'ahu tree; Pupu kani oe	E					x	ļ	
Achatinella rosea	Snail, O'ahu tree; Pupu kani oe	E					x		
Achatinella sowerbyana	Snail, O'ahu tree; Pupu kani oe	E					x	ļ	
Achatinella spaldingi	Snail, O'ahu tree; Pupu kani oe	E		l			x	<u> </u>	

DISTRIBUTION								
d; T=threatened; (CH)=critical habitat designated; P≈proposed.	STATUS	Hawai'i	Маці	Lāna'i	Moloka'i	Oʻahu	Kaua'i	N.W. Islands, <u>Ka</u> ho'olawe, <u>Ni'ihau</u> , or <u>O</u> ceanic
Snail. O'ahu tree: Pupu kani oe	E		1			x		
Snail, O'ahu tree: Pupu kani oe	E		<u> </u>	1		x		
	E					x		
Snail, Oahu tree; Pupu kani de			· · ·					
Snail, O'ahu tree; Pupu kani oe	E			<u> </u>				
Snail, O'ahu tree; Pupu kani oe	E					x		
Snail, O'ahu tree; Pupu kani oe	Е					X	<u> </u>	
Snail, O'ahu tree; Pupu kani oe	E					×	 	
Snail, O'ahu tree; Pupu kani oe	E					x		
Snail O'ahu tree: Pupu kani oe	E		1			x		
Snail, Newcomb's; Pupu wai lani	T T		1				x	
	<ul> <li>:d; T=threatened; (CH)=critical habitat designated; P=proposed. Laysan; Midway; Necker; Nihoa; PH = Pearl &amp; Hermes</li> <li>Snail, O'ahu tree; Pupu kani oe</li> </ul>	xd; T=threatened; (CH)=critical habitat designated; P=proposed.       STATUS         Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes       E         Snail, O'ahu tree; Pupu kani oe       E </td <td>xd; T=threatened; (CH)=critical habitat designated; P=proposed.       STATUS       Hawai'i         Laysan; Midway; Necker; Nihoa; PH = Pearl &amp; Hermes       E         Snail, O'ahu tree; Pupu kani oe       E         Snail, O'ahu tree; Pupu kan</td> <td>xd; T=threatened; (CH)=critical habitat designated; P=proposed.       STATUS       Hawai'i       Maui         Laysan; Midway; Necker; Nihoa; PH = Pearl &amp; Hermes       E      </td> <td>Xd; T=threatened; (CH)=critical habitat designated; P=proposed. Laysan; Midway; Necker; Nihoa; PH = Pearl &amp; Hermes       STATUS       Hawai'i       Maui       Lāna'i         Snail, O'ahu tree; Pupu kani oe       E      </td> <td>xd; T=threatened; (CH)=critical habitat designated; P=proposed. Laysan; Midway; Necker; Nihoa; PH = Pearl &amp; Hermes       STATUS       Hawai'i       Maui       Lāna'i       Moloka'i         Snail, O'ahu tree; Pupu kani oe       E      </td> <td>Main       Jana'i       Moloka'i       O'ahu         A: T=threatened; (CH)=oritical habitat designated; P=proposed.       STATUS       Hawai'i       Maui       Lāna'i       Moloka'i       O'ahu         Ausan; Midway; Necker; Nihoa; PH = Pearl &amp; Hermes       E        X         Snail, O'ahu tree; Pupu kani oe       E        X         Snail, O'ahu tree; Pupu kani oe</td> <td>STATUS       Hawai'i       Maui       Lāna'i       Moloka'i       O'ahu       Kaua'i         'd; T=threatened; (CH)=critical habitat designated; P=proposed. Laysan; Midway; Necker; Nihoa; PH = Pearl &amp; Hermes       E       Image: Composed in the composed</td>	xd; T=threatened; (CH)=critical habitat designated; P=proposed.       STATUS       Hawai'i         Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes       E         Snail, O'ahu tree; Pupu kani oe       E         Snail, O'ahu tree; Pupu kan	xd; T=threatened; (CH)=critical habitat designated; P=proposed.       STATUS       Hawai'i       Maui         Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes       E	Xd; T=threatened; (CH)=critical habitat designated; P=proposed. Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes       STATUS       Hawai'i       Maui       Lāna'i         Snail, O'ahu tree; Pupu kani oe       E	xd; T=threatened; (CH)=critical habitat designated; P=proposed. Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes       STATUS       Hawai'i       Maui       Lāna'i       Moloka'i         Snail, O'ahu tree; Pupu kani oe       E	Main       Jana'i       Moloka'i       O'ahu         A: T=threatened; (CH)=oritical habitat designated; P=proposed.       STATUS       Hawai'i       Maui       Lāna'i       Moloka'i       O'ahu         Ausan; Midway; Necker; Nihoa; PH = Pearl & Hermes       E        X         Snail, O'ahu tree; Pupu kani oe       E        X         Snail, O'ahu tree; Pupu kani oe	STATUS       Hawai'i       Maui       Lāna'i       Moloka'i       O'ahu       Kaua'i         'd; T=threatened; (CH)=critical habitat designated; P=proposed. Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes       E       Image: Composed in the composed

#### LISTED ARTHROPODS (14 Endangerd + 1 Threatened = 15 taxa; 3 proposed Endangered)

LISTED ARTHROTODS (14 Endang	Wolfenider Kauni cave	E						x	
Adelocosa anops (CH)	Won spider, Radar care		×	x		1			Ka
Manduca blackburni (CH)	Moth, Blackburn's sphinx	L	^						
Drosophila aglaia (CH)	Picture-wing fly, Oahu	E						<u> </u>	
Drosophila attigua (pCH) (syn.w/D. sharpi)	Picture-wing fly, Kauai	PE							
Drosophila differens (CH)	Picture-wing fly, Molokai	E				X			
Drosophila hemipeza (CH)	Picture-wing fly, Oahu	E					×		
Drosophila heteroneura (CH)	Picture-wing fly, Hawaii	E	x			ļ			
Drosophila montgomeryi (CH)	Picture-wing fly, Oahu	E				<u> </u>	×		
Drosophila mulli (CH)	Picture-wing fly, Hawaii	Т	x					<u></u>	<u> </u>
Drosophila musaphila (CH)	Picture-wing fly, Kauai	E						<u> </u>	
Drosophila neoclavisetae (CH)	Picture-wing fly, Maui	E		x				ļ	
Drosophila obatai (CH)	Picture-wing fly, Oahu	E					×		
Drosophila ochrobasis (CH)	Picture-wing fly, Hawaii	E	x						
Drosophila substenoptera (CH)	Picture-wing fly, Oahu	E					X		<u> </u>
Drosophila tarphytrichia (CH)	Picture-wing fly, Oahu	E					x	_	
Megalagrion nesiotes	Flying earwig Hawaiian damselfly	PE	x	x			ļ		
Megalagrion pacificum	Pacific Hawaiian damselfly	PE	x	x	X	X	×	×	
Spelaeorchestia / na (CH)	Amphipod, Kaua'i cave	E			<u> </u>		<u> </u>	X	<u> </u>

Species status by island: E= endangered; T= threatened; P= formally proposed as E or T; (CH)=critical habitat designated; pCH=critical habitat proposed ;\*=possibly extirpated in the wild.  $\ddagger$ =N.W. Hawaiian Islands: <u>Frigate</u>; <u>Kure</u>; <u>Laysan</u>; <u>M</u>idway; <u>Necker</u>; <u>Nihoa</u>; <u>PH</u> = Pearl & Herrnes.

			1	ISTRIBUTIO	ON		
STATUS	Hawai'i	Maui	Lāna'i	Moloka'i	Oʻahu	Kaua'i	N.W. Islands <u>;</u> , <u>Ka</u> ho'olawe, and <u>Ni'ihau</u>

# LISTED PLANTS (285 Endangered, 10 Threatened; 45 proposed Endangered)

Abutilon eremitopetalum	No common name	Ε			~				
Abutilon menziesii	Koʻoloa'ula	E	· · · · · · · · · · · · · · · · · · ·		1				
Abuilon sandwicense (CH)	No common name	E					✓ СН		
Acaena exigua	Liliwai	E		<b>/</b> *				√*	
Achyranthes mutica (CH)	No common name	E	✓ CH					√×	
Achyranthes splendens var. rotundata	Hinahina ewa	E			¥*	/*	1		
Adenophorus periens (CH)	No common name	E	√СН		√*	√СН	√*СН	√сн	
Alectryon macrococcus var. auwahiensis (CH)	Mahoe	E		√сн					
Alectryon macrococcus var. macrococcus (CH)	Mahoe	E		√сн		√СН	√СН	√сн	
Amaranthus brownii (CH)	No common name	E							Nihoa CH
Argyroxiphium kauense (CH)	'Ahinahina, Ka'u silversword	E	√СН						
Argyroxiphium sandwicense ssp. macrocephalum (CH)	'Ahinahina, Haleakala silversword	r		√СН					
Argyroxiphium sandwicense ssp. sandwicense	'Ahinahina, Mauna Kea	E							
Asplenium peruvianum var. insulare (CH) (listed as Asplenium fragile var. insulare)	No common name	E	√СН	√СН					
Astelia waialealae	painiu	PE						pCH	
Bidens micrantha ssp. kalealaha (CH)	Koʻokoʻolau	E		√СН	∕сн				
Bidens wiebkei (CH)	Koʻokoʻolau	E				√сн			
Bonamia menziezii (CH)	No common папе	E	√СН	√Сн	· ·	√*	√Сн	√сн	
Brighamia insignis (CH)	Olulu	Е						√СН	Niihau*CH
Brighamia rockii (CH)	Pua 'ala	E		✓°СН	<b>√</b> *	√СН			
Caesalpinia kavaiensis	Uhiuhi	E	1	√*	√ <b>*</b>		· ·	√* 	
Canavalia molokaiensis (CH)	'Awikiwiki	Ε				√СН			
Canavalia napaliensis	Awikiwiki	PE						pCH	
Cenchrus agrimoniodes var. agrimonioides (CH)	Kamanomano	E	<b>√</b> *	√сн	√* 		√сн		
Cenchrus agrimonioides var. laysanensis	Kamanomano	E							L*, K*, M*
Centaurium sebacoides (CH)	'Awiwi	E		√сн	· ·	√СН	√СН	√сн	
Chamaesyce celastroides var. kaenana (CH)	`Akoko	E					√сн		
Chamaesyce deppeana (CH)	Akoko	E					√сн		
Chamaesyce eleanoriae	'Akoko	PE						рСН	
Chamaesyce halemanui (CH)	'Akoko	E						√сн	
Chamaesyce herbstii (CH)	*Akoko	Б				<u> </u>	√CH		1

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# HAWAIIAN ISLANDS PLANTS: Updated April 9, 2009

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والمراجعة معاملة الأبيان متعامل الرابي المربو الترابي المتعاد والمراجع والمتعامل ومعاملاتها والمتحال والمتحار والمتحد

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LISTED SPECIES, AS DESIGNATED UNDER THE U.S. DADA					1	DISTRIBUTIO	ON		
se di secondo de la compañía de la c	ased as E or T'	STATUS	Howaii	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islandst. Kaboʻolawe, and Ni'lhau
Species status by island: E= endangered; 1= inreatened; F- tormany prop (CH)=critical habitat designated; pCH=critical habitat proposed; *=possibly with the total to the total to the total to the total to the total total total to the total	PH = Pearl & Hermes.		riawati	maa			(21)		
2=N.W. Hawanan Islands: Frigate, Kure, Laysan, Midway, Meeker, Midway,	`Akoko	· E					√СН		
Chamaeswee remvi var. kauaiensis	Akoko	PE						pCri	
Chamaosuro remui var remui	'Akoko	PE						pCH	
Cinnunger ve rackii (CH)	'Akoko	E					₹CH		
Chamaesyce statisheroji var. kalaeloana (listed as Euphorbia skottsbergii var. kalaeloana)	'Akoko	E					×		
Charneyiera densiflara	Papala	PE			1		<u> </u>	рсн	
Clemonia drenauomorulia (CH)	'Oba wai	3	✓CH					<u> </u>	
Clermonia a Ganone p. (Ch)	`Oha wai	E	√сн	√СН			<u> </u>		
Clemantia ablavatalia ssp. breviges (CH)	'Oha wai	E				√CH			
Clermonia oblongifalia ssp. maujensis (CH)	'Oha wai	E		√СН	¥*				
Clermontia veleana sso, veleana (CH)	'Oha wai	E	√сн		1			<u></u>	
Clermontia peleana ssp. singuliflora (CH)	'Oha wai	E	√*СН		<u> </u>			<u> </u>	
Clermontia pyrularia (CH)	'Oha wzi	E	√СН						
Clermontia samuelii ssp. hanaensis (CH)	'Oha wai	E		√СН				<u> </u>	
Clermontia samuellii ssp. samuelii (CH)	'Oha wai	E		√СН					
Colubrina oppositifolia (CH)	Kauila	E	√СН	✓СН			JCH	/*CH	
Ctenitis squamigera (CH)	Рацоа	E		√СН			VCH		
Cyanea acuminata (CH)	Haha	E						√CH	
Cyanca asarifolia (CH)	Haha	E							
Cyanea copelandii ssp. copelandii	Haha	E	~*	(611					
Cyanea copelandii ssp. haleakalaensis (CH)	Haha	E					√сн		
Cyanea crispa (CH)	Haha	E					_	PCH	
Cyanea dolichopoda	Haha	PE				√сн			
Cyanea dunbariae (CH)	Haha	E	<u> </u>	_ <u>_</u>				pCH*	
Cyanen electeensis	Haha	PE		1/04					
Cyanea glabra (CH)	Haha							+	
Cyanea grimesiana ssp. grimesiana (CII)	Haha	E					- СН		
Cyanea grimesiana ssp. obatae (CH)	Haha								
Cyanea hamatiflora ssp. carlsonii (CH)	Haha	E		ХСН					
Cyanea hamatiflora ssp. hamatiflora (CII)	Haha		_				√сн		
Cyanea humboldiiana (CH)	Flaha	Ľ				<u> </u>		pCH*	
Cyanea kolekoleensis	Haha	re					√сн		
Cyanea koolauensis (CH)	Haba							pCH*	•
Cyanea kuhihewa	Haha		+ -						
Cyanea lobata SSP. ii (listed as Cyanea lobata )	Haha								l

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			DISTRIBUTION							
Species status by island: E= endangered; T= threatened; P= formally proposed as E or T; (CH)=critical habitat designated; pCH=critical habitat proposed ;*=possibly extirpated in the wild. ±=N.W. Hawaijan Islands: Frigate; Kure; Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes.		STATUS	Hawai'i	i'i Maui	Läna'i	Moloka'i	Oʻahu	Kaua'i	N.W. Islands‡, Kaho'olawe, and <u>Ni'ihar</u>	
Cyanea lobata ssp. lobata (listed as Cyanea lobata ) (CH)	Haha	E		✓ СН						
Cyanea longiflora (CH)	Haba	E					√СН			
Cyanea macrostegia ssp. gibsonii	Haha	E			1					
Cyanea magnicalyx (listed as Cyanea grimesiana ssp. grimesiana ) (CH)	Haha	E		√СН						
Cyanea mannii (CH)	Haha	E				√СН				
Cyanea maulensis (listed as Cyanea grimesiana ssp. grimesiana )	Haha	E	]	√ <b>*</b>						
Cyanea mceldowncy (CH)	Haha	Ē		√сн						
Cyanea munroi ( listed as Cyanea grimesiana ssp. grimesiana ) (CH)	Haha	E				√СН		1		
Cyanea pinnatifida (CH)	Haha	E					√СН			
Cyanea platyphylla (CH)	'Aku'aku	E	√СН				<u> </u>	<u> </u>		
Cyanea procera (CH)	Haha	E				√СН				
Cyanea recta (CH)	Hoba	Т						<b>С</b> Н		
Cyanea remyi (CH)	Haha	Е						√сн		
Cyanea rivularis (listed as Delissea rivularis ) (CH)	No common name?	E						√сн		
Cyanea sulicina (listed as Cyanea recta ) (CH)	Haha	Т						√Сн		
Cyanca shipmanii (CH)	Haha	E	✓CH							
Cyanea stjohnii (CH)	Haba	E					√СН			
Cyanea stictophylla (CH)	Haba	E	√СН				L			
Cyanea superba ssp. regina (CH)	Haha	E					√*СН			
Cyanea superba ssp. superba (CH)	Haha	E					√сн			
Cyanea truncata (CH)	Haha	E		1			√СН			
Cyanea undulata (CH)	Haha	E	<u> </u>					√сн		
Cyperus fauriei (CH)	No common name	E	√сн		/=	√СН		1		
Cyperus pennatiformis ssp. bryanii (CII) (listed as Mariscus pennatiformis)	No соттов ванс	E							L CH	
Cyperus pennatiformis ssp. pennatiformis (CH) (listed as Mariscus pennatiformis)	No common name	E		√сн			√*CH	✓*CH		
Cyperus trachysanthos (CII)	Pu'uka'a	E			¥*	V*	√сн	✓CH	Niihau *	
Cyrtandra crenata	Ha'iwale	E					*			
Cyrtandra cyaneoides (CH)	Mapele	E						√СН		
Cyrtandra dentata (CH)	Ha'iwale	E					√сн			
Cyrtandra giffardii (CU)	Ha`iwale	E	√СН				<u> </u>			
Cyrtandra kealiae ssp. kealiae (listed as Cyrtandra limahuliensis )(CH)	Fla`iwale	т						√Сн		
Cyrtandra munroi (CH)	Ha`iwale	E	ļ	√СН		1	ļ			
Cyrtandra oenobarba	Ha`iwale	PE	L					pCH		
Cyrtandra paliku	Ha'iwale	PE	<u> </u>	<u> </u>	ļ		1011	pCH		
Cyrtandra polyantha (CH)	Ha'iwale	E		<u> </u>	<u> </u>		CH			

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			DISTRIBUTION						
Species status by island: E= endangered; T= threatened; P= formally prop (CH)=critical habitat designated; pCH=critical habitat proposed;*=possibly	posed as E or T; extirpated in the wild. PU = Peorl & Hermes	STATUS	Hawai'i	Maui	Lūna'i	Moloka'i	O'ahu	Kaua'i	N.W. Isla <b>rds‡.</b> <u>Ka</u> ho'olawe, and <u>Nijiha</u> u
;=N.W. Hawaiian Islands: Frigate; Kure; Laysan; Midway; Necker; Ninoa;	Ha'iwale	E					√СН		
	Ha'iwale	E	√СН				-		
	Ha'iwalc	E					√СН		
Cyrranara (rriditora (Cr)	No common name	E	√*СН						
Delissed arguitaemata (listed as Delissed mathata ) (Ch)	No common name	E						√СН	
Defissed kalidiensis (fisied as Defissed unandud ) (Ch)	No common name	E							Niihau*
Delissea inthanensis (listed as Delissea unaniata )	No common name	E						√СН	
Delissea rhytidosperma (CH)	No common paine		1				✓*CH		
Delissea subcordata (CH)	No common nunc	E			<u> </u>		√•СН		
Delissea takeuchii (listed as Delissea subcordata ) (CA)	No common name			×				1	
Delissea undulata	No common name						√СН		
Delissea waianaeensis (listed as Delissea subcordata ) (CH)	No common name		✓CH	√сн	· · · · · · · · · · · · · · · · · · ·	√СН	√сн	√*СН	-
Diellia erecta (CH)	No contation name						√СН	1	-
Diellia falcata (CH)	No common name					-		pCH	
Diellia maunii	No common name	E	<u></u>	-				<b>Г</b> СН	
Diellia pallida (CH)	No common name			+			- СН	1	
Diellia unisora (CH)	No contation tastic	F		- СН	/*	√*CH	- <b>√</b> *CH	√*СН	
Diplazium molokaiense (CH)	No common name	DE						pCH	
Doryopteris angelica	No common name	DE		1				pCH	
Dryapteris crinalis vas. podosorus	Palapalai aumakua	FE					√сн	1	
Dubautia herbstobatae (CH)	Na'ena'e			- <del> </del> -				pCH	
Dubautia imbricata ssp. imbricata	Na'ena'e	PE	_ <u></u>		<u></u>	-	·	pCH	
Dubantia kalalanensis	Na'ena'e	PE						pCH	
Dubautia kenwoodii	Na'ena'e	PE						√сн	
Dubautia latifolia (CH)	Kaholapehu	Е				<u></u>		√СН	
Dubautia pauciflorula (CII)	Na'ena'e	E		104					
Dubautia plantaginea ssp. lumilis (CH)	Na'ena'e	E						PCH	
Dubaula plantaginea ssp. magnifolia	Na'ena'e	PE			_			DCH	
Dubautia waialealae	Na'ena'e	PE					√*CH		
Eragrostis fosbergii (CH)	No common name	E				7100	VCH		
Eugenia koolanensis (CH)	Nioi	E					/CH	√CH	
Euphorbia haeleeleana (CH)	No common name	E							
Exocarpos lutcolus (CII)	Heau	E				/+00	700	VCH	
Flueggea neowawraea (CH)	Mehamehame	E	✓CH	✓CH	_ <u> </u>				
Galmia Ianaiensis	No common name	E							
Gardenia brighamii	Nanu	E	^*						<u></u>

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			DISTRIBUTION							
Species status by island: E= endangered; T= threatened; P= formally proposed as E or T; (CH)=critical habitat designated; pCH=critical habitat proposed;*=possibly extirpated in the wild. $\pm$ =N.W. Hawaiian Islands: Frigate; Kure; Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes.		STATUS	Hawai'i	Maui	Lāna'i	Moloka'i	Oʻahu	Kaua'i	N.W. Islands <u>*</u> , Kaho'olawe, and <u>Ni'iha</u> u	
Gardenia mannii (CH)	Nanu	E					√сн			
Geranium arboreum (CII)	Nohoanu	E		√СН						
Geranium kauaiense	Nohoanu	PE		[				pCH		
Geranium multiflorum (CII)	Nohoanu	E		√СН						
Gouania hillebrandii (CH)	No common name	E		√СН	1.	1			K*	
Govania meyenii (CH)	No common name	E				1	√сн	√СН	1	
Gonania vitifolia (CH)	No common name	E	√СН	√*СН			√сн			
Haplostachys haplostachya	No common nante	E	~	<b>√</b> ≭				14	1	
Hedyotis cookiana (CH)	`Awiwî	E	√*					√СН		
Hedyolis coriacea (CH)	Kio`ele	E	√СН	√СН			√*CH		1	
Hedyotis degeneri var. coprosmifolia (CH)	No common name	E					√*CH		1	
Hedyotis degeneri var. degeneri (CH)	No common name	E					√сн			
Hedyotis mannii (CH)	Pito	E		√сн	~	· ·			-	
Hedyotis parvula (CH)	No common name	E					√сн			
Hedyotis schlechtendahliana var. remyl	Кора	E			√*					
Hedyotis stjohnii (CII)	No common name	E						√СН		
Hesperomannia arborescens (CH)	No common name	E		1	√*	√СН	✓CH			
Hesperomannia arbuscula (CH)	No common name	E		√СН			√Сн			
Hesperomannia lydgatei (CII)	No common name	E		1				√СН		
Hibiscadelphus distans	Hau kuahiwi	E						1		
Hibiscadelphus giffardianus (CH)	Hau kuahiwi	E	√сн							
Hibiscadelphus hualalaiensis (CH)	Hau kuahiwi	E	√СН			1				
Hibiscadelphus woodii (CH)	Hau kuahiwi	E						√сн		
Hibiscus arnottianus ssp. immaculatus (CH)	Koki'o ke'oke'o	E		[		1				
Hibiscus brackenridgei ssp. brackenridgei (CH)	Ma'o hau hele	E	√СН	√сн	1					
Hibiscus brackenridgei ssp. mokuleianns (CH)	Ma'o hau hele	E				√СН	√*CH			
Hibiscus brackenridgei ssp. molokaiana (CH)	Ma'o hau hele	E				√*CH	√СН			
Hibiscus clayi (CH)	Koki'o 'ula'ula	E			1			✓CH		
Hibiscus waimeae ssp. hannerae (CH)	Koki'o ke'oke'o	E			ĺ			√CH		
Huperzia mannii (CH)	Wawae'iole	E	¥	· ·				ñ		
Huperzia mutans (CH)	Wawae'iole	E					1	1*		
Ischaemum byrone (CH)	Hilo ischaemum	E	<b>СН</b>	√СН		√Сн	1	- СН		
Isodendrion hosakae (CH)	Aupaka	E	√СН							
Isodendriou laurifolium (CH)	Aupaka	E					√СН	√СН		
Isodendrion longifolium (CH)	Aupaka	Т					√СН	√СН		

