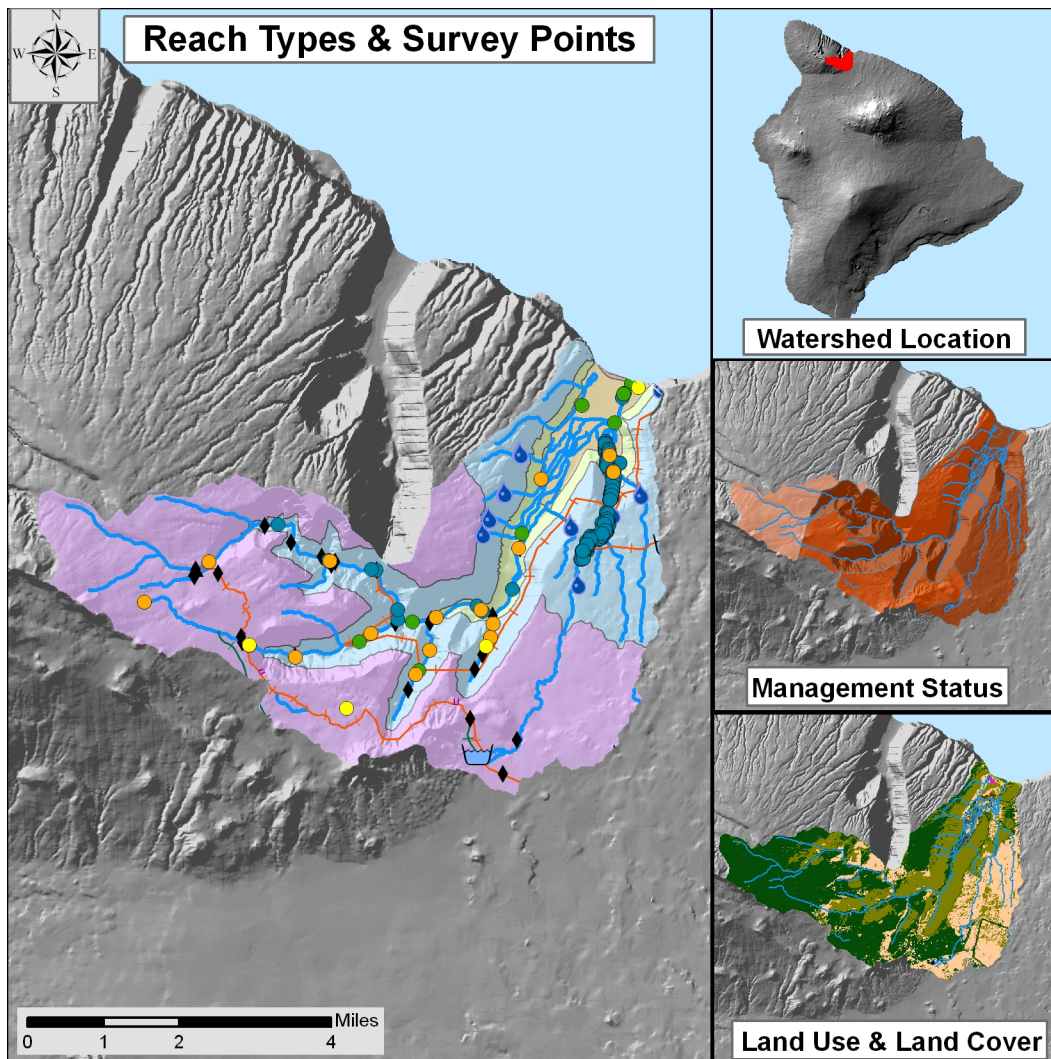


Wailoa, Hawai'i



WATERSHED FEATURES

Wailoa watershed occurs on the island of Hawai'i. The Hawaiian meaning of the name is "long water". The area of the watershed is 25.6 square mi (66.2 square km), with maximum elevation of 5335 ft (1626 m). The watershed's DAR cluster code is 5, meaning that the watershed is medium size, steep in the upper watershed, and with little embayment. The percent of the watershed in the different land use districts is as follows: 27.1% agricultural, 72.9% conservation, 0% rural, and 0% 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> |
|-----------------|----------------|--------------|------------|---------------|---------------------------|--------------|----------------|
| 0.0 | 0.0 | 44.8 | 0.0 | 0.0 | 0.0 | | 55.2 |

