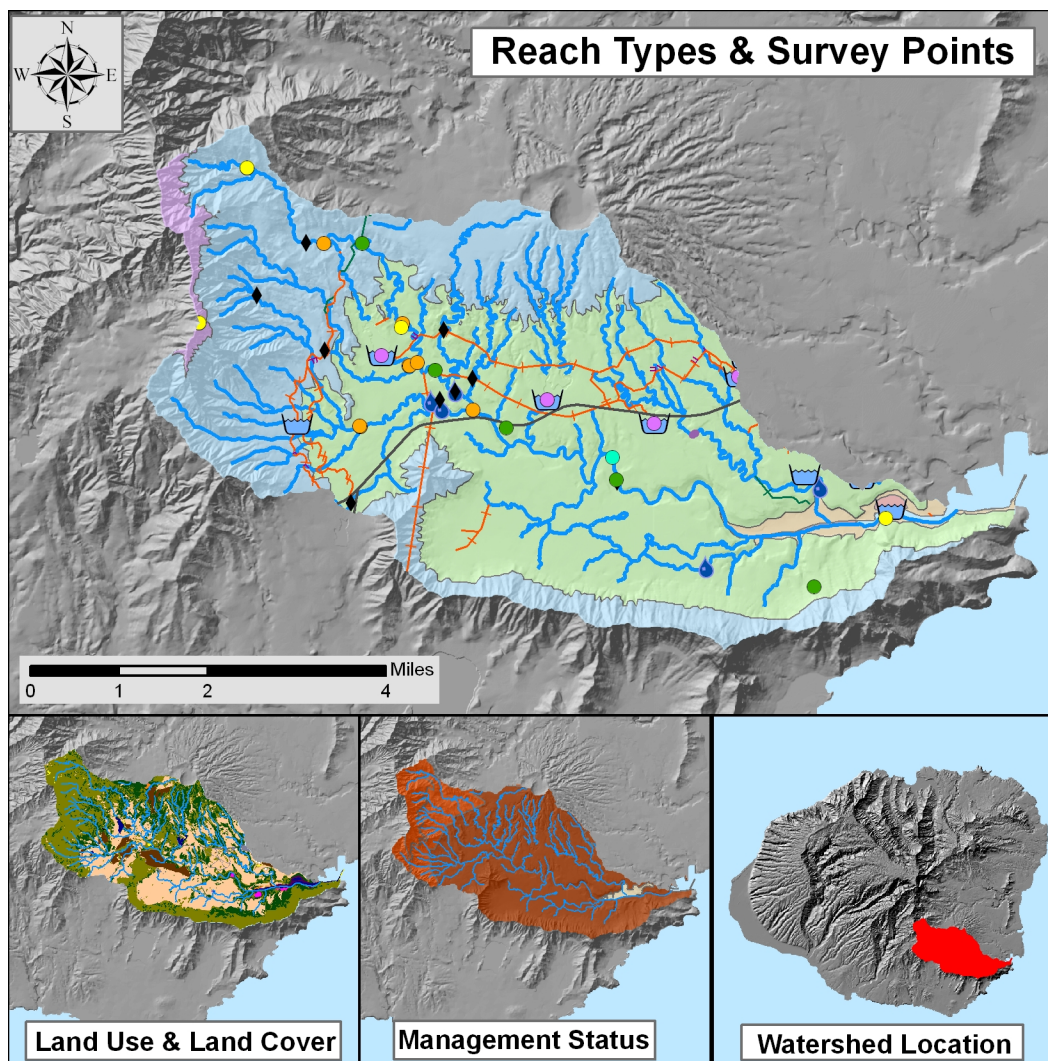


Hulē'ia, Kaua'i



WATERSHED FEATURES

Hulē'ia watershed occurs on the island of Kaua'i. The Hawaiian meaning of the name is “pushed through”. The area of the watershed is 28.2 square mi (73 square km), with maximum elevation of 3261 ft (994 m). The watershed's DAR cluster code is 4, meaning that the watershed is medium size, steep in the upper watershed, and with embayment. The percent of the watershed in the different land use districts is as follows: 69.7% agricultural, 29.9% conservation, 0% rural, and 0.4% 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	1.3	19.9	0.0	0.4	0.0		78.5

