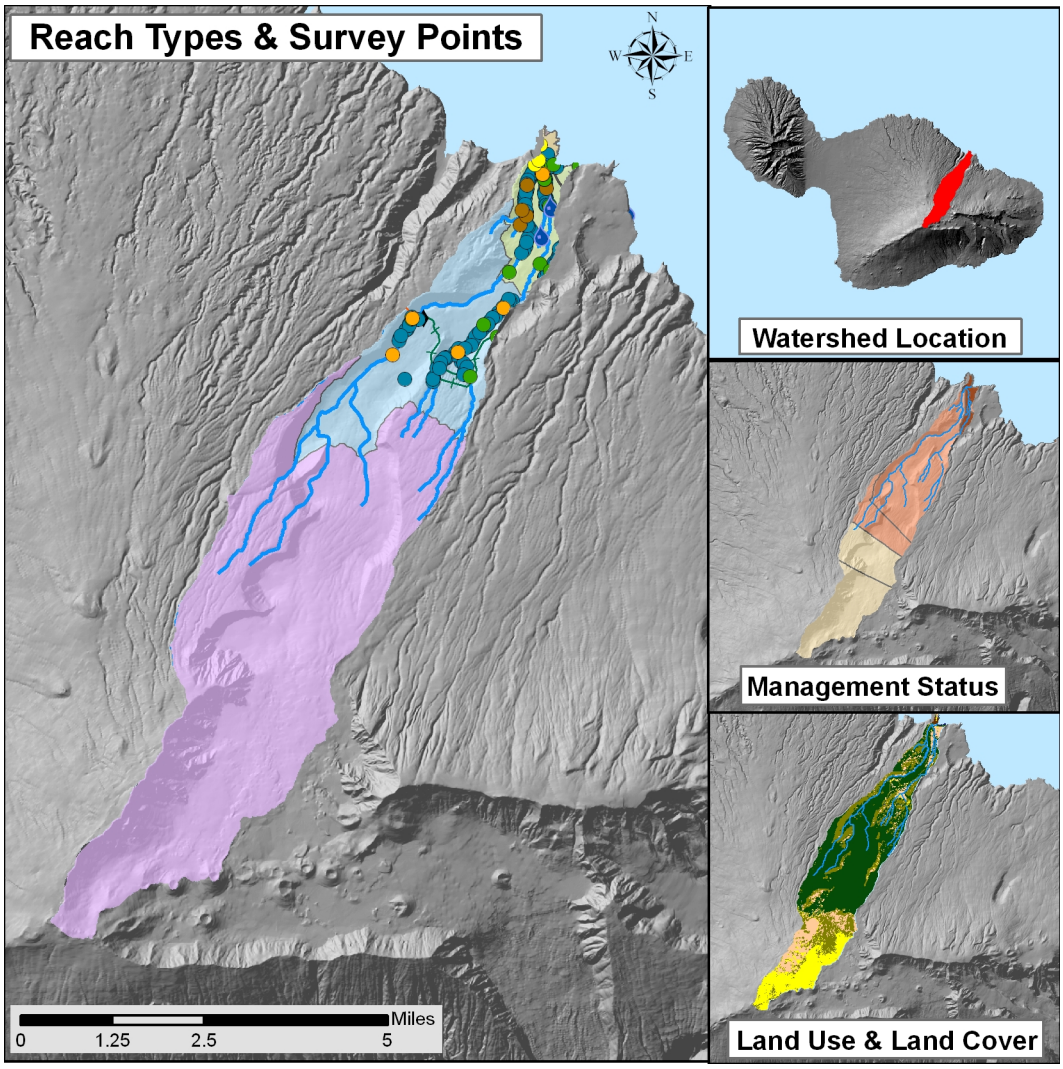
DAR Watershed Code: 64011

Pi‘ina‘au, Maui



WATERSHED FEATURES

Pi‘ina‘au watershed occurs on the island of Maui. The Hawaiian meaning of the name is unknown. The area of the watershed is 20.5 square mi (53.2 square km), with maximum elevation of 10007 ft (3050 m). The watershed's DAR cluster code is 6, meaning that the watershed is large, narrow, and steep in the upper watershed. The percent of the watershed in the different land use districts is as follows: 3% agricultural, 97% 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.