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 | 14.4 | 30.2 | 55.4 |

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 | 0.1 | 0.03 | 0.09 |
| Low Intensity Developed | 0.3 | 0.08 | 0.21 |
| Cultivated | 0.7 | 0.18 | 0.47 |
| Grassland | 22.0 | 5.63 | 14.59 |
| Scrub/Shrub | 30.3 | 7.75 | 20.07 |
| Evergreen Forest | 46.4 | 11.86 | 30.71 |
| Palustrine Forested | 0.0 | 0.00 | 0.00 |
| Palustrine Scrub/Shrub | 0.0 | 0.00 | 0.00 |
| Palustrine Emergent | 0.1 | 0.02 | 0.04 |
| Estuarine Forested | 0.0 | 0.00 | 0.00 |
| Bare Land | 0.1 | 0.02 | 0.04 |
| Unconsolidated Shoreline | 0.0 | 0.00 | 0.00 |
| Water | 0.1 | 0.01 | 0.04 |
| Unclassified | 0.0 | 0.00 | 0.00 |

STREAM FEATURES

Wailoa is a perennial stream. Total stream length is 51.5 mi (82.9 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> |
| 0.0 | 20.7 | 14.3 | 39.5 | 25.4 |

The following stream(s) occur in the watershed:

| | | | | |
|---------------|----------|---------------|---------|---------|
| Alakahi | Hi'ilawe | Kawaiki | Ko'iawe | Lālākea |
| Naalapa falls | Nanaue | Waiamoa falls | Wailoa | Waimā |
| Waipi'o | | | | |

BIOTIC SAMPLING EFFORT

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

| | | | | | | |
|------|------|------|------|------|------|------|
| 1968 | 1990 | 1992 | 1995 | 1996 | 1997 | 1998 |
| 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 |

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 | 1 | 0 | 1 | 4 |
| DAR Observation | 0 | 3 | 5 | 1 | 0 |
| DAR Point Quadrat | 0 | 76 | 150 | 171 | 0 |
| DAR Report | 0 | 1 | 3 | 6 | 0 |
| HDFG | 0 | 2 | 6 | 5 | 2 |
| Published Report | 0 | 6 | 2 | 2 | 0 |

BIOTA INFORMATION

Species List

Native Species

- Crustaceans** Amphipod sp.
Atyoida bisulcata
Macrobrachium grandimanus
Macrobrachium sp.
- Fish** *Awaous guamensis*
Eleotris sandwicensis
 Gobiid sp.
Kuhlia sandwicensis
Kuhlia xenura
Lentipes concolor
Mugil cephalus
Sicyopterus stimpsoni
Stenogobius hawaiiensis
- Snails** *Neritina granosa*
Neritina vespertina
Oxychilus cellarius
- Worms** *Myzobdella lugubris*
 unidentified worm

Native Species

- Insects** *Anax junius*
Anax strenuus
Chironomus hawaiiensis
Chloropid sp.
Dasyhelea hawaiiensis
Eurynogaster sp.
Hyposmocoma sp.
Limnoxenus semicylindricus
Limonia grimshawi
Limonia jacobus
Limonia sp.
Limonia stygipennis
Megalagrion blackburni
Megalagrion calliphya
Megalagrion hawaiiense
Megalagrion sp.
Microvelia vagans
Orthocladius sp.
Procanacae acuminata
Procanace constricta
Saldula exulans
Scatella cilipes
Scatella clavipes
Scatella hawaiiensis
Scatella mauiensis
Scatella oahuense
Scatella sp.
Scatella warreni
Sigmataneurum sp.
Telmatogeton sp.
Telmatogeton torrenticola
Tethina variseta

Introduced Species

| | |
|--------------------|---|
| Amphibians | <i>Bufo marinus</i> <i>Rana catesbiana</i> |
| Clams | <i>Corbicula fluminea</i> |
| Crustaceans | <i>Macrobrachium lar</i> <i>Procambarus clarkii</i> |
| Fish | <i>Gambusia affinis</i> <i>Micropterus sp.</i> <i>Misgurnus anguillicaudatus</i> <i>Oreochromis mossambicus</i> <i>Poecilia sphenops</i> Poeciliid sp. <i>Tilapia sp.</i> unidentified poeciliid <i>Xiphophorus helleri</i> |
| Snails | Lymnaeid sp. <i>Melania sp.</i> Physid sp. <i>Planorbella duryi</i> <i>Pomacea canaliculata</i> <i>Pseudosuccinea columella</i> <i>Tarebia granifera</i> |

