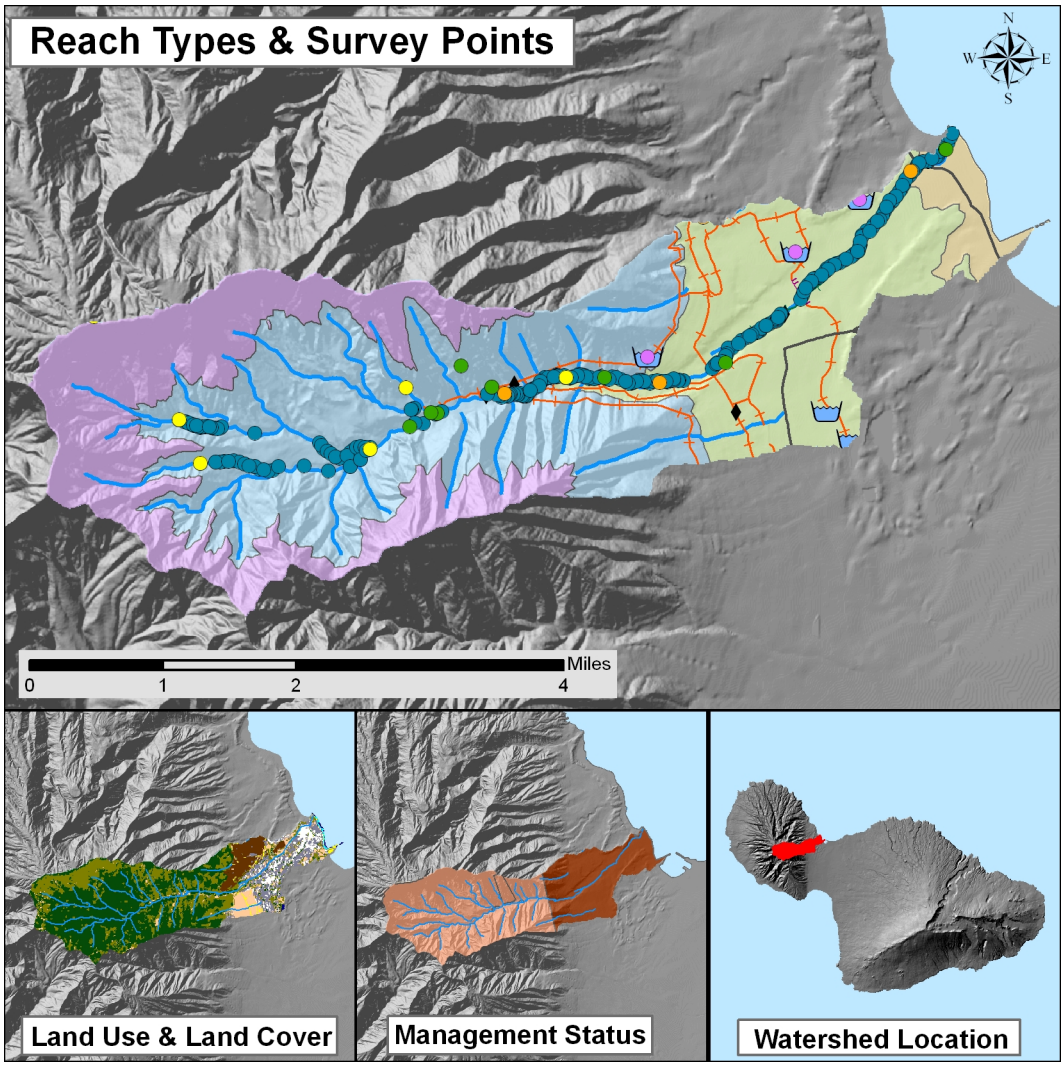
DAR Watershed Code: 62009

ʻĪao, Maui



WATERSHED FEATURES

ʻĪao watershed occurs on the island of Maui. The Hawaiian meaning of the name is "cloud supreme". The area of the watershed is 11.9 square mi (30.8 square km), with maximum elevation of 5,787 ft (1,764 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: 12.1% agricultural, 68.1% conservation, 0.6% rural, and 19.3% 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.

