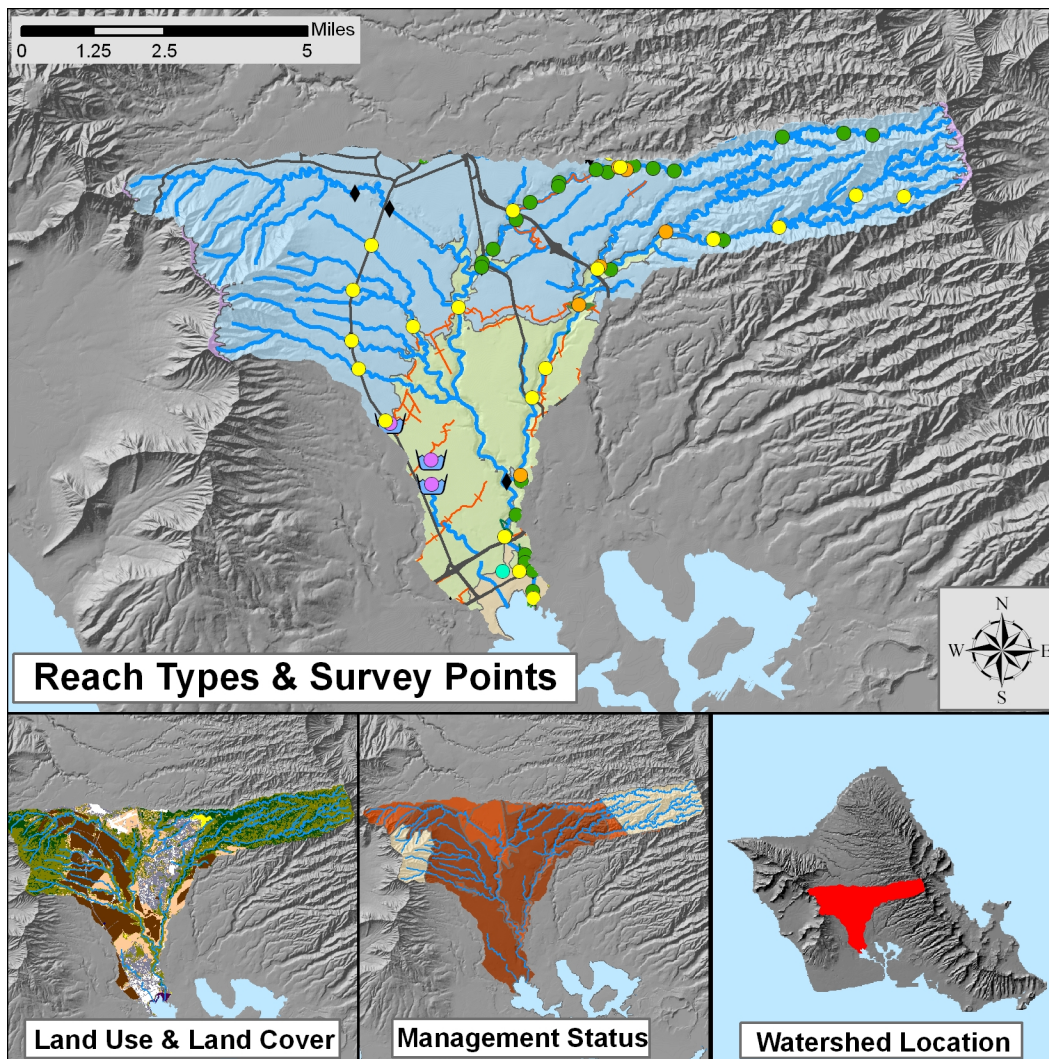


Waikele, O‘ahu



WATERSHED FEATURES

Waikele watershed occurs on the island of O‘ahu. The Hawaiian meaning of the name is “muddy water”. The area of the watershed is 48.2 square mi (124.8 square km), with maximum elevation of 3045 ft (928 m). The watershed's DAR cluster code is 7, meaning that the watershed is very large, steep in the upper watershed, and with large embayments. The percent of the watershed in the different land use districts is as follows: 46% agricultural, 27% conservation, 0% rural, and 27% urban.