Introduced Species

| | |
|----------------|--|
| Insects | <i>Cheumatopsyche analis</i> <i>Cheumatopsyche pettiti</i> Chironomid larvae <i>Chrysotus longipalpus</i> <i>Chrysotus sp.</i> <i>Cricotopus bicinctus</i> <i>Dolichopus exsul</i> <i>Enallagma civile</i> <i>Hecamede granifera</i> <i>Hydrellia williamsi</i> <i>Hydroptila potosina</i> <i>Ischnura posita</i> <i>Ischnura ramburi</i> <i>Limonia advena</i> <i>Mesovelgia amoena</i> <i>Ochthera circularis</i> <i>Orthemis ferruginea</i> <i>Pantala flavescens</i> <i>Psychoda sp.</i> <i>Syntormon flexible</i> <i>Tachytrechus angustipennis</i> Trichoptera larvae |
|----------------|--|

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>Macrobrachium grandimanus</i> | Endemic | 2.5 | 3 | 2.9 |
| <i>Macrobrachium lar</i> | Introduced | 1 | 6 | 3.2 |
| <i>Procambarus clarkii</i> | Introduced | 0.5 | 5 | 2.4 |
| <i>Macrobrachium sp.</i> | Unknown | 0.75 | 1.5 | 1.3 |
| <i>Eleotris sandwicensis</i> | Endemic | 1.5 | 4.75 | 3.1 |
| <i>Kuhlia xenura</i> | Endemic | 1.25 | 1.5 | 1.5 |
| <i>Lentipes concolor</i> | Endemic | 1 | 2.5 | 1.4 |
| <i>Sicyopterus stimpsoni</i> | Endemic | 0.75 | 3.5 | 1.6 |
| <i>Stenogobius hawaiiensis</i> | Endemic | 2 | 3 | 2.6 |
| Gobiid sp. | Indigenous | 1 | 1.125 | 1.0 |
| <i>Gambusia affinis</i> | Introduced | 0.5 | 0.75 | 0.7 |
| <i>Misgurnus anguillicaudatus</i> | Introduced | 2.5 | 2.5 | 2.5 |
| <i>Poecilia sphenops</i> | Introduced | 1.5 | 1.5 | 1.5 |
| Poeciliid sp. | Introduced | 2 | 2 | 2.0 |
| <i>Xiphophorus helleri</i> | Introduced | 0.5 | 4 | 1.5 |

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>Atyoida bisulcata</i> | Endemic | | 0.04 | 1.67 | 13.9 | |
| <i>Eleotris sandwicensis</i> | Endemic | | 0.16 | 0.11 | | |

| | | | | |
|-----------------------------------|------------|------|------|------|
| <i>Kuhlia xenura</i> | Endemic | 0.43 | | |
| <i>Lentipes concolor</i> | Endemic | 0.16 | 0.04 | 0.01 |
| <i>Macrobrachium grandimanus</i> | Endemic | 0.16 | | |
| <i>Sicyopterus stimpsoni</i> | Endemic | 2.57 | 2.43 | |
| <i>Stenogobius hawaiiensis</i> | Endemic | 0.16 | 0.02 | |
| <i>Awaous guamensis</i> | Indigenous | 0.78 | 1 | 0.02 |
| Gobiid sp. | Indigenous | 0.16 | 0.05 | |
| <i>Gambusia affinis</i> | Introduced | | | 0.02 |
| <i>Macrobrachium lar</i> | Introduced | 1.56 | 1.09 | 0.06 |
| <i>Misgurnus anguillicaudatus</i> | Introduced | | | 0.01 |
| <i>Poecilia sphenops</i> | Introduced | 0.04 | | |
| <i>Procambarus clarkii</i> | Introduced | | | 0.83 |
| <i>Xiphophorus helleri</i> | Introduced | 0.51 | | 1.76 |
| <i>Macrobrachium sp.</i> | Unknown | | 0.11 | |