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			DISTRIBUTION								
Contraction by John J. Do and a words To threatened. Dollarmally prop	osed as E or T:	STATUS	Hawai'î	Maui	Lāna'i	Moloka'i	Oʻahu	Kaua'i	N.W. Islands‡. Kaho'olawe, and <u>Ni'ihau</u>		
Species status by island: L= engangerci, i= inreaction; i= infinite propagation (CH)=critical habitat designated; pCH=critical habitat proposed; *=possibly	extirpated in the wild. PH = Pearl & Hermes		1101701.1						N/ikou#		
*=N.W. Hawaiian Islands: Frigate; Kure; Laysan; Miloway; Necker; Niloca; Isodordian multiplium (CH)	Wahine noho kula	E	1	√*СН	√ <b>*</b>	✓*CH	v*CH		Nubau		
Favalaa kalaalawansis (CH)	Kohe malama malama o Kanaloa	E							KUH		
	No common name	PE						рСН	ļ		
Acysseria enco	No соттоп пате	PE						рСН			
Lectio spatia	Koki'o	E				√×					
AUXILI COUNES	Hou hele 'ula; koki'o	E	√СН								
Norma arynamionaes (CH)	Koki'o	E	1					√сн			
Nokia kulatensis (CH)	Kamakahala	E		1			√сн	1			
Laborina cynanarae (CA)	Kamakahala	PE	1					PCII			
Lagorana neueri	Kamakahala	E	1					√СН			
Laooraa yyyster (CA)	Kamakahala	PE		1		1		PCH			
Laboratu pantta	Kamakahala	E		1	1		<u> </u>				
Labornia impona va, inducessis	Kamakahala	E	1					√СН			
Laborata ungona var. numanaensis (CA)	Komakahala	E				√СН		<u> </u>			
Laborata trytora (CR)	* กายนายน	E	1				√сн	_ <u></u>			
Lepinnan aronsenia (CA)	Nche	E		1			√Сн				
Lipochaela lobaldi sep koalanansis (CH)	No common name	E		1			√СН	_ <u>_</u>			
Lobelia ganachaliya (CD)	No common name	E					✓CH				
Lopena monostacnya (CA)	No common name	ε	-				√CH	✓CH	Niihau*		
Labelia adhumin (CB)	No common name	E					И СН				
Luciente danharcides	Lehua makanoe	PE						рСН			
Lysimachia Gliolia (CID	No common name	E					√сн	VCH			
Lysumachia hild	No common name	PE						pCH			
Lysimachia bulantai (CH)	No common name	E		√СН							
Lysimachia waxima (CH)	No common name	E				√сн					
Lysimachia nandane	No common name	PE						pCH			
Lysimachia sconidaisis	No common name	PE						pCH			
Lysinactina scoparciais	No common name	PE						рСЯ	Nilharr		
	'fhi'ihi	E					✓CH		- Nunau		
Melanthere (mrini (CH) (listed as Linachaeta (duriei )	Nehe	E						→ CH			
Melandrera kamolonsie (CH) (listed as Linochaeta kamolensis )	Nehe	E		√Сң							
Melanthera micrantha sen evigua (CH) (listed as Lipochaeta micrantha)	Nche	E									
Matanthara micrantha ssp. nicrantha (CH) (listed as Lipochaeta micrantha)	Nche	E									
Malanthera temifolia (CII) (listed as Lipochaeta tenuifolia )	Nehe	E					✓CH				
Melanthera venosa as Lipochaeta venosa )	Nehe	E									

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			DISTRIBUTION							
Species status by island: E= endangered; T= threatened; P= formally proposed as E or T; (CH)=critical babitat designated; pCH=critical babitat proposed ;*=possibly extirpated in the wild.		STATUS	Hawai'i	i'i Maui	Lâna'î	Moloka'i	O'ahu	Kaua'i	N.W. Islands <u>t</u> , <u>Ka</u> ho'olawe, and <u>Ni'ih</u> a	
Melanthera waimeaensis (CH) (listed as Lipochaeta waimeaensis )	Nche	E					√CH			
Melicope adscendens (CH)	Alani	E		√сн			****			
Melicope balloui (CH)	Alani	E		√СН						
Melicope degeneri	Alani	PE						pCH		
Melicope haupuensis (CH)	Alani	E						√СН		
Melicape knudsenii (CH)	Alani	E		√сн				√СН		
Melicope lydgatei (CH)	Alani	E					√Сн			
Melicope mucronulata (CH)	Alani	E		√*СН		√сн				
Melicope типгоì	Alani	Е			~	1				
Melicope ovalis (CH)	Alani	E	1	√сн						
Melicope pallida (CH)	Alani	E					√*СН	√СН		
Melicope paniculata	Alani	PE						pCH		
Melicope puberula	Alani	PE						pCH		
Melicope quadrangularis	Alani	E						√*	·	
Melicope reflexa (CH)	Atoni	Ē				√сн				
Melicope saint-johnii (CH)	Alani	E					√СН			
Melicope zahlbruckneri (CH)	Alani	E	√СН					T		
Munroidendron racemosum (CH)	No common name	E						√СН		
Myrsine juddii (CH)	Kolea	E					√СН			
Myrsine knudsenii	Kolea	PE						рСН		
Myrsine linearifolia (CH)	Kolea	T						√СН		
Myrsine mezii	Kolca	PE						рСН		
Neraudia angulata 🗤, angulata (CH)	No common nanc	E					√CH			
Neraudia angulata væ. deutata (CH)	No common name	E					√СН			
Nerandia ovata (CH)	No common name	ε	√сн							
Neraudia sericea (CH)	No common name	E		√Сн	-	√сн			K*	
Nothocestrum breviflorum (CH)	'Aica	E	√сн							
Nothocestrum peltatum (CH)	'Aica	E	1					√СН		
Nototrichium humile (CH)	Kulu'i	E		√*СН			√CĦ			
Ochrosia kilaueaensis	Holei	E	·/*							
Panicum fauriei voz. carteri (CH)	Carter's panic grass	E		Ý	· ·	-	√СН			
Panicum niihauense (CH)	Lau'chu	E						√СН	Niihau*	
Peucedanum sandwicense (CH)	Makou	т		✓CH		/СН	√СН	√СН		
Phyllostegia glabra var. Ianaiensis	Ulihi	E			√* 			L		
Phyllostegia haliakalae (listed as Phyllostegia mollis ) (CH)	No common name	E		√СН		*	√*СН	<u> </u>		

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,,,,,,,			DISTRIBUTION						
Species status by island: E= endangered; T= threatened; P= formally propo (CH)=critical habitat designated; pCH=critical habitat proposed; *=possibly d	sed as E or T; extirpated in the wild. H = Pearl & Hermes	STATUS	Hawai'i	Maui	Lãna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands‡. Kaho'olawe, and <u>Ni'ih</u> au
T=N.W. Hawaiian Islands: Frigate; Kure; Laysan; Midway; Necker; Miloa, F	No common name	E					∙√СН		
Phyliostegia infoinda (CTI)	No common name	E				1			
Phyllostegie kadagensis (CH)	No common name	E					√сн		
Phyllostogia kadadensis (CNA)	No common name	E				1		√СН	
Phyllostegic Mattern (CD)	No common name	E		√*СН		√СН			
Phyllostegia manat (CA)	No common name	E					√СН		
	No common name	E							
Phylostegia parvijiora va. glavnaštala	No common name	E					√сн		
Phylostegia parvijiora Vat. Iyagater (CH)	No common name	E		 √*	[		√сн	1	
Phyllostegia partitiora var. partitiora (CH)	No common hame	Е		√СН		√*CH	1		
Phyllosiegra pilosa (listed as Phyllosiegra monts )	Kiponapona	E	√СН						
Phyllostegia racemosa (CH)	No common name	PE						pCH	
Phyllostegia renovans	No common name	E	√сн			1	1	-	
Phyllostegia velutina (CH)	No common name	E		·[				√сн	
Phyllostegia wainteae (CH)	No common serve	E	√СН	1			1		
Phyllostegia warshaueri (CH)	No common name	E						√СН	
Phyllostegia wawrana (CH)	Hoawa	PE		+	1			pCH	
Pittosporum napaliense	Loukobi louzhinzi	E	√СН						
Plantago hawaiensis (CII)	Laukahi kuahiwi		-		+			√СН	
Plantago princeps var. anomala (CH)	Lankini kualiwi		1.	√СН		√CH		1	
Plantago princeps var. laxiflora (CH)	Lauxani kuabiwi		<u> </u>				√сн	√сн	
Plantago princeps var. longibracteata (CH)	Laukani kuaniwi		<u> </u>				<b>СН</b>		
Plantago princeps var. princeps (CH)	Laukani kuaniwi			√*CH			✓*CH	√сн	
Platanthera holochila (C11)	No common name	E DE						pCH	
Platydesma rostrata	Pilo kea lau in								-
Pteomele hawaiiensis (CH)	Hala pepe	<u>_</u>						✓CH	
Poa mannii (CH)	No common name	E		·				√сн	
Poa sandvicensis (CH)	No common name	E						√СН	
Poa siphonoglossa (CH)	No common name	E	(0)1		/CH				
Portulaca sclerocarpa (CH)	Po'e	E	V.H		· cn	-			
Pritchardia affinis	Louiu	E			_				Niihau
Pritchardia aylmer-robinsonii	Wahane	E						DCH	
Pritchardia hardyi	Loulu	39				<u> </u>			
Pritchardia kaalae	Loulu	E							
Pritchardia munroi	Loulu	E							
Princhardia napaliet	Loulu	E	⊥	<u> </u>					

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		DISTRIBUTION							
Species status by island: E= endangered; T= threatened; P= formally (CH)=critical habitat designated; pCH=critical habitat proposed ;*=po	r proposed as E or T; ssibly extirpated in the wild.	STATUS	Hawai'i	Maui	Lāna'i	Moloka'i	O'ahu	Kaua'i	N.W. Islands‡, Kabo'olawe, and <u>Ni'</u> ihau
Pritchardia remota (CH)	Loulu	ε							Nihoa CH
Pritchardia schattaueri	Louiu	E			1			1	
Pritchardia viscosa	Loulu	E						1	
Psychotria grandiflora	Kopiko	PE				1		рСН	
Psychotria hobdyi	Kopiko	PE						pCH	
Pteralyxia kauaiensis (CH)	Kaulu	E					1	√СН	
Pteris lidgatei (CH)	No common name	E		√сн		√*CH	√сн		
Remya kauaiensis (CH)	No common name	E			1		1	✓CH	
Remya manitensis (CH)	No common name	E		√СН				1	
Remya montgomeryi (CH)	No common name	E						√сн	
Sanicula mariversa (CH)	No common name	E		1			✓CH		
Sanicula purpurea (CH)	No common name	ε		√сн			✓CH		
Santalum freycinetianum var. lanalense	'Iliahi	ε		1	1				
Scaevola coriacea	Dwarf naupaka	E	×	1	\/*	1	√*	×*	Nijhau*
Schiedea adamantis	No common name	Ε	T				1		
Schiedea apokremnos (CH)	No common name	E	-		Ī			√СН	
Schiedea attenuata	No common name	PE						pCH	
Schiedea haleakalensis (CH)	No common name	E		√сн					
Schiedea helleri (CH)	No соттов паше	E		1			1	√СН	
Schiedea hookeri (CH)	No common пате	Е		√*			✓CH		
Schiedea kaalae (CH)	No common name	E					√СН		
Schiedea kanaiensis (CH)	No common name	E						√СН	
Schiedea kealiae (CII)	No common name	E					√СН		
Schiedea laui	No common пагле	E				√СН			
Schiedea lychnoides (listed as Alsinidendron lychnoides ) (CH)	Kuawawaenohu	E						√CH	
Schiedeä lydgatei (CH)	No соизмол пагле	E				√СН			
Schiedea membranacea (CH)	No common name	E					<u> </u>	√СН	
Schiedea nuttallii (CH)	No common name	E		· /*		×	√СН		
Schiedea obovata (listed as Alsinidendron obovatum) (CH)	No common nane	E			<u> </u>		/сн		
Schiedea perlmanni (listed as Schiedea mutallii) (CH)	No common пате	E						√СН	
Schiedea sarmentosa (CH)	No common name	E				√СН			
Schiedea spergulina var. leiopoda (listed as Schiedea spergulina ) (CH)	No common name	E					<u> </u>	√Сн	
Schiedea spergulina var. spergulina (listed as Schiedea spergulina ) (CH)	No common name	т					1	√сн	
Schiedea stellarioides (CH)	Laulihilihi	Ê						√СН	
Schiedea trinervis (listed as Alsinidendron trinerve) (CH)	No common name	E				1	C⊓		

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			DISTRIBUTION								
Species status by island: E= endangered; T= threatened; P=^formally prop (CH)=critical habitat designated; pCH=critical habitat proposed ;*=possibly	osed as E or T; extirpated in the wild.	STATUS	Hawaiʻi	Maui	Lūna'i	Moloka'i	O*ahu	Kaua'i	N.W. Islands‡, Kaho'olawe, and <u>Niil</u> hau		
t=N.W. Hawajjan Islands: Frigate; Kure; Laysan; Midway; Necker; Nihoa;	PH = Pearl & Hermes.								Nihoa CH		
Schiedea verticillata (CH)	No common name	Б						√CH			
Schiedea viscosa (listed as Alsinidendron viscosum) (CH)	No common name	E				(01)	104	JCH	K Nijhau*, Nc.		
Sesbania tomentosa (CH)	Ohai	E	√сн	✓CH	·	V CH		- Cri			
Sicyos alba (CH)	'Anunu	E	√СН								
Silene alexandri (CH)	No common name	E				✓CH	L				
Silene hawaiiensis (CH)	No common name	Т	√СН				(01)				
Silene lanceolata (CH)	No common name	E	√сн		<b>√</b> ‡	7Сн	VCH				
Sitene perlmanii (CH)	No common name	ε		<u> </u>			✓ •Сн	1.			
Solanum incompletum (CH)	Popolo ku mai	E	√СН	×*	×*		(tout				
Solanum sandwicense (CH)	Popoto 'niakeakua	E			ļ		V CH	VCH /CH			
Spermolepis hawaiiensis (CH)	No common name	Ē	√сн	√сн		V*CH	V CH				
Stenogyne angustifolia (Visted as Stenogyne angustifolia var. angustifolia )	No common name	E	1	/*							
Stenogyne bifida (CH)	No common name	E				V"CH	ļ	(01)			
Stenogyne campanulata (C11)	No common name	E						V CR			
Stenogyne kanehoana (CH)	No common name	E			<u> </u>		√сн				
Stenogyne kealiae	No common name	PE						PCFI			
Tetramolopium arenarium 350, arenarium (listed as Tetramolopium arenarium)	No common name	E	1	/t							
Tetramolonium arcnarium ssp. laxum (listed as Tetramolopium arenarium)	No common name	E		√ <b>*</b>					····		
Terranolonium arenarium vac. arenarium (listed as Tetramolopium arenarium)	No common name	E	1	√*	<u> </u>						
Terromolopium arenarium var. conferrum (listed as Tetramolopium arenarium)	No common name	E	1								
Tetrawolopium capillare (CH)	No common name	E		✓*CH	<u> </u>						
Tetramolopium filiforme var. filiforme (listed as Tetramolopium filiforme) (CH)	No common name	E					V CH				
Tetramolonium filiforme var. polyphyllum (listed as T. filiforme ) (CH)	No common name	E					V CH				
Tetramalanium levidotum ssp. levidotum (CH)	No common name	E					• СН				
Terranalanium remvi (CH)	No common name	E		√*CH	√СН						
Tetramolopium rockii yaz, calcisabulorum (listed as Tetramolopium rockii ) (CH)	No common parte	т				√СН					
Tetramolopium rockii var rockii (listed as Tetramolopium rockii ) (CH)	No common name	τ				√сн					
Tetranlocandra hisattenuata	No common name	PE						pCH			
Tetraplasandra fismii	No common name	PE						рСн			
Tatraplasandra gunungarna (CH)	'Ohc'ohe	Ē					/СН				
Trematolobelia singularis (CH)	No common пате	E					/СН	<u> </u>			
Unem kadae (CH)	Opune	E					Сн				
Vicia menziusii	Hawaiian vetch	E	1			_			V Nüb-		
Vigna o-wahnensis (CH)	No common name	E	✓CH	√сн			✓ *CH		K, Millau*		
Viola chamissoniana (CH)	'olopu: pamakani	E					✓ CH		L		

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			DISTRIBUTION						
Species status by island: E= endangered; T= threatened; P= formally proposed as E or T; (CH)=critical habitat designated; pCH=critical habitat proposed ;*=possibly extirpated in the wild. $\pm$ =N.W. Hawaiian Islands: Frigate; Kure; Laysan; Midway; Necker; Nihoa; PH = Pearl & Hermes.		STATUS	Hawai'i	Maui	Läna'i	Moloka'i	O'ahu	Kaua'i	N.W. fslands‡, Kaho'olawe, and Nëlhao
Viola helenae (CH)	No common name	E						✓CH	
Flola kanaensis var. nahiawaensis (CH)	Nani wai`ale'ale	E		1				√СН	
fiola lanaiensis	No common name	Е							
Viola oahuensis (CH)	No common name	E					₹CĦ		
Wilkesia hobdyi (CH)	Iliau	E						√Сн	
Xylosma crenatum (CH)	No соттол пате	Е					-	√СН	
Zanthoxylum dipetalum var. tomentosum (CH)	A'e	E	√сн	1					
Zanthoxylum hawaiiense (CH)	A'e	E	√СН	√Сн	<b>*</b> *	√сн		√СН	

# — Conservation

ORDINANCE NO. \_\_\_\_\_

BILL NO.

# A BILL FOR AN ORDINANCE AMENDING TITLE 14 MAUI COUNTY CODE, RELATING TO WATER CONSERVATION

# BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI

SECTION 1. Section 14.03., Maui County Code, is amended to read as follows:

# DRAFT

Chapter 14.03

APPENDIX E

WATER CONSE	RVATION
Sections:	
14.03.010	Policy
14.03.020	Water Conservation Plan
14.03.030	Landscape Water Conservation
14.03.040	Leak Detection
14.03.050	Water Waste Prohibitions
14.03.060	Fixture and Facility Performance Standards
14.03.070	Retrofit on Resale Provisions
14.03.080	Water Reuse
14.03.090	Reserved

#### 14.03.10 Policy Statement

# I. 1. Findings

The Maui County Council has found that:

- A. The limited supply of County waters are subject to ever increasing demands
- B. Maui County is growing in population, and it is important to implement water conservation measures now in order to stretch supplies as long as possible.
- C. Maui County's economic prosperity depends upon adequate water supply.
- D. Studies have shown that landscape accounts for about fifty percent of all water used in urban areas. Water conserving landscapes can use as little as one third of the water of a traditional non-water-conserving landscape. These savings can be substantial, if projected through the life of a development.
- E. Water conservation will save money and can be accomplished without degradation of aesthetic values.
- F. State and County policy and Community Plans promote conservation and efficient use of water.
- G. Landscapes provide recreation areas, cleaner air and water, prevent erosion, offer fire protection and help to partially replace ecosystems where these have been displaced by development
- H. Landscape design, installation and maintenance can and should be water efficient.
- I. The high cost of living in Hawaii and the even higher cost of living in Maui leaves our community with less capital for development of new water resources. Water conservation can reduce competition for capital which could otherwise be spent on proper system maintenance and other priorities.
- J. Proper landscape conservation prevents waste of drinking water by inefficient use in the landscape.
- II. Purpose and Intent
  - A. Promote the values and benefits of landscapes while recognizing the need to invest water and other resources as efficiently as possible;
  - B. Establish a structure for designing, installing and maintaining water efficient landscapes in new and refurbished projects;
  - C. Establish provisions for water management practices and water waste prevention for established landscapes.
  - D. Reduce supplemental water use through climate-based plant material choices, design, irrigation scheduling, and soil management.
  - E. Promote the conservation of potable and non-potable water by encouraging the preservation of appropriate native plant communities, the use of site-specific

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plant materials and to establish techniques for installation and maintenance of landscape materials and irrigation systems.

- F. Improve the aesthetic appearance of commercial, industrial and residential areas through the incorporation of appropriate landscape features into development in ways that harmonize and enhance the built environment.
- G. Preserve the native and endemic vegetation of the island while encouraging the removal and discouraging the use of species which can damage the watershed or cause other nuisance.
- H. Encourage the utilization of readily available water conserving technology to maximize resource efficiency.
- D. This Chapter shall be known as the Water Conservation Plan Ordinance
- E. The Director of Water Supply shall adopt rules as appropriate to implement the provisions of this section.

# **14.03.020** Water Conservation Plan (from council)

- A. The Department of Water Supply shall maintain and periodically update a water conservation plan and program. This plan include regulatory and non-regulatory elements such as prevention of water waste, measures to reduce outdoor water use, measures to insure efficient use of water within the distribution system, measures to maximize plumbing efficiency and other measures as deemed appropriate. The council shall enact regulatory elements of the water conservation plan by ordinance.
- B. The regulatory elements of the water conservation plan shall include as a minimum water use regulations relating to outdoor watering, provisions for prevention of water waste, plumbing efficiency and water reuse, as well as provisions to enable budgeting and implementation for non-regulatory measures as deemed appropriate.
- C. The Department of Water Supply shall provide to council an annual report on the implementation and effectiveness of its conservation program.
- D. The Department's Water Use, Development and Protection Plan shall include analysis of the costs and benefits of implementing various demand and supply side measures, and the conservation program shall be updated accordingly.
- E. Private purveyors of water utilizing or conveying more than ½ MGD (500,000 gallons per day) shall be required to maintain and periodically update a water conservation plan and program, to include as a minimum provision for maximizing efficiency and minimizing water waste. A summary of this conservation plan and program shall be submitted and held on file with the Department of Water Supply.
- F. Operators of facilities or large landscapes requiring the use of 250,000 gallons per day or more shall also be required to maintain and periodically update a water conservation plan and program, which shall include a description of the water use, and measures instituted to maximize

#### Conservation

efficiency and minimize waste. A summary of this conservation plan and program shall be submitted and held on file with the Department of Water Supply.

# 14.03.030 Landscape Conservation

A. General Provisions

1. Periodic Update of Regulations

The Department of Water Supply, after consulting with and considering the recommendations of interested agencies, may from time to time propose to the Administration, Board and Council regulations to establish additional or revised procedures to implement this chapter, and to make more specific the standards and guidelines prescribed in this chapter. Such regulations as are approved by resolution of the Council shall have the force and effect of law unless otherwise indicated.

