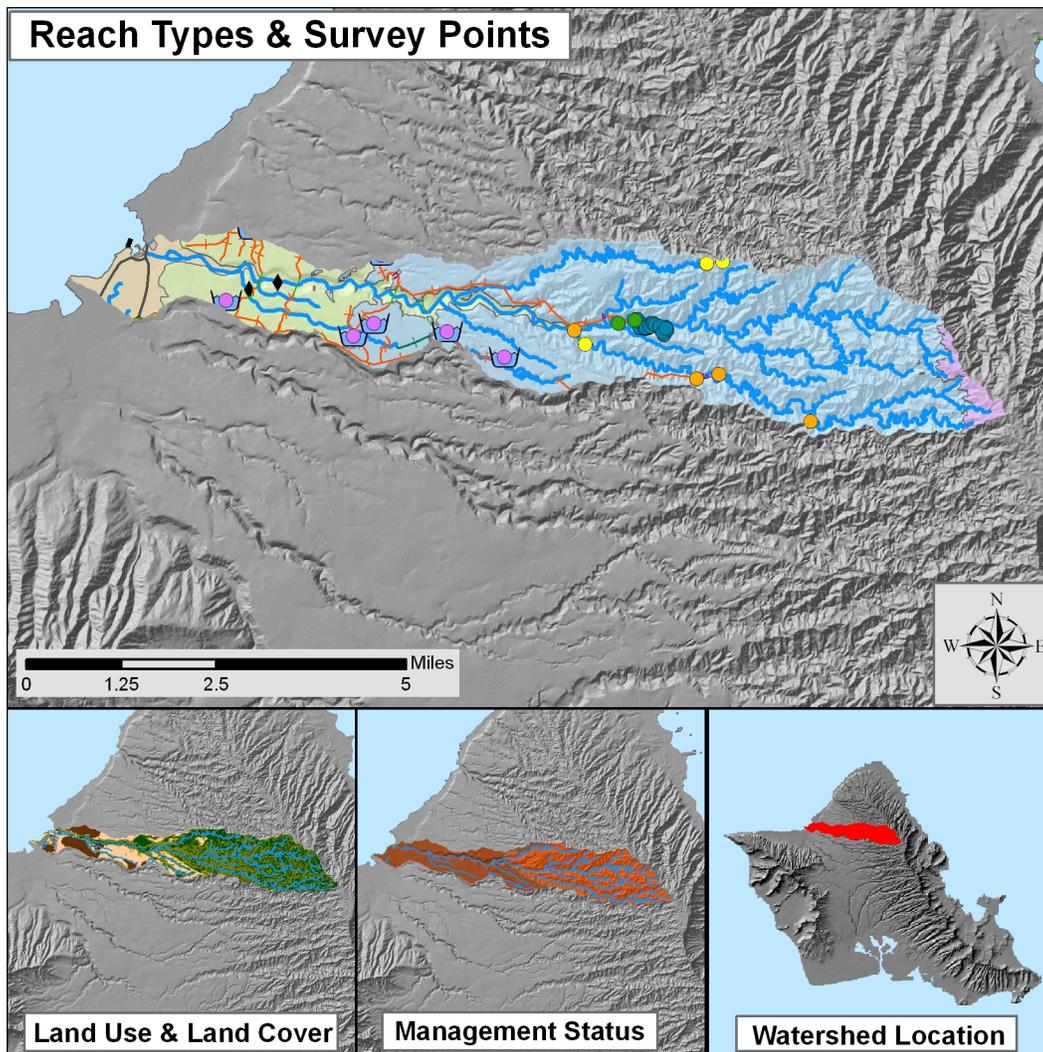


Anahulu River, O'ahu



WATERSHED FEATURES

Anahulu River watershed occurs on the island of O'ahu. The Hawaiian meaning of the name is "ten days". The area of the watershed is 17 square mi (44.1 square km), with maximum elevation of 2844 ft (867 m). The watershed's DAR cluster code is not yet determined. The percent of the watershed in the different land use districts is as follows: 27.6% agricultural, 70.4% conservation, 0% rural, and 2% 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</u>	<u>Private</u>
62.6	0.0	0.2	0.0	0.1	0.0		37.1