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 | P | | |
| <i>Atyoida bisulcata</i> | Endemic | | P | P | P | P |
| <i>Macrobrachium grandimanus</i> | Endemic | | P | P | | |
| <i>Eleotris sandwicensis</i> | Endemic | | P | P | | |
| <i>Kuhlia xenura</i> | Endemic | | P | | | |
| <i>Lentipes concolor</i> | Endemic | | P | P | P | |
| <i>Sicyopterus stimpsoni</i> | Endemic | | P | P | P | P |
| <i>Stenogobius hawaiiensis</i> | Endemic | | P | P | | |
| <i>Anax strenuus</i> | Endemic | | | P | P | |
| <i>Chironomus hawaiiensis</i> | Endemic | | | P | | |
| <i>Dasyhelea hawaiiensis</i> | Endemic | | | P | | |
| <i>Hyposmocoma sp.</i> | Endemic | | | P | | |
| <i>Limnoxenus semicylindricus</i> | Endemic | | | P | P | |
| <i>Limonia grimshawi</i> | Endemic | | | | P | |
| <i>Limonia jacobus</i> | Endemic | | P | P | P | |
| <i>Limonia stygipennis</i> | Endemic | | | | P | |
| <i>Megalagrion blackburni</i> | Endemic | | | P | P | P |
| <i>Megalagrion calliphya</i> | Endemic | | | | | P |
| <i>Megalagrion hawaiiense</i> | Endemic | | | P | | P |
| <i>Megalagrion sp.</i> | Endemic | | P | P | P | P |
| <i>Microvelia vagans</i> | Endemic | | | | P | |

Wailoa, Hawai'i

| | | | | | |
|-----------------------------------|------------|---|---|---|---|
| <i>Orthocladius sp.</i> | Endemic | P | P | | |
| <i>Procanacae acuminata</i> | Endemic | | P | P | |
| <i>Procanace constricta</i> | Endemic | | P | P | |
| <i>Saldula exulans</i> | Endemic | P | P | P | |
| <i>Scatella cilipes</i> | Endemic | | P | P | |
| <i>Scatella clavipes</i> | Endemic | P | P | P | |
| <i>Scatella hawaiiensis</i> | Endemic | | | P | |
| <i>Scatella mauiensis</i> | Endemic | P | | | |
| <i>Scatella oahuense</i> | Endemic | P | | | |
| <i>Scatella warreni</i> | Endemic | | P | P | |
| <i>Telmatogeton torrenticola</i> | Endemic | P | P | P | |
| <i>Neritina granosa</i> | Endemic | P | P | | |
| Amphipod sp. | Indigenous | | P | P | |
| <i>Awaous guamensis</i> | Indigenous | P | P | P | P |
| Gobiid sp. | Indigenous | P | P | | |
| <i>Mugil cephalus</i> | Indigenous | P | | | |
| <i>Anax junius</i> | Indigenous | P | | | |
| <i>Eurynogaster sp.</i> | Indigenous | | | P | |
| <i>Limonia sp.</i> | Indigenous | | | P | |
| <i>Scatella sp.</i> | Indigenous | | | P | |
| <i>Sigmataneurum sp.</i> | Indigenous | | | P | |
| <i>Telmatogeton sp.</i> | Indigenous | P | P | P | |
| <i>Oxychilus cellarius</i> | Indigenous | | | | P |
| <i>Bufo marinus</i> | Introduced | P | P | | |
| <i>Rana catesbiana</i> | Introduced | P | P | | |
| <i>Corbicula fluminea</i> | Introduced | P | | | |
| <i>Macrobrachium lar</i> | Introduced | P | P | P | |
| <i>Procambarus clarkii</i> | Introduced | P | P | P | |
| <i>Gambusia affinis</i> | Introduced | P | P | P | |
| <i>Micropterus sp.</i> | Introduced | | P | | |
| <i>Misgurnus anguillicaudatus</i> | Introduced | | | P | |
| <i>Oreochromis mossambicus</i> | Introduced | P | P | | |
| <i>Poecilia sphenops</i> | Introduced | P | | | |
| Poeciliid sp. | Introduced | P | | | |
| unidentified poeciliid | Introduced | P | | | |