Military	Federal	State	OHA	County	Nature Conservancy	Other Private
0.0	0.0	2.1	0.0	0.0	0.0	97.9

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

Permanent Biodiversity Protection	Managed for Multiple Uses	Protected but Unmanaged	Unprotected
0.1	65.1	0.0	34.8

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

	Percent	Square mi	Square km
High Intensity Developed	3.9	0.47	1.21
Low Intensity Developed	8.0	0.95	2.47
Cultivated	5.6	0.66	1.72
Grassland	6.4	0.76	1.97
Scrub/Shrub	25.9	3.08	7.97
Evergreen Forest	48.9	5.81	15.06
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	0.0	0.00	0.00
Bare Land	0.8	0.09	0.24
Unconsolidated Shoreline	0.2	0.02	0.06
Water	0.2	0.02	0.06
Unclassified	0.0	0.00	0.00

STREAM FEATURES

ʻĪao is a perennial stream. Total stream length is 26.2 mi (42.1 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.

Estuary	Lower	Middle	Upper	Headwaters
0.0	2.5	18.6	72.0	7.0

The following stream(s) occur in the watershed:

Ae	ʻĪao	Kinihāpai	Māniania	Nākalaloa
Nākalaloa	Poʻonāhoahoa	Puʻulio		

BIOTIC SAMPLING EFFORT

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

1961	1962	1976	1990	1991	1992	1993
1994	1995	1996	2000	2001	2005	2007

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

Survey type	Estuary	Lower	Middle	Upper	Headwaters
Damselfly Surveys	0	0	1	7	0
DAR General Surveys	0	0	0	9	0
DAR Observation	0	0	1	1	0
DAR Point Quadrat	0	24	156	98	0
HDFG	0	1	1	2	0
Published Report	0	2	2	7	0
Reservoir	0	0	2	1	0

BIOTA INFORMATION

Species List

Native Species

Crustaceans	*Atyoida bisulcata*
Fish	*Awaous guamensis*
	Eleotris sandwicensis
	Gobiid sp.
	Kuhlia sandvicensis
	Kuhlia sp.
	Lentipes concolor
	Mugil cephalus
	Sicyopterus stimpsoni
	Stenogobius hawaiiensis
Worms	*Oligochaete sp.*

Native Species

Insects	Diptera sp.
	Megalagrion blackburni
	Megalagrion hawaiiense
	Megalagrion nigrohamatum nigrohamatum
	Megalagrion sp.
	Procanace sp.
	Telmatogeton sp.
	Telmatogeton torrenticola

Introduced Species

Amphibians	*Bufo marinus*
	Rana catesbiana
Crustaceans	Isopod sp.
	Macrobrachium lar
Fish	*Gambusia affinis*
	Poecilia reticulata
	Poeciliid sp.
	Tilapia sp.
	Xiphophorus helleri
Snails	Gastropod sp.
	Lymnaeid sp.
	Lymnea sp.
	Physid sp.

Introduced Species

Insects	*Cheumatopsyche analis*
	Cheumatopsyche pettiti
	Chironomid larvae
	Hydroptila arctia
	Hydroptila potosina
	Trichoptera larvae

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

Scientific Name	Status	Minimum Size	Maximum Size	Average Size
Bufo marinus	Introduced	0.375	6	1.8
Rana catesbiana	Introduced	0.25	0.75	0.3
Atyoida bisulcata	Endemic	0.25	2	1.4
Macrobrachium lar	Introduced	3	4.5	3.8
Lentipes concolor	Endemic	2	4	2.8
Sicyopterus stimpsoni	Endemic	1	3.5	2.1
Awaous guamensis	Indigenous	0.75	8	3.7
Kuhlia sp.	Indigenous	1.5	1.5	1.5
Gambusia affinis	Introduced	1.25	2	1.5
Poecilia reticulata	Introduced	0.25	2	0.9
Poeciliid sp.	Introduced	0.25	1.5	0.3
Xiphophorus helleri	Introduced	1.25	3	2.3
Physid sp.	Introduced	0.125	0.25	0.1