Land Stewardship: Percentage of the land in the watershed managed or controlled by the corresponding agency or entity. Note that this is not necessarily ownership.

<u>Military</u>	<u>Federal</u>	<u>State</u>	<u>OHA</u>	<u>County</u>	<u>Nature Conservancy</u>	<u>Other Private</u>
7.3	25.7	0.0	0.0	3.8	6.6	56.4

Land Management Status: Percentage of the watershed in the categories of biodiversity protection and management created by the Hawaii GAP program.

Permanent Biodiversity <u>Protection</u>	Managed for Multiple <u>Uses</u>	Protected but <u>Unmanaged</u>	<u>Unprotected</u>
21.1	0.0	22.4	56.4

Land Use: Areas of the various categories of land use. These data are based on NOAA C-CAP remote sensing project.

	<u>Percent</u>	<u>Square mi</u>	<u>Square km</u>
High Intensity Developed	4.8	2.30	5.96
Low Intensity Developed	11.7	5.65	14.63
Cultivated	17.5	8.43	21.83
Grassland	11.3	5.47	14.16
Scrub/Shrub	34.6	16.67	43.17
Evergreen Forest	19.1	9.23	23.89
Palustrine Forested	0.0	0.00	0.00
Palustrine Scrub/Shrub	0.0	0.00	0.00
Palustrine Emergent	0.0	0.00	0.00
Estuarine Forested	0.3	0.13	0.33
Bare Land	0.6	0.29	0.75
Unconsolidated Shoreline	0.0	0.00	0.01
Water	0.1	0.04	0.11
Unclassified	0.0	0.00	0.00

STREAM FEATURES

Waikele is a perennial stream. Total stream length is 134.7 mi (216.8 km). The terminal stream order is 4.

Reach Type Percentages: The percentage of the stream's channel length in each of the reach type categories.

<u>Estuary</u>	<u>Lower</u>	<u>Middle</u>	<u>Upper</u>	<u>Headwaters</u>
0.5	0.0	23.6	75.9	0.0

The following stream(s) occur in the watershed:

'Ēkaha Nui	Hō'ae'ae	Huliwai	Kipapa	Manuwaiahu
Poliwai	Waiakakalaua	Waikakalaua	Waikele	

BIOTIC SAMPLING EFFORT

Biotic samples were gathered in the following year(s):

1960	1961	1962	1989	1990	1991	1992
1993	1998	1999	2001	2002		

Distribution of Biotic Sampling: The number of survey locations that were sampled in the various reach types.

<u>Survey type</u>	<u>Estuary</u>	<u>Lower</u>	<u>Middle</u>	<u>Upper</u>	<u>Headwaters</u>
Damselfly Surveys	1	2	7	9	0
HDFG	0	0	4	2	0
Published Report	3	6	9	24	0
Reservoir	0	0	3	0	0
USGS Surveys	0	1	0	0	0

BIOTA INFORMATION

Species List

Native Species

- Crustaceans** Amphipod sp.
Atyoida bisulcata
Ligia hawaiiensis
Macrobrachium grandimanus
Periclimenes sp.
Thalamita crenata
- Fish** *Awaous guamensis*
Dorosoma petenense
Eleotris sandwicensis
Kuhlia sandwicensis
Mugil cephalus
Saurida gracilis
Sicyopterus stimpsoni
Sphyraena barracuda
Stenogobius hawaiiensis
- Snails** *Erinna newcombi*
Ferrissia sharpi
 Snail sp.
- Sponges** *Heteromeyenia baileyi*
- Worms** *Myzobdella lugubris*
Namalycastis abiuma
Namalycastis sp.
Oligochaete sp.
Prostoma sp.

Native Species

- Insects** *Anax junius*
Anax sp.
Chironomus hawaiiensis
Collembola sp.
Dolichopodid sp.
 Empidid sp.
 Ephydrid sp.
Forcipomyia sp.
Hemerodromia sp.
Hydroptila sp.
Megalagrion blackburni
Megalagrion sp.
Microvelia vagans
Orthocladius sp.
Saldula exulans
Scatella sexnotata
 Tipulid sp.