Wailoa, Hawai'i

| | | | | | |
|-----------------------------------|--------------|---|---|---|---|
| <i>Xiphophorus helleri</i> | Introduced | P | P | P | |
| <i>Cheumatopsyche analis</i> | Introduced | P | | | |
| <i>Cheumatopsyche pettiti</i> | Introduced | P | P | P | |
| Chironomid larvae | Introduced | P | P | P | P |
| <i>Chrysotus longipalpus</i> | Introduced | | P | | |
| <i>Chrysotus sp. [of authors]</i> | Introduced | P | | | |
| <i>Cricotopus bicinctus</i> | Introduced | P | P | | |
| <i>Dolichopus exsul</i> | Introduced | | P | P | |
| <i>Enallagma civile</i> | Introduced | P | | | |
| <i>Hecamede granifera</i> | Introduced | P | | | |
| <i>Hydrellia williamsi</i> | Introduced | P | | | |
| <i>Ischnura posita</i> | Introduced | P | P | | |
| <i>Ischnura ramburi</i> | Introduced | P | P | | |
| <i>Limonia advena</i> | Introduced | P | P | P | |
| <i>Mesovelgia amoena</i> | Introduced | P | | P | |
| <i>Ochthera circularis</i> | Introduced | P | | | |
| <i>Orthemis ferruginea</i> | Introduced | P | P | | |
| <i>Pantala flavescens</i> | Introduced | P | P | P | |
| <i>Psychoda sp.</i> | Introduced | | P | | |
| <i>Syntormon flexible</i> | Introduced | P | | | |
| <i>Tachytrechus angustipennis</i> | Introduced | P | P | | |
| Trichoptera larvae | Introduced | | | P | |
| <i>Melania sp.</i> | Introduced | | P | | |
| Physid sp. | Introduced | P | | | |
| <i>Planorbella duryi</i> | Introduced | P | | | |
| <i>Pomacea canaliculata</i> | Introduced | P | | | |
| <i>Pseudosuccinea columella</i> | Introduced | P | P | | |
| <i>Pseudosuccinea columella</i> | Introduced | P | P | | |
| <i>Tarebia granifera</i> | Introduced | P | | | |
| <i>Chloropid sp.</i> | Undetermined | P | | | |
| <i>Tethina variseta</i> | Undetermined | P | | | |
| <i>Macrobrachium sp.</i> | Unknown | P | P | | |
| unidentified worm | Unknown | 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): Outstanding

U.S. Fish and Wildlife Service High Quality Stream (1988): yes

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.

Yes

Native Macrofauna
Diversity > 5 spp.

Yes

Absence of Priority 1
Introduced

No

Abundance of Any
Native Species

No

Presence of Candidate
Endangered Species

No

Endangered Newcomb's
Snail Habitat

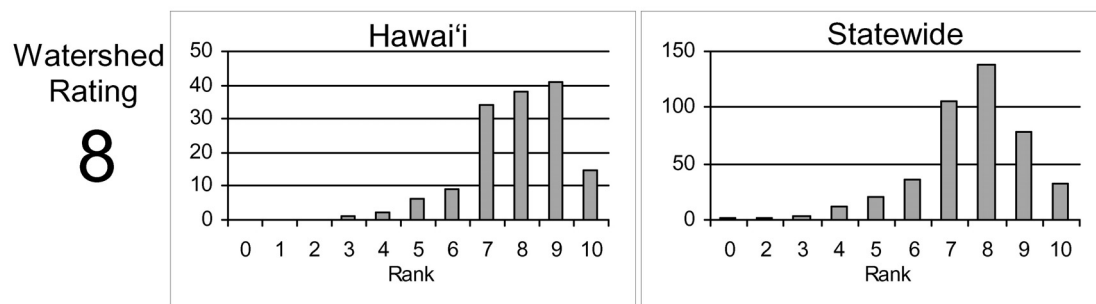
No

CURRENT WATERSHED AND STREAM RATINGS

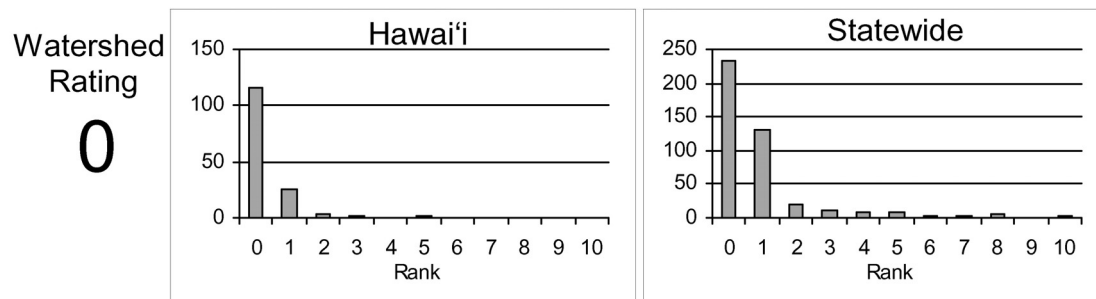
The current watershed and stream ratings are based on the data contained in the DAR Aquatic Surveys Database. The ratings provide the score for the individual watershed or stream, the distribution of ratings for that island, and the distribution of ratings statewide. This allows a better understanding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