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

Scientific Name	Status	Estuary	Low	Mid	Upper	Headwaters
Atyoida bisulcata	Endemic				7.38	
Lentipes concolor	Endemic			0.02	0.07	
Sicyopterus stimpsoni	Endemic			0.18		
Awaous guamensis	Indigenous			0.26		
Kuhlia sp.	Indigenous		0.21			
Bufo marinus	Introduced			0.03		
Gambusia affinis	Introduced			0.49	0.07	
Macrobrachium lar	Introduced			0.02		
Physid sp.	Introduced			0.63	0.63	
Poecilia reticulata	Introduced			1.66	5.25	
Poeciliid sp.	Introduced			7.75	0.1	
Rana catesbiana	Introduced			0.15		
Xiphophorus helleri	Introduced			0.54	0.03	

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

Scientific Name	Status	Estuary	Lower	Middle	Upper	Headwaters
Atyoida bisulcata	Endemic		P	P	P	
Eleotris sandwicensis	Endemic				P	
Lentipes concolor	Endemic		P	P	P	
Sicyopterus stimpsoni	Endemic		P	P	P	
Stenogobius hawaiiensis	Endemic				P	
Megalagrion blackburni	Endemic			P	P	
Megalagrion hawaiiense	Endemic				P	
Megalagrion nigrohamatum nigrohamatum	Endemic				P	
Megalagrion sp.	Endemic		P	P	P	

Telmatogeton torrenticola	Endemic			P	
Awaous guamensis	Indigenous	P	P	P	
Gobiid sp.	Indigenous	P	P		
Kuhlia sandvicensis	Indigenous			P	
Kuhlia sp.	Indigenous	P			
Procanace sp.	Indigenous			P	
Telmatogeton sp.	Indigenous			P	
Bufo marinus	Introduced		P		
Rana catesbiana	Introduced		P		
Isopod sp.	Introduced			P	
Macrobrachium lar	Introduced		P		
Gambusia affinis	Introduced		P	P	
Poecilia reticulata	Introduced		P	P	
Poeciliid sp.	Introduced		P	P	
Tilapia sp.	Introduced			P	
Xiphophorus helleri	Introduced		P	P	
Cheumatopsyche analis	Introduced		P	P	
Cheumatopsyche pettiti	Introduced			P	
Chironomid larvae	Introduced	P	P	P	
Hydroptila arctia	Introduced			P	
Hydroptila potosina	Introduced			P	
Trichoptera larvae	Introduced			P	
Gastropod sp.	Introduced			P	
Lymnaeid sp.	Introduced	P	P	P	
Lymnea sp.	Introduced			P	
Physid sp.	Introduced			P	P
Diptera sp.	Undetermined			P	
Oligochaete sp.	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): 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.	Native Macrofauna Diversity > 5 spp.	Absence of Priority 1 Introduced
No	Yes	No
Abundance of Any Native Species	**Presence of Candidate Endangered Species**	**Endangered Newcomb's Snail Habitat**
No	No	No

