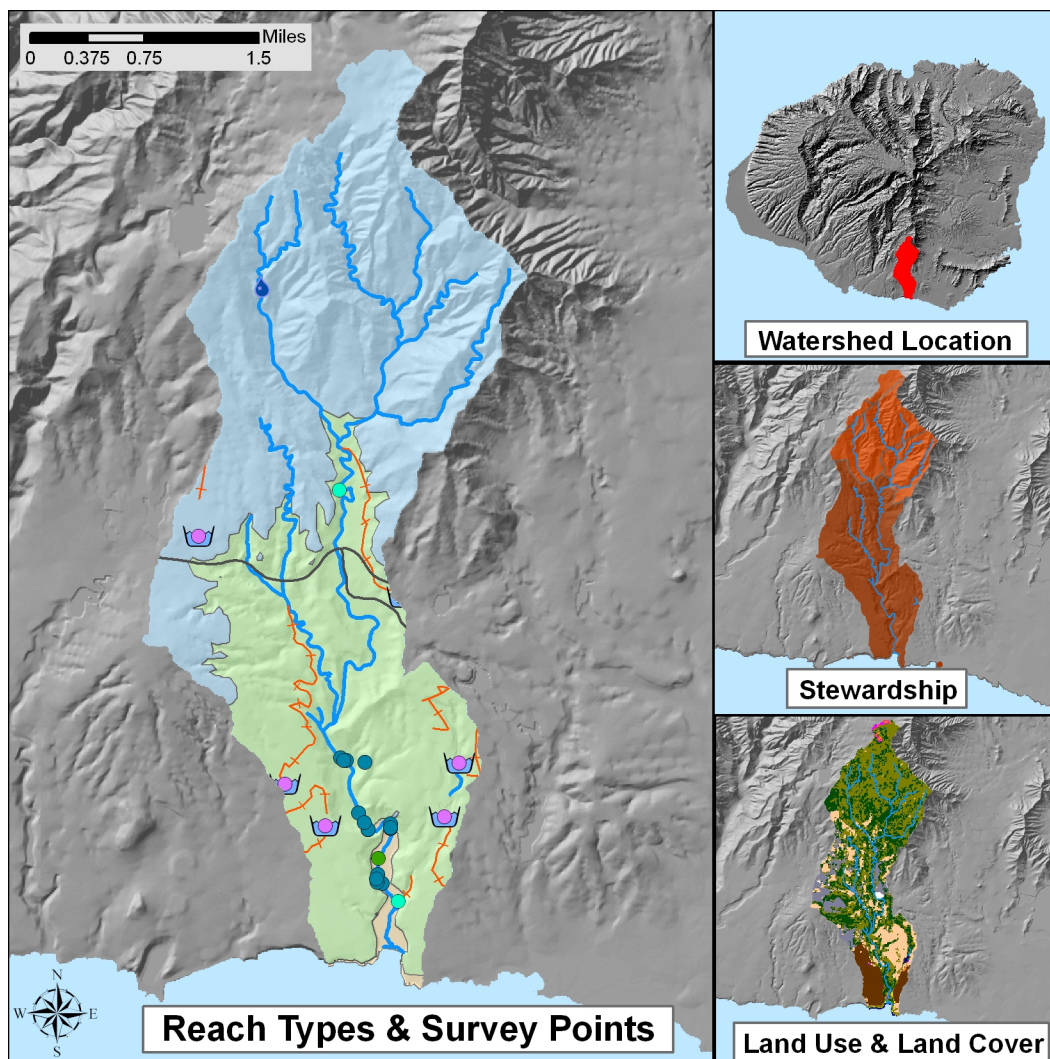


Lāwa‘i, Kaua‘i



WATERSHED FEATURES

Lāwa‘i watershed occurs on the island of Kaua‘i. The Hawaiian meaning of the name is unknown. The area of the watershed is 7.9 square mi (20.4 square km), with maximum elevation of 2372 ft (723 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: 48.5% agricultural, 37.4% conservation, 1.7% rural, and 12.3% 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	38.9	0.0	0.0	0.0		61.1