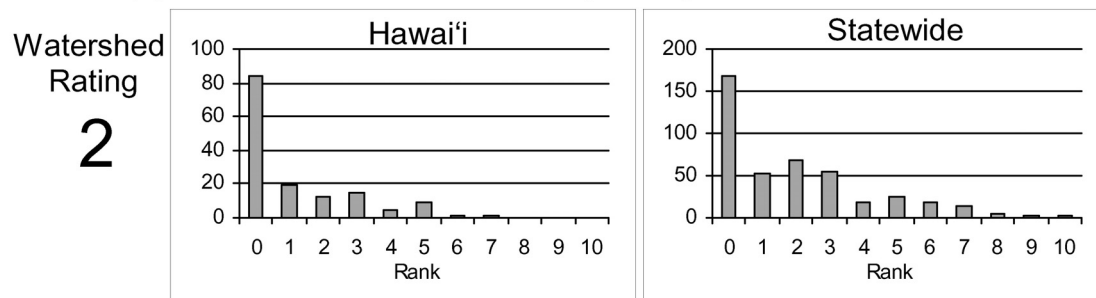
Land Cover Rating: Rating is based on a scoring system where in general forested lands score positively and developed lands score negatively.



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

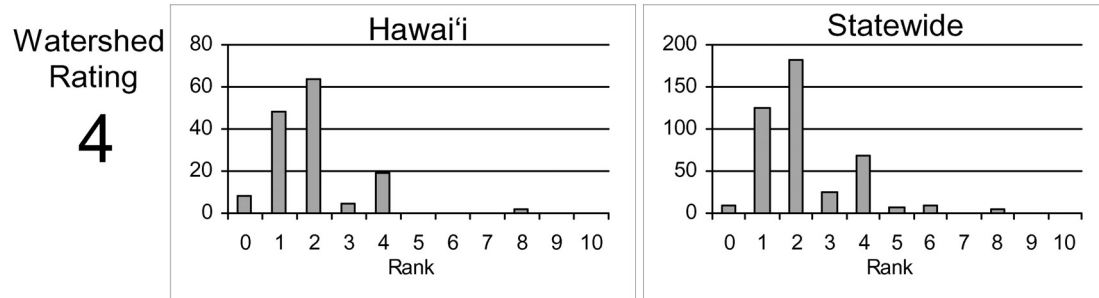


Stewardship Rating: Rating is based on a scoring system where higher levels of land and biodiversity protection within the watershed score positively.