CURRENT WATERSHED AND STREAM RATINGS

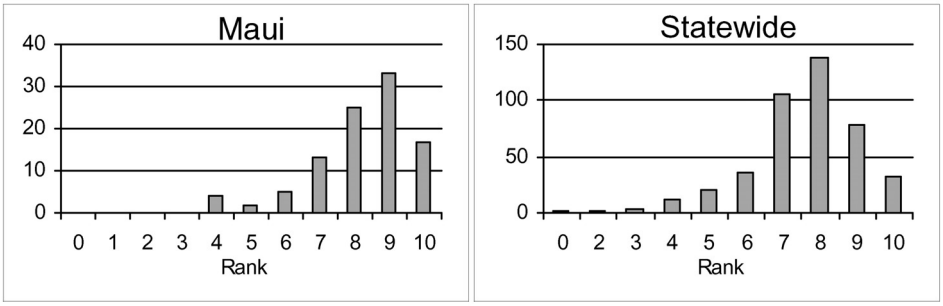
The current watershed and stream ratings are based on the data contained in the DAR Aquatic Surveys Database. The ratings provide the score for the individual watershed or stream, the distribution of ratings for that island, and the distribution of ratings statewide. This allows a better understanding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

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

Watershed Rating

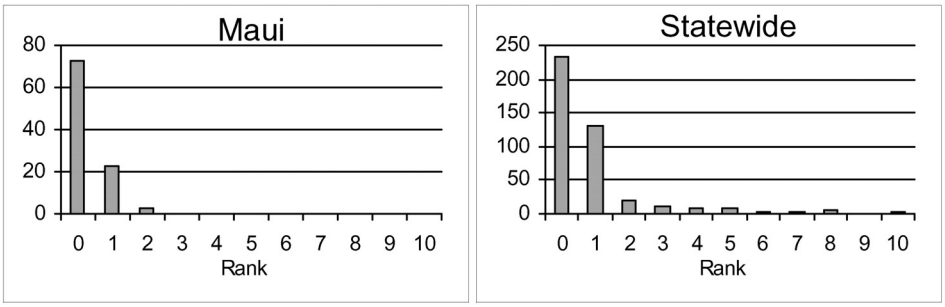
7



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

Watershed Rating