# 2. Definitions

The words used in this ordinance have the meaning set forth below:

Agricultural Operation	A business venture in which crops are grown for the purposes of earning a livelihood, as represented and claimed on federal and state tax forms, or a subsistence operation of sufficient size and scope to support the residents of the property on which the agricultural activities take place. A few orchard trees or a vegetable garden do not constitute an agricultural operation.
Amendment	Materials added to the soil, such as compost, leaf mold, peat moss, ground bark or other materials, which improve aeration and percolation of clay soils and may help hold water in sandy soils.
Anti-drain Valve or Check Valve	A valve located under a sprinkler head to hold water in the system so it minimizes drainage from lower elevation sprinkler heads.
Application Rate	The depth of water applied to a given area, usually measured in inches per hour.
Athletic Field	A turf area used primarily for organized sports.
Automatic Control Valve	A device used to control the flow of water at a particular section of the irrigation system.
Automatic Controller	A mechanical or solid state timer, capable of operating valve stations to set the days and length of time of a water application.

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Backflow Prevention Device	A safety device used to prevent pollution or contamination of the water supply due to the reverse flow of water from the irrigation system.
Bubblers	Irrigation heads which deliver water to the soil adjacent to the heads.
Check Valve	A valve located under a sprinkler head to hold water in the system so it mini- mizes drainage from the lower elevation sprinkler heads.
Controller	A device that operates each irrigation zone for a determined time and fre- quency, based upon irrigation schedule or in some cases feedback of soil mois- ture content or climatic conditions.
Covenants	Agreements entered into by property owners, leaseholders and renters, which set conditions for the use, maintenance and or sale of property.
Damaged Land	A parcel or parcels of land which are the subject of plans or efforts
Reclamation Project	to restore or reclaim ecological or other values after that land has been quarried, mined or used for other purposes disruptive to the natural landscape. Such proj- ect may have the goals of restoring a site to a condition similar to or compatible with that which existed prior to such use, or to develop the site to some other productive use of the land; to restore forests, pasture, crops, wildlife area, or etc. However, exemptions under this ordinance, shall not apply to projects or efforts to develop a site for subsequent development/construction.
Development	The construction, erection or emplacement of one or more buildings, structures, or surface improvements on land which is a premise in order to establish or expand a principal residential or non-residential use.
Distribution Uniformit	yMeasure of the uniformity of irrigation water applied over a given area. Some- times calculated based on the ratio of the average low quarter depth of irrigation water compared to the average depth of irrigation water applied.
Drip Emitter	An irrigation emission device that delivers a measured reduced quantity of water at a consistent rate of discharge.

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# Conservation

Drip Irrigation	Low pressure, low volume irrigation applied slowly near or at ground level to minimize runoff and loss to evaporation.
Ecological Restoration Project	A project intended for the restoration of a native ecosystem or area, and not intended for continued irrigation.
Emitter	Drip irrigation fittings that deliver water slowly from the system to the soil.
Established Landscape	The point at which plants in the landscape have developed roots into the soil adjacent to the root ball.
Establishment Period	The period until the plants in the landscape have developed roots in the soil adjacent to the root ball. Generally the first year after installing a plant in the landscape.
ET Controller	Controller that automatically adjusts the watering time and frequency based on local weather conditions such as rain, wind, heat, or estimated evaporation and transpiration rates.
Evapotranspiration	The quantity of water evaporated from adjacent soil surfaces and transpired by plants during a specific time.
Flow Rate	The rate at which water flows through pipes and valves.
Flow Restriction Device	Device applied by the water utility to the customer's meter that restricts the volume of flow to the customer.
Fugitive Water	The pumping, flow, release, escape or leakage of any water from any pipe, valve, faucet, connection, diversion, well or any facility for the purpose of water supply, transport, storage, disposal or delivery to adjacent property or the public right-of-way.
Hand Watering	The application of water for irrigation purposes through a hand-held hose, including hoses moved into position by hand and left to flow freely or through a shut-off nozzle.

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Heritage Plants	Any plant or group of plants which meet one or more of the following criteria: 1) having a relationship to an event of cultural or historical significance, 2) is deemed of public interest or special interest by the County's Arborist Committee ?; 3) a tree having a circumference of 72"; 4) a native species which is classified as rare, endangered, threatened or species of concern, 5) other criteria?
High Water Use Turf	A surface layer of earth containing regularly mowed grass, with its roots, which requires large volumes and or frequent application of water throughout its life. High water use grasses include but are not limited to varieties of bluegrass, vari- eties of ryegrass, varieties of fescue and bent grass.
High Water Use Plants	High-water-using plants are characterized by high transpiration rates, shallow rooting, and the need for frequent watering. Refer to the Maui County Planting Plan and/or DWS list of plants.
Hydrozone	A portion of the landscaped area having plants with similar water needs that are served by a valve or set of valves with the same schedule. A hydrozone may be irrigated or non-irrigated, but should have similar characteristics in terms of water needs of the plants, precipitation rate of irrigation devices, solar radiation, wind conditions, soil type and slope. A naturalized area planted with native vegetation that will not need supplemental irrigation once established is a non- irrigated hydrozone.
Irrigation Audit	Procedure to collect and present information concerning the design, mainte- nance, uniformity of application rate, precipitation rate, efficiency, and general condition of an irrigation system and its components.
Infiltration Rate	The rate of water entry into the soil expressed as a depth of water per unit of time in inches per hour.
Irrigation	Intentional application of water for purposes of sustained plant growth and/or optimized production.
Irrigation Efficiency	The measurement of the amount of water beneficially used divided by the amount of water applied. Irrigation efficiency is derived from measurements and estimates of irrigation system characteristics and management practices.
Landscape Irrigation	A process to perform site inspections, evaluate irrigation systems,

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Conservation	
Audit	and develop efficient irrigation schedules.
Landscaped Area	The entire parcel less the building footprint, driveways, non-irrigated por- tions of parking lots, hardscapes (such as decks and patios), and other non- porous areas. Includes the public right-of-way. Water features are included in the calculation of the landscaped area.
Lateral Line	The water delivery pipeline that supplies water to the emitters or sprinklers from the valve. (this definition applies to landscape irrigation only)
Low Head Drainage	A condition in which water siphons out of the lowest head in a sprinkler zone after watering is completed. When the water flow to the zone has been shut off at the end of its cycle, the remaining water in the lines will drain downhill to the lowest point. If a sprinkler head is located in the lowest part of the system, water will flow out of that head until an equilibrium has been reached or all of the water has emptied out of that zone's pipes. This can usually be corrected by adjustments to the system or installation of devices, called drain check valves, that can prevent low head drainage
Low Water Use Plants	Plants which are able to survive without supplemental water once estab- lished as specified in plant list.
Main Line	The pressurized pipeline that delivers water from the water source to the valve or outlet. (this definition applies to landscape irrigation only)
Mature Landscape	The point at which plants in the landscape have developed roots into the soil adjacent to the root and are somewhat self-sufficient.
Mister	A device that produces a cooling effect by emitting fine particles of water into the air in the form of a mist.
Moisture Sensing Device	A device that measures the amount of water in the soil
Model Home	A dwelling built first by a developer to allow potential purchasers to see what the finished product will look like once the other homes in the devel- opment are completed.

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Mulch	Any material such as leaves, bark, straw, wood chips or other materials applied to the soil surface to reduce evaporation.
New Development	Any development approved by Maui County after the effective date of this ordi- nance, including those developments which have received some approvals prior to the effective date of this ordinance but which have not aleady submitted all construction plans or constructed landscape improvements.
Operating Pressure	The pressure at which a system of sprinklers operates, usually indicated at the base of a sprinkler.
Overhead Sprinkler Irrigation System	A system in which water is distributed by overhead high-pressure sprinklers or guns or by lower-pressure sprays. A system utilizing sprinklers, sprays, or guns mounted overhead on permanently installed risers is often referred to as a solid-set irrigation system.
Overspray	Water which is delivered beyond the landscaped area, wetting pavements, walks, structures, or other non-target landscaped areas.
Percolation	The movement of water through the soil
Practical Turf Areas	The use of turf only in those areas of active play or recreation such as sports fields, school yards, picnic grounds, other areas with intense foot traf- fic, etc. These shall be planted with drought tolerant and non-invasive varieties of turf. Native grasses are encouraged.
Rain Sensing or Shut-off Device	A system which automatically shuts off the irrigation system when it rains
Recreational Area	An area devoted to active sports, play or picnicking, or to facilities and equip- ment for recreational purposes, swimming pools, tennis courts, playgrounds, community clubhouses, and other similar uses.
Recycled Water, Reclaimed Water, or Treated Effluent Water	Treated or recycled water of a quality suitable for nonpotable uses such as landscape irrigation, not intended for drinking.

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#### Conservation

Rotary Nozzle A rotating, multi-stream, multi-trajectory rotating (MSMTR) sprinkler which distributes water in a number of individual streams of varying trajectories. This helps to uniformly distribute water throughout the radius range. Rotary nozzles are generally the size of the nozzles in fixed spray heads and thread onto pop-up heads just as spray nozzles do. They can also be threaded onto shrub adapters for installation onto risers. Rotary nozzles have variously cut nozzle openings that rotate during use to distribute the water more evenly throughout the watering pattern than spray heads. Rotary nozzles are designed to be installed on the risers of some of the most commonly used spray heads. They can be easily installed by simply unscrewing the existing spray nozzle and screwing on the rotary nozzle. Nozzle adjustment for radius or arc is a simple screw adjustment. The irrigation schedule can then be adjusted to reflect the lower precipitation rate and higher distribution uniformity. Rotary nozzles offer a low cost opportunity to improve the efficiency of many existing systems, particularly on smaller turf areas (approximately half an acre), which are among the highest water using (and wasting) sites. Water turns a small turbine (water wheel or fan) in the base of the unit which drives a series of gears that cause the head to rotate. The gear drive mechanism is sealed from dirt and debris. The nozzle can be installed on a spray head which normally uses conventional fixed pattern and variable arc spray nozzles. The rotary nozzle distributes the water in a pattern similar to a rotor head in the way that it rotates, compared to a normal spray nozzle which does not rotate. Due to their low precipitation rate, highly uniform distribution, and increased radius range, rotary nozzles can use less water than spray nozzles if the irrigation system is designed and installed properly. Rotary nozzles may be inserted into the body of the head after it has been installed. However, uniform and complete coverage depends selection of the appropriate nozzle for the area to be covered. Two different nozzles will cause the same rotary head to vary the distance of throw by 10 feet or more and increase water use by factors of two or three. Run-off Water which is not absorbed by the soils or landscape to which it is applied. For example, run-off may result from water that it applied at too great a rate (application rate exceeds infiltration rate) or when there is a severe slope. This section does not apply to stormwater run-off which is created by natural precipitation rather than human-caused or applied water use. Shut-off Nozzle Device attached to the end of a hose that completely shuts off the flow, even if left unattended. Single Family A lot or premise upon which is established one dwelling only. Of

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Residential	the allowable principal uses, such use shall be the only use on that lot or prem- ise.
Smart Controller	Controller that automatically adjusts the watering time and frequency based on soil moisture, rain, wind, evaporation and transpiration rates or plant type.
Soil Moisture Sensing Device	A device, usually either a tensiometer or conductivity based device, used for sensing moisture in soils, and for controlling irrigation systems based on soil moisture. By sensing actual moisture levels in soils, such devices can save water in systems which have been over-irrigating. Preventing over irriga- tion can increase turf health. The use of automated soil moisture sensors also save labor by eliminating the need for re-programming and temporary rain shut- offs thereby reducing both water and labor costs for owners.
Soil Texture	The classification of soil based on the percentage of sand, silt and clay in the soil
Spray Irrigation	The application of water to landscaping by means of a device that projects water through the air in the form of small particles or droplets.
Sprinkler Head	A device which discharges water through a nozzle.
Static Water Pressure	The pipeline or municipal water supply pressure when water is not flowing.
Station, Circuit or Zone	An area served by one value or by a set of values that operate simultaneously.
Temporary Irrigation System	Irrigation systems which are installed and permanently disabled within a period of 36 contiguous months.
Turf	A surface layer of earth containing mowed grass with its roots. Annual blue- grass, Kentucky bluegrass, Perennial ryegrass, Red fescue, and Tall fescue are cool-season grasses. Bermuda grass, Kikuyu grass, Seashore paspallum, St. Augustine grass, Zoysia grass, and Buffalo grass are warm-season grasses.
Uniformity	Describes how evenly water is applied over a given area.

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# Conservation

Useable Precipitation or Effective Rainfall	The amount of precipitation that contributes to the water needs of plants. Irrigation scheduling should be adjusted to reflect useable precipitation.
Valve	A device used to control the flow of water in the irrigation system.
Water Conservation Concept Statement	A one page checklist and narrative summary of the project as shown in section
Warm Season Turf	Turf grasses which need warm weather to germinate and grow. Warm sea- son grasses can generally tolerate drought conditions due to root systems which tend to be deeper and more extensive than the root systems of cool season grasses. Zoysia grass, Bermuda grass, St. Augustine grass and other grasses are examples of warm season grasses. See also Turf, above.
Water Waste	The non-beneficial use of water. Non beneficial uses include but are not limited to: 1) landscape water which is applied in such a manner rate and or quantity that it overflows the landscaped area being watered and runs onto adjacent property or public right-of-way; 2) landscape water which leaves a sprinkler, sprinkler system or other application device in such a manner or direction as to spray onto adjacent property or public right-of-way; 3) washing of vehicles, equipment or hard surfaces such as parking lots, aprons, pads, driveways or other surfaced areas when water is applied in sufficient quantity to flow from that surface onto adjacent property or the public right of way; 4) water applied in sufficient quantity to cause ponding on impervious surfaces.
3. Applicability	
a This	section shall apply to:
1. W m th 2. N 3. C 4. C 5. N ag p 6. G 7. C 8. Se	Vater conservation landscape requirements shall apply to all new develop- nents, excluding individual single family homes with irrigated area of less nan 3,000 square feet. ew development or refurbishment projects involving more than two homes. ommon areas in new and retrofitted developments ommercial, residential and industrial developments. ew development applications shall include landscape documentation pack- ges which require final approval at the time of final project approval. Public arks, with the exception of turf requirements. emeteries, with the exception of turf requirements. chool Grounds, with the exception of turf requirements.
b. This	section shall not apply to

- 1. Non-irrigated landscapes, with the exception that provisions for prevention of runoff, overspray or other water waste shall still apply.
- 2. Landscapes that are irrigated entirely with reclaimed water.
- 3. Individual Home-owner provided landscaping of less than 3,000 square feet.
- 4. Home-owner provided landscaping of individual homes in areas where rainfall exceeds 50"/year.
- 5. Ecological restoration projects which do not require a permanent irrigation system
- 6. Damaged-land reclamation projects that do not require a permanent irrigation system.
- 7. Commercial or subsistence agricultural operations are exempt from provisions of this ordinance except that provisions for prevention of water waste and prohibition of nuisance plants still apply.

# 14.03.031 Site Design & Plant Selection

- A. Hydrozones
  - 1. Plants having similar water use shall be grouped together in different hydrozones.
  - 2. Fire prevention shall be addressed in areas that are fire prone. Information about fire prone areas and appropriate landscaping for fire safety is available from <the Fire Department?
- B. Turf Restrictions
  - 1. The maximum allowed turf and or decorative water area (expressed as percent of planted area) shall be 20% for new industrial, commercial, institutional, and public or quasi-public developments, residential developments with common areas, residential lots greater than <sup>1</sup>/<sub>4</sub> acre or located in areas that receive less than 50" of rain per year
  - 2. If turf is an essential part of the development, such as playing fields for schools or public parks, a higher percentage will be allowed, and will be evaluated on an individual basis.
  - 3. No turf shall be allowed in median strips or in areas less than 8' wide.
  - 4. Turf grass perimeters shall be minimized to improve irrigation efficiency. Long narrow strips of turfgrass such as traffic medians and areas between curbs and side-walks are not permitted, unless the turf selected requires no more water than a low-water use groundcover.
  - 5. No turf shall be allowed in median strips less than 8 feet wide.
  - 6. To minimize runoff, turf shall not be utilized on slopes exceeding 10%.
  - 7. Public parks, golf courses, cemeteries, school grounds and playing fields are exempted from turf limitations.
  - 8. Parks, golf courses, cemeteries, school grounds, and sports fields, though exempt from turf limitations, shall in no circumstance have water requirements that exceed those which would result if the area were planted in 100% warm season turf.

# C. Plant Materials

1. Plants shall be selected appropriately based upon their adaptability to the climatic,

geologic and topographical conditions of the site.

- 2. The planting of trees is encouraged wherever it is consistent with other provisions of this ordinance.
- 3. Protection and preservation of native species and natural vegetation are encouraged. Wherever practical, native species adapted to the natural rainfall of the area should be selected. Guidance may be found in the Maui County Planting Plan, list additional sites ??, the Department of Water Supply's (landscape brochure, website - or list sites hear, UH, Maui Nui Botanical Garden etc. ?)
- 4. 85% of the plants in non-turf areas shall be well suited to the natural climatic conditions of the subject area, and require little additional water.
- 5. No more than ten percent of the plants selected for non-turf areas may be considered high-water use plants.
- 6. Nothing in this or any other section of this ordinance shall compel removal of heritage plants.
- 7. Parks, Golf Courses, Cemeteries, and School Grounds, though exempt from turf restrictions applying to other landscapes, shall use drought tolerant turf species and shall use low-water use plants as much as possible.
- 8. The use of plants listed as nuisance species in either the Maui County Planting Plan, DWS Plant Brochure, Hawaiian Ecosystems At Risk, list of priority species for removal by the Maui Invasive Species Committee, or other list of nuisance species is prohibited. Landscapes shall conform with the provisions of under HRS chapter 152 and HAR Title 4 Subtitle 6 Chapter 68 referring to noxious weeds.
- 9. Groundcovers other than lawns shall be used on slopes exceeding 10% to reduce runoff
- D. Ornamental Water Features (Fountains, Ponds, Pools, Others)
  - 1. Water bodies that are part of the landscaping for new and rehabilitated developments shall be restricted and subject to permit, except where such water bodies are integral to the operations of the development.
  - 2. Decorative water bodies in which potable water is sprayed into the air shall be discouraged.
  - 3. Recirculating water shall be used for decorative water features.
  - 4. Outdoor fountains shall be equipped with wind shutoff valves.
  - 5. Outdoor fountains shall be equipped with rain shutoff controls.
  - 6. Outdoor fountains shall be equipped with automated timers.
  - 7. All ornamental uses of water in the common areas of projects such as ponds, lakes and fountains shall be supplied, operated and maintained with alternative sources of water, such as reclaimed water, brackish water, or cooling tower water if they are available.
  - 8. Natural water features are not restricted, but should be clearly identified in the landscape design.
  - 9. Covers for pools and spas are encouraged.

# E. Soils & Grading

- 1. Soil types and infiltration rates shall be considered when designing irrigation systems.
- 2. Design should include soil analysis to determine
  - a. Soil texture, indicating the percentage of organic matter
  - b. Approximate soil infiltration rate (measured or derived from soil infiltration rate tables)
  - c. pH
  - d. Measure of total soluble salts
  - e. Grading shall be minimized to avoid soil compaction
  - f. Where topsoil layers are thin, mulch shall be added to the soil surface after planting.
  - g. Non-porous material shall not be placed under mulch amendments.

# 14.03.033 Water Source Selection

- A. Recycled Water
  - 1. The installation of recycled water irrigation systems shall be required for new developments wherever a reclaimed water distribution system has been installed and can be used in compliance with regulatory requirements, in accordance with 20.30.010 or 14. (reclaimed water provisions) unless a written exemption has been granted and signed by the Departments of Public Works and Water Supply. (revise to match current reclaimed water code)
  - 2. Recycled water irrigation systems shall be designed and operated in accordance with all State and County codes.
- B Irrigation systems in commercial, industrial, hotel and motel developments shall make use of recycled or brackish water unless a written exemption has been granted by the County Department of Public Works & Waste Management, stating that non-potable water meeting all health standards is not available and will not be available in the foreseeable future.
- C. Notwithstanding other provisions of this section, non-potable water shall be used for irrigation of Golf Courses, according to the provisions of Maui County Code §20.24 or §14.08(reserved).

# 14.03.034 Equipment

- A. . Automatic irrigation systems shall be used for landscapes in which the irrigated area exceeds 2 acres.
- B. All irrigation systems shall be equipped with a controller capable of dual or multiple programming for separation of turf and non-turf areas, multiple cycle capabilities and flexible calendar programming.
- C. All irrigation controllers shall be equipped with a water percent adjustment feature.
- D. Irrigation controllers shall be equipped with a rain shutoff device.
- E. All automatically controlled irrigation systems shall utilize SMART controllers capable of responding appropriately for each lawn circuit.
- F. Drip systems shall be constructed of non-corrosive materials.

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G.	Drip irrigation systems shall be utilized wherever trees, shrubs or groundcovers are irri- gated
H.	Drip and bubbler irrigation systems shall not discharge water in excess of 1.5 gallons per minute per device.
Ι	Irrigation systems shall be designed and equipment selected and maintained to provide a distribution uniformity not less than 85% for drip irrigation, 70% for rotors, and 60% for spray heads.
J	Sprinkler heads shall be selected for proper area coverage, application rate, operating pressure, adjustment capability, and ease of maintenance.
К	Sprinkler heads which are used on slopes exceeding 10% and which are located within 10 feet of any hardscape shall have a precipitation rate that does not exceed 0.85 inches per hour
L	Pop-up sprinklers in turf areas shall be at least 4" high.
M	Sprinkler head orientation and throw shall be designed to minimize run-off and overspray into non-irrigated areas.
Ν	Large sprinkler zones shall be equipped with high uniformity rotary nozzles.
0	Serviceable check valves are required where elevation differential may cause low head drainage.
Р	Any irrigation equipment located within 12" of pedestrian and vehicular use shall be located entirely below grade or otherwise adequately protected from potential damage.
Q	Where pressure exceeds manufacturers recommendations, pressure regulating nozzles are required on spray heads.
14.03	.035 Irrigation Scheduling
А.	Irrigation scheduling shall incorporate the use of evapotranspiration data or soil moisture data to apply the appropriate levels of water for different climates and regions.
В.	Landscape irrigation shall be scheduled between 7:00 P.M. and 10:00 A.M. to reduce evaporation losses.
C.	Irrigation schedules shall be set according to plants actual water needs.
14.03	.036 Prevention of Runoff, Overspray or Other Water Waste
Α.	Irrigation systems shall be designed, installed, operated and maintained so as to prevent run-off, overspray, or low-head-drainage, including but not limited to1 landscape water which is applied in such a manner rate and or quantity that it overflows or sprays the land- scaped area being watered and runs onto adjacent property or public right-of-way; 2 wash- ing of vehicles, equipment or hard surfaces such as parking lots, aprons, pads, driveways or other surfaced areas when water is applied in sufficient quantity to flow from that sur- face onto adjacent property or the public right of way; 3 water applied in sufficient quan- tity to cause ponding on impervious surfaces
В.	Proper irrigation equipment and schedules, including features such as repeat cycles, shall be used to closely match application rates to infiltration rates thereby mini-
	mizing runon.