Introduced Species

- Amphibians** *Bufo marinus*
Rana catesbiana
 Ranid sp.
- Clams** *Corbicula fluminea*
- Crustaceans** *Hyalella azteca*
Macrobrachium lar

Introduced Species

- Insects** *Aedes albopictus*
Cheumatopsyche analis
Cheumatopsyche pettiti
 Chironomid larvae
Cricotopus bicinctus
Crocothemis servilia

Fish	<i>Neocaridina denticulata</i>	<i>Enallagma civile</i>
	<i>Procambarus clarkii</i>	<i>Goeldichironomus holoprasinus</i>
	<i>Ancistrus cf. temminckii</i>	<i>Ischnura posita</i>
	<i>Clarias fuscus</i>	<i>Ischnura ramburi</i>
	<i>Gambusia affinis</i>	<i>Limonia advena</i>
	<i>Lepomis sp.</i>	<i>Mesovelgia amoena</i>
	<i>Micropterus dolomieu</i>	<i>Mesovelgia mulsanti</i>
	<i>Misgurnus anguillicaudatus</i>	<i>Orthemis ferruginea</i>
	<i>Mugilogobius cavifrons</i>	<i>Pantala flavescens</i>
	<i>Oreochromis mossambicus</i>	<i>Trichocorixa reticulata</i>
	<i>Poecilia reticulata</i>	Trichoptera larvae
	<i>Poecilia sphenops</i>	<i>Tropisternus lateralis humeralis</i>
	Poeciliid sp.	<i>Tropisternus salsamentus</i>
	<i>Pterygoplichthys multiradiatus</i>	
	<i>Sarotherodon melanotheron</i>	
	<i>Tilapia sp.</i>	
	unidentified cyprinid	
	unidentified poeciliid	
	<i>Valamugil engeli</i>	
	<i>Xiphophorus helleri</i>	
<i>Xiphophorus sp.</i>		
Snails	Gastropod sp.	
	<i>Melania sp.</i>	
	Physid sp.	
	<i>Pomacea canaliculata</i>	
	<i>Pomacea sp.</i>	
	<i>Tarebia granifera</i>	
Thiarid sp.		

Species found in Impoundments

Fish	<i>Lepomis sp.</i>
	<i>Tilapia sp.</i>
	unidentified cyprinid

Species Distributions: Presence (P) of species in different stream reaches.

<u>Scientific Name</u>	<u>Status</u>	<u>Estuary</u>	<u>Lower</u>	<u>Middle</u>	<u>Upper</u>	<u>Headwaters</u>
<i>Myzobdella lugubris</i>	Cryptogenic	P				
<i>Atyoida bisulcata</i>	Endemic				P	
<i>Ligia hawaiiensis</i>	Endemic	P				
<i>Macrobrachium grandimanus</i>	Endemic	P	P			
<i>Eleotris sandwicensis</i>	Endemic	P	P			
<i>Sicyopterus stimpsoni</i>	Endemic				P	
<i>Stenogobius hawaiiensis</i>	Endemic	P	P			
<i>Chironomus hawaiiensis</i>	Endemic	P				
<i>Megalagrion blackburni</i>	Endemic				P	