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	38.9	61.1

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	0.3	0.02	0.06
Low Intensity Developed	7.3	0.57	1.48
Cultivated	6.8	0.53	1.38
Grassland	13.1	1.03	2.66
Scrub/Shrub	39.0	3.07	7.95
Evergreen Forest	32.3	2.55	6.59
Palustrine Forested	0.1	0.01	0.02
Palustrine Scrub/Shrub	0.5	0.04	0.10
Palustrine Emergent	0.3	0.02	0.06
Estuarine Forested	0.0	0.00	0.00
Bare Land	0.1	0.01	0.02
Unconsolidated Shoreline	0.0	0.00	0.01
Water	0.3	0.03	0.07
Unclassified	0.0	0.00	0.00

STREAM FEATURES

Lāwaʻi is a perennial stream. Total stream length is 18.5 mi (29.8 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	6.6	40.2	53.2	0.0

The following stream(s) occur in the watershed:
Lāwaʻi

BIOTIC SAMPLING EFFORT

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

1962 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>
DAR Point Quadrat	0	8	8	0	0
Published Report	0	1	1	0	0
Reservoir	0	0	4	1	0
USGS Surveys	0	1	1	0	0

BIOTA INFORMATION

Species List

Native Species

Crustaceans	Amphipod sp. <i>Atyoida bisulcata</i> <i>Macrobrachium grandimanus</i> Ostracod sp.
Fish	<i>Awaous guamensis</i> <i>Eleotris sandwicensis</i> <i>Kuhlia xenura</i> <i>Sicyopterus stimpsoni</i> <i>Stenogobius hawaiiensis</i>
Snails	<i>Ferrissia sharpi</i>
Worms	<i>Namalycastis sp.</i> <i>Oligochaete sp.</i>

Native Species

Insects	<i>Dasyhelea sp.</i> Empidid sp. Ephydrid sp. <i>Forcipomyia sp.</i> <i>Hydroptila sp.</i> <i>Ischnura odonata</i> <i>Orthocladus sp.</i>
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Introduced Species

Amphibians	<i>Bufo marinus</i> <i>Rana catesbiana</i>
Clams	<i>Corbicula fluminea</i> Sphaerid sp.
Crustaceans	Isopod sp. <i>Macrobrachium lar</i> <i>Procambarus clarkii</i>
Fish	Cichlid sp. <i>Clarias fuscus</i> <i>Gambusia affinis</i> <i>Lepomis sp.</i> <i>Micropterus sp.</i> <i>Misgurnus anguillicaudatus</i> <i>Oreochromis mossambicus</i> <i>Poecilia reticulata</i> <i>Poecilia sphenops</i> Poeciliid sp. <i>Tilapia sp.</i> unidentified cyprinid <i>Xiphophorus helleri</i>

Introduced Species

Insects	<i>Cheumatopsyche analis</i> Chironomid larvae <i>Oxythira maya</i> <i>Pantala flavescens</i>
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Snails *Melanoides tuberculata*
 Physid sp.
 Tarebia granifera

Species found in Impoundments

Fish *Lepomis sp.*
 Micropterus sp.
 Tilapia sp.
 unidentified cyprinid

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>Bufo marinus</i>	Introduced	0.25	0.25	0.3
<i>Rana catesbiana</i>	Introduced	1.5	1.5	1.5
<i>Corbicula fluminea</i>	Introduced	0.75	0.75	0.8
<i>Sicyopterus stimpsoni</i>	Endemic	2	3	2.7
<i>Stenogobius hawaiiensis</i>	Endemic	1.5	4	2.5
<i>Awaous guamensis</i>	Indigenous	0.5	4	2.0
<i>Gambusia affinis</i>	Introduced	1.25	1.25	1.3
<i>Oreochromis mossambicus</i>	Introduced	2	5	3.1
<i>Poecilia reticulata</i>	Introduced	0.5	1	0.8
<i>Poecilia sphenops</i>	Introduced	1.5	2	1.7
Poeciliid sp.	Introduced	0.25	1	0.6
<i>Tilapia sp.</i>	Introduced	2.5	8	3.3
<i>Xiphophorus helleri</i>	Introduced	1	4	2.1
<i>Melanoides tuberculata</i>	Introduced	1	1	1.0