D.	Water application per cycle shall match soil absorption rates. Avoid runoff by discon- tinuing the application of water as soon as it occurs. Watering in states can allow water to soak
	in between applications thus improving the efficiency of water use
E.	Conventional sprinklers shall not be used where the perimeter to area ratio (P/A)
	exceeds 0.25.
F.	Drip, low volume spray, or high uniformity rotary nozzles should be used to minimize
	run-off.
G.	Sprinkler heads with a precipitation rate of 0.85" per hour or less shall be used on
	slopes exceeding 15% to minimize run-off, or exceeding 10% within 8 feet of hardscape.
H.	Turf grass perimeters shall be minimized to improve irrigation efficiency. Long nar-
	row strips of turf grass such as traffic medians and areas between curbs and sidewalks are not
	permitted.
I.	This ordinance is intended to prevent water waste, and is not intended to supersede
	existing County provisions regarding prohibition of Water Waste.
J.	No property holder's association may establish criteria for landscaping that prohibit
	owners from removing turf grass and installing water-efficient landscape plants in compliance
	with these provisions.
K.	Even where hand watering is employed, over-watering as evidenced by soggy soils,
	continually wet pavement, standing water, run-off into streets or other hardscape shall be pre-
	vented and shall be considered a violation of this ordinance.

# 14.03.037 Maintenance

- A. . Landscapes shall be maintained to insure water efficiency. A regular maintenance schedule shall include but not be limited to checking, adjusting and repairing irrigation equipment; resetting or adjusting automatic controllers, aerating and dethatching turf areas, replenishing mulch, soil amending, fertilizing, pruning and weeding in all landscape areas.
- B. Whenever possible, repair of irrigation equipment shall be done with the originally specified materials, their equivalents, or compatible materials of greater efficiency.
- C. Repairs of leaks, breaks or malfunctioning equipment shall be made promptly. It shall be unlawful to allow leakage or other inefficient condition caused by equipment malfunction to continue beyond a reasonable time. For purposes of this section, a reasonable time shall not exceed 48 hours.
- D. Leaking or faulty system elements shall be shut off until repairs can be made.

# 14.03.038 Monitoring, Meters, Audits, Certification

- A Meters
  - 1. Separate landscape water meters shall be installed for all projects except for single family homes or projects with a landscaped area of less than 10,000 square feet.
- B Landscape Irrigation Audits & Certification
  - 1. All new non-residential developments, or residential developments with common with landscaped and irrigated areas greater than 10,000 square feet are required to

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have a landscape audit prior to (release of bond and) close of sale in which a certified irrigation designer or certified auditor shall conduct a final field observation and certify that the landscape has been designed in accordance with the provisions of this section. The certified irrigation designer or auditor shall specifically indicate that plants were installed as specified, that the irrigation system was installed as designed, that an irrigation audit has been performed, and provide a list of any observed deficiencies.

2. All existing landscaped and irrigated areas which exceed 10,000 square feet, and to which the County provides water including green belts, common areas, multi-family housing, schools, businesses, parks, cemeteries, hotels, motels, golf courses and publicly owned landscapes shall have a landscape irrigation audit at least once every five years. These audits shall reference and be in accordance with the standards set by the Irrigation Association.

# 14.03.039 Education, Incentives and Enforcement

- A. Public Education
  - 1. Information on conservation which is provided by County agencies during the permit process shall be provided by consultants and representatives to each affected applicant.
  - 2. New development shall provide information to all buyers or long-term leaseholders regarding the design, installation and maintenance of water efficient landscapes.
  - 3. If a residential development utilizes model homes during marketing, model homes must abide by the provisions of this section, including the use of non-invasive drought tolerant plants and a maximum of 20% turf or water area..
  - 4. Signs shall be used to identify the water efficient landscape and featuring elements such as hydrozones, irrigation equipment and others which contribute to the overall water efficient theme.
  - 5. Developers shall provide buyers with sample landscape plans using non-invasive plants adapted to the natural rainfall of the area.
  - 6. The developer shall also provide information about water conservation by distributing pamphlets to buyers regarding this subject. Such pamphlets are now available from the Maui County Department of Water Supply and other agencies.
- B Incentives
  - 1. The Department of Water Supply may adjust its rate and fee structure as necessary to provide for landscape conservation incentives where these are anticipated to result in economically viable conservation savings.
  - 2. The Department of Water Supply may withdraw incentive programs when these are deemed no longer effective or cost-beneficial.
- C Enforcement

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- 1. Inspection
  - a. The County shall have the right to inspect new developments for compliance prior to granting final approvals.
  - b. Inspection for new development or other inspection shall be carried out with due regard for the convenience and schedule of the owners, the privacy of the occupants, and shall be during business hours unless requested otherwise by the land-scape owner and approved by the Department Director.
  - c. Where consent to an inspection has been refused, or has been unobtainable within a reasonable period of time, OR where a report of violation has been made to the County, the County shall have the right to make un-announced inspection. Such inspection shall be during normal business hours and shall be conducted with due regard for the privacy of occupants.

# 2. Penalties

- a. Any responsible party found to violate the provisions of this ordinance shall be subject to progressively higher fees, leading to to County-installed flow restriction and ultimately to meter removal.
- b. In lieu of paying fees for first and second violations only, the responsible party may elect to have a landscape water audit performed by an authorized landscape irrigation auditor, (to be conducted in accordance with the current edition of the landscape auditors handbook). The audit must be performed within 30 days of the violation notice, and the recommendations of the audit must be implemented within 60 days of the violation notice. If these deadlines are met, the fees for violation will be waived. As of the third violation on a premise, the responsible party will be required to have an audit, implement the audit AND pay the fees.
- c. For the purposes of assessing fees or flow restriction for violations, any previous violation shall not be considered if a period of five years has elapsed since the last violation was incurred, or the property is acquired by a new owner.

# 14.03.040 Leak Detection and Prevention

- A.. The Department shall monitor consumers' water consumption and issue high consumption notices to customers when warranted.
- B. The Department shall maintain a leak detection program.
- C. The Department shall prioritize the replacement of old and leak-prone mains
- D. The Department shall assist residents and businesses in detection and prevention of leaks through education, distribution of tablets to detect toilet leaks, or other measures as approrpriate. The department shall encourage members of the public to report water leaks.
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#### 14.03.050 Water Waste Prohibitions

- A. No person, firm, corporation or government agency shall waste, cause or permit to be wasted any water.
- B. No person, firm, corporation or government agency shall cause or permit the flow of fugitive water onto adjacent property or public right of way, except as resulting from firefighting, system flushing or other public need or public facilities maintenance need.
- C. No person, firm, corporation or government agency shall utilize potable water for construction dust control.
- D. No person, firm, corporation or government agency shall utilize misters except as specifically permitted.
- E. Washing of sidewalks, walkways, driveways, parking lots and other hard-surfaced areas by direct hosing of potable water is hereby prohibited, except as may be necessary and appropriate under other regulations specifically to dispose of flammable or otherwise dangerous liquids or substances, or otherwise necessary to prevent or eliminate dangers to public health and safety.
- F. The escape of water through breaks or leaks within the customer's plumbing or distribution system for any substantial period of time within which the break or leak should reasonably have been discovered and corrected. It shall be presumed that a period of 48 hours after the customer discovers the break or leak is a reasonable time within which to correct the break or leak.
- G. Use of any irrigation in a manner that does not comply with 14.03.030-039 of this chapter is hereby prohibited.
- H. Other provisions of this section notwithstanding, the use of water for required flushing to maintain water quality, and for fire training operations as needed is allowed.

# 14.03.060 Fixture & Facility Performance Standards

# 14.03.061 General

#### A. Purpose

- The purpose of this section is to reduce unnecessary water consumption, sewer flows and energy use by establishing water conserving standards for plumbing fixtures. Several types of fixtures and appliances for bathroom, kitchen, laundry, cooling and other uses can reduce water consumption and hot water heating needs. The purpose of this section is to provide minimum standards for such appliances, to insure efficient use of water in accordance with the national energy policy act and chapter 16.2 of the Maui County Code.
- B. Applicability
  - 1. This section shall apply to
    - a. All new structures

- b. Retrofit or renovation of existing structures
- c. Structures which are undergoing transfer of ownership
- 2. This section shall not apply to showers faucets or other fixtures which require a higher flow for safety reasons, such as safety showers for hazardous materials removal or etc.
- C. Periodic Update

The Department of Water Supply, Department of Environmental Management or Planning Department DSA, after consulting with and considering the recommendations of interested agencies, may from time to time propose to the Administration, Board and Council updates to standards and guidelines prescribed in this chapter. Such regulations as are approved by resolution of the Council shall have the force and effect of law unless otherwise indicated.

D. Conformance with Maui County Code Chapter 16.2 and Uniform Plumbing Code Chapter 10
 Low flow fixtures in accordance with Maui County Code 16.20 and chapter 10 of the Uniform Plumbing Code, are hereby required.

# 14.04.062 Performance Standards

The following performance standards shall apply to all new construction and to replacement of fixtures.

- A. The flow rate of toilets shall not be greater than 1.6 gallons per flush.
   (US Energy Policy Act) Toilets with a flow rate equal to or less than 1.28 gallons per flush are encouraged, and rebate programs will not be issued for toilet replacement over the 1.28 gpf average recommended by LEED. (US Green Building Council Leadership in Energy and Environmental Design, as well as by EPA Water Sense)
- B. The flow rate of showerheads shall not exceed 2.5 gpm at 80 psi or 2.2 gpm at 60 psi (or 1.5)
- C. The flow rate of Kitchen Faucets shall not exceed 2.5 gpm at 80 psi, nor 2.2 gpm at 60 psi
- D. The flow rate of Bathroom Faucets shall not exceed 2.5 gpm at 80 psi, nor 2.2 gpm at 60 psi (1.5, 1.2, 1 also available and rquired in some places)
- E. The flow rate of Urinals shall not exceed 1 gpm (waterless urinals are also available and encouraged ? )
- F. Residential Dishwashers shall require no more than 7 gallons per load (? 6.5 by 2011, 6.25 by 2016, 6 by 2025 ?) (Oregon rebates 6.5 or less now) (National Appliance Energy Conservation Vickers 2001 check ref- 4.5)
- G. Commercial Dish Washers
  - Pre-Rinse Spray Valves on new Commercial dishwashers shall have a flow rate of equal to or less than 1.6 gpm at 60 psi. (Calif code Ttle 20 division 2 chapter 4 article 4 §1605.3 ) (1.6 - 2.65 at 80 available per a different article)
  - 2. Ware Washing units shall have flow rates of less than 1 gallon per rack
- H. Residential Clothes Washers shall have a water factor of 5 or less, and use no more than 27 gallons per load.

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(Old washers use4d 32-59 gallons per load, current efficient washers can use 18-25 gallons per load) (Calif code 8.5 effective jan 1, 07)

- I. Commercial Clothes Washers shall have a maximum water factor of 9.5 (Effective in California code Jan 1, 2007) (now can be less - 6 or lower)
- J. Tunnel washers should have a maximum water factor of 2.

#### K. Cooling

- 1. In accordance with \$14.25A.040 of the Maui County Code, discharge of cooling system water to the public wastewater system is prohibited, except in cases where reclaimed water is used, or when cooling water is utilized in another on-site process.
- 2. New water cooling systems must recirculate water. Installing a new non-recirculating (also known as single-pass or once-through) cooling system is prohibited.
- 3. Commercial Ice makers shall either utilize air or if water is utilized, shall be equipped with re-circulating closed loop chilled water.
- 4. Evaporative coolers and other cooling systems shall be maintained properly so as to prevent un-necessary overflow into drain lines.
- L. Process Water
  - 1. All uses of water for cooling, irrigation, or commercial or industrial processes that exceed 20,000 gallons per day shall be separately metered.
  - 2. New commercial car wash facilities shall recirculate and reuse a minimum of seventy five percent of wash and rinse water.

## 14.03.063 Submetering Multi-family and Multi-use buildings

All new multifamily and multi-use commercial structures shall be constructed so as to provide for the measurement of water use in each unit through submeters (owned by the property owner) or individual meters (owned by the Utility).

# 14.03.070 Retrofit on Resale Provisions

A. Definitions

The following definitions are applicable to this section only

Bathroom	means any alteration of or addition to a bathroom in any structure which
Alteration	would require a plumbing permit for replacement of a toilet.
Bathroom Alteration Retrofit Certificate	means a certificate that certifies that any responsible person who has completed a bathroom alteration has replaced any existing plumbing fixture in the altered bathroom with a water-conserving plumbing fixture.

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Change of Ownership	means a transfer, sale, or exchange of the fee interest in any real property.
Existing Plumbing Fixture	<ul> <li>means the following:</li> <li>(1) any toilet manufactured to use more than 1.6 gallons of water per flush;</li> <li>(2) any urinal manufactured to use more than one gallon of water per flush;</li> <li>(3) any showerhead manufactured to have a flow capacity of more than 2.5 gallons of water per minute;</li> <li>(4) any faucet that emits more than 2.2 gallons of water per minute; or</li> <li>(5) any residential reverse osmosis system that does not have a shutoff valve.</li> </ul>
Existing	means either of the following:
Structure	(1) any structure served by the County of Maui and equipped with toilets manufactured to use more than 1.6 gallons of water per flush, or urinals manufactured to use more than 1 gallon of water per flush; or
	(2) any structure served by the County of Maui and equipped with showerheads that have a flow capacity of more than 2.5 gallons of water per minute, faucets that emit more than 2.2 gallons of water per minute, or residential reverse osmosis systems that do not have a shutoff valves.
Retrofit	means to replace any existing plumbing fixture in an exiting structure with a water- conserving plumbing fixture.
Transfer of Responsibility to Retrofit	means a certificate filed by a transferor of any existing structure before a change of Certificateownership that certifies that the transferor and the transferee mutually agree that responsibility for compliance with this Section is assumed by the trans- feree of the existing structure.
Low Flush Toilet Rebate Program	means a County-sponsored water conservation program that offers a financial incentive to water customers who replace a toilet that is manufactured to use more than or equal to 1.6 gallons of water per flush with a toilet manufactured to use less than 1.6 gallons of water per flush.
Water Conservation Certificate	means a certificate filed by a transferor or transferee of any structure or existing structurebefore a change of ownership that certifies any structure or existing structure is equipped or retrofitted only with water-conserving plumbing fix- tures or toilets manufactured to use no more than 1.6 gallons of water per flush.
Water Conserving Plumbing Fixture	means: (1) any toilet manufactured to use no more than 1.6 gallons of water per flush, tha meets performance standards established by American Societyof Mechanical Engineers Standards A112.19.2-1990 and A112.19.6-1990;

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(2) any urinal manufactured to use no more than 1 gallon of water per flush, that meets performance standards established by American Society of Mechanical Engineers Standards A112.19.2-1990 and A112.19.6-1990;

- (3) any showerhead manufactured to have a flow capacity of no more than2.5 gallons of water per minute;
- (4) any faucet that emits no more than 2.2 gallons of water per minute; or
- (5) any residential reverse osmosis system that has a shutoff valve.
- B. Requirements for Retrofit upon Change of Ownership
  - 1. Before a change of ownership, the transferor of any existing structure shall replace any existing plumbing fixture with a water-conserving plumbing fixture.
  - 2. Before a change of ownership, the transferor and the transferee of any existing structure may agree to transfer responsibility for compliance with this section to the transferee. If the transferee assumes responsibility for retrofitting, the transferee shall complete the retrofit within at least 90 calendar days of the change of ownership.
  - 3 The transferor and the transferee of any existing structure may agree to have compliance with this section included as a condition of escrow, have the responsibility for retrofitting assumed by the transferee, and have the retrofit paid for from the proceeds of the sale of the existing structure.
  - 4. If the transferor and the transferee agree to have compliance with this section included as a condition of escrow, the escrow agent shall retain a sufficient sum of money, agreed upon by the transferor and the transferee, to be retained from the proceeds of the sale to complete the retrofit.
  - 5. The transferee shall complete the retrofit within at least 90 calendar days of the close of escrow.
  - 6. After the transferee has completed the retrofit, the transferee shall submit proof of completion of the retrofit to the escrow agent. The escrow agent may release the retained funds from the proceeds of the sale upon receiving reasonable, satisfactory proof of completion of the retrofit from the transferee.
  - 7. The Department of Water Supply / DSA ? shall establish administrative regulations for the procedures to be followed by the transferor, the transferee, and the escrow agent for complying with this section.
- .C. The transferor of any existing structure shall not be required to retrofit when a change of ownership occurs as a result of the following.
  - a. A court order, including an order by a probate court in the administration of an estate;
  - b. A foreclosure or voluntary or involuntary bankruptcy;
  - c. The exercise of eminent domain;
  - d. The administration of a deceased person's estate, guardianship, conservatorship, or trust;

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- e. One title co-holder of real property transferring, selling, or exchanging with one or more other title co- holders;
- f. A transfer, without consideration, from one family member to another family member; or
- g. A decree of dissolution of marriage, a decree of legal separation, or from a property settlement agreement incidental to such a decree.
- D. Retrofit upon Bathroom Alteration

Upon bathroom alteration, the responsible person shall replace any existing plumbing fixture in the bathroom being altered with a water-conserving plumbing fixture.

# E. Retrofit Exemptions

An exemption to the provisions of this section may be granted if under the following conditions :

- 1. A water-conserving plumbing fixture would be installed in an existing structure that has been identified by a local, state, or federal government entity as an historical site, and an historically accurate water-conserving plumbing fixture is not available;
- 2. Installation of a water-conserving plumbing fixture would require modifications to plumbing system components located beneath a finished wall or surface; or
- 3. The unique configuration of a building drainage system or portions of a public sewer, or both, require a greater quantity of water to flush the system in a manner consistent with public health.

# F. Self-verification

- 1. Before a change of ownership, the transferor and the transferee of any structure or any existing structure shall complete the following procedures:
- 2. The transferor shall sign a Water Conservation Certificate certifying that the transferor has complied with the requirements of this section or is exempt from retrofitting as defined in \_ above
- 3. After signing the Water Conservation Certificate, the transferor shall forward the Water Conservation Certificate to the transferee for review and signature.
- 4. .The transferee shall sign the Water Conservation Certificate, thereby acknowledging awareness and understanding of the requirements of this section.
- 5. After the transferee has signed the Water Conservation Certificate, the transferor shall file the Water Conservation Certificate with the Department of Water Supply.
- 6. If the structure or existing structure goes through escrow, the transferor also shall file a copy of the Water Conservation Certificate with the escrow agent before the close of escrow.
- G. In the event the transferor and transferee of an existing structure agree that the transferee shall have responsibility for the retrofit upon change of ownership pursuant to this section, before the change of ownership, the transferor and the transferee shall complete the following procedures:
  - 1. The transferor and the transferee shall sign a Transfer of Responsibility to Retrofit

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Certificate certifying that the transferee has assumed responsibility for the retrofit.

- 2. After the transferor and the transferee have signed the Transfer of Responsibility to Retrofit Certificate, the transferor shall file the Transfer of Responsibility to Retrofit Certificate with the Department of Water Supply.
- 3. If the existing structure goes through escrow, the transferor also shall file a copy of the Transfer of Responsibility to Retrofit Certificate with the escrow agent before the close of escrow.
- 4. Upon completing the retrofit, the transferee shall sign a Water Conservation Certificate certifying that the transferee has complied with the requirements of this section.

5. Within at least 30 calendar days of the completion of the retrofit, the transferee shall file the signed Water Conservation Certificate with the Department of Water Supply.

F. If the transferor and the transferee have agreed to have compliance with this section included as a condition of escrow, have the responsibility for retrofitting assumed by the transferee, and have the retrofit paid for from the proceeds of the sale of the existing structure, then the transferor and the transferee shall complete the following procedures:

- 1. The transferor and the transferee shall sign a Transfer of Responsibility to Retrofit Certificate certifying that the transferee has assumed responsibility for the retrofit.
- 2. After the transferor and the transferee have signed the Transfer of Responsibility to Retrofit Certificate, and before the close of escrow, the transferor shall file the Transfer of Responsibility to Retrofit Certificate with the Building Official and a copy thereof with the escrow agent.
- 3. Upon completing the retrofit, the transferee shall sign a Water Conservation Certificate certifying that the transferee has complied with the requirements of this division.
- 4. Within at least 30 calendar days of the completion of the retrofit, the transferee, or the escrow agent on the transferee's behalf, shall file the signed Water Conservation Certificate with the Building Official.
- 5. The transferor of any structure that is in compliance with the requirements of this divisionshall not be required to file a Water Conservation Certificate with the Building Official before a change of ownership if a Water Conservation Certificate has been filed with the Water Department / DSA ? by a previous owner of the structure.
- G. Upon completing the retrofit of a bathroom, the responsible person shall complete the following procedures:
  - 1. The responsible person shall sign a Bathroom Alteration Retrofit Certificate certifying that the responsible person has complied with the requirements of this section.

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- 2. Within at least 30 calendar days following completion of any bathroom alteration, the responsible person shall file the signed Bathroom Alteration Retrofit Certificate with the Building Official.
- H.. Agent
   Nothing in this division is intended to create any duty upon the agent of a transferor or a transferee of any structure or any existing structure, unless otherwise mutually agreed to in writing.

# 14.03.080 Water Re-use

- A. Commercial properties within 100' of R-1 distribution systems are required to provide for use of reclaimed water in irrigation as prescribed in chapter \$20.30 of the Maui County Code.
- 14.03.090 Reserved

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# APPENDIX F

# Draft Wellhead Protection Ordinance

# Draft Wellhead Protection Ordinance, County of Maui, Hawaii

# 1. PURPOSE AND INTENT

The jurisdiction of Maui County recognizes that many residents rely on groundwater for their safe drinking water supply, and that certain land uses can contaminate groundwater. To ensure the protection of these drinking water supplies, this ordinance establishes a zoning overlay district to be known as the Wellhead Protection Overlay District.

The purpose of the Wellhead Protection Overlay District is to protect public health and safety by minimizing contamination of aquifers and preserving and protecting existing and potential sources of drinking water supplies. It is the intent to accomplish this through both public education and public cooperation, as well as by creating appropriate land use regulations that may be imposed in addition to those currently imposed by existing zoning districts or other county regulations.

The Wellhead Protection Overlay District is superimposed on current zoning districts and shall apply to all new construction, reconstruction, or expansion of existing buildings and new or expanded uses. Applicable activities/ uses allowed in a portion of one of the underlying zoning districts which fall within the

Wellhead Protection Overlay District must additionally comply with the requirements of this district. Uses prohibited in the underlying zoning districts shall not be permitted in the Wellhead Protection Overlay District.

#### 2. **DEFINITIONS**

For the purposes of this section, the following terms are defined below:

AQUIFER. A geological formation, group of formations or part of a formation composed of rock, sand or gravel capable of storing and yielding groundwater to wells and springs.

CONTAMINATION. An impairment of water quality by chemicals, radionuclides, biologic organisms, or other extraneous matter whether or not it affects the potential or intended beneficial use of water.

DEVELOPMENT. The carrying out of any construction, reconstruction, alteration of surface or structure or change of land use or intensity of use.

FACILITY. Something that is built, installed, or established for a particular purpose.

HAZARDOUS MATERIAL. A material which is defined in one or more of the following categories:

Ignitable: A gas, liquid or solid which may cause fires through friction, absorption of moisture, or which has low flash points. Examples: white phosphorous and gasoline.

Carcinogenic: A gas, liquid, or solid which is normally considered to be cancer causing or mutagenic. Examples: PCB's in some waste oils.

Explosive: A reactive gas, liquid or solid which will vigorously and energetically react uncontrollably if exposed to heat, shock, pressure or combinations thereof. Examples: dynamite, organic peroxides and ammonium nitrate.

Highly Toxic: A gas, liquid, or solid so dangerous to man as to afford an unusual hazard to life. Example: chlorine gas.