Waikele, O'ahu

<i>Megalagrion sp.</i>	Endemic			P	P
<i>Microvelia vagans</i>	Endemic				P
<i>Orthocladius sp.</i>	Endemic	P	P	P	
<i>Saldula exulans</i>	Endemic				P
<i>Erinna newcombi</i>	Endemic			P	
<i>Ferrissia sharpi</i>	Endemic		P	P	
Amphipod sp.	Indigenous		P	P	
<i>Periclimenes sp.</i>	Indigenous	P			
<i>Thalamita crenata</i>	Indigenous	P			
<i>Awaous guamensis</i>	Indigenous	P	P		P
<i>Dorosoma petenense</i>	Indigenous	P			
<i>Kuhlia sandvicensis</i>	Indigenous	P	P		
<i>Mugil cephalus</i>	Indigenous	P	P		
<i>Saurida gracilis</i>	Indigenous	P			
<i>Sphyaena barracuda</i>	Indigenous	P			
<i>Anax junius</i>	Indigenous	P	P	P	P
<i>Anax sp.</i>	Indigenous			P	P
<i>Scatella sexnotata</i>	Indigenous	P			
<i>Heteromeyenia baileyi</i>	Indigenous			P	P
<i>Namalycastis sp.</i>	Indigenous		P	P	
<i>Bufo marinus</i>	Introduced	P	P	P	P
<i>Rana catesbiana</i>	Introduced	P	P	P	
Ranid sp.	Introduced				P
<i>Corbicula fluminea</i>	Introduced	P	P		
<i>Hyalella azteca</i>	Introduced	P			
<i>Macrobrachium lar</i>	Introduced	P	P	P	
<i>Neocaridina denticulata</i>	Introduced	P	P	P	P
<i>Procambarus clarkii</i>	Introduced	P	P	P	
<i>Ancistrus cf. temminckii</i>	Introduced	P	P	P	P
<i>Clarias fuscus</i>	Introduced			P	P
<i>Gambusia affinis</i>	Introduced	P	P	P	P
<i>Lepomis sp.</i>	Introduced			P	
<i>Micropterus dolomieu</i>	Introduced		P		
<i>Misgurnus anguillicaudatus</i>	Introduced			P	P
<i>Mugilogobius cavifrons</i>	Introduced	P	P		

<i>Oreochromis mossambicus</i>	Introduced		P			
<i>Poecilia reticulata</i>	Introduced	P	P	P	P	
<i>Poecilia sphenops</i>	Introduced		P			
Poeciliid sp.	Introduced		P	P		
<i>Pterygoplichthys multiradiatus</i>	Introduced					P
<i>Sarotherodon melanotheron</i>	Introduced					P
<i>Tilapia sp.</i>	Introduced	P	P	P		
unidentified cyprinid	Introduced			P		
unidentified poeciliid	Introduced	P	P			P
<i>Valamugil engeli</i>	Introduced	P				
<i>Xiphophorus helleri</i>	Introduced	P	P	P	P	
<i>Xiphophorus sp.</i>	Introduced		P	P		
<i>Aedes albopictus</i>	Introduced	P				
<i>Cheumatopsyche analis</i>	Introduced		P	P	P	
<i>Cheumatopsyche pettiti</i>	Introduced	P				
Chironomid larvae	Introduced		P	P		
<i>Cricotopus bicinctus</i>	Introduced		P			
<i>Crocothemis servilia</i>	Introduced	P	P			
<i>Enallagma civile</i>	Introduced	P	P	P		
<i>Ischnura posita</i>	Introduced	P	P	P	P	
<i>Ischnura ramburi</i>	Introduced	P	P			
<i>Limonia advena</i>	Introduced	P				
<i>Mesovelgia amoena</i>	Introduced					P
<i>Mesovelgia mulsanti</i>	Introduced					P
<i>Orthemis ferruginea</i>	Introduced	P	P			
<i>Pantala flavescens</i>	Introduced	P	P	P	P	
Trichoptera larvae	Introduced		P			
<i>Tropisternus lateralis humeralis</i>	Introduced	P				
<i>Tropisternus salsamentus</i>	Introduced	P				
<i>Melania sp.</i>	Introduced			P	P	
Physid sp.	Introduced			P		
<i>Pomacea canaliculata</i>	Introduced	P				
<i>Pomacea sp.</i>	Introduced	P	P			
<i>Tarebia granifera</i>	Introduced		P			

Thiarid sp.	Introduced	P	P	P
<i>Dolichopodid sp.</i>	Undetermined	P		
Empidid sp.	Undetermined		P	P
Ephydrid sp.	Undetermined		P	
<i>Hydroptila sp.</i>	Undetermined		P	P
Snail sp.	Undetermined			P
<i>Oligochaete sp.</i>	Undetermined		P	P

HISTORIC RANKINGS

Historic Rankings: These are rankings of streams from historical studies. "Yes" means the stream was considered worthy of protection by that method. Some methods include non-biotic data in their determination. See Atlas Key for details.

Multi-Attribute Prioritization of Streams - Potential Heritage Streams (1998): No

Hawaii Stream Assessment Rank (1990): Without Data

U.S. Fish and Wildlife Service High Quality Stream (1988): No

The Nature Conservancy- Priority Aquatic Sites (1985): No

National Park Service - Nationwide Rivers Inventory (1982): No

Current DAR Decision Rule Status: The following criteria are used by DAR to consider the biotic importance of streams. "Yes" means that watershed has that quality.