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>Sicyopterus stimpsoni</i>	Endemic		0.03			
<i>Stenogobius hawaiiensis</i>	Endemic		0.07			
<i>Awaous guamensis</i>	Indigenous		0.2	0.66		
<i>Bufo marinus</i>	Introduced			15.2		
<i>Corbicula fluminea</i>	Introduced			0.02		
<i>Gambusia affinis</i>	Introduced		0.06			
<i>Melanoides tuberculata</i>	Introduced			0.02		
<i>Oreochromis mossambicus</i>	Introduced			0.24		
<i>Poecilia reticulata</i>	Introduced		0.03	0.68		
<i>Poecilia sphenops</i>	Introduced		0.42			
Poeciliid sp.	Introduced		1.44	1.42		
<i>Rana catesbiana</i>	Introduced		0.01			
<i>Tilapia sp.</i>	Introduced		0.05	0.26		
<i>Xiphophorus helleri</i>	Introduced		0.07	0.16		

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		
<i>Macrobrachium grandimanus</i>	Endemic		P			
<i>Eleotris sandwicensis</i>	Endemic		P			
<i>Kuhlia xenura</i>	Endemic		P			
<i>Sicyopterus stimpsoni</i>	Endemic		P			
<i>Stenogobius hawaiiensis</i>	Endemic		P			
<i>Orthocladus sp.</i>	Endemic		P	P		
<i>Ferrissia sharpi</i>	Endemic		P	P		
Amphipod sp.	Indigenous		P	P		
<i>Awaous guamensis</i>	Indigenous		P	P		
<i>Forcipomyia sp.</i>	Indigenous		P			
<i>Namalycastis sp.</i>	Indigenous			P		
<i>Bufo marinus</i>	Introduced			P		
<i>Rana catesbiana</i>	Introduced		P			
<i>Corbicula fluminea</i>	Introduced		P	P		
Sphaerid sp.	Introduced			P		
Isopod sp.	Introduced			P		
<i>Macrobrachium lar</i>	Introduced		P	P		
<i>Procambarus clarkii</i>	Introduced			P		
Cichlid sp.	Introduced		P			
<i>Clarias fuscus</i>	Introduced		P	P		
<i>Gambusia affinis</i>	Introduced		P			
<i>Lepomis sp.</i>	Introduced			P	P	
<i>Micropterus sp.</i>	Introduced			P	P	
<i>Misgurnus anguillicaudatus</i>	Introduced			P		
<i>Oreochromis mossambicus</i>	Introduced		P	P		
<i>Poecilia reticulata</i>	Introduced		P	P		
<i>Poecilia sphenops</i>	Introduced		P			
Poeciliid sp.	Introduced		P	P		
<i>Tilapia sp.</i>	Introduced		P	P		
unidentified cyprinid	Introduced			P	P	
<i>Xiphophorus helleri</i>	Introduced		P	P		
<i>Cheumatopsyche analis</i>	Introduced		P	P		

Chironomid larvae	Introduced	P	P
<i>Oxythira maya</i>	Introduced	P	
<i>Pantala flavescens</i>	Introduced	P	
<i>Melanooides tuberculata</i>	Introduced	P	P
Physid sp.	Introduced		P
<i>Tarebia granifera</i>	Introduced	P	
Ostracod sp.	Undetermined	P	P
<i>Dasyhelea sp.</i>	Undetermined	P	
Empidid sp.	Undetermined	P	P
Ephydrid sp.	Undetermined		P
<i>Hydroptila sp.</i>	Undetermined	P	P
<i>Ischnura odonata</i>	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): Moderate

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.