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>
1.3	0.0	19.9	78.8

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	0.08
Low Intensity Developed	1.2	0.33	0.85
Cultivated	4.1	1.16	3.02
Grassland	29.4	8.28	21.44
Scrub/Shrub	37.9	10.68	27.66
Evergreen Forest	24.7	6.97	18.04
Palustrine Forested	0.1	0.02	0.06
Palustrine Scrub/Shrub	0.5	0.14	0.35
Palustrine Emergent	0.3	0.07	0.19
Estuarine Forested	0.5	0.14	0.36
Bare Land	0.2	0.06	0.16
Unconsolidated Shoreline	0.0	0.00	0.00
Water	1.1	0.30	0.79
Unclassified	0.0	0.01	0.02

STREAM FEATURES

Hulē'ia is a perennial stream. Total stream length is 89.7 mi (144.4 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>
1.2	0.0	67.2	31.5	0.1

The following stream(s) occur in the watershed:

Halenānahu	Ho'inakāunalehua	Hulē'ia	Kamo'oloa	Ku'ia
Paohia	Papakōlea	Pāpua'a	Puhi	
Weoweopilau				

BIOTIC SAMPLING EFFORT

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

1937	1952	1962	1964	1978	1990	1994
2001	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	1	0	1	4	0
HDFG	0	0	7	1	0
HDFG releases	0	0	1	0	0
Published Report	0	0	4	1	0
Reservoir	0	0	3	0	0
USGS Surveys	0	0	1	0	0

BIOTA INFORMATION

Species List

Native Species

Crustaceans

Amphipod sp.
Atyoida bisulcata
Macrobrachium grandimanus
 Ostracod sp.

Fish

Awaous guamensis
Eleotris sandwicensis
 Gobiid sp.
Kuhlia xenura
Mugil cephalus
Stenogobius hawaiiensis

Worms

Namalycastis sp.
Oligochaete sp.

Native Species

Insects

Empidid sp.
 Ephydrid sp.
Ischnura odonata
Megalagrion oresitrophum
Megalagrion orobates
Megalagrion sp.
Orthocladius sp.
Telmatogeton sp.
 Tipulid sp.

Introduced Species

Amphibians

Bufo marinus

Clams

Corbicula fluminea
 Sphaerid sp.

Crustaceans

Isopod sp.
Macrobrachium lar
Procambarus clarkii

Fish

Clarias fuscus
Gambusia affinis
Lepomis macrochirus
Lepomis sp.
Micropterus dolomieu
Micropterus salmoides
Micropterus sp.
Poecilia reticulata
Poecilia sphenops
Sarotherodon melanotheron
Xiphophorus helleri

Introduced Species

Insects

Cheumatopsyche analis
 Chironomid larvae
Hydroptila potosina
Ischnura posita
Oxythira maya
 Trichoptera larvae

Snails	<i>Cipangopaludina chinensis</i> Lymnaeid sp. <i>Melania</i> sp. <i>Melanooides tuberculata</i> Planorbid sp.
Worms	<i>Dugesia</i> sp.

Species found in Impoundments

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

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>Macrobrachium grandimanus</i>	Endemic			P		
<i>Eleotris sandwicensis</i>	Endemic			P		
<i>Kuhlia xenura</i>	Endemic			P		
<i>Stenogobius hawaiiensis</i>	Endemic			P		
<i>Megalagrion oresitrophum</i>	Endemic			P	P	
<i>Megalagrion orobates</i>	Endemic			P	P	
<i>Megalagrion</i> sp.	Endemic			P	P	
<i>Orthocladius</i> sp.	Endemic			P		
Amphipod sp.	Indigenous			P		
<i>Awaous guamensis</i>	Indigenous			P		
Gobiid sp.	Indigenous			P		
<i>Mugil cephalus</i>	Indigenous			P		
<i>Telmatogeton</i> sp.	Indigenous			P		
<i>Namalycastis</i> sp.	Indigenous			P		
<i>Bufo marinus</i>	Introduced			P		
<i>Corbicula fluminea</i>	Introduced			P		
Sphaerid sp.	Introduced			P		
Isopod sp.	Introduced			P		
<i>Macrobrachium lar</i>	Introduced			P		
<i>Procambarus clarkii</i>	Introduced			P		
<i>Clarias fuscus</i>	Introduced			P		
<i>Gambusia affinis</i>	Introduced			P	P	
<i>Lepomis macrochirus</i>	Introduced			P		
<i>Lepomis</i> sp.	Introduced			P		
<i>Micropterus dolomieu</i>	Introduced			P		
<i>Micropterus salmoides</i>	Introduced			P	P	
<i>Micropterus</i> sp.	Introduced			P		