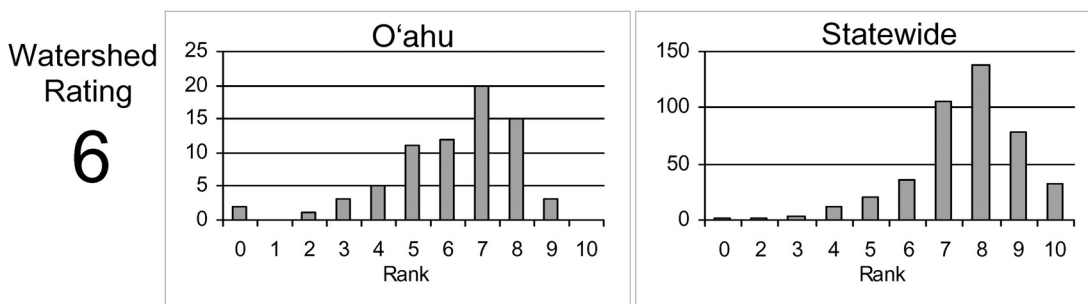
Native Insect Diversity <u>> 19 spp.</u>	Native Macrofauna <u>Diversity > 5 spp.</u>	Absence of Priority 1 <u>Introduced</u>
No	Yes	No
Abundance of Any <u>Native Species</u>	Presence of Candidate <u>Endangered Species</u>	Endangered Newcomb's <u>Snail Habitat</u>
No	No	No

CURRENT WATERSHED AND STREAM RATINGS

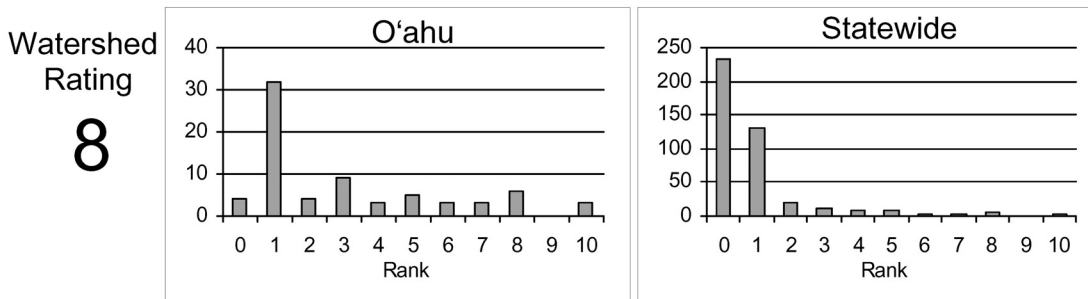
The current watershed and stream ratings are based on the data contained in the DAR Aquatic Surveys Database. The ratings provide the score for the individual watershed or stream, the distribution of ratings for that island, and the distribution of ratings statewide. This allows a better understanding of the meaning of a particular ranking and how it compares to other streams. The ratings are standardized to range from 0 to 10 (0 is lowest and 10 is highest rating) for each variable and the totals are also standardized so that the rating is not the average of each component rating. These ratings are subject to change as more data are entered into the DAR Aquatic Surveys Database and can be automatically recalculated as the data improve. In addition to the ratings, we have also provided an estimate of the confidence level of the ratings. This is called rating strength. The higher the rating strength the more likely the data and rankings represent the actual condition of the watershed, stream, and aquatic biota.