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>
0.0	0.0	62.9	37.1

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	0.0	0.01	0.02
Low Intensity Developed	1.9	0.33	0.86
Cultivated	7.5	1.27	3.28
Grassland	13.2	2.24	5.81
Scrub/Shrub	38.9	6.62	17.14
Evergreen Forest	38.1	6.49	16.81
Palustrine Forested	0.0	0.00	0.00
Palustrine Scrub/Shrub	0.1	0.01	0.03
Palustrine Emergent	0.0	0.00	0.00
Estuarine Forested	0.0	0.00	0.00
Bare Land	0.1	0.01	0.04
Unconsolidated Shoreline	0.0	0.00	0.00
Water	0.2	0.04	0.09
Unclassified	0.0	0.00	0.00

STREAM FEATURES

Anahulu River is a perennial stream. Total stream length is 64.6 mi (103.9 km). The terminal stream order is 3.

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>
1.3	0.0	14.6	83.3	0.8

The following stream(s) occur in the watershed:

Anahulu Kawai Iki Kawailoa Kawainui

BIOTIC SAMPLING EFFORT

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

1900 1901 1961 1962 1975 1990 1991
1992 2003

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	0	0	0	6	0
DAR Observation	0	0	0	9	0
DAR Point Quadrat	0	0	0	42	0
DAR Report	0	0	0	1	0
HDFG	0	0	1	3	0
Published Report	0	0	0	2	0
Reservoir	0	0	1	4	0

BIOTA INFORMATION**Species List****Native Species**

Crustaceans	<i>Atyoida bisulcata</i> <i>Macrobrachium grandimanus</i>
Fish	<i>Awaous guamensis</i> <i>Lentipes concolor</i> <i>Mugil cephalus</i> <i>Sicyopterus stimpsoni</i>
Sponges	<i>Heteromeyenia baileyi</i>

Native Species

Insects	<i>Anax junius</i> <i>Anax sp.</i> <i>Dasyhelea hawaiiensis</i> <i>Hyposmocoma sp</i> <i>Megalagrion leptodemas</i> <i>Megalagrion nigrohamatum</i> <i>nigrolineatum</i> <i>Megalagrion oceanicum</i> <i>Megalagrion pacificum</i> <i>Megalagrion sp.</i> <i>Microvelia vagans</i> <i>Procanace bifurcata</i> <i>Saldula exulans</i> <i>Scatella cilipes</i> <i>Scatella clavipes</i> <i>Telmatogeton sp.</i>
----------------	--

Introduced Species

Amphibians	<i>Rana catesbiana</i>
Crustaceans	<i>Macrobrachium lar</i>
Fish	<i>Clarias fuscus</i> <i>Cyprinus carpio</i> <i>Lepomis sp.</i> <i>Micropterus sp.</i> <i>Misgurnus anguillicaudatus</i> <i>Poecilia reticulata</i> <i>Tilapia sp.</i> <i>Xiphophorus helleri</i>
Snails	<i>Lymnaeid sp.</i>

Introduced Species

Insects	<i>Cheumatopsyche analis</i> Chironomid larvae <i>Chrysotus longipalpus</i> <i>Enallagma civile</i> <i>Hydroptila potosina</i> <i>Ischnura posita</i> <i>Tramea abdominalis</i>
----------------	---

Species found in Impoundments

Fish	<i>Lepomis sp.</i> <i>Micropterus sp.</i> <i>Tilapia sp.</i>
-------------	--

Species Size Data: Species size (inches) observed in DAR Point Quadrat Surveys.

<u>Scientific Name</u>	<u>Status</u>	<u>Minimum Size</u>	<u>Maximum Size</u>	<u>Average Size</u>
<i>Rana catesbiana</i>	Introduced	1.5	3	2.6
<i>Awaous guamensis</i>	Indigenous	1.5	5	2.8
<i>Misgurnus anguillicaudatus</i>	Introduced	1	5.5	2.5
<i>Enallagma civile</i>	Introduced	0.75	0.75	0.8
<i>Tramea abdominalis</i>	Introduced	2	2	2.0

Average Density: The densities (#/square yard) for species observed in DAR Point Quadrat Surveys averaged over all sample dates in each reach type.