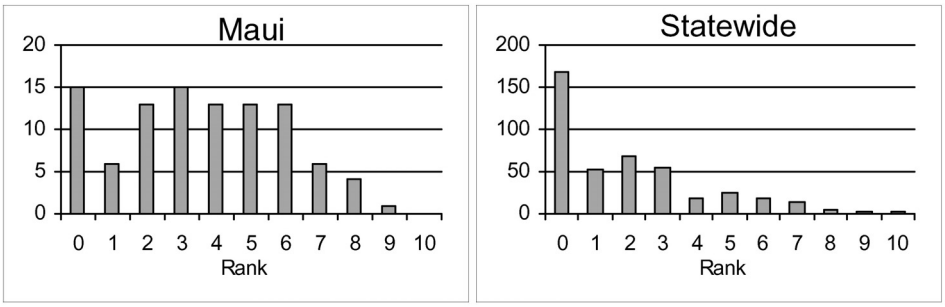
1



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

Watershed Rating

4

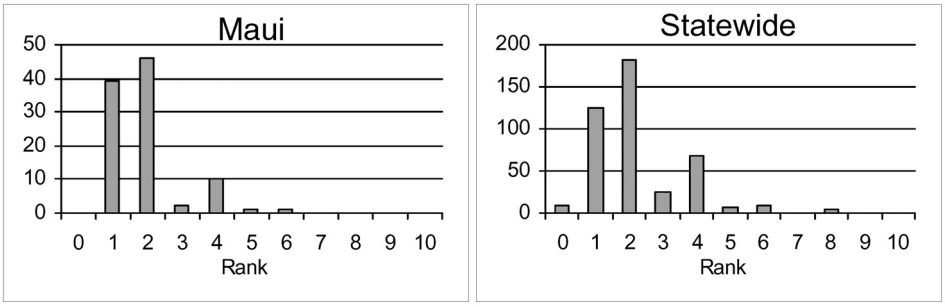


WATERSHED RATING (Cont): ʻĪao, Maui

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

Watershed Rating

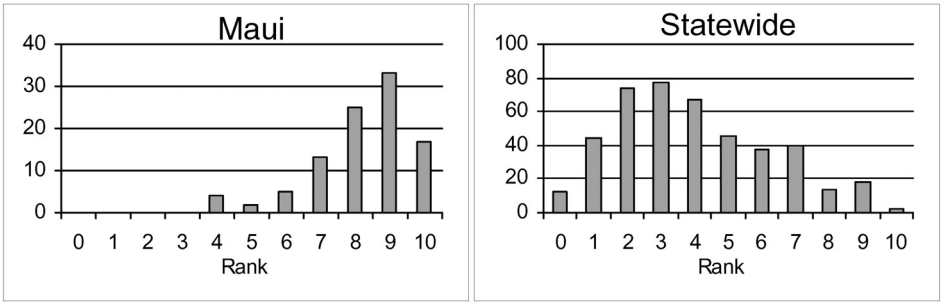
4



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

Watershed Rating

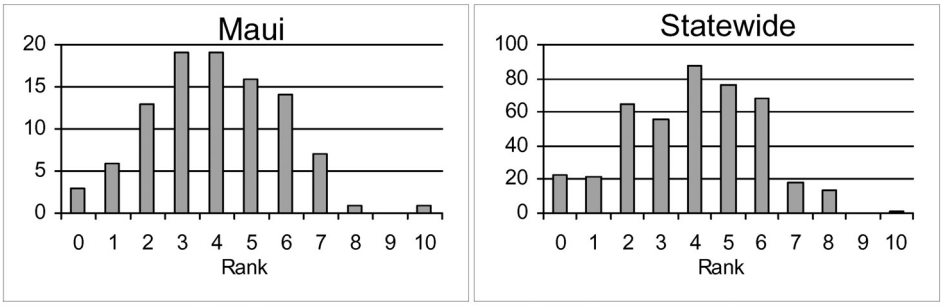
5



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.

Watershed Rating

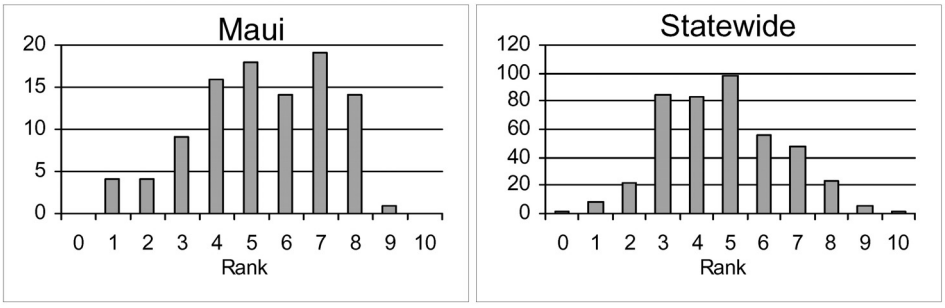
7



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.