WATERSHED RATING: Waikele, O'ahu

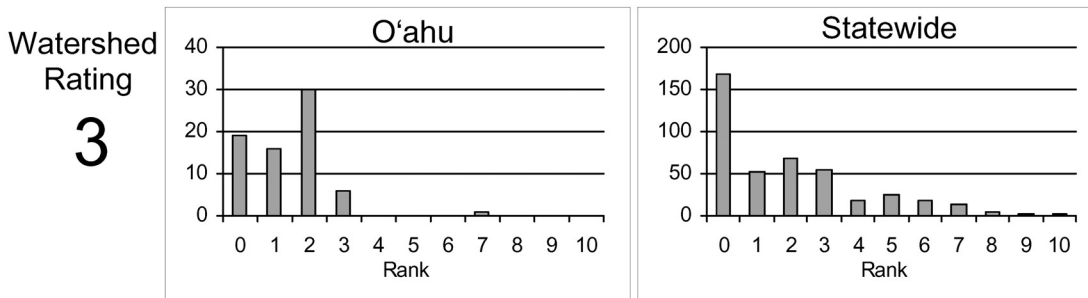
Land Cover Rating: Rating is based on a scoring system where in general forested lands score positively and developed lands score negatively.



Shallow Waters Rating: Rating is based on a combination of the extent of estuarine and shallow marine areas associated with the watershed and stream.

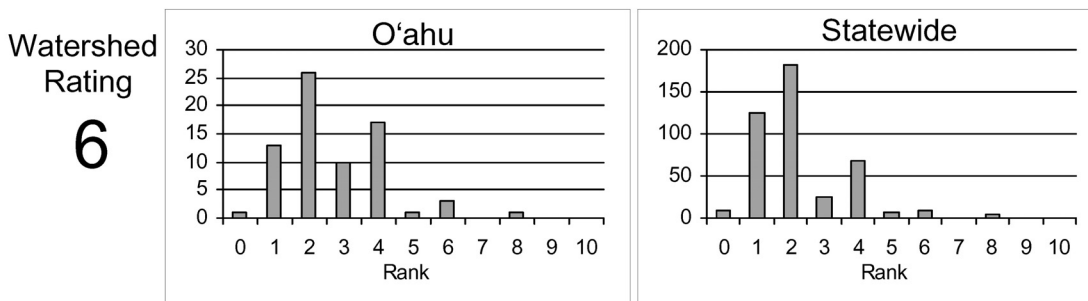


Stewardship Rating: Rating is based on a scoring system where higher levels of land and biodiversity protection within the watershed score positively.

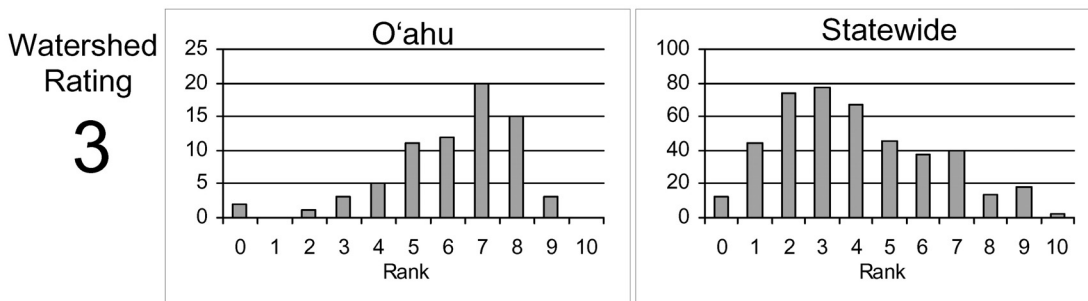


WATERSHED RATING (Cont): Waikele, O'ahu

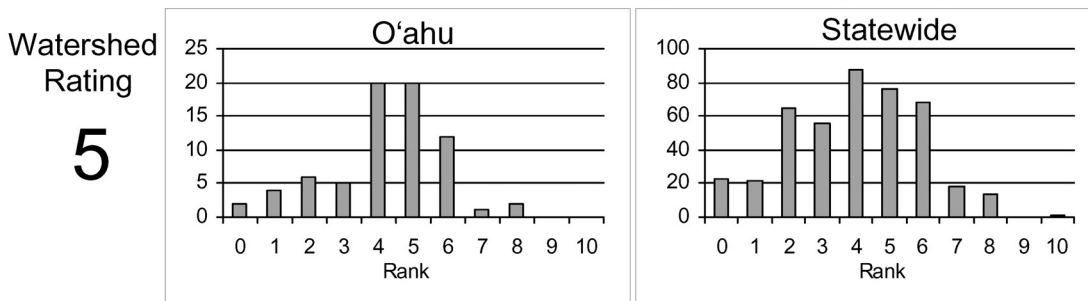
Size Rating: Rating is based on the watershed area and total stream length. Larger watersheds and streams score more positively.