Moderately Toxic: A gas, liquid or solid which through repeated exposure or in a single large dose can be hazardous to man.

Corrosive: Any material, whether acid or alkaline, which will cause severe damage to human tissue, or in case of leakage might damage or destroy other containers of hazardous materials and cause the release of their contents. Examples: battery acid and phosphoric acid

PRIMARY CONTAINMENT FACILITY. A tank, pit, container, pipe or vessel of first containment of a liquid or chemical.

RELEASE. Any unplanned or improper discharge, leak, or spill of a potential contaminant including a hazardous material.

SECONDARY CONTAINMENT FACILITY. A second tank, catchment pit, pipe, or vessel that limits and contains liquid or chemical leaking or leaching from a primary containment area; monitoring and recovery are required,

TIME-OF-TRAVEL DISTANCE. The distance that groundwater will travel in a specified time. This distance is generally a function of the permeability and slope of the aquifer.

WELLHEAD PROTECTION AREA. The surface and subsurface area surrounding a water well or wellfield, that supplies a public water supply system, through which contaminants are reasonably likely to move toward and reach the water well or wellfield.

WELLHEAD PROTECTION OVERLAY DISTRICT: The zoning district defined to overlay other zoning districts in Maui County. This district may includes the designated wellhead protection areas as identified on Land Zoning Maps.

# 3. ZONES WITHIN THE WELLHEAD PROTECTION OVERLAY DISTRICT

3.1 ZONE A1 – 50 FEET DIRECT CHEMICAL CONTAMINATION ZONE.

Zone A1 is defined as the fixed 50 feet radius around each well. The purpose of this zone is to provide protection from vandalism, tampering, or other threats at the well site.

#### a. Permitted Uses.

The following uses are allowed within Zone A1 provided they meet the appropriate performance standards outlined in 3.1.b below and are designed so as to prevent any groundwater contamination. Necessary public utilities/facilities including the construction, maintenance, repair, and enlargement of drinking water supply related facilities such as, but not limited to, wells, pipelines, aqueducts, and tunnels.

#### **b.** Performance Standards:

Vehicles shall not be parked in the immediate well area, even when working on well maintenance or repair, unless required for power supply

Motor oil, fuel, paints, and any maintenance chemicals shall not be stored in the pump house or Zone A1.

Any underground storage tanks, hazardous materials, and septic systems shall be removed or relocated from this zone, where possible

Hazardous materials shall be stored in a secure building on an impermeable surface with adequate spill containment

Propane gas shall be used for power pumps

Any non-water supply activities shall be kept out of the Zone A1 area

3.2 ZONE A2 – 1,000 FEET DIRECT CHEMICAL CONTAMINATION ZONE.

Zone A2 is defined as the intersection of the modeled Wellhead Protection Area and the fixed 1,000 feet radius around each well. The purpose of this zone is to provide minimum distance from sources of pollution consistent with Hawaii Well Construction and Pump Installation Standards.

#### a. Prohibited Uses:

The following uses are prohibited within Zone A2:

Cesspool, septic tank, or subsurface sewage leaching field

Hazardous waste landfills and ponds, or chemical storage

Treated effluent injection well

3.3 ZONE B – INDIRECT MICROBIAL CONTAMINATION ZONE: 2 YEAR TRAVEL TIME.

Zone B consists of the surface area overlying the portion of the aquifer(s) that contributes water to the well within a two-year time-of-travel.

#### a. Permitted Uses:

All other uses permitted in the underlying zoning districts, unless prohibited under 3.3 b. provided that they can meet the Performance Standards as outlined for the Wellhead Protection Overlay District under 3.3.e.

Minimum lot size for unsewered residential uses shall be two acres, except for; a) existing lots of record on the effective date of this Ordinance and b) developments which will be served by municipal sewer within five years of the approval of the development. In order to provide for efficiently serving these developments with municipal sewer, lots smaller than two acres can be approved, provided that sufficient land area will be maintained in an undeveloped state such that no more than one residence is allowed for each two acres of the overall development.

New development construction shall implement best management practices described in 3.3.e.

#### **b.** Prohibited Uses.

The following uses are prohibited within Zone B, the two-year time-of-travel zone.

Electrical/electronic manufacturing facility;

Funeral services/graveyards

Golf courses

Metal plating/finishing/fabricating facility;

Chemical processing/storage facility;

Plastics/synthetic production facility;

Junk/scrap/salvage yard;

Major transportation corridors/highways/freeways/turnpikes;

Mines/gravel pit

Landfills/dumps

Injection wells/dry wells/sumps;

Artificial recharge projects (non-potable water)

Reclaimed wastewater irrigation class R2 and R3

Sewage sludge land application

Underground storage tanks, (except those with spill, overfill, and corrosion protection requirements in place);

All uses not permitted in the underlying zone district

#### c. Prohibited Uses Subject To Exception:

The following uses, unless granted an exception under 3.3.d., are prohibited within Zone B, the two-year time-of-travel zone.

Automobile body/repair shop;

Car washes;

Cement/concrete plants;

Gas station;

Fleet/trucking/bus terminal;

Dry cleaner;

Irrigated crops using soil fumigants (> 50 acres) or pesticides with high leachability;

Land divisions resulting in high density (>1 unit/2 acre) septic systems;

Machine shop;

Wood preserving/treating facility;

Confined animal feeding operations

Equipment maintenance/fueling areas;

Hospitals;

Parking lots/malls (>50 spaces);

Reclaimed wastewater irrigation R1 or better;

Waste transfer/recycling stations;

Above ground storage tanks;

All other facilities involving collection, handling, manufacture, use, storage, transfer or disposal of any solid or liquid material or waste having potentially harmful impact on groundwater quality;

#### d. Exceptions:

Where the underlying zoning permits a use that would be prohibited by this ordinance, a wellhead area exception may be granted by the County Department of Water Supply, provided that the use conforms to provisions of the underlying zoning district as certified by the County Department of Planning, meets the performance standards outlined in 3.3.e below, follows design guidelines outlined in section 4, that any concerns of the State Department of Health have been addressed, and that adequate information to evaluate the project has been provided.

Exception may be approved by the County Department of Water Supply for expansion of existing nonconforming uses to the extent allowed by the underlying district. The applicant should consult the local zoning plan to confirm nonconforming uses. The County Department of Water Supply reserves the right to review all applications and shall not grant approval unless it finds such expansion does not pose greater potential contamination of groundwater than the existing use.

#### e. Performance Standards:

The following standards shall apply to uses in Zones B and C of the Wellhead Protection Overlay District:

Any facility involving the collection, handling, manufacture, use, storage, transfer or disposal of any solid or liquid material or wastes, unless granted a special exception either through permit or another ordinance, must have a secondary containment system which is easily inspected and whose purpose is to intercept any leak or release from the primary containment vessel or structure. Underground tanks must be in compliance with underground storage tank rules adopted January 28,2000 in HAR Title 11 Chapter 281.

Open liquid waste ponds containing materials referred to in item (1) above will not be permitted without a secondary containment system.

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All permitted facilities must adhere to appropriate federal and state standards for storage, handling and disposal of any hazardous waste materials.

All abandoned wells should be properly plugged according to local and state regulations.

Confined animal facilities should meet "Management Measure for Wastewater and Runoff from Confined Animal Facilities" as set in Hawaii's Coastal Nonpoint Pollution Control Program Management Plan, Volume 1, 1996.

Irrigated crops should implement Integrated Pest Management in accordance with US Department of Agriculture Natural Resources Conservation Service Technical Guide 1989.

Construction activities shall be in accordance to County Code Chapter 20.08 and these standards:

There shall be a designated person on site during operating hours who is responsible for supervising the use, storage, and handling of hazardous material and who shall take appropriate mitigating actions necessary in the event of fire or spill.

.Hazardous materials left on site when the site is unsupervised must be inaccessible to the public. Locked storage sheds, locked fencing, locked fuel tanks on construction vehicles, or other techniques may be used if they will preclude access.

Construction vehicles and stationary equipment that are found to be leaking fuel, hydraulic fluid, and/or other hazardous materials shall be removed from the site and from Wellhead Protection Zones A, B or C. The vehicle or equipment may be repaired in place, provided the leakage is completely contained.

Storage and dispensing of flammable and combustible liquids from tanks, containers, and tank vehicles into the fuel and fluid reservoirs of construction vehicles or stationary equipment on the construction site shall be in accordance with these standards and County Fire Code Chapter 16.04A

Hazardous materials and other deleterious substances shall not be allowed to enter stormwater systems.

3.4 ZONE C - INDIRECT CHEMICAL CONTAMINATION ZONE: 10 YEAR TRAVEL TIME.

Zone C consists of the surface area overlying the portion of the aquifer(s) that contributes water to the well within a ten-year time-of-travel.

#### a. Permitted Uses:

All other uses permitted in the underlying zoning districts, unless prohibited under 3.3 b. provided that they can meet the Performance Standards as outlined for the Wellhead Protection Overlay District under 3.3.e.

#### **b.** Prohibited Uses.

The following uses are prohibited within Zone C, the ten-year time-of-travel zone.

Electrical/electronic manufacturing facility;

Chemical processing/storage facility;

Plastics/synthetic production facility;

Junk/scrap/salvage yard;

Metal plating/finishing/fabricating facility;

Mines/gravel pit

Landfills/dumps

Injection wells/dry wells/sumps;

Underground storage tanks, (except those with spill, overfill, and corrosion protection requirements in place);

All uses not permitted in the underlying zone district

#### c. Prohibited Uses Subject To Exception:

The following uses, unless granted an exception under 3.4.d., are prohibited within Zone B, the ten-year time-of-travel zone.

Automobile body/repair shop;

Gas station;

Fleet/trucking/bus terminal;

Dry cleaner;

Golf courses;

Machine shop;

Wood preserving/treating facility;

Confined animal feeding operations

Land divisions resulting in high density (>1 unit/acre) septic systems;

Equipment maintenance/fueling areas;

All other facilities involving collection, handling, manufacture, use, storage, transfer or disposal of any solid or liquid material or waste having potentially harmful impact on groundwater quality;

#### d. Exceptions:

Where the underlying zoning permits a use that would be prohibited by this ordinance, a wellhead area exception may be granted by the County Department of Water Supply, provided that the use conforms to provisions of the underlying zoning district as certified by the County Department of Planning, meets the performance standards outlined in 3.3.e below, follows design guidelines outlined in section 4, that any concerns of the State Department of Health have been addressed, and that adequate information to evaluate the project has been provided.

Exception may be approved by the County Department of Water Supply for expansion of existing nonconforming uses to the extent allowed by the underlying district. The applicant should consult the local zoning plan to confirm nonconforming uses. The County Department of Water Supply reserves the right to review all applications and shall not grant approval unless it finds such expansion does not pose greater potential contamination of groundwater than the existing use.

#### 4. DEVELOPMENT GUIDELINES

The following design guidelines are encouraged for all new commercial, residential or mixed use development projects, excluding residential subdivisions of 2 lots or less in the 2-year time of travel Zone B:

Commercial and high-density residential development should be minimized and located at as far distance from the wellhead as possible.

Appropriate uses are open space, passive parks, schools and low density residential (minimum 2-acre lots)

The following design guidelines are encouraged for all new commercial, residential or mixed use development projects, excluding residential subdivisions of 2 lots or less in the 10 year time of travel Zone C:

High risk commercial and high-density residential development should be minimized and located at as far distance from the wellhead as possible.

Appropriate uses are open space, passive parks, schools, low risk commercial and low density residential (minimum 1-acre lots)

The following design guidelines are encouraged for all new commercial, residential or mixed use development projects, excluding residential subdivisions of 2 lots or less in Zone B and C:

Storm-water infiltration basins should be located outside the WHPA where feasible.

Active parks and schools should implement Integrated Pest Management.

Where development is proposed on property extending both inside and outside the WHPA, and where sufficient buildable land area exists on the portion of the property outside the WHPA boundary to accommodate the proposed development, and where applicable setbacks permit, that area in its entirety should be utilized before any land within the WHPA should be used. Where insufficient buildable land area exists on the portion of the property outside the WHPA to accommodate the proposed development, as much of the development as possible should be sited outside the WHPA.

Proposed development entirely within the WHPA should be grouped and sited on the subject parcel at as far distance as possible from the wellhead.

Expansions of existing uses should at least conform to these guidelines where the use is expanding beyond its' property boundaries.

Vegetative cover should be provided on all disturbed land areas, excluding fallow agricultural fields, not covered by paving, stone or other solid material. The maintenance or use of native plant materials with lower water and nutrient requirements is encouraged.

#### 5. LIABILITY

Nothing in this ordinance shall be construed to imply that the County of Maui has accepted any of an owner/developer's liability if a permitted facility or use contaminates groundwater in any aquifer.

#### 6. DISTRICT BOUNDARY DISPUTES

If the location of the Wellhead Protection Overlay District boundary in relation to a particular parcel is in doubt, the rules in Chapter 19.06 apply.

#### 7. ENFORCEMENT

a. Any person may submit a verbal or written complaint alleging a violation of this ordinance.

b. Any approval or permit issued pursuant to the provisions of this ordinance shall comply with all applicable requirements of Chapter 19.530.

c. Where an exception to a prohibited use is granted condition to performance standards, the appropriate enforcement agency of the applicable performance standard shall be notified to follow up with inspection as needed.

## 8. SAVING CLAUSE

Should any section or provision of this ordinance be declared invalid, such decision shall not affect the validity of the ordinance as a whole or any other part thereof. A determination that any portion or provision of this overlay protection district is invalid shall not invalidate any special permit previously issued thereunder.

Approved by: \_\_\_\_\_

Date: \_\_\_\_\_

# APPENDIX G Resolution Establishing The Lana'i Water Advisory Committee

# COUNTY OF MAUI BOARD OF WATER SUPPLY RESOLUTION NO. 05 (1999)

# ESTABLISHING THE LANAI WATER ADVISORY COMMITTEE

WHEREAS, the preparation of the Maui County Water Use and Development Plan (WUDP) is the responsibility of the Board of Water Supply (Board); and

WHEREAS, Board Rule §16-02-17 enables the Board to appoint standing committees and select committees to discharge its responsibilities and functions; and

WHEREAS, the Board wishes to formalize and establish consistent guidelines for implementation of community participation in Water Use and Development Planning; and

WHEREAS, water use issues on the island of Lanai have arisen because the island has limited water resources; and

WHEREAS, the Board is committed to public involvement in planning and decisionmaking efforts as it relates to the Lanai WUDP; and

WHEREAS, the establishment of the Lanai Water Advisory Committee (LWAC) will enable the Board to complete the WUDP for the island of Lanai;

NOW, THEREFORE, BE IT RESOLVED by the Board of Water Supply and the County of Maui:

- 1. The Lanai Water Advisory Committee (LWAC) is hereby established. The LWAC shall consist of the following members selected by their respective organization (where appropriate):
  - (1) Two (2) voting members from Lanai Company;
  - (2) Two'(2) voting members from Lanai'ians for Sensible Growth;
  - (3) One (1) voting member from the Lanal Planning Commission;
  - (4) Councilmember from the island of Lanai, or his representative, with voting rights on the LWAC;

- (5) Three (3) residents of Lanai who are not affiliated with any of the above referenced organizations and who are entitled to vote on LWAC matters. The residents shall be selected by six (6) affirmative votes cast by the LWAC voting members from Lanai Company, Lanai'ians for Sensible Growth, the member of the Lanai Planning Commission, and the Lanai Councilmember or his representative. In the event that six (6) votes can not be obtained as to any resident, the Director is hereby authorized to make the selection of the resident(s) from among those considered. The Director's decision shall be final.
- (6) One (1) non-voting member from Lanaiians for Economic Growth and Stability.
- 2. The Department of Water Supply, through the Director, shall be the lead agency and shall provide appropriate staffing for the LWAC. The Department of Planning, Department of Public Works and Waste Management, Commission on Water Resources Management, Department of Land and Natural Resources, and other appropriate county or state agencies shall be consulted and may participate in the Lanai WUDP process. Staff personnel from these departments or agencies shall not have any vote in any LWAC proceedings.
- 3. The purpose and intent of the LWAC is to provide public input and involvement during the development of the Lanai WUDP and to monitor the Lanai WUDP implementation. The LWAC may organize itself as it deems appropriate to accomplish its purpose, including the adoption of by-laws for its own internal governance.
- 4. The LWAC is established and shall remain in existence until otherwise determined by the Board by subsequent resolution.
- 5. In consultation with the LWAC, the Director shall determine the meeting dates of the LWAC.
- 6. All communications between the Board and the LWAC shall only be through the Director.
- 7. The Director may propose amendments to the composition, purpose, and term of the LWAC, which may be approved by the Board by resolution. The Director shall notify the LWAC members prior to proposing any such amendments to the Board.

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- 8. The Director is authorized to take any and all appropriate action necessary to carry out the purpose and intent of this Resolution that does not require Board approval.
- 9. That this resolution shall apply only to the process of drafting, reviewing, updating and implementing Water Use and Development Plans, and does not supersede any powers the Board, Administration, or other agencies already have to appoint advisory committees.
- 10. The Director shall notify each member of their selection to the LWAC.

IN WITNESS WHEREOF, and by proper vote of the Board of Water Supply, I have hereunto subscribed my name and affixed the seal of the Board of Water Supply this 16th day of March, 1999.

Robert K. Takitani, Chairman Maui County Board of Water Supply

Approved as to form and legality:

Gary W. Zakian, Deputy Corporation Counsel

Resolution No. 05 (1999)

# CERTIFICATION

The undersigned hereby certifies that the foregoing Resolution is a true and correct copy of Resolution No. 05 (1999) adopted at the meeting of the Board of Water Supply, County of Maui, duly held on the 16th day of March, 1999.

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- I.K

David Craddick, Director Department of Water Supply

**APPENDIX H** 

# Establishing Water Advisory Committees

LWAC DISCUSSION DRAFT

# A BILL FOR AN ORDINANCE TO ESTABLISH COMMUNITY PARTICIPATION IN THE FORM OF WATER ADVISORY COMMITTEES FOR DEVELOPMENT AND REVIEW OF WATER USE AND DEVELOPMENT PLANS

## BE IT ORDAINED BY THE PEOPLE OF THE COUNTY OF MAUI:

Chapter 2.88 A of the Maui County Code is amended as follows:

# I. Section 2.88A.010 Sections:

Section 2.88A.010 is amended to include definitions provided herein. Section 2.88A.020 is amended to include language provided herein. A new section 2.88A.030 is added, and the current Sections 2.88A.030 through 2.88A.050 are re-numbered as Sections 2.88A.040 through 2.88A.060. A new Section 2.88A.070 is added. The Sections of the amended Chapter are as follows:

#### Sections:

Definitions
Purpose & Intent
Water Advisory Committees
Adoption of the Plan
Application of the Plan
Amendment
Severability

# II. Section 2.88A.020 Definitions:

For purposes of this chapter, unless it is plainly evident from the context that a different meaning is intended, certain terms and words are defined as follows:

Maui County Water Use & Development Plan - Lana'i

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"Board" means the board of water supply of the county of Maui

"Commission" means the commission on water resource management of the State of Hawaii

"Council" means the council of the county of Maui

"County" means the County of Maui, a political subdivision of the State of Hawaii

"Department" means the Department of Water Supply of the County of Maui

"Director" means the director of water supply of the county of Maui

"DWS" means the Department of Water Supply of the County of Maui

"Plan" means the water use and development plan for the County of Maui, comprised of the technical report and executive summary.

"State Water Code" means chapter 174C, Hawaii Revised Statutes. (Ord 1948 §2, 1990)

A new definition is hereby added:

"Water Planning Districts" means areas served by a common mix of sources, connected such that sources are shared, or a distinct region or area served by small separate systems. They are defined as the following broad service areas, and shall include both DWS and non-DWS facilities:

1) Central Maui

Including but not limited to the area along the north from Waihee to Kuau, across the central isthmus, and along the south from Maalaea to Makena

2) Upcountry

Including but not limited to the current system areas known as Upper Kula, (incl. Ulupalakua-Kanaio), Lower Kula, and Makawao (incl. Pukalani through Makawao and Haiku to Ulumalu).

3) Lahaina

Including but not limited to the current system areas known as Honokohau, Mahinahina/ Alaeloa, and Lahaina

<u>4) Hana</u>

Including but not limited to Kailua, Keanae, Nahiku, Hana and Kaupo

5) Molokai

Including the entire island of Molokai

<u>6) Lanai</u>

Including the entire island of Lanai

# III. Section 2.88A.020 Purpose and Intent

Section 2.88A.020 is hereby amended as follows.

The purpose of the plan is to meet the mandate of the state water code relative to statewide water resources planning, more specifically to aid the commission and the county of Maui in the conservation, development and use of the water resources of the county. (Ord. 1948 §2, 1990)

The intent of this ordinance is to insure effective community participation in Water Use & Development Planning, and to acknowledge the direction taken by the State in publishing its *Framework for Updating the Hawaii Water Plan* to involve the public in planning & decision making and to practice integrated resources planning.

# IV. Section 2.88A.030 Water Advisory Committees

Section 2.88A.030 is hereby added

2.88A.030 Water Advisory Committees

- <u>A.</u> <u>A Water Advisory Committee shall be established in each Water Planning District.</u>
- B. Water Advisory Committees shall be composed of residents, purveyors and resource managers in the district served by the committee. In addition, at least one member of the Water Advisory Committee may be a Planning Commission representative for that district, (provided that person is willing to serve) and at least one shall be a County Council members serving the affected region, or that person's appointed representative
- <u>C.</u> <u>The membership of Each Water Advisory Committee shall be proposed by the Direc-</u> tor, with review by the Board, and approval by the Mayor.
- D In recruiting and selecting members for each Water Advisory Committee, The Department shall follow the principles in the Statewide Framework For Updating the Hawaii Water Plan, striving to be inclusive of stakeholders and achieve balanced participation.
- E If deemed advisable by the Department and Mayor, a substantial and balanced mailing list may substitute for a defined number of committee participants, provided that the mailing list is greater than 25 people, the opportunity to participate is advertised for at least a month, and the Mayor and Council have opportunity to contribute to the mailing list.
- <u>F</u> To allow for flexibility and recognition of the unique character of each district, various particulars of the committees, including but not limited to composition, membership, terms, meeting schedule, sunset, functions and other items described in 2.88A.030 D through J, contained herein, will be defined by the Director as specified in attachments for each district. These attachments are hereby incorporated into this rule, may be revised by the Director as needed to optimize implementation of the Water Use & Development Planning Functions without need for additional ordinance or rule-making proceedings.

- <u>G</u> Each Water Advisory Committee shall meet at a schedule determined by the Director, to discuss and make recommendations for update and development of the Draft Water Use and Development Plan, or for review of plan status and implementation.
- <u>H</u> In the event that the Director finds it necessary, Water Advisory Committees may be asked to select representatives to meet with Water Advisory Committees of other regions, to work toward resolution of inter-regional disputes.
- I Upon completion of the Water Use and Development Plan the Water Advisory Committees may continue to meet to review status and implementation of the Water Use and Development Plan, as deemed advisable by the Director.
- J
   The purpose of the Water Advisory Committees pertains specifically to the process of drafting, reviewing, updating and monitoring the implementation of the Water Use & Development Plans, and the establishment of these committees does not supersede any existing powers of the Board, Administration, Planning Commission, Council or other agencies.
- <u>K</u> The Director may waive the provisions of this section to the extent that they prevent obtaining or granting of federal aid on any project or the prosecution of work thereunder.