Watershed Rating

7

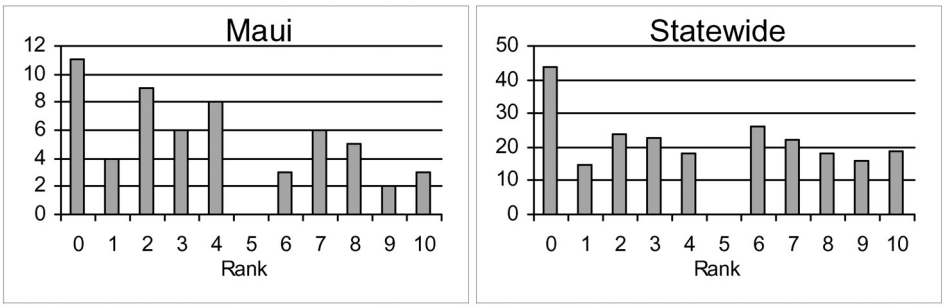


BIOLOGICAL RATING: ʻĪao, Maui

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

Stream Rating

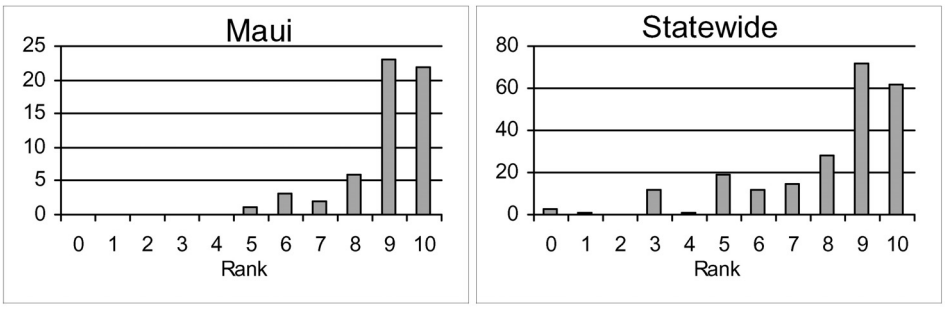
8



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

Stream Rating

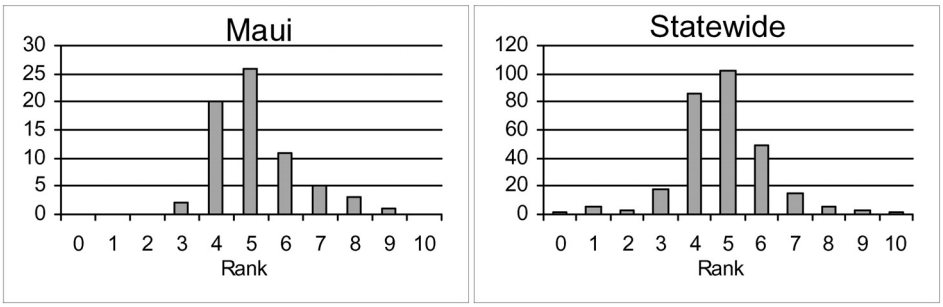
5



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

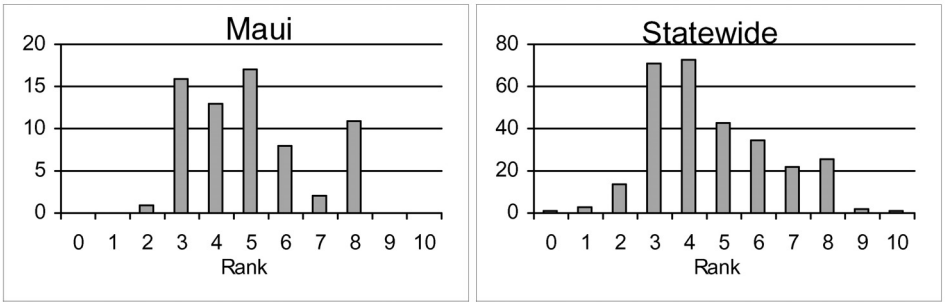
3



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

Stream Rating

4

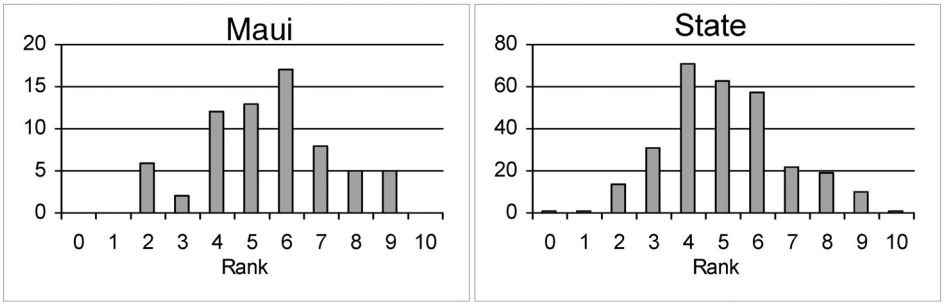


OVERALL RATING: ʻĪao, Maui

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

Watershed Rating

6

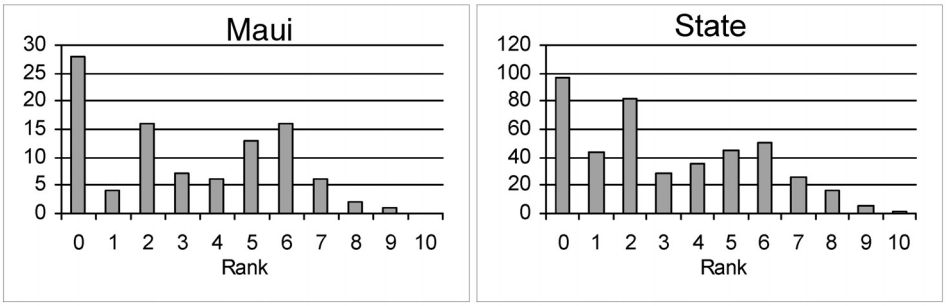


RATING STRENGTH: ʻĪao, Maui

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



REFERENCES

1961. Shima, S.I. Limnological Survey for Introduction of Exotic Species of Fish.

1978. Timbol, A.S. and Maciolek. Stream Channel Modification in Hawaii. Part A: Statewide Inventory of Streams; Habitat Factors and Associated Biota.

1990. Hau, S. Memo Notebook: 1990 FW Stream Surveys Vol. 2.

1990. Hau, S. Memo Notebook: 1990 FW Stream Surveys Vol. 4.

1991. Hau, S. Skippy Hau Databook No. 391 Volume 5.

1994. Way, C.M. Proceedings of the International Symposium on Hawaiian Stream Ecology, Preservations, and Management. US Army Corps of Engineers.

1995. Benbow, M.E., Burky, A.J. and C.M. Way. Life Cycle of a Torrenticolous Hawaiian Chironomid (Telmatogeton torrenticola): Stream Flow and Microhabitat Effects. Ann. Limnol. - Int. J. Lim. 39 (2). 103-114.