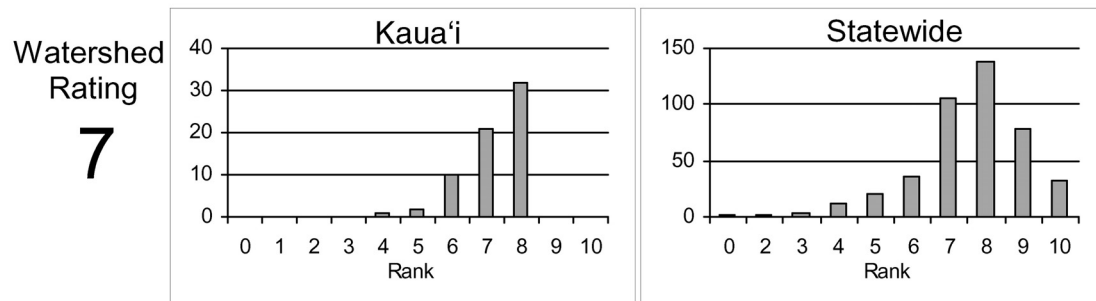
Native Insect Diversity <u>> 19 spp.</u>	Native Macrofauna <u>Diversity > 5 spp.</u>	Absence of Priority 1 <u>Introduced</u>
No	Yes	No
Abundance of Any <u>Native Species</u>	Presence of Candidate <u>Endangered Species</u>	Endangered Newcomb's <u>Snail Habitat</u>
Yes	No	No

CURRENT WATERSHED AND STREAM RATINGS

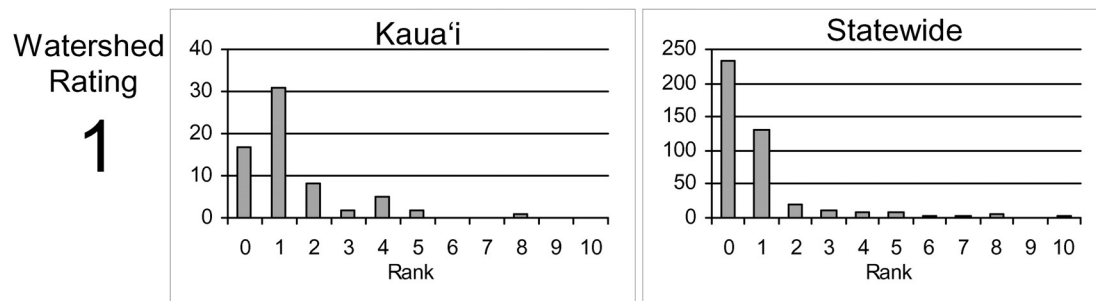
The current watershed and stream ratings are based on the data contained in the DAR Aquatic Surveys Database. The ratings provide the score for the individual watershed or stream, the distribution of ratings for that island, and the distribution of ratings statewide. This allows a better understanding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

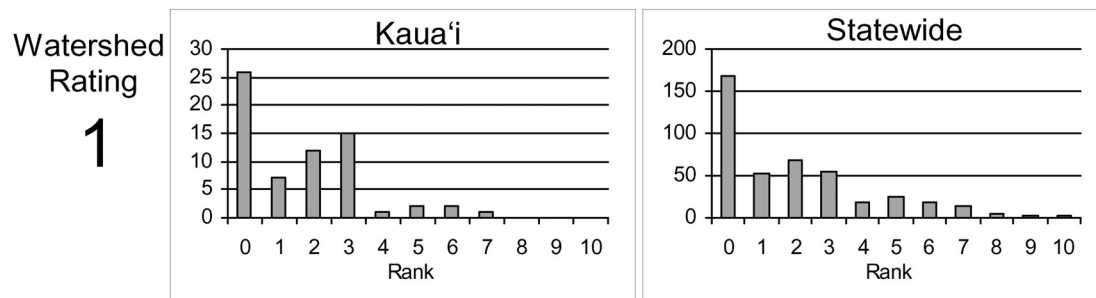
Land Cover Rating: Rating is based on a scoring system where in general forested lands score positively and developed lands score negatively.