<u>Scientific Name</u>	<u>Status</u>	<u>Estuary</u>	<u>Low</u>	<u>Mid</u>	<u>Upper</u>	<u>Headwaters</u>
<i>Awaous guamensis</i>	Indigenous				0.25	
<i>Enallagma civile</i>	Introduced				0.08	
<i>Misgurnus anguillicaudatus</i>	Introduced				0.83	
<i>Rana catesbiana</i>	Introduced				0.25	
<i>Tramea abdominalis</i>	Introduced				0.08	

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>Atyoida bisulcata</i>	Endemic			P	P	
<i>Lentipes concolor</i>	Endemic				P	
<i>Dasyhelea hawaiiensis</i>	Endemic				P	
<i>Hyposmocoma sp.</i>	Endemic				P	
<i>Megalagrion leptodemas</i>	Endemic				P	
<i>Megalagrion nigrohamatum nigrolineatum</i>	Endemic				P	
<i>Megalagrion oceanicum</i>	Endemic				P	
<i>Megalagrion pacificum</i>	Endemic				P	
<i>Megalagrion sp.</i>	Endemic			P	P	
<i>Microvelia vagans</i>	Endemic				P	
<i>Procanace bifurcata</i>	Endemic				P	
<i>Saldula exulans</i>	Endemic				P	
<i>Scatella cilipes</i>	Endemic				P	
<i>Scatella clavipes</i>	Endemic				P	
<i>Awaous guamensis</i>	Indigenous				P	
<i>Anax junius</i>	Indigenous				P	
<i>Anax sp.</i>	Indigenous			P		
<i>Telmatogeton sp.</i>	Indigenous				P	
<i>Heteromeyenia baileyi</i>	Indigenous				P	

<i>Rana catesbiana</i>	Introduced		P
<i>Macrobrachium lar</i>	Introduced		P
<i>Lepomis sp.</i>	Introduced	P	P
<i>Micropterus sp.</i>	Introduced		P
<i>Misgurnus anguillicaudatus</i>	Introduced		P
<i>Tilapia sp.</i>	Introduced	P	P
<i>Cheumatopsyche analis</i>	Introduced		P
Chironomid larvae	Introduced	P	P
<i>Chrysotus longipalpus</i>	Introduced		P
<i>Enallagma civile</i>	Introduced		P
<i>Hydroptila potosina</i>	Introduced		P
<i>Ischnura posita</i>	Introduced		P
<i>Tramea abdominalis</i>	Introduced		P
Lymnaeid sp.	Introduced		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): Substantial

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
> 19 spp.

No

Native Macrofauna
Diversity > 5 spp.