#### 2.88A.040 Adoption of the Plan

The council hereby adopts the plan, and any future revision, amendment or modification of the same, pursuant to section 2.88A.050 of this chapter, shall be deemed part of the plan without further adoption or amendment to this chapter and will be incorporated into this chapter by reference. (Ord. 1948 §2 1990)

## 2.88A.050 Application of the Plan

Section 2.88A.020 is hereby amended as follows.

The plan shall serve as a guideline to the council, the board and all other agencies or departments of the County (a) in approving or recommending to other agencies the use or commitment of the water resources in the County, and (b) in using public funds to develop water resources to meet existing or projected future demands on the public water systems as set forth in the plan, and (c) in establishing or recommending for consideration policies or protective measures for water resource management as appropriate to meet critical concerns of individual or collective water districts. (Ord. 1948 §2 1990)

#### 2.88A.050 Amendment

Section 2.88A.020 is hereby amended as follows.

If a proposed community plan amendment will impact the plan, the director shall initiate any necessary plan amendments.

An amendment to the plan proposed by the council, the director or any agency shall be referred to the Department for its review and recommendation. The Department shall hold

appropriate public hearings on proposed revisions or amendments and shall transmit them, with its findings and recommendations to the council. Within forty-five days of receipt of a proposed amendment, the council shall approve the amendment by ordinance. If the council fails to act within forty-five days, the amendment shall be deemed disapproved.

The mayor shall appoint a nine member task force to be chaired by the director to assist the Department with the review and amendment of the plan whenever the planning director recommends the revisions to the general plan pursuant to section 8-8.3.3 of the revised charter of the county of Maui. The task force shall recommend to the Department amendments to the plan so as to be consistent with any community plan amendment. (Ord. 1948 §2, 1990)

The Water Advisory Committees shall be established and serve as described in Section 2.88A.040 above, and shall recommend updates or changes as necessary based on community plan amendments, status of water resources or other critical factors. The Water Advisory committees shall recommend to the Department amendments as necessary to be consistent with general and community plan amendments. (Ord. 1948 §2, 1990)(Ord. 1948 §2, 1990)

#### VIII.2.88A.070 Severability

Section 2.88A.070 is hereby added:

The invalidity of any word, section, clause, paragraph, sentence part, or provision of this chapter shall not affect the validity of any other part of this chapter which can be given effect without such invalid part or parts.

#### **IX.Effective Date**

This ordinance shall take effect upon its approval.

# Attachment A

Water Use & Development Plan - Water Advisory Committee for Lana'i

# I. Establishment of the Lana`i Water Advisory Committee.

There shall be a Lana'i Water Advisory Committee (LWAC).

# II. Special Provisions:

# A. Balance of Membership

Membership and representation on the Lana'i Water Advisory Committee shall be as follows:

Organization or Entity	Number of Representa- tives
Lana`i Company	2
Lana`ians for Sensible Growth	2
At Large Lana`i Residents	3
Member of Lana`i Planning Commission	1
Council Member Residing on Island	1
Lead Agency - Department of Water Supply Staff	1 Ex Officio
Advising Agency - Commission on Water Resources Management	1 Ex Officio
Advising Agency - Department of Land & Natural Resources	1 Ex Officio
Advising Agency - Maui County Planning Department	1 Ex Officio
Advising Agency - Maui County Department of Public Works & Environ- mental Management	1 Ex Officio

# B. Meeting Frequency & Triggers for Calling a Meeting

The LWAC shall meet bimonthly during drafting and update of the Water Use and Development Plan, and quarterly thereafter. Additional meetings may be held on an as-needed basis, if one or more of the following conditions apply: 1) DWS receives a development proposal for review for the island of Lana'i which is inconsistent with the Water Use and Development Plan.

2) DWS receives a development proposal for review for the island of Lana'i which is anticipated to utilize more than 60,000 gpd, or which will cause pumpage to exceed designation triggers set by the Commission on Water Resource Management.

3) DWS receives a development proposal for review which may cause pumpage to exceed operational guidelines.

4) DWS receives a development proposal for review which involves a community plan amendment.

5) Status of the aquifer or watershed has been altered, implementation of source water protection is in question, or monitoring shows that implementation is ineffective and discussion is deemed advisable.

6) LWAC members or other supporting agencies request a meeting due to questions regarding implementation of Water Use and Development Plan measures, or status of water source & supply, or other unforeseen issues pertaining to the status of the water supply, or the drafting, implementation, and consistency of the Water Use and Development Plan with the Community Plan.

#### C. Coordination with Planning

If a proposed land use is heard by the planning department and or council, and if said land use could be contrary to the information in the Water Use and Development Plan, exceed consumption triggers based on standards for source and system viability as set by the Department, have potential for significant adverse affect on source or systems, or be contrary to any policy or resource protective measure contained in the plan, the Department may request to the Planning Department that the project be reviewed by the water advisory committee.

The Planning Director will determine whether such request for referral is to be granted. In the case of such referrals, the Planning Department, Planning Commission or Council shall consider the recommendations of the Water Advisory Committee for the record.

The results of these reviews shall be forwarded to the Director. The Director will in turn forward these recommendations to the Director of the Planning Department of the County of Maui.

The land use decision making body may over-ride the recommendations of the Department and Water Advisory Committee, except where this would conflict with the but should state the reason for such action on the record.

APPENDIX I	Saving Water In The Yard: What &
	How To Plant In Your Area
	& Other Conservation Materials


Saving Water In The Yard: What & How To Plant In Your Area & Other Conservation Materials

# Saving Water in The Yard What and How to Plant in Your Area

Wet Windward Areas
 Cool, Dry, Upper Elevations
 Warm to Hot, Low Elevations
 Moister, Low Areas Near Mountains
 Windward Coastal Salt Spray Zones



Type	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
туре	Psilotum pudum	moa, moa kula	1'	1'	sea to 3,000'	Dry to Wet
	Sadleria cyatheoides	'ama'u, ama'uma'u		and the second		5 - C - C - C - C
r Sh	Lipochaeta succulenta	nehe	2'	5'	sea to 1,000'	Dry to Wet
1 - 011	Cocce pucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
	Delebordio procina	lo'ulu, hawane	40'	10'	1,000' to 3,000'	Dry to Wet
	Prichardia alectria		15'		The state of the	
	Pritchardia forbesiaria		25'	15'	sea to 1,000'	Dry to Wet
	Pritchardia filiebrardia	marsh cypress, 'ahu'awa	0.5'	0.5'	sea to 1,000'	Dry to Medium
	Mariscus Javanicus	kolokololau	1	2'	sea to 1,000'	Dry to Wet
h	Bidens hillebrandiana ssp. filliebrandiana	N PI	6		And And	
h	Cordyline fruticosa		3'	2'	1,000' to 3,000'	Dry to Wet
h	Hedyotis spp.	au, pilo	8'	6'	sea to 1,000'	Dry to Medium
h - Tr	Broussonetia papyrifera	wauke, paper mulberry	50' - 100'	40' - 80'	1.500' to 4.000'	Dry to Mediun
r	Acacia koa	koa	50'	50'	sea to 3.000'	Medium to We
r	Aleurites moluccana	candlenut, kukui	50	10	sea to 3 000'	Medium to We
r	Calophyllum inophyllum	kamani, alexandrian laurel	60	40	000 10 01000	
r	Charpentiera obovata		15	25'	sea to 1 000'	Dry to Wet
r	Cordia subcordata	kou	30	23	368 10 1,000	
r	Hibiscus furcellatus	'akiohala, hau-hele	8		sea to 1 000'	Dry to Wet
r	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25	20	sea to 1,000	Dry to Wet
r	Morinda citrifolia	indian mulberry, noni	20	15	sea to 1,000	Dry to Wet
r	Pandanus tectorius	hala, puhala (HALELIST)	35'	25	sea to 1,000	Modium to M
	Abaia aliviformia	maile	Vine	A State	sea to 6,000	Intediant to w



Туре	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
E	Psilotum nudum	moa, moa kula	1'	1'	sea to 3,000'	Dry to Wet
F	Sadleria cyatheoides	'ama'u, ama'uma'u	and particular	E. Street		
G	Eragrostis monticola	kalamalo	1'	2'	sea to 3,000'	Dry to Medium
Gr	Ipomoea tuboides	Hawaiian moon flower, 'uala	1	10'	sea to 3,000'	Dry to Medium
Gr	Peperomia leptostachya	'ala'ala-wai-nui	1'	1'	sea to 3,000'	Dry to Medium
Gr	Plumbago zeylanica	'ilie'e	1	5.4 J. P. S. S.		
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta rockii	nehe	2'	2'	sea to 3,000'	Dry to Medium
Sh	Argemone glauca var. decipiens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Artemisia mauiensis var. diffusa	Maui wormwood, 'ahinahina	2'	3'	1,000' to higher	Dry to Medium
Sh	Chenopodium oahuense	'aheahea, 'aweoweo	6'		sea to higher	Dry to Medium
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Lipochaeta lavarum	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	Senna gaudichaudii	kolomana	5'	5'	sea to 3,000'	Dry to Mediun
Sh	Styphelia tameiameiae	pukiawe	6'	6'	1,000' to higher	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Mediun
Sh - Tr	Nototrichium sandwicense	kulu'i	8'	8'	sea to 3,000'	Dry to Mediun
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8'	sea to higher	Dry to Medium
r	Acacia koa	koa	50' - 100'	40' - 80'	1,500' to 4,000'	Dry to Medium
r	Charpentiera obovata		15'	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	and the second	
T	Frythrina sandwicensis	wiliwili	20'	20'	sea to 1,000'	Dry
1	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet



Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Nestegis sandwicensis	olopua	15'	15'	1,000' to 3,000'	Dry to Medium
Pleomele auwahiensis	halapepe	20'	S. Kasara		
Rauvolfia sandwicensis	hao	20'	15'	sea to 3,000'	Dry to Medium
Santalum ellipticum	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Sophora chrysophylla	mamane	15'	15'	1,000' to 3,000'	Medium
Alyxia oliviformis	maile	Vine		sea to 6,000'	Medium to Wet
And and a support of the local division of t	Scientific Name Nestegis sandwicensis Pleomele auwahiensis Rauvolfia sandwicensis Santalum ellipticum Sophora chrysophylla Alyxia oliviformis	Scientific NameCommon NameNestegis sandwicensisolopuaPleomele auwahiensishalapepeRauvolfia sandwicensishaoSantalum ellipticumcoastal sandalwood, 'ili-ahiSophora chrysophyllamamaneAlyxia oliviformismaile	Scientific NameCommon NameHeightNestegis sandwicensisolopua15'Pleomele auwahiensishalapepe20'Rauvolfia sandwicensishao20'Santalum ellipticumcoastal sandalwood, 'ili-ahi8'Sophora chrysophyllamamane15'Alyxia oliviformismaileVine	Scientific NameCommon NameHeightSpreadNestegis sandwicensisolopua15'15'Pleomele auwahiensishalapepe20'20'Rauvolfia sandwicensishao20'15'Santalum ellipticumcoastal sandalwood, 'ili-ahi8'8'Sophora chrysophyllamamane15'15'Alyxia oliviformismaileVine15'	Scientific NameCommon NameHeightSpreadElevationNestegis sandwicensisolopua15'15'1,000' to 3,000'Pleomele auwahiensishalapepe20'20'20'Rauvolfia sandwicensishao20''15'sea to 3,000'Santalum ellipticumcoastal sandalwood, 'ili-ahi8'8'sea to 3,000'Sophora chrysophyllamamane15'15'1,000' to 3,000'Alyxia oliviformismaileVinesea to 6,000'



ITPE:	F Fern G Grass Gr G	round Cover Sh Shrub P Pa	lm :	S Sedge	Tr Tree	V Vine
Туре	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
F	Psilotum nudum	moa, moa kula	1'	1'	sea to 3,000'	Dry to Wet
G	Colubrina asiatica	'anapanapa	3'	10'	sea to 1,000'	Dry to Wet
G	Eragrostis monticola	kalamalo	1'	2'	sea to 3,000'	Dry to Medium
G	Eragrostis variabilis	'emo-loa	1'	2'	sea to 3,000'	Dry to Medium
G	Fimbristylis cymosa ssp. spathacea	mau'u'aki'aki fimbristylis	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Boerhavia repens	alena	0.5'	4'	sea to 1,000'	Dry to Medium
Gr	Chamaesyce celastroides var. laehiensis	akoko	2'	3'	sea to 1,000'	Dry to Medium
Gr	Cressa truxillensis	cressa	0.5'	1	sea to 1,000'	Dry to Medium
Gr	Heliotropium anomalum var. argenteum	hinahina ku kahakai	1	2'	sea to 1,000'	Dry to Medium
Gr	Ipomoea tuboides	Hawaiian moon flower, uala	1'	10'	sea to 3,000'	Dry to Medium
Gr	Jacquemontia ovalifolia ssp. sandwicensis	pa'u o hi'iaka	0.5'	6'	sea to 1,000'	Dry to Medium
Gr	Lipochaeta integrifolia	nehe	1	5'	sea to 1,00'	Dry to Medium
Gr	Peperomia leptostachya	'ala'ala-wai-nui	1	T	sea to 3,000'	Dry to Medium
Gr	Plumbago zeylanica	'ilie'e	1'		Maria a La	C. SANGER U.
Gr	Sesuvium portulacastrum	'akulikuli, sea-purslane	0.5'	2'	sea to 1,000'	Dry to Wet
Gr	Sida fallax	'ilima	0.5'	3'	sea to 1,000'	Dry to Medium
Gr	Tephrosia purpurea var. purpurea	้อนกับกับ	2'	2'	sea to 1,000'	Dry to Medium
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta rockii	nehe	2'	2'	sea to 3,000'	Dry to Medium
Gr - Sh	Lipochaeta succulenta	nehe	2'	5'	sea to 1,000'	Dry to Wet
Gr - Sh	Lycium sandwicense	'ohelo-kai, 'ae'ae	2'	2'	sea to 1,000'	Dry to Medium
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
S	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5	0.5'	sea to 1,000'	Dry to Medium



Туре	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Argemone glauca var. decipiens	pua kala	3'	2'	sea to 3,000'	Dry to Medium
Sh	Bidens mauiensis	ko'oko'olau	1	3'	sea to 1,000'	Dry to Medium
Sh	Bidens menziesii ssp. menziesii	ko'oko'olau	1	3'		
Sh	Bidens micrantha ssp. micrantha	ko'oko'olau	1	3'	A Read Providence	PROPERTY.
Sh	Chenopodium oahuense	'aheahea, 'aweoweo	6'		sea to higher	Dry to Medium
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Gossypium tomentosum	mao, Hawaiian cotton	5'	8'	sea to 1,000'	Dry to Medium
Sh	Hedyotis spp.	au, pilo	3'	2'	1,000' to 3,000'	Dry to Wet
Sh	Lipochaeta lavarum	nehe	3'	3,	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluche	4'	6	sea to 3,000'	Dry to Medium
Sh	Scaevola sericea	naupaka, naupaka-kahakai	6'	8'	sea to 1,000'	Dry to Medium
Sh	Senna gaudichaudii	kolomana	5'	5	sea to 3,000'	Dry to Medium
Sh	Solanum nelsonii	'akia, beach solanum	3'	3'	sea to 1,00'	Dry to Medium
Sh	Styphelia tameiameiae	pukiawe	6'	6'	1,000' to higher	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh	Wikstroemia uva-ursi kauaiensis kauaiensis	'akia, Molokai osmanthus			- 花子一一一一	ALC: NOTE:
Sh - Tr	Broussonetia papyrifera	wauke, paper mulberry	8'	6'	sea to 1,000'	Dry to Medium
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh - Tr	Nototrichium sandwicense	kulu'i	8'	8	sea to 3,000'	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8,	sea to higher	Dry to Medium
Tr	Aleurites moluccana	candlenut, kukui	50'	50'	sea to 3,000'	Medium to Wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60'	40'	sea to 3,000'	Medium to Wet
Tr	Canthium odoratum	Alahe'e, 'ohe'e, walahe'e	12'	8'	sea to 3,000'	Dry to Medium
Tr	Cordia subcordata	kou	30'	25'	sea to 1,000'	Dry to Wet
Tr	Diospyros sandwicensis	lama	12'	15'	sea to 3,000'	Dry to Medium
Tr	Frythrina sandwicensis	wiliwili	20'	20'	sea to 1,000'	Dry
Tr	'etrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet
			1	1		



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Туре	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Tr	Morinda citrifolia	indian mulberry, noni	20'	15'	sea to 1,000'	Dry to Wet
Tr	Nesoluma polynesicum	keahi	15'	15'	sea to 3,00'	Dry
Tr	Nestegis sandwicensis	olopua	15'	15'	1,000' to 3,000'	Dry to Medium
Tr	Pandanus tectorius	hala, puhala (HALELIST)	35'	25'	sea to 1,000'	Dry to Wet
Tr	Pleomele auwahiensis	halapepe	20'	Store Par	State States	
Tr	Rauvolfia sandwicensis	hao	20'	15'	sea to 3,000'	Dry to Medium
Tr	Reynoldsia sandwicensis	'ohe makai	20'	20'	1,000' to 3,000'	Dry
Tr	Santalum ellipticum	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Tr	Thespesia populnea	milo	30'	30'	sea to 3,000'	Dry to Wet



Туре	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
	Psilotum nudum	moa, moa kula	1	1'	sea to 3,000'	Dry to Wet
	Sadleria cyatheoides	'ama'u, ama'uma'u	Section Section	and the second		
	Colubrina asiatica	'anapanapa	3'	10'	sea to 1,000'	Dry to Wet
	Eragrostis monticola	kalamalo	T	2'	sea to 3,000'	Dry to Medium
	Eragrostis variabilis	'emo-loa	1'	2'	sea to 3,000'	Dry to Medium
	Fimbristylis cymosa ssp. spathacea	mau'u'aki'aki fimbristylis	0.5'	1'	sea to 1,000'	Dry to Medium
r	Chamaesyce celastroides var. laehiensis	'akoko	2'	3.	sea to 1,000'	Dry to Medium
r	Ipomoea tuboldes	Hawaiian moon flower, 'uala	T.	10'	sea to 3,000'	Dry to Medium
r	Jacquemontia ovalifolia ssp. sandwicensis	pa'u o hi'iaka	0.5'	6'	sea to 1,000'	Dry to Medium
lange and	Lipochaeta integrifolia	nehe	T	5'	sea to 1,00'	Dry to Medium
r.	Peperomia leptostachya	'ala'ala-wai-nui	T	1'	sea to 3,000'	Dry to Mediun
r	Plumbago zeylanica	'ilie'e	T	A BARRIE		
1.00 and	Sida fallax	'ilima	0.5'	3'	sea to 1,000'	Dry to Mediun
r	Tephrosia purpurea var. purpurea	'auhuhu	2'	2'	sea to 1,000'	Dry to Mediur
r - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hibiscus	3'	2'	sea to 3,000'	Dry to Mediur
r - Sh	Lipochaeta rockii	nehe	2'	2	sea to 3,000'	Dry to Mediur
r - Sh	Lipochaeta succulenta	nehe	2'	5'	sea to 1,000'	Dry to vvet
	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to vvet
	Pritchardia arecina	lo'ulu, hawane	40'	10'	1,000' to 3,000'	Dry to Wet
	Pritchardia forbesiana	loʻulu	15'		and the second	
	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5'	0.5'	sea to 1,000'	Dry to Mediu
h	Argemone glauca var. decipiens	pua kala	3'	2'	sea to 3,000'	Dry to Mediu
5	Artemisia australis	'ahinahina	2'	3'	sea to 3,000'	Dry to Mediur



Туре	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Artemisia mauiensis var. diffusa	Maui wormwood, 'ahinahina	2'	3'	1,000' to higher	Dry to Medium
Sh	Bidens hillebrandiana ssp. hillebrandiana	ko'oko'olau	1'	2'	sea to 1,000'	Dry to Wet
Sh	Bidens menziesii ssp. menziesii	ko'oko'olau	1'	3.		
Sh	Bidens micrantha ssp. micrantha	ko'oko'olau	1'	3,		
Sh	Cordyline fruticosa	ti, ki	6			
Sh	Dianella sandwicensis	'uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Lipochaeta lavarum	nehe	3'	3.	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluehe	4'	6'	sea to 3,000'	Dry to Medium
Sh	Scaevola sericea	naupaka, naupaka-kahakai	6'	8'	sea to 1,000'	Dry to Medium
Sh	Solanum nelsonii	'akia, beach solanum	3'	3'	sea to 1,00'	Dry to Medium
Sh	Styphelia tameiameiae	pukiawe	6'	6'	1,000' to higher	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4'	sea to 1,000'	Dry to Medium
Sh	Wikstroemia uva-ursi kauaiensis kauaiensis	'akia, Molokai osmanthus	est application			
Sh - Tr	Broussonetia papyrifera	wauke, paper mulberry	8'	6'	sea to 1,000'	Dry to Medium
Sh - Tr	Myoporum sandwicense	naio, false sandalwood	10'	10'	sea to higher	Dry to Medium
Sh - Tr	Nototrichium sandwicense	kulu'i	8'	8'	sea to 3,000'	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'ali'i	6'	8'	sea to higher	Dry to Medium
Tr	Acacia koa	koa	50' - 100'	40' - 80'	1,500' to 4,000'	Dry to Medium
Tr	Aleurites moluccana	candlenut, kukui	50'	50'	sea to 3,000'	Medium to wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60'	40'	sea to 3,000'	Medium to wet
Tr	Canthium odoratum	Alahe'e, 'ohe'e, walahe'e	12'	8'	sea to 3,000'	Dry to Medium
Tr	Charpentiera obovata		15'		1	
Tr	Cordia subcordata	kou	30'	25	sea to 1,000'/	Dry to vvet
Tr	Diospyros sandwicensis	lama	12'	15'	sea to 3,000	Dry to Mealum y
Tr	Hibiscus furcellatus	'akiohala, hau-hele	8'			
Tr	Metrosideros polymorpha var. macrophylla	ohi'a lehua	25'	25'	sea to 1,000'	Dry to Wet
Tr	Morinda citrifolia	indian mulberry, noni	20'	15'	sea to 1,000'	Dry to vvet



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Туре	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Tr	Nestegis sandwicensis	olopua	15'	15'	1,000' to 3,000'	Dry to Medium
Tr	Pandanus tectorius	hala, puhala (HALELIST)	35'	25'	sea to 1,000'	Dry to Wet
Tr	Pleomele auwahiensis	halapepe	20'	1		
Tr	Rauvolfia sandwicensis	hao	20'	15'	sea to 3,000'	Dry to Medium
Tr	Santalum ellipticum	coastal sandalwood, 'ili-ahi	8'	8'	sea to 3,000'	Dry to Medium
Tr	Sophora chrysophylla	mamane	15'	15'	1,000' to 3,000'	Medium
Tr	Thespesia populnea	milo	30'	30'	sea to 3,000'	Dry to Wet
V	Alyxia oliviformis	maile	Vine	1.12	sea to 6,000'	Medium to Wet
Contract Contract			a state of the state of the state	a start and a start	and the state of the state of the	