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

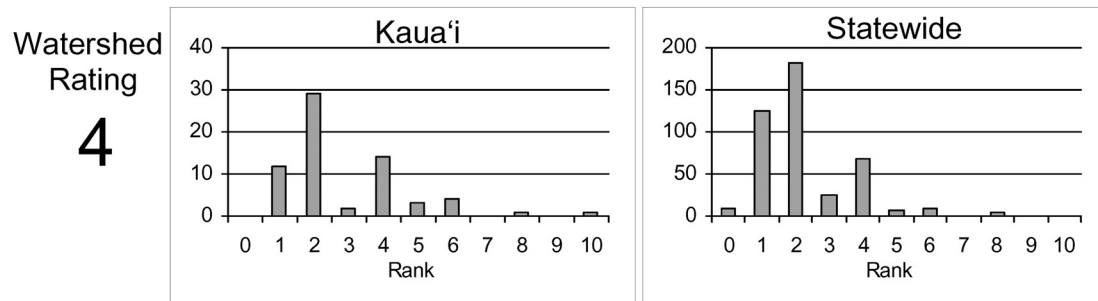


Stewardship Rating: Rating is based on a scoring system where higher levels of land and biodiversity protection within the watershed score positively.

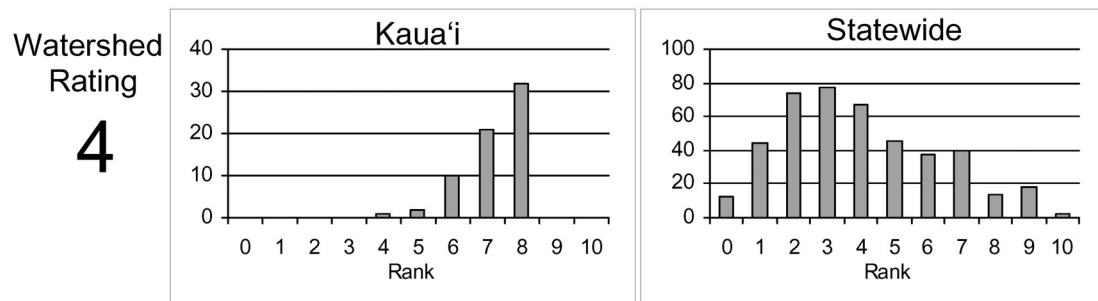


WATERSHED RATING (Cont): Lāwa‘i, Kaua‘i

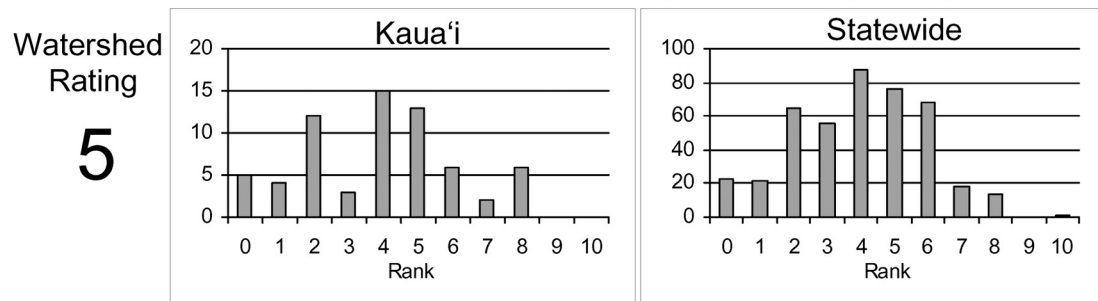
Size Rating: Rating is based on the watershed area and total stream length. Larger watersheds and streams score more positively.