1996. Hau, S. Postlarval Migration of Three Native Gobies (Lentipes concolor, Awaous guamensis, and Sicyopterus stimpsoni) in ʻĪao Stream on the Island of Maui (Abstract). Will Stream Restoration Benefit Freshwater, Estuarine, and Marine Fisheries? 159.

1996. Hau, S. Skippy Hau Databook.

1996. Tagawa, A.W. and G.R. Higashi. Management of a Database on the Occurrence, Abundance and Distribution of Native Freshwater Species. Job Progress Report.

2000. McIntosh, M.D. The Effects of Stream Diversion on Riffle Macroinvertebrate Communities from a Maui, Hawaii, Stream. Masters Thesis.

2002. McIntosh, M.D., Benbow, M.E., and A.J. Burky. Effects of Water Removal on Introduced Caddis flies from a Tropical Mountain Stream. Ann. Limnol. - Int. J. Lin. 39 (4). 297-306.

2003. Flint, Jr. O.S. and R.A. Englund. A Reassessment and New State Records of Trichoptera Occurring in Hawaiʻi with Discussion on Origins and Potential Ecological Impacts. Bishop Museum Occasional Papers: No. 73. 31-40.

2004. Benbow, M.E., Burky, A.J., and C.M. Way. Morphological Characteristics and Species Separation of Hawaiian Postlarval Amphidromous Fishes. Micronesia, Vol. 37, No. 1. 127-143.

2006. Polhemus, D.A. Megalagrion Survey Notes in spreadsheet form.

2008. Hawaiʻi Division of Aquatic Resources. DAR Point Quadrat Survey Data from the DAR Aquatic Surveys Database.

2008. Hawaiʻi Division of Aquatic Resources. Impoundment Surveys in DAR Aquatic Surveys Database.

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