<i>Poecilia reticulata</i>	Introduced		P	
<i>Poecilia sphenops</i>	Introduced		P	
<i>Sarotherodon melanotheron</i>	Introduced		P	
<i>Xiphophorus helleri</i>	Introduced		P	P
<i>Cheumatopsyche analis</i>	Introduced		P	P
Chironomid larvae	Introduced		P	P
<i>Hydroptila potosina</i>	Introduced		P	P
<i>Ischnura posita</i>	Introduced	P	P	
<i>Oxythira maya</i>	Introduced	P		
<i>Trichoptera larvae</i>	Introduced		P	
Lymnaeid sp.	Introduced			P
<i>Melania sp.</i>	Introduced		P	P
<i>Melanoides tuberculata</i>	Introduced		P	
Planorbid sp.	Introduced		P	
<i>Dugesia sp.</i>	Introduced		P	
Ostracod sp.	Undetermined		P	P
Empidid sp.	Undetermined		P	
Ephydrid sp.	Undetermined		P	
<i>Ischnura odonata</i>	Undetermined		P	
Tipulid sp.	Undetermined		P	P
<i>Oligochaete sp.</i>	Undetermined		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.

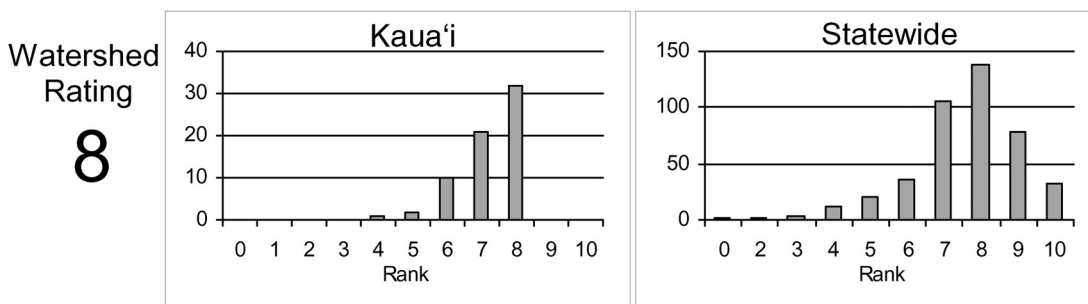
Native Insect Diversity <u>> 19 spp.</u>	Native Macrofauna <u>Diversity > 5 spp.</u>	Absence of Priority 1 <u>Introduced</u>
No	Yes	No
Abundance of Any <u>Native Species</u>	Presence of Candidate <u>Endangered Species</u>	Endangered Newcomb's <u>Snail Habitat</u>
Yes	No	No

CURRENT WATERSHED AND STREAM RATINGS

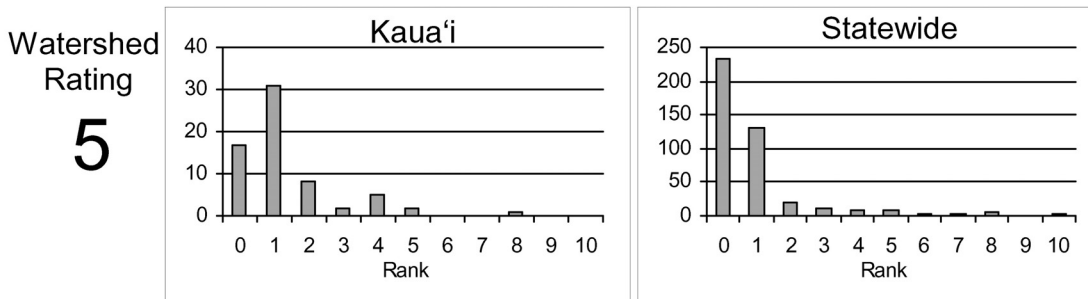
The current watershed and stream ratings are based on the data contained in the DAR Aquatic Surveys Database. The ratings provide the score for the individual watershed or stream, the distribution of ratings for that island, and the distribution of ratings statewide. This allows a better understanding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