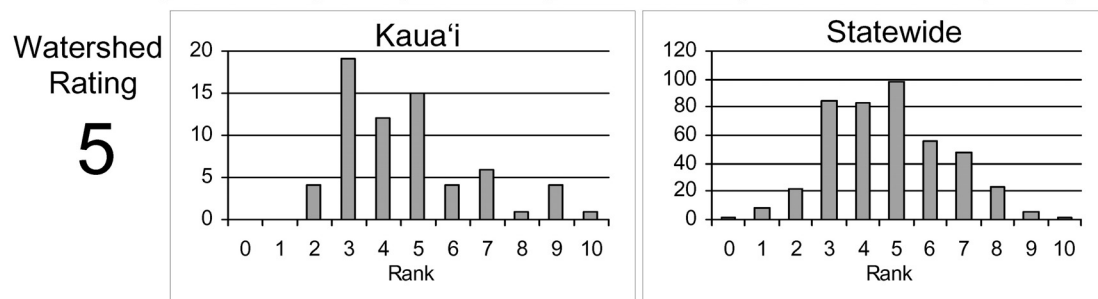
Wetness Rating: Rating is based on the average annual rainfall within the watershed. Higher rainfall totals score more positively.



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.



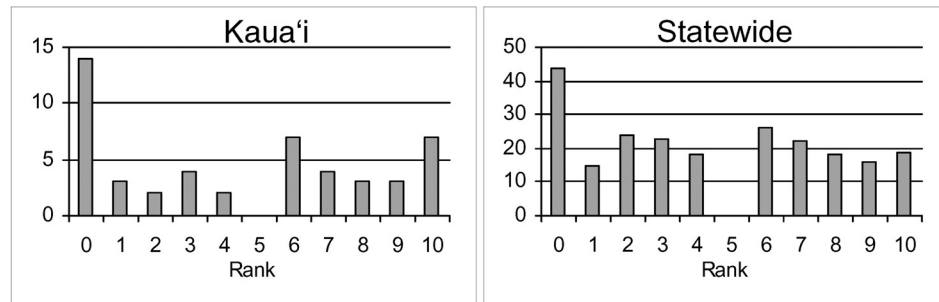
Total Watershed Rating: Rating is based on combination of Land Cover Rating, Shallow Waters Rating, Stewardship Rating, Size Rating, Wetness Rating, and Reach Diversity Rating.



BIOLOGICAL RATING: Lāwa‘i, Kaua‘i

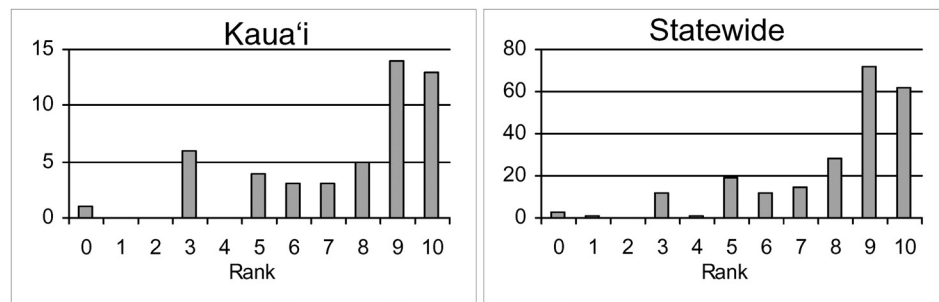
Native Species Rating: Rating is based on the number of native species observed in the watershed.

Stream Rating
8



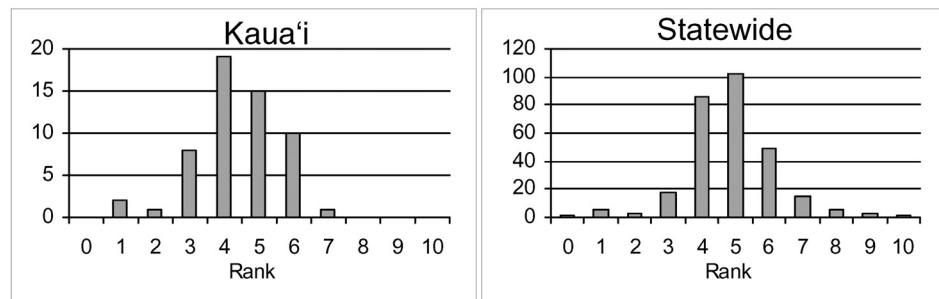
Introduced Genera Rating: Rating is based on the number of introduced genera observed in the watershed.