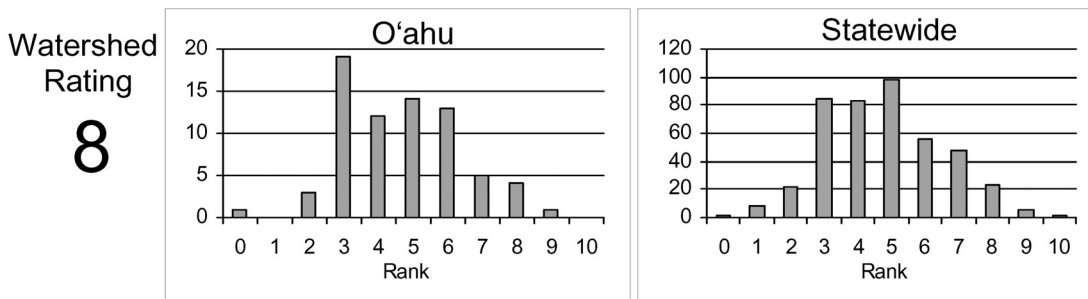
Wetness Rating: Rating is based on the average annual rainfall within the watershed. Higher rainfall totals score more positively.



Reach Diversity Rating: Rating is based on the types and amounts of different stream reaches available in the watershed. More area in different reach types score more positively.



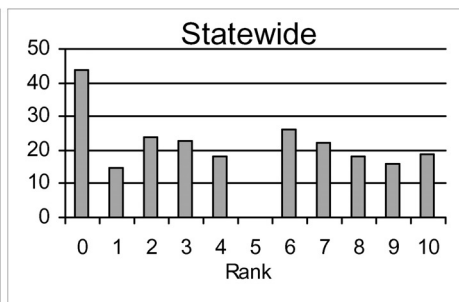
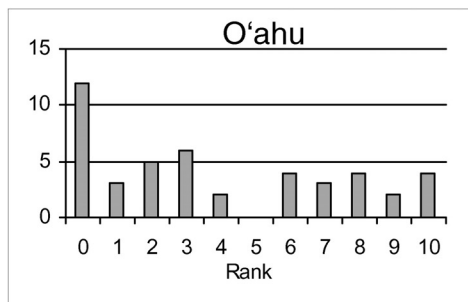
Total Watershed Rating: Rating is based on combination of Land Cover Rating, Shallow Waters Rating, Stewardship Rating, Size Rating, Wetness Rating, and Reach Diversity Rating.



BIOLOGICAL RATING: Waikele, O'ahu

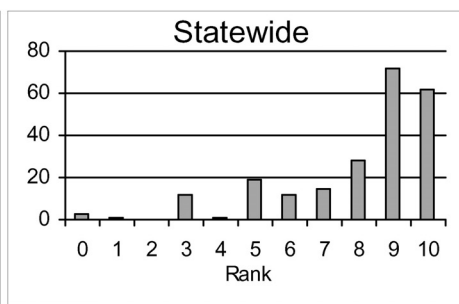
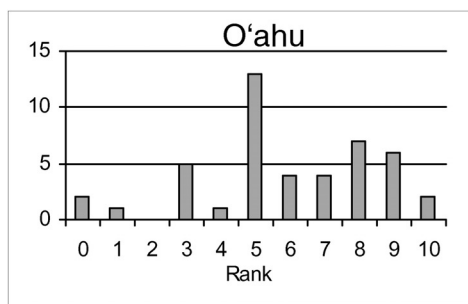
Native Species Rating: Rating is based on the number of native species observed in the watershed.