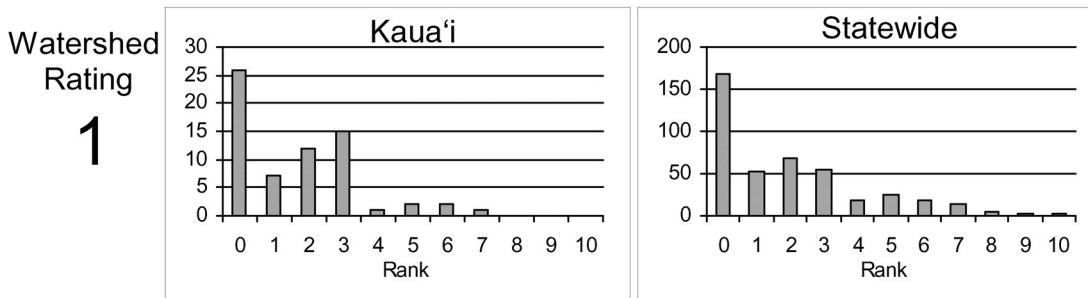
Land Cover Rating: Rating is based on a scoring system where in general forested lands score positively and developed lands score negatively.



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

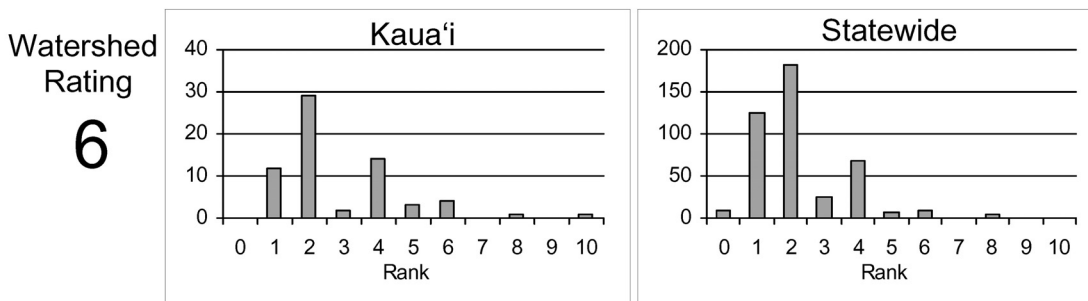


Stewardship Rating: Rating is based on a scoring system where higher levels of land and biodiversity protection within the watershed score positively.

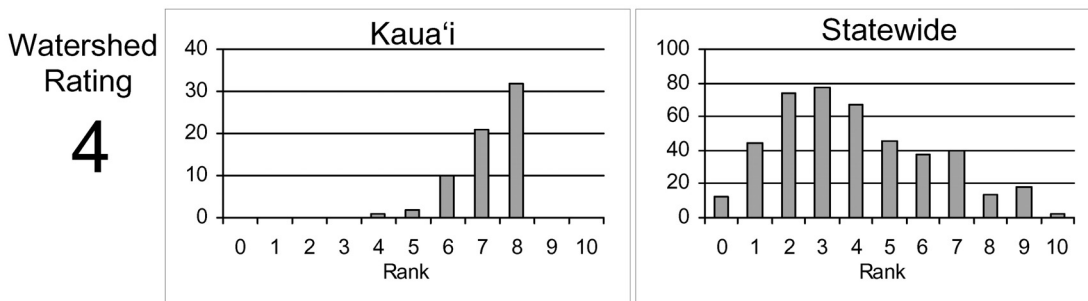


WATERSHED RATING (Cont): Hulē'ia, Kaua'i

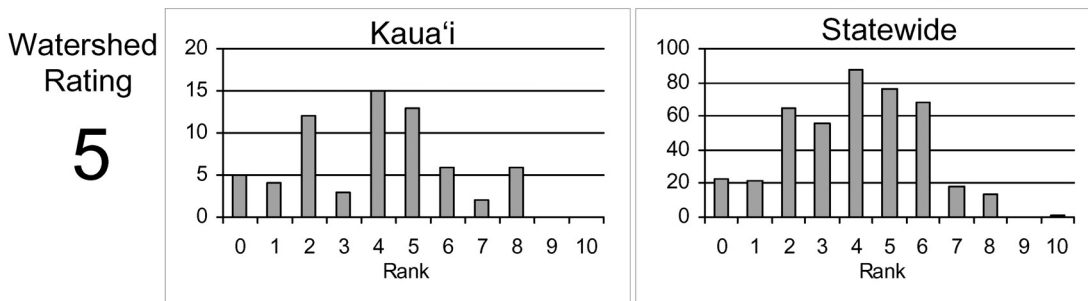
Size Rating: Rating is based on the watershed area and total stream length. Larger watersheds and streams score more positively.