Stream Rating
0



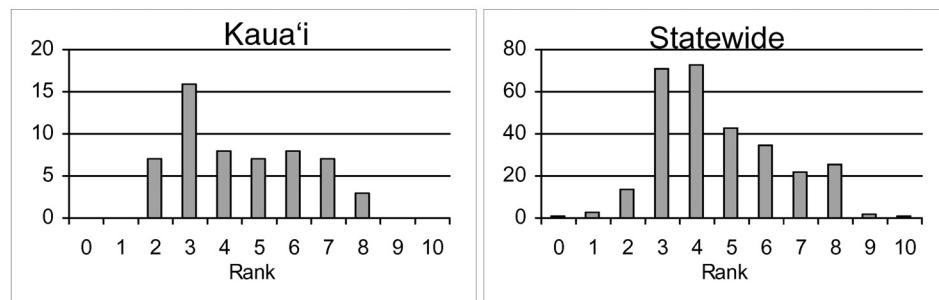
All Species' Score Rating: Rating is based on the Hawaii Stream Assessment scoring system where native species score positively and introduced species score negatively.

Stream Rating
1



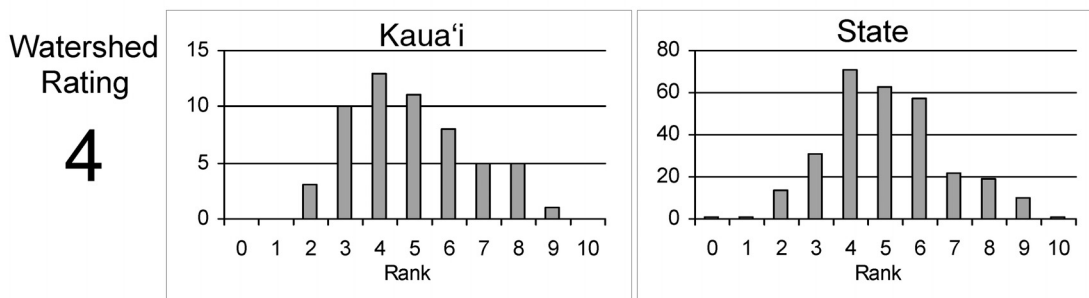
Total Biological Rating: Rating is the combination of the Native Species Rating, Introduced Genera Rating, and the All Species' Score Rating.

Stream Rating
2



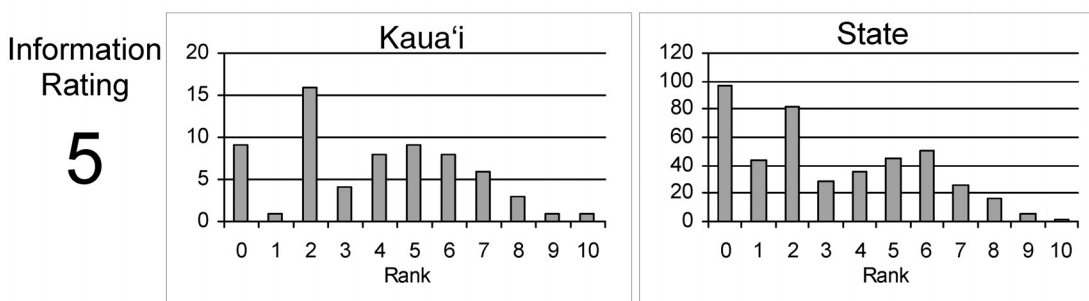
OVERALL RATING: Lāwa‘i, Kaua‘i

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



RATING STRENGTH: Lāwa‘i, 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

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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.

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.