Yes

Absence of Priority 1
Introduced

No

Abundance of Any
Native Species

No

Presence of Candidate
Endangered Species

Yes

Endangered Newcomb's
Snail Habitat

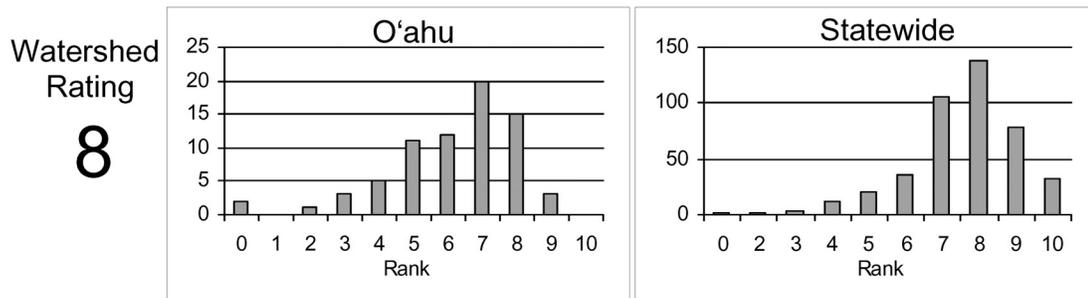
No

CURRENT WATERSHED AND STREAM RATINGS

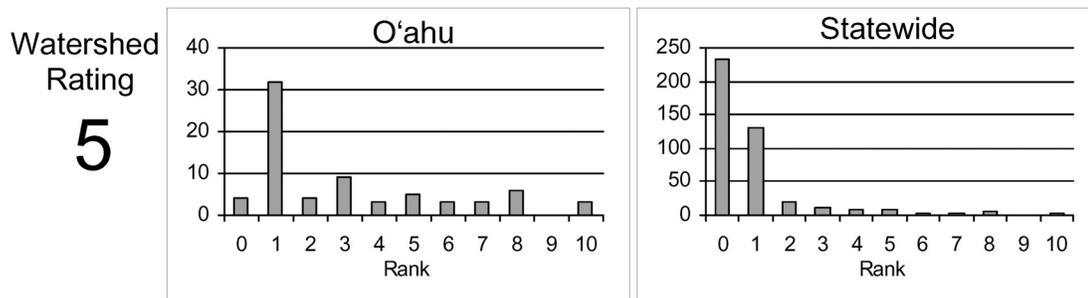
The current watershed and stream ratings are based on the data contained in the DAR Aquatic Surveys Database. The ratings provide the score for the individual watershed or stream, the distribution of ratings for that island, and the distribution of ratings statewide. This allows a better understanding 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: Anahulu River, O'ahu

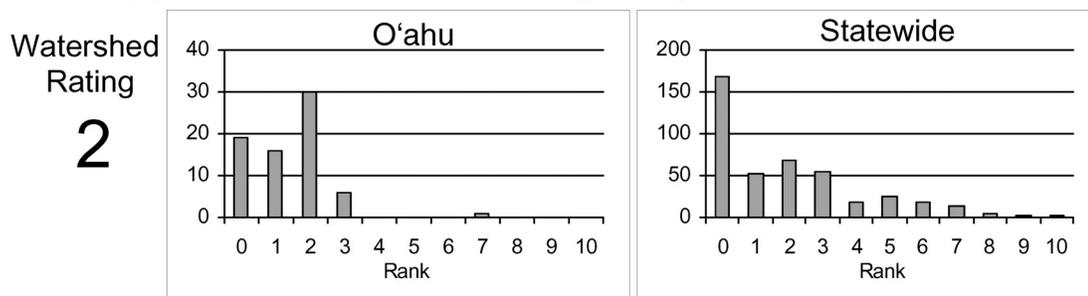
Land Cover Rating: Rating is based on a scoring system where in general forested lands score positively and developed lands score negatively.



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

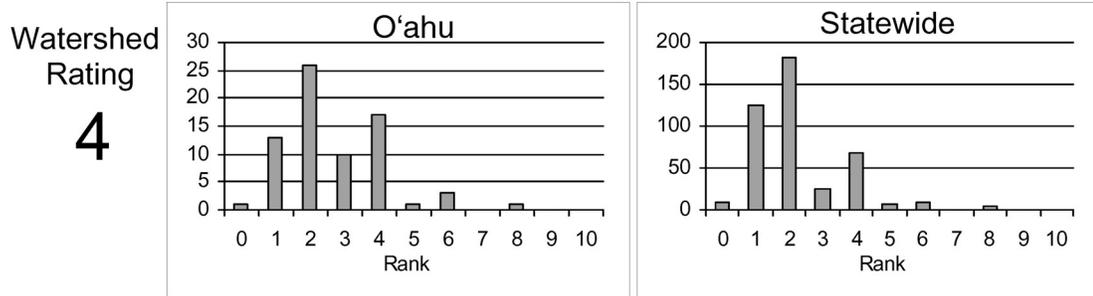


Stewardship Rating: Rating is based on a scoring system where higher levels of land and biodiversity protection within the watershed score positively.