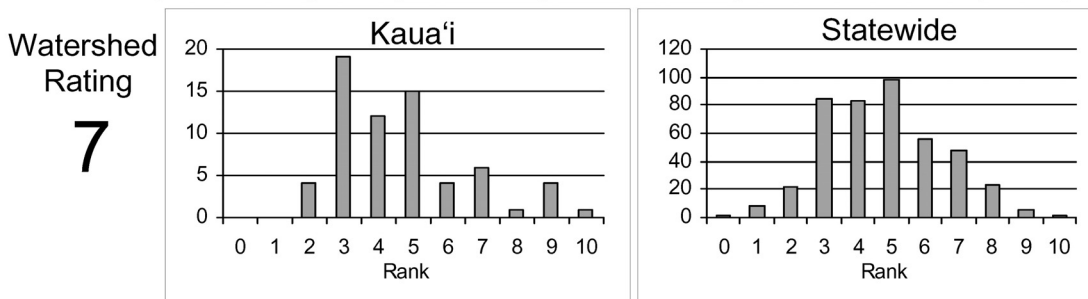
Wetness Rating: Rating is based on the average annual rainfall within the watershed. Higher rainfall totals score more positively.



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.



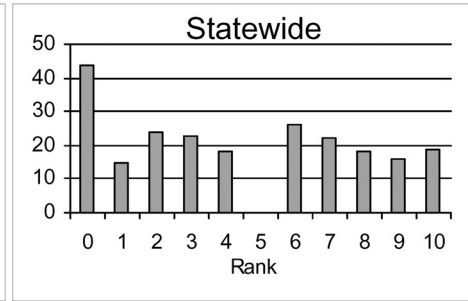
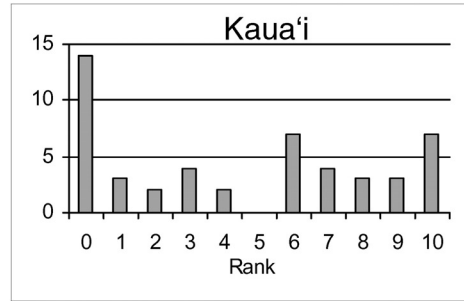
Total Watershed Rating: Rating is based on combination of Land Cover Rating, Shallow Waters Rating, Stewardship Rating, Size Rating, Wetness Rating, and Reach Diversity Rating.



BIOLOGICAL RATING: Hulē'ia, Kaua'i

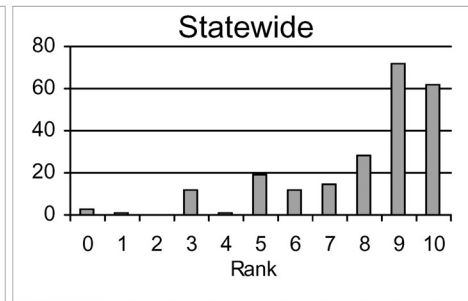
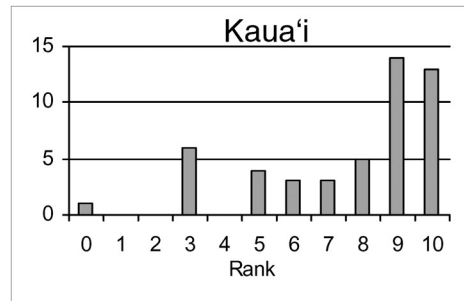
Native Species Rating: Rating is based on the number of native species observed in the watershed.

Stream Rating
7



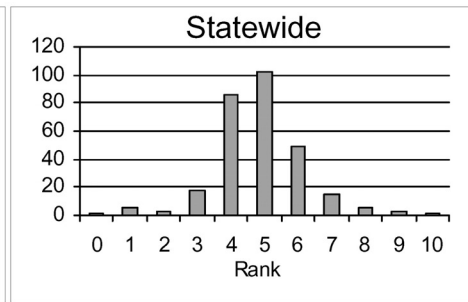
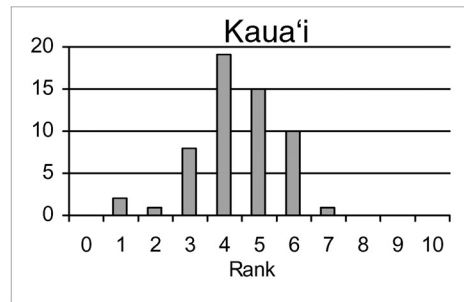
Introduced Genera Rating: Rating is based on the number of introduced genera observed in the watershed.