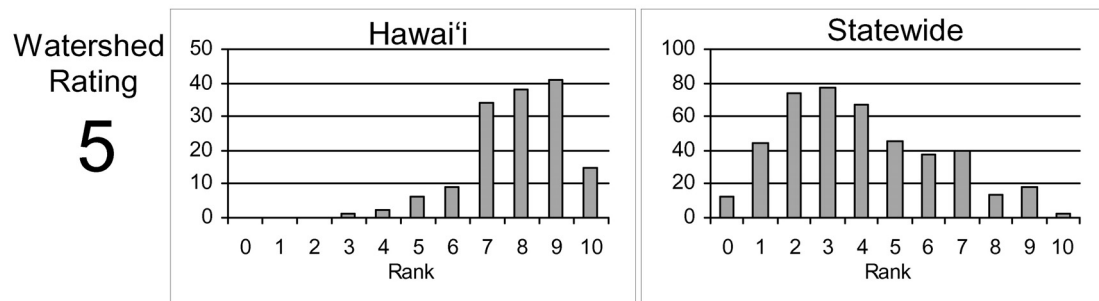


WATERSHED RATING (Cont): Wailoa, Hawai'i

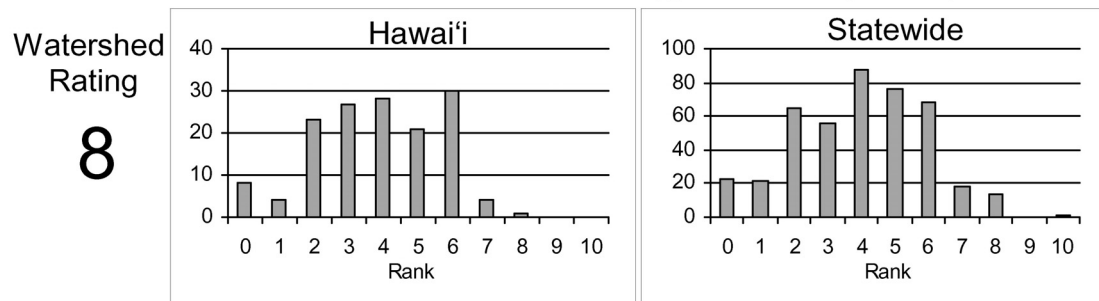
Size Rating: Rating is based on the watershed area and total stream length. Larger watersheds and streams score more positively.



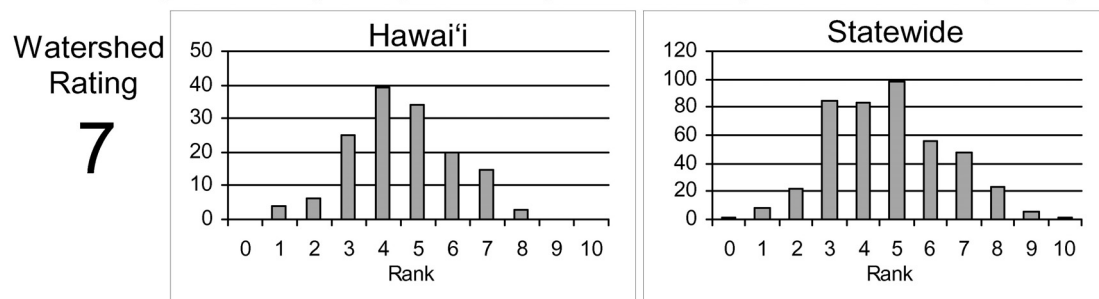
Wetness Rating: Rating is based on the average annual rainfall within the watershed. Higher rainfall totals score more positively.



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.



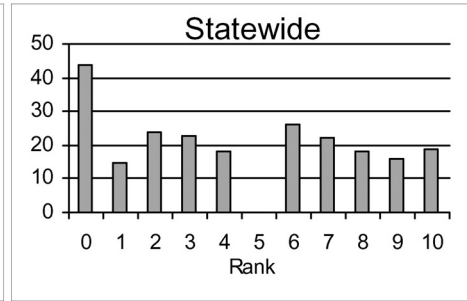
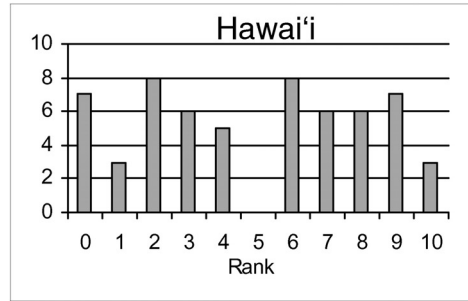
Total Watershed Rating: Rating is based on combination of Land Cover Rating, Shallow Waters Rating, Stewardship Rating, Size Rating, Wetness Rating, and Reach Diversity Rating.



BIOLOGICAL RATING: Wailoa, Hawai'i

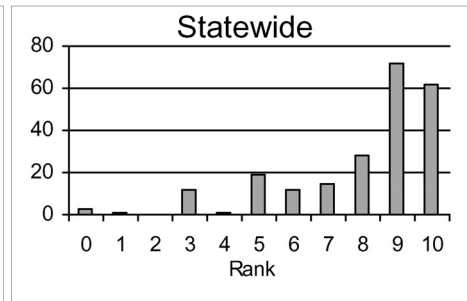
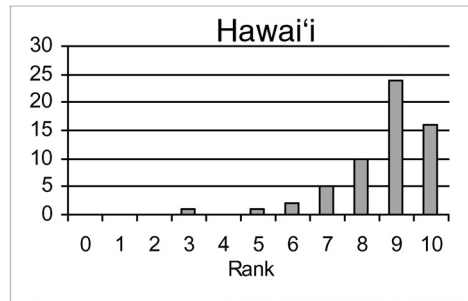
Native Species Rating: Rating is based on the number of native species observed in the watershed.