Military	Federal	State	OHA	County	Nature Conservancy	Other Private
0.0	26.8	54.0	0.0	0.0	16.1	3.1

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
42.9	54.0	0.0	3.1

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	0.0	0.00	0.00
Low Intensity Developed	0.1	0.03	0.07
Cultivated	0.2	0.05	0.13
Grassland	11.8	2.43	6.29
Scrub/Shrub	22.1	4.53	11.73
Evergreen Forest	50.7	10.41	26.96
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	14.9	3.06	7.92
Unconsolidated Shoreline	0.0	0.01	0.02
Water	0.1	0.01	0.03
Unclassified	0.0	0.00	0.00

STREAM FEATURES

Pi‘ina‘au is a perennial stream. Total stream length is 24.2 mi (39 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	1.6	24.0	42.5	31.8

The following stream(s) occur in the watershed:

Hau‘oliwahine Kano Kuo Palauhulu Pi‘ina‘au Pokakaekane

BIOTIC SAMPLING EFFORT

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

1962	1967	1979	1980	1990	1991	1992
1993	1994	1995	1996	2000	2002	2003
2007	2008					

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	2	0	0	0
DAR General Surveys	0	10	25	0	0
DAR Point Quadrat	0	6	99	57	0
HDFG	0	0	2	4	0
Published Report	1	2	9	4	0
Unpublished Report	0	0	5	0	0

BIOTA INFORMATION

Species List

Native Species

Crustaceans	Amphipod sp.
	Atyoida bisulcata
	Macrobrachium grandimanus
Fish	*Awaous guamensis*
	Eleotris sandwicensis
	Gobiid sp.
	Kuhlia sp.
	Lentipes concolor
	Sicyopterus stimpsoni
	Stenogobius hawaiiensis
Snails	*Ferrissia sharpi*
	Neritina granosa
	Neritina vespertina

Native Species

Insects	*Anax junius*
	Anax sp.
	Anax strenuus
	Campsicnemus lepidochaites
	Megalagrion blackburni
	Megalagrion hawaiiense
	Megalagrion nigrohamatum nigrohamatum
	Megalagrion pacificum
	Megalagrion sp.
	Procanace constricta
	Rhantus pacificus
	Scatella cilipes
	Scatella femoralis
	Scatella mauiensis
	Scatella oahuense
	Telmatogeton sp.
	Telmatogeton torrenticola

Introduced Species

Amphibians	*Rana catesbiana*
	Ranid sp.
Clams	*Corbicula fluminea*
	Musculium partumieum
	Pisidium sp.
Crustaceans	*Macrobrachium lar*
Fish	*Poecilia reticulata*
Snails	*Lymnea sp.*
	Physid sp.
	Pomacea canaliculata
	Thiarid sp.

Introduced Species

Insects	*Cheumatopsyche analis*
	Chironomid larvae

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

Scientific Name	Status	Minimum Size	Maximum Size	Average Size
Ranid sp.	Introduced	0.25	2	1.1
Atyoida bisulcata	Endemic	0.75	2	1.2
Macrobrachium lar	Introduced	1.5	5	2.9
Lentipes concolor	Endemic	1	5	2.3
Sicyopterus stimpsoni	Endemic	1	3.5	2.2
Awaous guamensis	Indigenous	2	6	3.5
Megalagrion sp.	Endemic	0.5	1	0.7
Neritina granosa	Endemic	0.25	1.5	0.6
Physid sp.	Introduced	0.25	0.25	0.3

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
Anax strenuus	Endemic				0.03	
Atyoida bisulcata	Endemic				1.54	
Lentipes concolor	Endemic			0.52		
Megalagrion blackburni	Endemic				0.03	
Megalagrion nigrohamatum	Endemic				0.07	
Megalagrion sp.	Endemic				0.3	
Neritina granosa	Endemic		3.35	2.32		
Sicyopterus stimpsoni	Endemic		0.74	0.15	0.03	
Awaous guamensis	Indigenous		1.12	0.75		
Macrobrachium lar	Introduced		0.37	0.25	0.03	
Ranid sp.	Introduced				0.07	

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

Scientific Name	Status	Estuary	Lower	Middle	Upper	Headwaters
Atyoida bisulcata	Endemic		P	P	P	
Macrobrachium grandimanus	Endemic		P			
Eleotris sandwicensis	Endemic		P			
Lentipes concolor	Endemic	P	P	P	P	
Sicyopterus stimpsoni	Endemic		P	P	P	
Stenogobius hawaiiensis	Endemic		P			
Anax strenuus	Endemic				P	
Campsicnemus lepidochaites	Endemic				P	
Megalagrion blackburni	Endemic				P	
Megalagrion hawaiiense	Endemic				P	
Megalagrion nigrohamatum nigrohamatum	Endemic				P	
Megalagrion pacificum	Endemic		P			
Megalagrion sp.	Endemic			P	P	