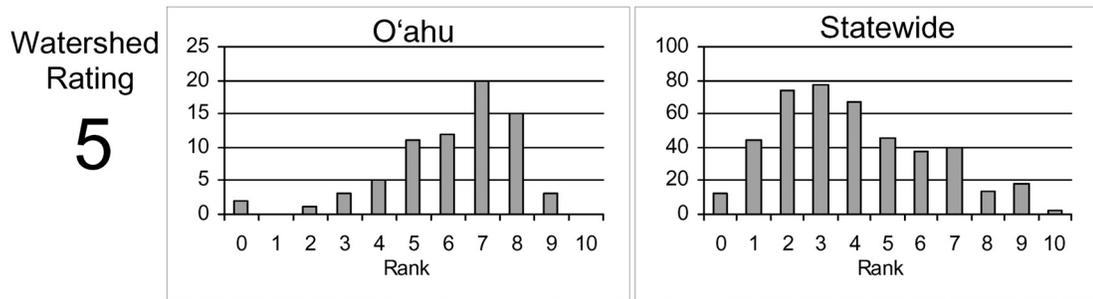


WATERSHED RATING (Cont): Anahulu River, O'ahu

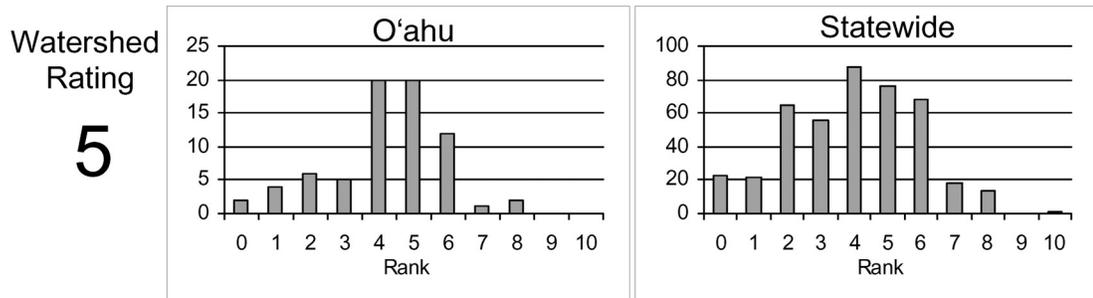
Size Rating: Rating is based on the watershed area and total stream length. Larger watersheds and streams score more positively.



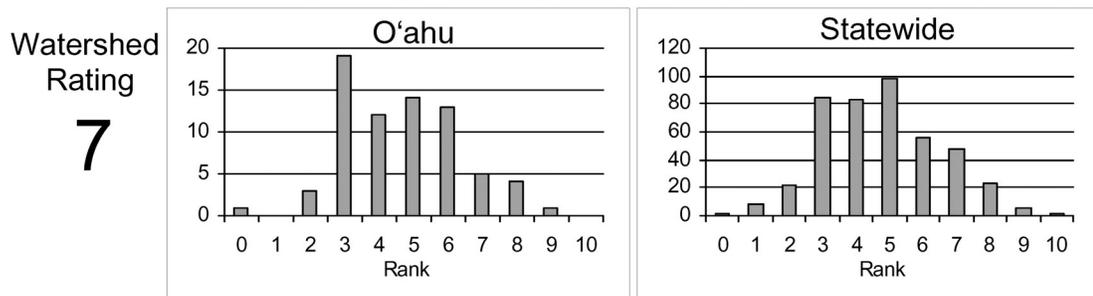
Wetness Rating: Rating is based on the average annual rainfall within the watershed. Higher rainfall totals score more positively.



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.