TYPE:	F Fern G Grass Gr G	round Cover Sh Shrub	P Palm	S Sedge	Tr Tree	V Vine
Туре	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
G	Colubrina asiatica	'anapanapa	3'	10'	sea to 1,000'	Dry to Wet
G	Eragrostis variabilis	'emo-loa	The second	2	sea to 3,000'	Dry to Medium
G	Fimbristylis cymosa ssp. spathacea	mau'u'aki'aki fimbristylis	0.5'	1	sea to 1,000'	Dry to Medium
Gr	Boerhavia repens	alena	0.5	4	sea to 1,000'	Dry to Medium
Gr	Chamaesyce celastroides var. laehiensis	'akoko	2'	3	sea to 1,000'	Dry to Medium
Gr	Cressa truxillensis	cressa	0.5'	1'	sea to 1,000'	Dry to Medium
Gr	Heliotropium anomalum var. argenteum	hinahina ku kahakai	L T	2'	sea to 1,000'	Dry to Medium
Gr	Jacquemontia ovalifolia ssp. sandwicensis	pa'u o hi'iaka	0.5'	6'	sea to 1,000'	Dry to Medium
Gr	Lipochaeta integrifolia	nehe	1	5'	sea to 1,00'	Dry to Medium
Gr	Sesuvium portulacastrum	'akulikuli, sea-purslane	0.5'	2'	sea to 1,000'	Dry to Wet
Gr	Sida fallax	'ilima	0.5'	3'	sea to 1,000'	Dry to Medium
Gr	Tephrosia purpurea var. purpurea	'auhuhu	2'	2'	sea to 1,000'	Dry to Medium
Gr - Sh	Hibiscus calyphyllus	ma'o hau hele, Rock's hiblscus	3	2	sea to 3,000'	Dry to Medium
Gr - Sh	Lycium sandwicense	'ohelo-kai, 'ae'ae	2'	2	sea to 1,000'	Dry to Medium
P	Cocos nucifera	coconut, niu	100'	30'	sea to 1,000'	Dry to Wet
P	Pritchardia hillebrandii	lo'ulu, fan palm	25'	15'	sea to 1,000'	Dry to Wet
S	Mariscus javanicus	marsh cypress, 'ahu'awa	0.5'	0.5	sea to 1,000'	Dry to Medium
Sh	Argemone glauca var. decipiens	pua kala	3	2'	sea to 3,000'	Dry to Medium
Sh	Artemisia australis	'ahinahina	2'	3'	sea to 3,000'	Dry to Medium
Sh	Bidens hillebrandiana ssp. hillebrandiana	ko'oko'olau	1	2	sea to 1,000'	Dry to Wet
Sh	Bidens mauiensis	ko'oko'olau	The second	3'	sea to 1,000'	Dry to Medium
Sh	Chenopodium oahuense	'aheahea, 'aweoweo	6'		sea to higher	Dry to Medium
Sh	Dianella sandwicensis	uki	2'	2'	1,000' to higher	Dry to Medium
Sh	Gossypium tomentosum	mao, Hawaiian cotton	5'	8,	sea to 1,000'	Dry to Medium



Туре	Scientific Name	Common Name	Height	Spread	Elevation	Water req.
Sh	Hedyotis spp.	au, pilo	3'	2	1,000' to 3,000'	Dry to Wet
Sh	Lipochaeta lavarum	nehe	3'	3'	sea to 3,000'	Dry to Medium
Sh	Osteomeles anthyllidifolia	'ulei, eluche	4	6'	sea to 3,000'	Dry to Medium
Sh	Scaevola sericea	naupaka, naupaka-kahakai	16 <sup>1</sup>	8'	sea to 1,000'	Dry to Medium
Sh	Senna gaudichaudii	kolomana	5	5'	sea to 3,000'	Dry to Medium
Sh	Solanum nelsonii	'akia, beach solanum	3'	3'	sea to 1,00'	Dry to Medium
Sh	Vitex rotundifolia	pohinahina	3'	4	sea to 1,000'	Dry to Medium
Sh	Wikstroemia uva-ursi kaualensis kaualensis	'akia, Molokai osmanthus				
Sh-Tr	Myoporum sandwicense	nalo, false sandalwood	10	10'	sea to higher	Dry to Medium
Sh-Tr	Dodonaea viscosa	'a'all'i	6'	8'	sea to higher	Dry to Medium
10	Algurites moluccana	candlenut, kukul	50'	50'	sea to 3,000	Medium to Wet
Tr	Calophyllum inophyllum	kamani, alexandrian laurel	60	40'	sea to 3,000'	Medium to Wet
5117	Cordia subcordata	kou	30'	25	sea to 1,000'	Dry to Wet
15	Hibiscus furcellatus	'akiohala, hau-hele	82			
BE	Morinda citrifolia	indian mulberry, noni	20	15'	sea to 1,000'	Dry to Wet
TE	Pandanus tectorius	hala, puhala (HALELIST)	35'	25	sea to 1,000'	Dry to Wet
717-	Thespesia populnea	milo	310	30'	sea to 3,000	Dry to Wet
V	Ipomoea pes-caprae	beach morning glory, pohuehue				



# DO NOT PLANT THESE PLANTS !!!

.

Common name	Scientific name	Plant family
black wattle	Acacia mearnsii	Mimosaceae
blackberry	Rubus argutus	Rosaceae
blue aum	Eucalyptus alobulus	Myrtaceae
bocconia	Bocconia frutescens	Papaveraceae
broad-leaved cordia	Cordia glabra	Boraginaceae
broomsedge, yellow bluestem	Andropogon virginicus	Poaceae
buffelgrass	Cenchrus ciliaris	Poaceae
butterily bush, smoke bush	Buddleja madagascariensis	Buddlejaceae
cats claw, Mysore thorn, wait-a-bit	Caesalpinia decapetala	Caesalpiniaceae
common ironwood	Casuarina equisetifolia	Casuarinaceae
common velvet grass, Yorkshire fog	Holcus lanatus	Poaceae
fiddlewood	Citharexylum spinosum	Verbenaceae
fire tree, fava tree	Myrica faya	Myricaceae
alorybower	Clerodendrum laponicum	Verbenaceae
hairy cat's ear, gosmore	Hypochoeris radicata	Asteraceae
haole koa	Leucaena leucocephala	Fabaceae
ivy gourd, scarlet-fruited gourd	Coccinia grandis	Cucurbitaceae
juniper berry	Citharexylum caudatum	Verbenaceae
kahili flower	Grevillea banksii	Proteaceae
klu, popinac	Acacia farnesiana	Mimosaceae
loawood, bloodwood tree	Haematoxylon campechianum	Caesalpiniaceae
Toquat	Eriobotrya japonica	Rosaceae
meadow ricegrass	Ehrharta stipoides	Poaceae
melaleuca	Melaleuca quinquenervia	Myrtaceae
miconia, velvet leaf	Miconia calvescens	Melastomataceae
narrow-leaved carpetgrass	Axonopus fissifolius	Poaceae
oleaster	Elaeagnus umbellata	Elaeagnaceae
oriental mangrove	Bruguiera gymnorrhiza	Rhizophoraceae
padang cassia	Cinnamomum burmanii	Lauraceae
palmgrass	Setaria palmifolia	Poaceae
pearl flower	Heterocentron subtriplinervium	Melastomataceae
quinine tree	Cinchona pubesens	Rubiaceae
satin leaf, caimitillo	Chrysophyllum oliviforme	Sapotaceae
silkwood, Queensland maple	Flindersia brayleyana	Rutaceae
silky oak, silver oak	Grevillea robusta	Proteaceae
sirawberry guava	Psidium cattleianum	Myrtaceae
swamp oak, saltmarsh, longleaf ironwood	Casuarina glauca	Casuarinaceae
sweet vernalgrass	Anthoxanthum odoratum	Poaceae
tree of heaven	Ailanthus altissima	Simaroubaceae
trumpet tree, guarumo	Cecropia obtusifolia	Cecropiaceae
white ginger	Hedychium coronarium	Zingiberaceae
white moho	Heliocarpus popayanensis	Tiliaceae
yellow ginger	Hedychium flavescens	Zingiberaceae

# DO NOT PLANT THESE PLANTS !!!

Common name	Scientific name	Plant family
	lasminum fluminense	Oleaceae
	Arthrostema ciliatum	Melastomataceae
·**	Dissotis rotundifolia	Melastomataceae
	Frideron karvinskianus	Asteraceae
	Eucelvatus robusta	Myrtaceae
	Hedychium gardnerianum	Zingiberaceae
		Juncaceae
	Lophostemon confertus	Myrtaceae
	Medinilla cuminoli	Melastomataceae
	Medinilla magnitica	Melastomataceae
	Medinilla venosa	Melastomataceae
	Melastoma candidum	Melastomataceae
	Melinis minutifiora	Poaceae
	Olea europaea	
	Oxyspora paniculata	Melastomataceae
	Panicum maximum	Poaceae
	Pasnalum urvillei	Poaceae
	Passiflora edulis	Passifloraceae
	Phormium tenax	Agavaceae
· · · · · · · · · · · · · · · · · · ·	Pinus taeda	Pinaceae
	Prosopis pallida	Fabaceae
	Pterolenis domerata	Melastomataceae
	Rhodomyrtus tomentosa	Myrtaceae
	Schefflera actinophylla	Araliaceae
	Svzvojum jambos	Myrtaceae
Australian Etaclinicad	Acacia melanoxylon	Mimosaceae
Australian blackwood	Cyathea cooperi	Cyatheaceae
Australian tree tern	Sphaeropteris cooperi	Cyatheaceae
Australian tree lent	Bidens pilosa	Asteraceae
	Brachiaria mutica	Poaceae
Chingee baryon Maylayan baryon	Ficus mirocarpa	Moraceae
Chinese violet	Asystasia gangetica	Acanthaceae
Christmasherry Brazilian nenner	Schinus terebinthifolius	Anacardiaceae
Lormosan koa	Acacia confusa	Mimosaceae
German WV	Senecio mikanioides	Asteraceae
Jananese honevslickle	Lonicera japonica	ПСаргітонасеае
Kostar's curse	Clidemia hirta	Melastomataceae
Lontana	Lantana camara	Verbenaceae
Mauritus hemo	Furcraea foelida	Agavaceae
Mexican ash tronical ash	Fraxinus uhdei	
Mexican tulin noppy	Hunnemannia fumariifolia	Papaveraceae
Mules foot Madagascar tree fern	Angiopteris evecta	
New Zealand laurel, karakaranut	Corynocarpus laevigatus	Murtanoan
New Zealand lea	Leptospermum scoparium	Pagage
Pampas grass	Cortaderia jubata	Moraceae
Panama rubber tree. Mexican rubber tree	Castilloa elastica	
Shoe on ardisia	Ardisia elliptica	I Doooifforgoogo
banan, 'oka	Passifiora mollissima	Fassiloiaceae

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## Selection

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As a general rule, it is best to select the largest and healthiest specimens. However, be sure to note that they are not pot-bound. Smaller, younger plants may result in a low rate of plant survival.<sup>1</sup> When selecting native species, consider the site they are to be planted in, and the space that you have to plant. For example: Mountain species such as koa and maile will not grow well in hot coastal areas exposed to strong ocean breezes. Lowland and coastal species such as wiliwili and Kou require abundant sunshine and porus soil. They will not grow well with frequent cloud cover, high rainfall and heavy soil.

Consider too, the size that the species will grow to be. It is not wise to plant trees that will grow too large.<sup>2</sup> Overplanting tends to be a big problem in the landscape due to the underestimation of a species' height, width or spread.

A large, dense canopied tree such as the kukui is a good shade tree for a lawn. However, it's canopy size and density of shade will limit what can be planted in the surrounding area. Shade cast by a koa and ohia lehua is relatively light and will not inhibit growth beneath it.

Keep seasons in mind when you are selecting your plants. Not all plants look good year round, some plants such as ilima will look scraggly after they have flowered and formed seeds. Avoid planting large areas with only one native plant. Mixing plants which naturally grow together will ensure the garden will look good all year round.<sup>3</sup> Looking at natural habitats helps to show how plants grow naturally in the landscape.

When planting an area with a mixed-ecosystem, keep in mind the size and ecological requirements of each plant. Start with the hardiest and most easily grown species, but allow space for fragile ones in subsequent plantings.

#### Acquiring natives

Plants in their wild habitat must be protected and maintained. It is best and easiest to get your plants from nurseries (see list), or friend's gardens. Obtain proper permits from landowners and make sure you follow a few common sense rules:

- collect sparingly from each plant or area.
- some plants are on the state or Federal Endangered Species list. Make sure you get permits (see app. A,B)

<sup>1</sup> K. Nagata, P.6

<sup>2</sup> K. Nagata, P.9

<sup>3</sup> Nagata, P.9

#### Soil

Once you have selected your site and the plants you wish to establish there, you must look at the soil conditions on the site. Proper soil is necessary for the successful growth of most native plants, which preform poorly in hard pan, clay or adobe soils. If natives are to be planted in these types of soil, it would be wise to dig planting holes several times the size of the rootball and backfill with 50-75% compost.<sup>4</sup> A large planting hole ensures the development of a strong root system. The plant will have a headstart before the roots penetrate the surrounding poor soil.<sup>5</sup>

It is recommended that native plants not be planted in ground that is more dense than potting soil. If there is no alternative, dig a hole in a mound of soil mixed with volcanic cinder which encourages maximum root development. Fill the hole with water, if the water tends to puddle or drain too slowly, dig a deeper hole until the water does not puddle longer than 1 or 2 minutes.<sup>6</sup> Well-drained soil is one of the most important things when planting natives as you will see in the next section.

#### Irrigation

Most natives do very poorly in waterlogged conditions. Do not water if the soil is damp. Water when the soil is dry and the plants are wilting. Once established, a good soaking twice a week should suffice. Deep soaking encourages the development of stronger, and deeper root systems. This is better than frequent and shallow watering which encourage weaker, more shallow root systems.

The following is a watering schedule from Kenneth Nagata's Booklet, How To Plant A Native Hawaiian Garden:

WATER REOUIREMENT	WATERING FREQUENCY
Heavy	3x / week
Moderate	2x / week
Light	lx/week

Red clay soils hold more water for a longer period of time than sandy soils do. If your area is very sunny or near a beach, things will dry out faster. Even in the area of one garden, there are parts that will need more or less water. Soils can vary and amount of shade and wind differ. After plants are established (a month or two for most plants, up to a year for some trees), you can back off watering.

<sup>4</sup> Nagata, p. 6.

<sup>5</sup> Nagata, p. 8

<sup>6</sup> Nagata, p. 8

Automatic sprinkler systems are expensive to install and must be checked and adjusted regularly. Above-ground systems allow you to monitor how much water is being put out, but you lose a lot due to malfunctioning of sprinkler heads and wind. The most efficient way to save water and make sure your plants get enough water, is to hand-water. This way you are getting our precious water to the right places in the right amounts.<sup>7</sup>

#### Fertilizer

An all-purpose fertilizer 10-10-10 is adequate for most species. They should be applied at planting time, 3 months later, and 6 months thereafter. Use half the dosage recommended for ornamentals and pay special attention to native ferns which are sensitive to strong fertilizers. Use of organic composts and aged animal manures is suggested instead of chemical fertilizers. In addition, use of cinders for providing trace minerals is strongly recommended.<sup>8</sup>

Natives are plants which were here hundreds of years before the polynesians inhabited the Hawaiian Islands. They were brought here by birds, or survived the harsh ocean conditions to float here. They are well-adapted to Hawaii's varying soil and environmental conditions. This is why they make prime specimens for a xeriscape garden. However, natives will not thrive on their own, especially under harsh conditions. On the other hand, like any other plant, if you over-water and over-fertilize them, they will die. Follow the instructions given to you by the nursery you buy the plant from, or from this booklet. Better yet, buy a book (suggested readings can be found in the bibliography in the back of this pamphlet), read it, and learn more about native plants. I guarantee that you will be pleased with the results.

<sup>&</sup>lt;sup>7</sup> Bornhorst, p. 19-20

<sup>\*</sup> Nagata, p. 6

## Propagation

There are many ways to propagate and plant-out native Hawaiian species. One of the most thourough and helpful book is Heidi Bornhorst's book, *Growing Native Hawaiian Plants*. The easiest, and best way to obtain natives for the novice gardener is to get them from a reputable nursery (see appendix c). That way all you will have to do is know how to transplant (if necessary) and plant-out when you are ready. These are the two methods I have listed here.

#### Transplanting

- 1. Use pots that are one size bigger than the potted plant is in
- 2. Get your potting medium ready

Good potting medium is a  $\frac{1}{2}$ ,  $\frac{1}{2}$  mixture of peat moss and perlite. If the plant is from a dry or coastal area, add chunks of cinder or extra perlite. If it is a wet forest species, add more peat moss or compost. Be aware that peat moss is very acidic and certain plants react severely to acidity.

If the plant is to eventually be planted into the ground, make a mix of equal parts peat moss, perlite, and soil from the area in which the plant is to be planted. Slow-release fertilizer can be mixed into the potting medium.

3. Once pots, potting medium, fertilizer and water are ready, you can begin re-potting. Keep the plant stem at the same depth it was in the original pot. Avoid putting the plant in too large a pot, as the plant may not be able to soak up all the water in the soil and the roots may drown and rot.

Mix potting medium and add slow-release fertilizer at this time. Pre-wet the medium to keep dust down and lessen shock to the plant. Put medium in bottom of pot. Measure for the correct depth in the new pot. Make sure there is from ½ to 2 inches from the top of the pot so the plant can get adequate water. Try to stand the plant upright and center the stem in the middle of the pot.

Water the plant thoroughly after transplanting. A vitamin B-1 transplanting solution can help to lessen the transplant shock. Keep the plant in the same type of environment as it was before, sun or shade. If roots were broken, trimm off some of the leaves to compensate for the loss.<sup>9</sup>

#### Planting out

1. Plant most native Hawaiian plants in a sunny location in soil that is well-drained.

2. Make the planting hole twice as wide as the root ball or present pot, and just as deep. If the soil is clay-like, and drains slowly, mix in some coarse red or bland cinder, coarse perlite or

<sup>&</sup>lt;sup>9</sup> Bornhorst, p.20-21

coarse compost. Place some slow-release fertilizer at the bottom of the hole.

3. Carefully remove the plant from the container and place it in the hole. The top of the soil should be at the same level as the top of the hole, if it is too high or too low, adjust the soil level so that the plant is at the right depth.

4. Water thoroughly after you transplant.

#### Mulch

Most natives cannot compete with weeds, and therefore must be weeded around constantly in order to thrive. Mulch is a practical alternative, which discourages and prevents weeds from growing.

Hawaii's hot, humid climate leads to the breaking down of organic mulches. Thick organic mulches such as wood chips and leaves, may also be hiding places for pests.

Stone mulches are attractive, permanent and can help to improve soil quality. Red or black cinder, blue rock chips, smooth river rocks and coral chips are some natural choices.<sup>10</sup> Macadamia nut hulls are also easy to find and can make a nice mulch.<sup>11</sup>

Never pile up mulch right next to the stem or trunk of a plant, keep it a few inches away.

<sup>11</sup> Nagata, p. 7

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<sup>&</sup>lt;sup>10</sup> Bornhorst, p. 24

#### ZONES

The Maui County Planting Plan has compiled a system of 5 zones of plant growth for Maui County. The descriptions of zones and maps for these zones are as follows:

#### Zone 1:

Wet areas on the windward side of the island. More than 40 inches of rain per year. Higher than 3,000 feet.

#### Zone 2:

Cool, dry areas in higher elevations (above 1,000 feet). 20 to 40 inches of rain per year.

#### Zone 3:

Low, drier areas, warm to hot. Less than 20 inches of rain per year. Sea level to 1,000 feet.

#### Zone 4:

Lower elevations which are wetter due to proximity of mountains. 1,000 to 3,000 feet.

#### Zone 5:

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Salt spray zones in coastal areas on the windward side.

These zones are to be used as a general guide to planting for Maui County. In addition to lookir at the maps, read the descriptions of the zones and decide which zone best fits your area. Plants can be listed in more than one zone and can be planted in a variety of conditions. For best results, take notes on the rainfall, wind, sun and salt conditions of your site. Use the zones as a general guide for selection and read about the plants to decide which best fits your needs as far as care and or function.

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### PLACES TO SEE NATIVES ON MAUI:

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The following places propagate native Hawaiian plants from seeds and/or cuttings. Their purpose is to protect and preserve these native plants. Please contact them before going to view the sites, they can provide valuable information and referral to other sources.

1.	Hoolawa Farms P O Box 731 Haiku HI 96708	575-5099
2.	The Hawaiian Collection 1127 Manu Street Kula HI 96790	878-1701
3.	Kula Botanical Gardens RR4, Box 228 Kula HI 96790	878-1715
4.	Maui Botanical Gardens Kanaloa Avenue, Kahului across from stadium	249-2798
5.	Kula Forest Reserve access road at the end of Waipoli Rd Call the Maui District Office	984-8100
6.	Wailea Point, Private Condominium residence 4000 Wailea Alanui, Kihei public access points at Four Seasons Resort or Polo Beach	875-9557
7.	Kahanu Gardens, National Tropical Botanical Garden Alau Place, Hana HI 96713	248-8912
8.	Kahului Library Courtyard 20 School Street Kahului HI 96732	873-3097

## PLACES TO BUY NATIVE PLANTS ON MAUL

1. Ho'olawa Farms Anna Palomino P O Box 731 Haiku HI 96708 575-5099

> \* The largest and best collection of natives in the state. They will deliver, but worth the drive to go and see! Will propagate upon request

- 2. Kahanu Gardens National Tropical Botanical Garden Alau Place, Hana 248-8912
- Kihana Nursery
   1708 South Kihei Road
   Kihei HI 96753
   879-1165
- Kihei Garden and Landscape Waiko Road, Wailuku P O Box 1058 Puunene HI 96784 244-3804
- 5. Kula Ace Hardware and Nursery 3600 Lower Kula Road Kula HI 96790 876-0734 \* many natives in stock
  - \* get most of their plants from Ho'olawa Farms
  - \* they take special requests

- Kulamanu Farms Ann Carter Kula HI 96790 878-1801
- Maui Nui Botanical Gardens Kanaloa Avenue (Across from stadium) Kahului HI 96732 249-2798
- 8. Native Gardenscapes Robin McMillan 1330 Lower Kimo Drive Kula HI 96790 870-1421

\* grows native plants and installs landscapes including irrigation.

- 9. Native Hawaiian Tree Source 1630 Piiholo Road Makawao HI 96768 572-6180
- 10. Native Nursery, LLC Jonathan Keyser 250-3341
- 11. New Moon Enterprises Pat Bily
  47 Kahoea Place
  Kula HI 96790
  878-2441
- 12. Waiakoa Tree Farm Kua Rogoff Pukalani HI 96768 Cell - 264-4166

# A Checklist of Water Conservation Ideas For



This checklist provides water conservation tips successfully implemented by industrial and commercial users. This list has been revised from the original copy first published and distributed by the Los Angeles Department of Water and Power and the Water Efficiency Manual by the North Carolina Department of Environment and Natural Resources.

#### START A WATER CONSERVATION PROGRAM

- Increase employee awareness of water conservation.
- Install signs encouraging water conservation in employee and customer restrooms.
- When cleaning with water is necessary, use budgeted amounts.
- Read water meter weekly to monitor success of water conservation efforts.
- Assign an employee to monitor water use and waste.
- Seek employee suggestions on water conservation; put suggestion boxes in prominent areas.
- Determine the quantity and purpose of water being used.
- Determine other methods of water conservation.
- Conduct contests for employees (e.g., posters, slogans, or conservation ideas).

### PLANNING AND DESIGN

• Consider the following:

- Physical conditions (drainage, soil type, sun/shade, etc.) and the use of the site (foot traffic, recreation, viewing, etc.)
- Creating shade areas, which can be 20 degrees cooler than non-shaded areas, decreasing evaporation.
- Grass areas only where needed; avoid small areas under 10 feet wide.