Procanace constricta	Endemic			P
Rhantus pacificus	Endemic			P
Scatella cilipes	Endemic			P
Scatella femoralis	Endemic			P
Scatella mauiensis	Endemic			P
Scatella oahuense	Endemic			P
Telmatogeton torrenticola	Endemic			P
Ferrissia sharpi	Endemic			P
Neritina granosa	Endemic	P	P	
Neritina vespertina	Endemic	P		
Amphipod sp.	Indigenous			P
Awaous guamensis	Indigenous	P	P	
Gobiid sp.	Indigenous	P	P	P
Kuhlia sp.	Indigenous	P		
Anax junius	Indigenous			P
Anax sp.	Indigenous	P		P
Telmatogeton sp.	Indigenous		P	P
Rana catesbiana	Introduced	P		P
Ranid sp.	Introduced			P
Corbicula fluminea	Introduced		P	
Macrobrachium lar	Introduced	P	P	P
Poecilia reticulata	Introduced	P		
Cheumatopsyche analis	Introduced			P
Chironomid larvae	Introduced		P	P
Lymnea sp.	Introduced	P		
Physid sp.	Introduced		P	P
Thiarid 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): 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.	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	Yes	No

CURRENT WATERSHED AND STREAM RATINGS

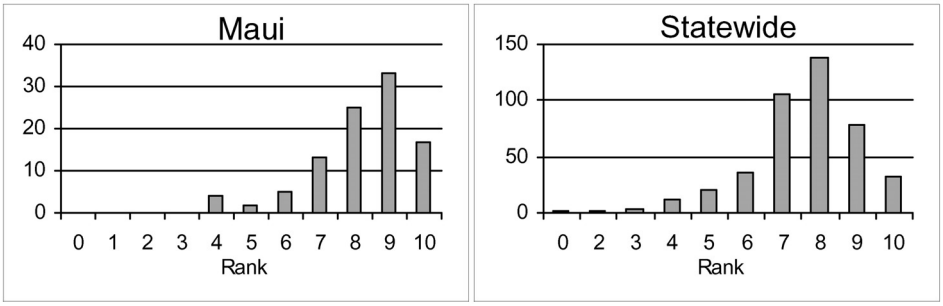
The current watershed and stream ratings are based on the data contained in the DAR Aquatic Surveys Database. The ratings provide the score for the individual watershed or stream, the distribution of ratings for that island, and the distribution of ratings statewide. This allows a better understanding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