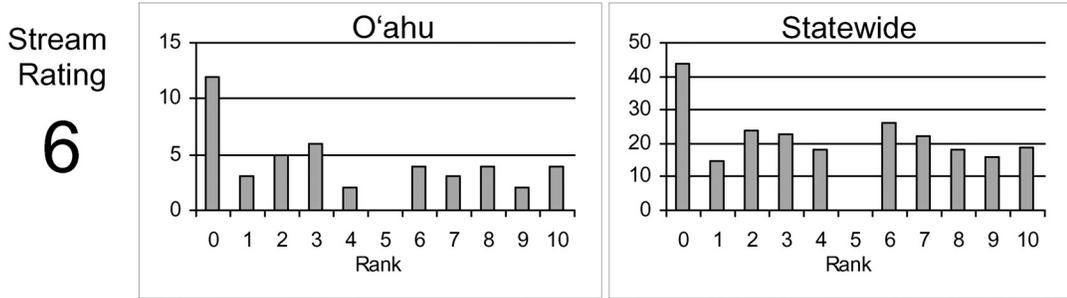


Total Watershed Rating: Rating is based on combination of Land Cover Rating, Shallow Waters Rating, Stewardship Rating, Size Rating, Wetness Rating, and Reach Diversity Rating.

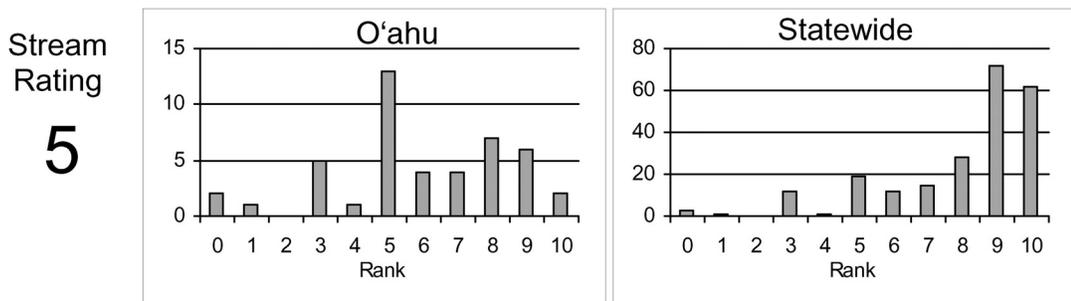


BIOLOGICAL RATING: Anahulu River, O'ahu

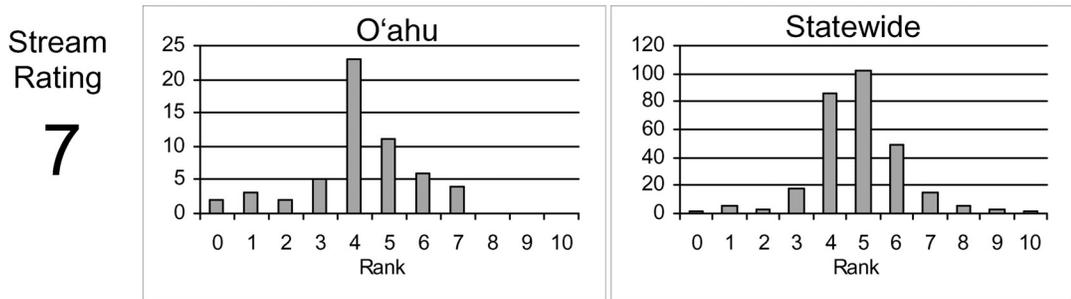
Native Species Rating: Rating is based on the number of native species observed in the watershed.



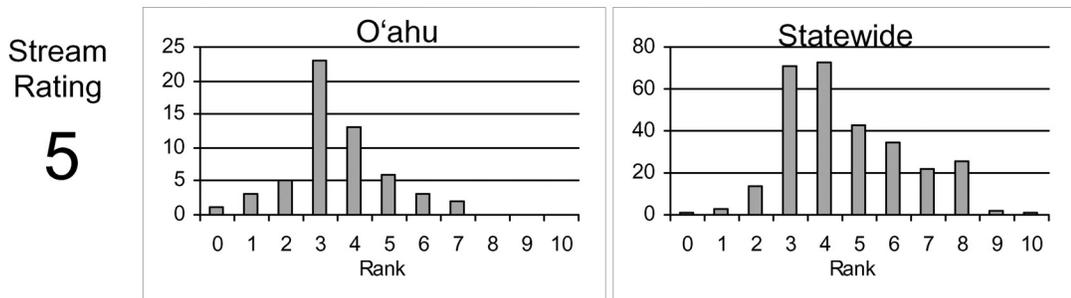
Introduced Genera Rating: Rating is based on the number of introduced genera observed in the watershed.