Stream Rating
7



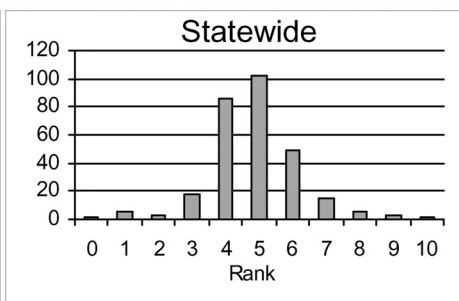
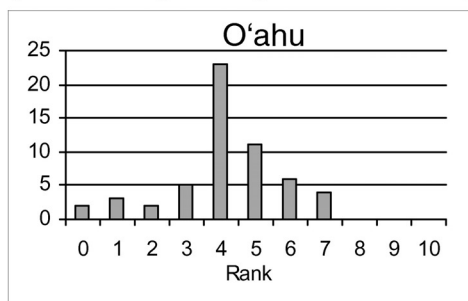
Introduced Genera Rating: Rating is based on the number of introduced genera observed in the watershed.

Stream Rating
0



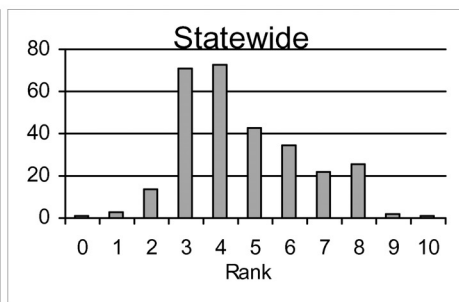
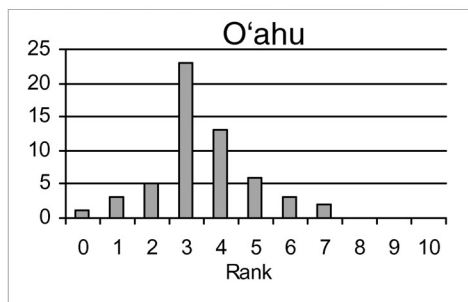
All Species' Score Rating: Rating is based on the Hawaii Stream Assessment scoring system where native species score positively and introduced species score negatively.

Stream Rating
1



Total Biological Rating: Rating is the combination of the Native Species Rating, Introduced Genera Rating, and the All Species' Score Rating.

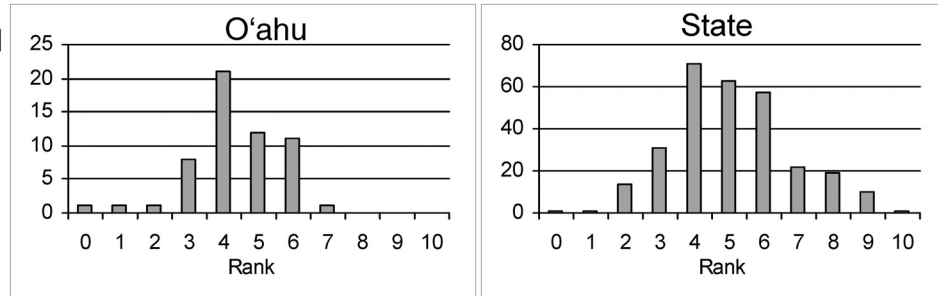
Stream Rating
1



OVERALL RATING: Waikele, O'ahu

Overall Rating: Rating is a combination of the Total Watershed Rating and the Total Biological Rating.

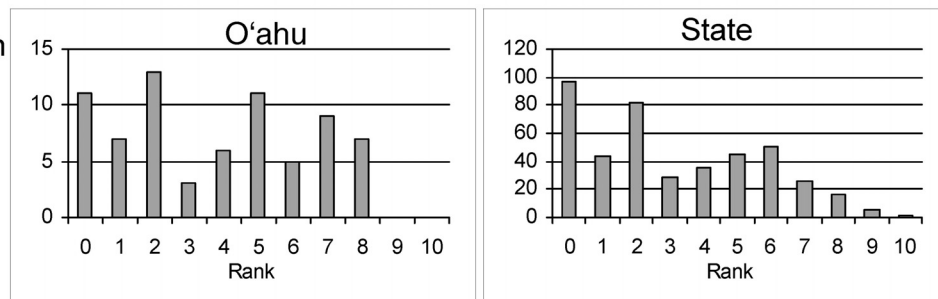
Watershed
Rating
5



RATING STRENGTH: Waikele, O'ahu

Rating Strength: Represents an estimate of the overall study effort in the stream and is a combination of the number of studies, number of different reaches surveyed, and the number of different survey types.

Information
Rating
8



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