Stream Rating
3



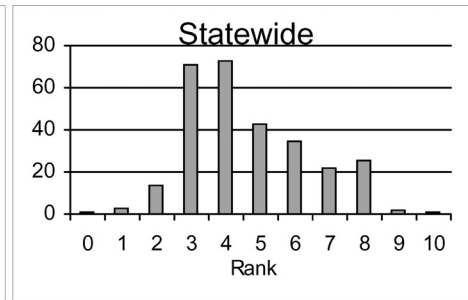
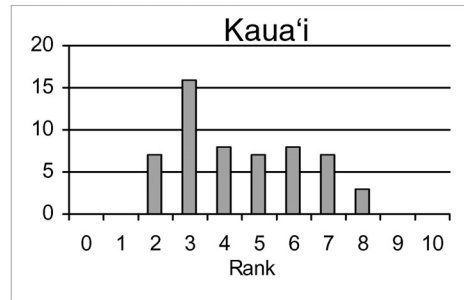
All Species' Score Rating: Rating is based on the Hawaii Stream Assessment scoring system where native species score positively and introduced species score negatively.

Stream Rating
1



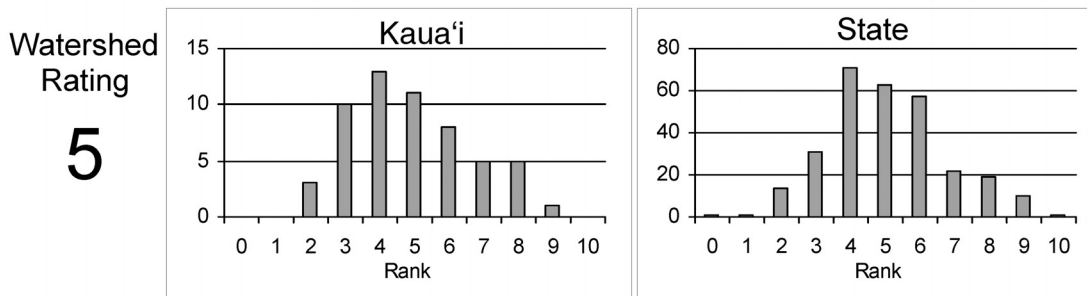
Total Biological Rating: Rating is the combination of the Native Species Rating, Introduced Genera Rating, and the All Species' Score Rating.

Stream Rating
2

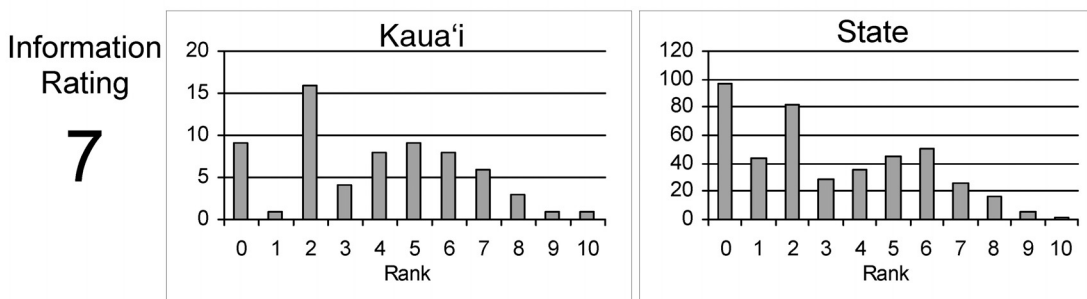


OVERALL RATING: Hulē‘ia, Kaua‘i

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

**RATING STRENGTH: Hulē‘ia, Kaua‘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.

**REFERENCES**

1965. Shima, S.I. Limnological Survey for Introduction of Exotic Species of Fish.
1993. Cowie, R.H. Identity, Distribution and Impacts of Introduced Ampullariidae and Viviparidae in the Hawaiian Islands. *J. Med & Appl. Malacol.*, 5. 61-67.
1994. Way, C.M. Proceedings of the International Symposium on Hawaiian Stream Ecology, Preservations, and Management. U.S. Army Corps of Engineers.
2005. Englund, R.A., Laederich, H.M., Ghotaslou, A., Bollick, H. and A.A. Scott. Analysis of Kaua‘i Aquatic Invertebrate Benthic Samples. Final Report, Hawaii Biological Survey.

2005. USGS. Stream Quality Indicators of Hawai‘i.
2006. Brasher, A.M.D., Luntun, C.D., Goodbred, S.L. and R.H. Wolff. Invasion Patterns Along Elevation and Urbanization Gradients in Hawaiian Streams. Transactions of the American Fisheries Society. 135. 1109-1129.
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.