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

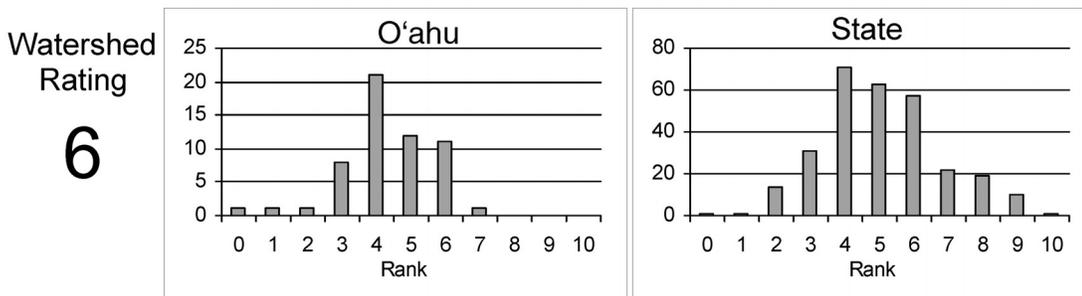


Total Biological Rating: Rating is the combination of the Native Species Rating, Introduced Genera Rating, and the All Species' Score Rating.



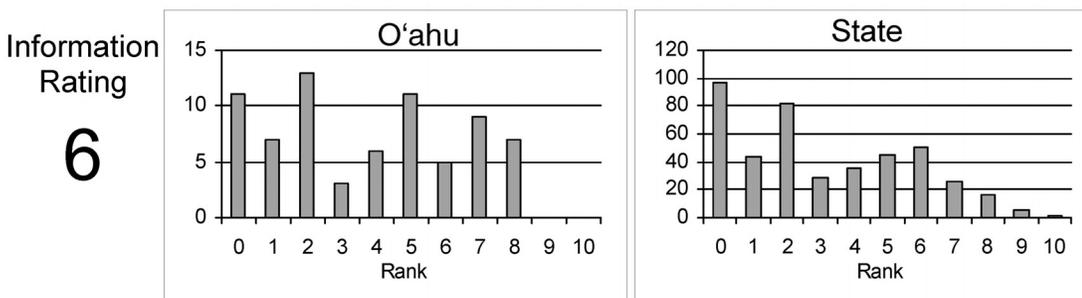
OVERALL RATING: Anahulu River, O'ahu

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



RATING STRENGTH: Anahulu River, 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.



REFERENCES

- 1961. Shima, S.I. Limnological Survey for Introduction of Exotic Species of Fish.
- 1975. Maciolek, J.A. Memorandum to Dr. Lau Director, Water Resources Research Center, on Kawainui Basin-aquatic biota, 10 June 1975.
- 1992. Yamamoto, M.N. Surveys, Monitoring and Habitat Studies of Native Freshwater Species on the Island of O'ahu. Job Progress Report.
- 1993. Higashi, G.R. and M.N. Yamamoto. Rediscovery of "Extinct" *Lentipes concolor* (Pisces: Gobiidae) on the Island of O'ahu, Hawai'i. *Pacific Science*, Vol. 47, No. 2. 115-117.

2003. Englund, R.A. et al. Systematic Inventory of Rare and Alien Aquatic Species in Selected O'ahu, Maui, and Hawai'i island Streams. Hawaii Biological Survey.
2003. Unknown. Report of Collecting and Other Activities, No. 2003-23.
2006. Polhemus, D.A. Maps of Damselfly Locations.
2006. Polhemus, D.A. Megalagrion Survey Notes in spreadsheet form.
2008. Hawai'i Division of Aquatic Resources. DAR Point Quadrat Survey Data from the DAR Aquatic Surveys Database.
2008. Hawai'i Division of Aquatic Resources. Impoundment Surveys in DAR Aquatic Surveys Database.