Stream Rating
10



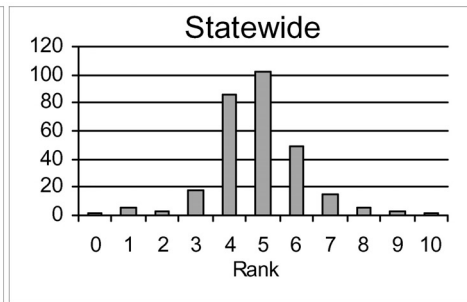
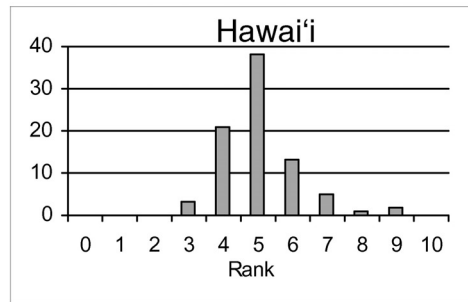
Introduced Genera Rating: Rating is based on the number of introduced genera observed in the watershed.

Stream Rating
5



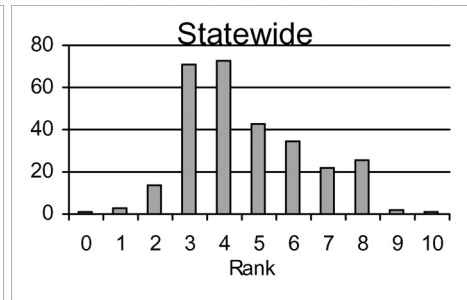
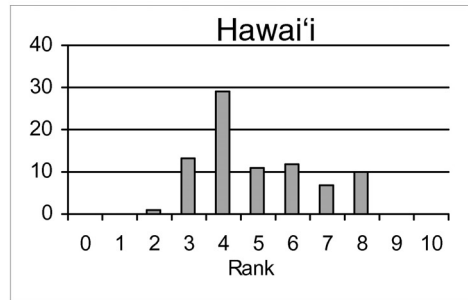
All Species' Score Rating: Rating is based on the Hawaii Stream Assessment scoring system where native species score positively and introduced species score negatively.

Stream Rating
6



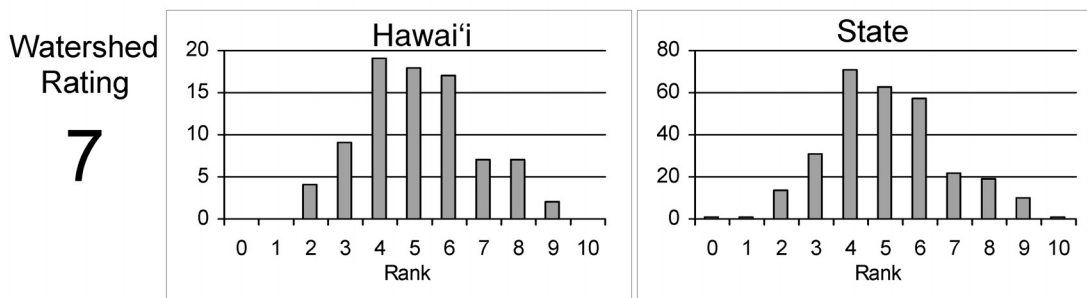
Total Biological Rating: Rating is the combination of the Native Species Rating, Introduced Genera Rating, and the All Species' Score Rating.

Stream Rating
6



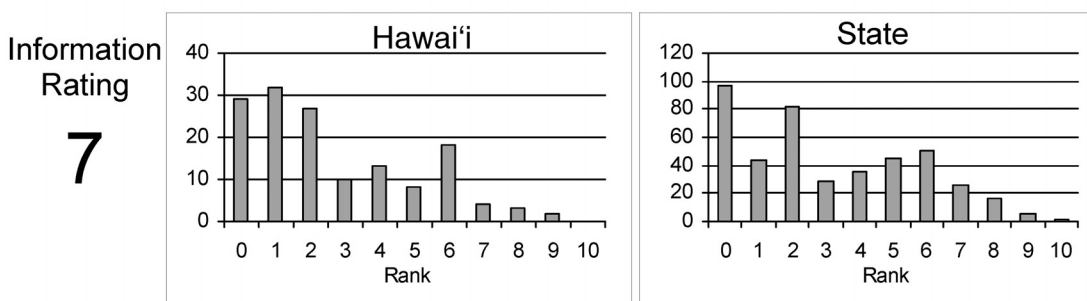
OVERALL RATING: Wailoa, Hawai'i

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



RATING STRENGTH: Wailoa, Hawai'i

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.



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