- Permeable materials such as porous concrete or permeable paving methods.
- Grading and directing surface run-off and rainfall gutters to landscaped areas as opposed to drainageways that exit the property.
- Incorporate high water demanding plants at the bottom of slopes, and maintain the use of existing trees, plants, and wildlife in the area during planning.
- Minimize the use of impermeable surfaces to lessen runoff and resulting stormwater pollution.
- Identify water source points.

- Develop a schematic of all water entry points (know where your faucets, time clocks, solenoids, booster pumps, sprinklers and bubblers are located).
- Identify capacity of each water-carrying unit and frequency of use.
- Determine specific use for each entry source.

#### ANALYZE AND IMPROVE SOIL CONDITIONS

- Test the soil quality, nutrients and absorptive capacity, and then select plants based on findings. Adjust the pH level if necessary.
- Use organic matter (compost, mulch or manure) to increase the soil's water holding capacity. This helps improve water distribution and lowers levels of evaporation.
- When improving the soil of a given area, remember to treat a larger area around the planting to allow ample space for root systems.
- Prevent heavy construction equipment from compacting soil in areas around trees or other sensitive habitats.

### PLANT SELECTION

- Choose native, climate-appropriate species.
- Consider plants' water demand, pest tolerance, soil nutrient and drainage requirements.

### INTERIOR AREAS

- Discontinue continuous flow.
- Use ponded water where available.
- Adjust flows to reduce discharge of water.
- Install water-saving devices to decrease water consumption – restrooms (toilet dams and flappers), faucets (aerators), cooling systems.
- Use recycling systems for chillers and cooling towers.

Consider installing energy-and-water-efficient air conditioning equipment.

#### MAINTENANCE PROCEDURES

- Sweep materials from floor instead of washing down whenever possible.
- Instruct clean-up crews to use less water where appropriate.
- Check water supply system for leaks.
- Repair dripping faucets and continuously-running or leaking toilets.

### DESIGN CRITERIA FOR TURF AND LANDSCAPE AREAS

- Contact the Department of Water Resources or your local water supplier about possible landscape water auditor classes for your golf course managers.
- Hire a golf course and/or landscape architect with water conservation and xeriscape experience.
- Use turf only where actually necessary: Immediate picnic areas/outside lunch areas and gold course target areas (greens, tees, landing areas).
- Turfgrass should be cut to the maximum recommended height for its type (generally a minimum of two inches to a maximum of four inches) for most efficient water use.
- Limit or exclude turf from roughs.



• Use only low-water use plant material in non-turf areas.

- Drip irrigation and microsprays place water at the base of the plant. This reduces evaporation and saves water by not soaking the entire ground surface. This works for trees, shrubs, and groundcovers.
- Use automatic irrigation systems monitored by moisture probes (i.e. tensiometers), and rain shut-off devices to cut power off during rain.
- Design dual watering systems with sprinklers for turf and low-volume irrigation for plants, trees, and shrubs. Operate sprinkler system before sunrise and after sunset. Amount of irrigation can be determined by the evapotranspiration rate, which DWR can help you determine.
- Use properly-treated waste water for irrigation where available.

### EXTERIOR AREAS

- Regular aeration of clay soils will improve water holding capabilities and prevent runoff.
- Discontinue using water to clean sidewalks, tennis courts, pool decks, driveways, and parking lots.
- Make sure irrigation water does not run onto streets or into alleys. Adjust sprinklers to water only plants and not sidewalks or roads.
- Use the same size nozzle when replacement is needed. Sprinklers should be replaced with the

same brand of sprinklers. Spray heads are aligned with grade.

 Replace worn spray nozzles.



- Regulate properly for system demands.
- Make sure rotors or spray heads are mounted correctly. Replace with proper unit for the job.
- Post a current controller schedule inside the door of the controller.

- Check for leaking valves.
- Adjust the operating time (runtimes) of the sprinklers to meet appropriate seasonal or monthly requirements.
- Check plant leaves and take soil samples to confirm proper system functioning.
- Look into alternative sources for irrigation water (i.e. the use of wells as opposed to city water, water reuse operations from air conditioning condensate, storm water retention ponds, or cisterns, non-contact cooling water).
- Use dedicated water meters to monitor landscaping water use.
- Have a catchment/distribution uniformity test performed on-site to determine how evenly water is applied when sprinklers are in use.

For more information, contact: **Maui County Department of Water Supply Water Resources and Planning Division** 59 Kanoa Street Wailuku, HI 96793 Telephone: (808) 244-8550 FAX: (808) 244-6701

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### PLANNING AND DESIGN

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  - Physical conditions (drainage, soil type, sun/shade, etc.) and the use of the site (foot traffic, recreation, viewing, etc.)

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- Grass areas only where needed; avoid small areas under 10 feet wide.
- Permeable materials such as porous concrete or permeable paving methods.



- Grading and directing surface run-off and rainfall gutters to landscaped areas as opposed to drainageways that exit the property.
- Incorporate high water demanding plants at the bottom of slopes, and maintain the use of existing trees, plants, and wildlife in the area during planning.
- Minimize the use of impermeable surfaces to lessen runoff and resulting stormwater pollution.
- Identify water source points.
- Develop a schematic of all water entry points (know where your faucets, time clocks, solenoids, booster pumps, sprinklers and bubblers are located).

- Identify capacity of each water-carrying unit and frequency of use.
- Determine specific use for each entry source.

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- Prevent heavy construction equipment from compacting soil in areas around trees or other sensitive habitats.

### PLANT SELECTION

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## INTERIOR AREAS

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- Adjust flows to reduce discharge of water.
- Install water-

saving devices to decrease water consumption – restrooms (toilet dams and flappers), faucets (aerators), cooling systems.



 Retrofit toilets with high efficiency models that use 1.28 gallons per flush or less.

- Retrofit urinals with high efficiency models that use 0.5 gallons per flush.
- Install showerheads with a flow rate of 1.5 gpm at 60 psi or less in all units.
- Retrofit bathroom sink faucets with fixtures that do not exceed 1 gpm at 60 psi.
- Use recycling systems for chillers and cooling towers.
- Consider installing energy-and-water-efficient air conditioning equipment.

### MAINTENANCE PROCEDURES

- Sweep materials from floor instead of washing down whenever possible.
- Instruct clean-up crews to use less water where appropriate.
- Check water supply system for leaks.
- Repair dripping faucets and continuously-running or leaking toilets.
- DESIGN CRITERIA FOR TURF AND LANDSCAPE AREAS
- Contact the Department of Water Resources or your local water supplier about possible landscape water auditor classes for managers.
- Hire a landscape architect with water conservation and xeriscape experience.
- Use turf only where actually necessary: Immediate picnic areas/outside lunch areas and gold course target areas (greens, tees, landing areas).
- Turfgrass should be cut to the maximum recommended height for its type (generally a minimum of two inches to a maximum of four inches) for most efficient water use.
- Use only low-water use plant material in non-turf areas.

- Drip irrigation and microsprays place water at the base of the plant. This reduces evaporation and saves water by not soaking the entire ground surface. This works for trees, shrubs, and groundcovers.
- Use

   automatic
   irrigation
   systems
   monitored
   by moisture
   probes (i.e.
   tensiometer
   s), and rain



shut-off devices to cut power off during rain.

- Design dual watering systems with sprinklers for turf and low-volume irrigation for plants, trees, and shrubs. Operate sprinkler system before sunrise and after sunset. Amount of irrigation can be determined by the evapotranspiration rate, which DWR can help you determine.
- Use properly-treated waste water for irrigation where available.

### EXTERIOR AREAS

- Regular aeration of clay soils will improve water holding capabilities and prevent runoff.
- Discontinue using water to clean sidewalks, tennis courts, pool decks, driveways, and parking lots.
- Make sure irrigation water does not run onto streets or into alleys. Adjust sprinklers to water only plants and not sidewalks or roads.
- Use the same size nozzle when replacement is needed. Sprinklers should be replaced with the same brand of sprinklers. Spray heads are aligned with grade.
- Replace worn spray nozzles.
- Regulate pressure properly for system demands.



- Make sure rotors or spray heads are mounted correctly. Replace with proper unit for the job.
- Post a current controller schedule inside the door of the controller.
- Check for leaking valves.
- Adjust the operating time (runtimes) of the sprinklers to meet appropriate seasonal or monthly requirements.
- Check plant leaves and take soil samples to confirm proper system functioning.
- Look into alternative sources for irrigation water (i.e. the use of wells as opposed to city water, water reuse operations from air conditioning condensate, storm water retention ponds, or cisterns, non-contact cooling water).
- Use dedicated water meters to monitor landscaping water use.
- Have a catchment/distribution uniformity test performed on-site to determine how evenly water is applied when sprinklers are in use.

For more information, contact: **Maui County Department of Water Supply Water Resources and Planning Division** 59 Kanoa Street Wailuku, HI 96793 Telephone: (808) 244-8550 FAX: (808) 244-6701

# A Checklist of Water Conservation Ideas For



This checklist provides water conservation tips successfully implemented by industrial and commercial users. This list has been revised from the original copy first published and distributed by the Los Angeles Department of Water and Power and information provided by WaterSense.

#### START A WATER CONSERVATION PROGRAM

- Increase employee awareness of water conservation.
- Install signs encouraging water conservation in employee and guest restrooms.
- When cleaning with water is necessary, use budgeted amounts.
- Determine the quantity and purpose of water being used.
- Read water meter weekly to monitor success of water conservation efforts.
- Assign an employee to monitor water use and waste.
- Seek employee suggestions on water conservation; put suggestion boxes in prominent areas.
- Determine other methods of water conservation.
- Conduct contests for employees (e.g., posters, slogans, or conservation ideas.

#### BUILDING MAINTENANCE

- Check water supply for leaks and turn off any unnecessary flows.
- Repair dripping faucets and showers and continuously-running or leaking toilets.

- Install flow reducers and faucet aerators in all plumbing fixtures where-ever possible.
  - Retrofit toilets with high efficiency models that use 1.28 gallons per flush or less.
  - Retrofit urinals with high efficiency models that use 0.5 gallons per flush.
  - Install showerheads with a flow rate of 1.5 gpm at 60 psi or less in all units.
  - Retrofit bathroom sink faucets with fixtures that do not exceed 1

gpm at 60 psi.



- Reduce water used
  - in toilet flushing by adjusting the vacuum flush mechanism or installing toilet tank displacement devices (dams, bottles, or bags).
- As appliances or fixtures wear out, replace them with water-saving models.
- Shut off water supply to equipment rooms not in use.
- Minimize the water used in cooling equipment in accordance with manufacturers' recommendations. Shut off cooling units when not needed.

- Keep hot water pipes insulated.
- Avoid excessive air conditioner blow-down. (Monitor total dissolved solids levels and blowdown only when needed). Utilize cooling/HVAC systems that conserve water and energy. Singlepass cooling should not be permitted.
- Install appropriate treatment systems to manage cooling tower make-up water quality.
- Instruct clean-up crews to use less water for mopping.
- Switch from wet or steam carpet cleaning methods to dry powder methods.
- Change window cleaning schedule from periodic to an on-call/as required basis.

### POOLS AND FOUNTAINS

- Channel splashed-out pool water onto landscaping.
- Lower pool water level to reduce amount of water splashed out.
- Use a pool cover to reduce evaporation when pool is not being used.
- Reduce the amount of water used to clean pool filters.
- Designate a separate meter for fountains to monitor for use, leaks, and onset of malfunctions
- Prohibit use of potable water in water decorations
- Use a re-circulating water system and monitor evaporation
- Limit the hours of operation to only when the facility is in use, and shut system off during times of drought

### KITCHEN AREA

- Turn off the continuous flow used to clean the drain trays of the coffee/milk/soda beverage island: clean the trays only as needed.
- Turn dishwasher off when not in use. Wash full loads only.

- Use water-conserving ice makers. Replace watercooled ice machines with efficient air-cooled models.
- Recycle water where feasible, consistent with state and county requirements.
- Recycle rinse water from the dishwater or recirculate it to the garbage disposal.
- Consider using "waterless woks."
- Presoak utensils and dishes in ponded water instead of using a running water rinse.



• Wash

vegetables in ponded water; do not let water run in preparation sink.

- Use air-cooled or closed-system re-circulating refrigeration systems.
- Use water from steam tables to wash down cooking area.
- Do not use running water to melt ice or frozen

### 🖶 BAR

• Do not use running water to melt ice in the sink strainers.

### LAUNDRY

- Encourage guests to re-use sheets and towels by placing tent cards in rooms.
- Reprogram machines to eliminate a rinse or suds cycle, if possible, and if not restricted by health regulations.
- Wash full loads only.
- Evaluate wash formula and machine cycles for water use efficiency.
- Adequate towel rack space enables and encourages guests to hang towels neatly. This can result in less required daily washing.

 Use Tunnel washers or multi-load washer extractors that should utilize no more than 2 gallons of water per pounds of laundry. Energy Star and WaterSense certified regular commercial clothes washers use no more than 6 gallons per cubic foot of laundry.

## EXTERIOR AREAS

- Convert from high-water using lawns, trees, and shrubs to xeriscape: Plan landscapes that require less water by using native, zone-appropriate plants.
- Inventory outdoor water use for landscaped areas.
- Do not water landscape everyday; two-to-three



times a week is usually sufficient.

- Stop hosing down sidewalks, driveways, and parking lots.
- Wash autos, buses, and trucks less often.
- Avoid plant fertilizing and pruning that would stimulate excessive growth. Install good control systems to monitor and manage values referred to in the following points.
- Remove weeds and unhealthy plants so remaining plants can benefit from the water saved.
- In many cases, older established plants require only infrequent irrigation. Look for indications of water need such as wilt, change of color, or dry soil.
- Install soil moisture overrides or timers on sprinkler systems. Smart controllers self-adjust depending on moisture conditions, and of multiple programming to separate turf and non-turf areas.

- Time watering, when possible, to occur in the early morning or evening when evaporation and discourage weeds.
- Remove thatch and aerate turf to encourage the movement of water to the root zone.
- Avoid run-off and make sure sprinklers cover just the lawn or garden, not sidewalks, driveways, or gutters.
- In winter, water only during prolonged hot and dry periods (During spring and fall, most plants need approximately half the amount needed during the summer.)

For more information, contact: **Maui County Department of Water Supply Water Resources and Planning Division** 59 Kanoa Street Wailuku, HI 96793 Telephone: (808) 244-8550 FAX: (808) 244-6701

# A Checklist of Water Conservation Ideas For



### MULTI-PASS COOLING

#### Conduct an Analysis and Audit of Cooling Towers

- Number of Towers
- Number of Passes
- Area, equipment or processes to be cooled
- Minimum cooling requirements (temperature, volume, duration, hours)
- Existence and location of meters in cooling towers
- Historical water use records for a minimum of three years
- Meter reading for make-up water
- Evaporative and other losses
- Total Dissolved Solids (TDS) Concentration in make-up and blow-down water
- Concentration ratios
- All health, safety, operational, regulatory, administrative and other requirements or policies that apply to the site

#### Consider Water Conservation in Selection and Contracting for Cooling Systems

• Design, specify and bid cooling systems as models to comply with.

- Include a cycles of concentration, corrosion and microbial KPI specification in the contract for a water service treatment provider. This will help to result in prompt identification and repair of leaks.
- Ensure that the cooling tower sump or holding tank is sized to accommodate any water returning from system pipe work when re-circulating pumps are shut down.
- Install a non-return valve on the pump delivery side to minimize water loss during tower shut-down.
- Cooling Tower or Chiller Blow-down: Water that is removed from re-circulating cooling water to reduce contaminant build-up.

**Typical Amounts**: Amounts vary with water quality and other factors, but optimization of blow-down represents the greatest opportunity for water efficiency improvement in cooling tower systems.

- Install good control systems to monitor and manage values referred to in the following points.
- Keep the ratio of make-up water quality to blowdown with water quality high. This ratio is called the "concentration ratio," or "cycle of concentration."
- Typical past concentration ratios were 2 to 3.
   These ratios can be raised to six or more, depending upon make-up water quality as well as the use and sensitivity of the cooling system.
- Maintain a high initial make-up water quality.
- Install treatment systems designed to maximize make-up water quality and/or improve quality of re-circulating water. NOTE: Selection of treatment options and best management for water quality for treatment systems and operations are also important factors to consider.
- Install sub-meters on the make-up water feed line and the blow-down line.
- If loads allow, design towers and adequate controls to allow for proportional or continuous make-up rather than batching, to avoid saw-tooth patterns and increase overall cycles
- Make-up: Water that is added to cooling towers to replace evaporation, blow-down and drift losses.
   Typical Amounts of Make-up: blow-down + evaporation + drift losses
  - Maintain a high initial make-up water quality.
  - Install treatment systems designed to maximize make-up water quality and/or improve quality of re-circulating water.
  - Install sub-meters on the make-up water feed line and the blow-down line to enable careful monitoring and control of water use.
- Evaporation: Water evaporated to cool the temperature of the remaining water. Loss of heat by evaporation is about 1,000 BTU per pound of water evaporated.

Typical Amounts of Evaporation: 1% of the rate of flow of re-circulating water for every 10° drop in temperature achieved by the tower, or -3 gpm per 100 tons of cooling load. (A ton, when used to describe cooling tower capacity, is about 12,000 BTU per hour of heat removal). Dew points also affect cooling. Cooling reduced when dew points are high. The lower the dew point, the greater temperature difference between water flowing into and out of the tower.

 Install good control systems so that when the dew point temperatures are low, fans can be slowed by using motor speed controls or cycled on and off, saving energy and evaporative losses.

- Drift Losses: Water lost from the cooling tower in the form of mist carried out by air drafts.
  Typical Amounts of Drift Losses: 0.2 0.5% of total circulation rate.
  - Reduce drift through baffles or drift eliminators

### MAINTENANCE

#### 🔶 Routine Check:

- Test water sample of cooling towers for proper concentration of dissolved solids. Adjust blow-down flows as necessary.
- Measure water treatment chemical residue in circulating water.
- Check strainers on bottom of collection basins.
- Check switches on make-up water controls.
- Inspect all moving parts.
- Check for excessive vibration in motors, fans, pumps, etc.
- Manually test the vibration limit switch by jarring it.
- Look for oil leaks in gearboxes.
- Check seals in cooling tower circulating pump for leaks.
- Insure the ball float is set and operating properly.
- Check for any structural deteriorating, loose connectors, water leaks, signs of drift, or openings in casings.
- Ensure that fill media within the cooling tower, if fitted, is in good condition to obtain optimum cooling. Fill which can be easily removed and cleaned will reduce build-up and increase efficiency.
- Seek and repair any unwanted flows in the cooling tower system.
- Maintain a log and watch for changes in:
  - Meter readings for make-up water
  - Meter readings for blow down water
  - Evaporative and other losses
  - Total Dissolved Solids (TDS) concentration in make-up and blow-down water
  - Concentration ratios

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# A Checklist of Water Conservation Ideas For



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#### GENERAL SUGGESTION

- Increase employee awareness of water conservation.
- Install signs encouraging water conservation in employee and customer restrooms.
- When cleaning with water is necessary, use budgeted amounts.
- Read water meter weekly to monitor success of water conservation efforts.
- Assign an employee to monitor water use and waste.
- Seek employee suggestions on water conservation; put suggestion boxes in prominent areas.
- Determine the quantity and purpose of water being used.
- Determine other methods of water conservation.
- Conduct contests for employees (e.g., posters, slogans, or conservation ideas).
- Provide table signs urging water conservation.
- Serve water only when requested by the customer.

#### BUILDING MAINTENANCE

 Reduce the load on air conditioning units by shutting off air conditioning when and where it is not needed.

- Check the water supply system for leaks and turn off any unnecessary flows.
- Repair dripping faucets and showers and continuously-running or leaking toilets.
- Install flow reducers and faucet aerators in all plumbing fixtures whereever possible.



- Reduce water used in toilet flushing by adjusting the vacuum flush mechanism or installing toilet tank displacement devices (dams, bottles, or bags).
- As appliances or fixtures wear out, replace them with water-saving models.
- Shut off water supply to equipment rooms not in use.
- Minimize the water used in cooling equipment in accordance with manufacturers' recommendations. Shut off cooling units when not needed.
- Keep hot water pipes insulated.
- Avoid excessive air conditioner blow-down. (Monitor total dissolved solids levels and blowdown only when needed).

- Instruct clean-up crews to use less water for mopping.
- Switch from wet or steam carpet cleaning methods to dry powder methods.
- Change window cleaning schedule from periodic to an on-call/as required basis.

## KITCHEN AREA

- Turn off the continuous flow used to clean the drain trays of the coffee/milk/soda beverage island: clean the trays only as needed.
- Consider using a "waterless wok."
- Dishwashers
  - Promote hand-scraping the dishes before loading a dishwasher.
  - Turn dishwasher off when not in use. Wash full loads only and try to fill racks to maximum capacity.
  - Keep flow rates as close to manufacturer's specifications as possible.
  - Install advanced rinse nozzles.
  - Install door switches for convenient on/off access.
  - Check voltage of boosters heater to make sure it fits the machine.
  - Use "steam doors" to prevent loss of water due to evaporation.



- Check volumes of service and estimate facility needs. A better option may be a larger machine that has a lower water flow per rack rate.
- Faucets
  - Do not leave faucets on to thaw vegetables and other frozen foods.
  - Post water conservation literature and reminders to staff around work areas.
  - Educate staff to look for leaks and broken faucets in their area.

- Replace spray heads with high- efficiency sprayers to reduce water flow.
- Adjust flow valve to reduce water flow.
- Check for leaks and worn gaskets.
- Install a flow restrictor to limit maximum flow rate to 2.5 gpm or less.
- Install a 2.5 gpm faucet aerator, maximizing flow efficiency by increasing air-flow to the
- Consider infrared or ultrasonic sensors that activate water

stream.



flow only in the presence of hands or some other object.

- Install pedal operated faucet controllers to ensure valves are closed when not in use.
- Use water from steam tables to wash down cooking area.
- Use water-conserving ice makers, one that uses an air-cooled compressor if possible.
- Recycle water where feasible, consistent with state and county requirements.
- Recycle rinse water from the dishwater or recirculate it to the garbage disposal.
- Minimize use of a garbage disposal by using a strainer/trap and disposal in trash or compost.
- Presoak utensils and dishes in ponded water instead of using a running-water rinse.
- Wash vegetables in ponded water; do not let water run in preparation sink.

## 🔶 BAR

• Do not use running water to melt ice in the sink strainers.

#### EXTERIOR AREAS

 Convert from high-water using lawns, trees, and shrubs to xeriscape: Landscape design incorporating plants providing beautiful color and requiring less water. Plan landscapes that require less water.

- Inventory outdoor water use for landscaped areas.
- Do not water landscape everyday; two-to-three times a week is usually sufficient.
- Stop hosing down sidewalks, driveways, and parking lots.
- Wash autos, buses, and trucks less often.
- Avoid plant fertilizing and pruning that would stimulate excessive growth. Install good control systems to monitor and manage values referred to in the following points.



- Remove weeds and unhealthy plants so remaining plants can benefit from the water saved.
- In many cases, older established plants require only infrequent irrigation. Look for indications of water need such as wilt, change of color, or dry soil.
- Install soil moisture overrides or timers on sprinkler systems.
- Time watering, when possible, to occur in the early morning or evening when evaporation is lowest.
- Mulch around plants to reduce evaporation and discourage weeds.
- Remove thatch and aerate turf to encourage the movement of water to the root zone.
- Avoid run-off and make sure sprinklers cover just the lawn or garden, not sidewalks, driveways, or gutters.
- Throughout winter, water only during prolonged hot and dry periods (During spring and fall, most

plants need approximately half the amount needed during the summer.)

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