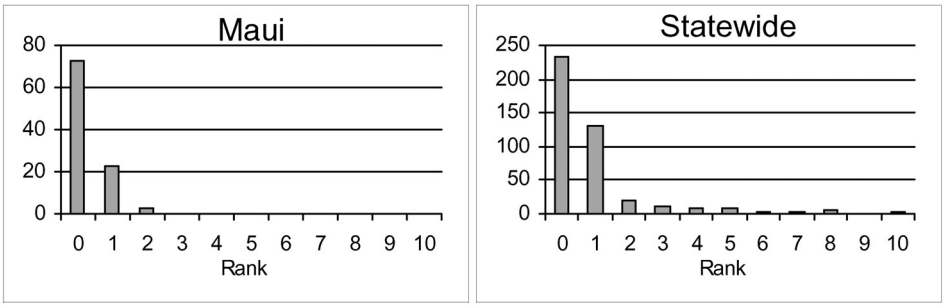
8



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

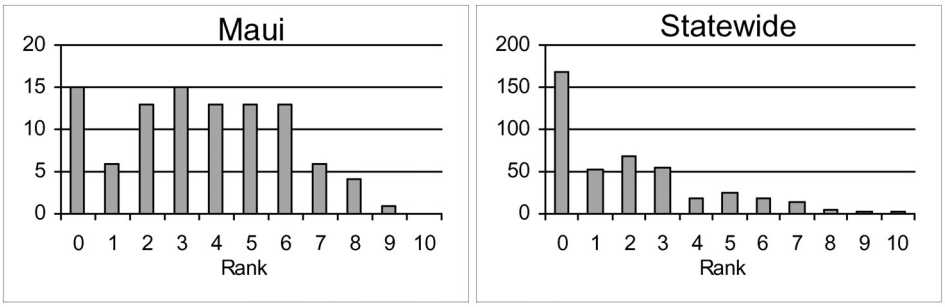
1



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

Watershed Rating

8

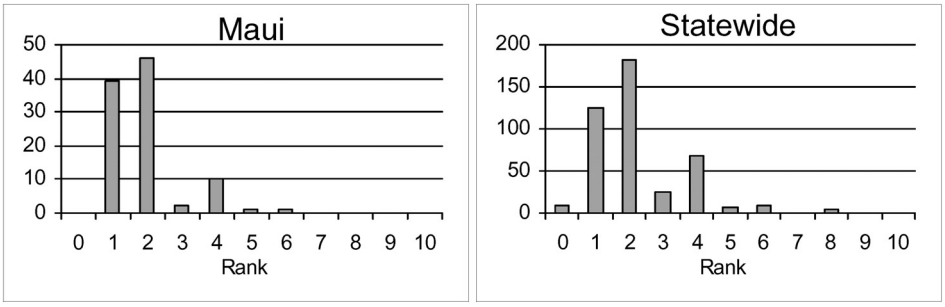


WATERSHED RATING (Cont): Pi‘ina‘au, Maui

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

Watershed Rating

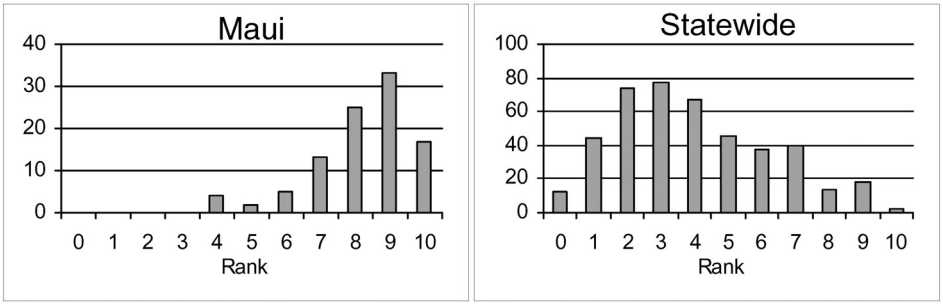
4



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

Watershed Rating

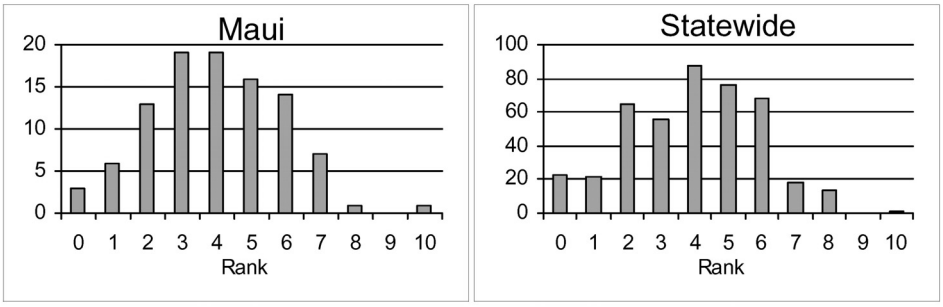
6



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

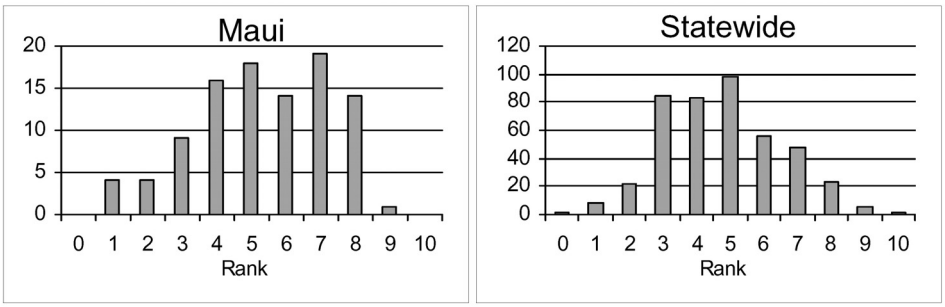
6



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

8

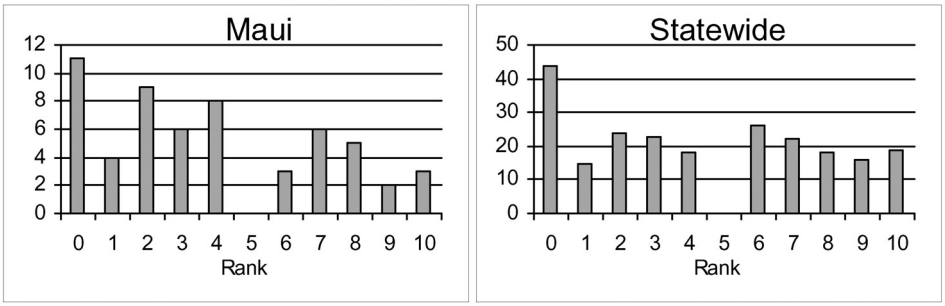


BIOLOGICAL RATING: Pi‘ina‘au, Maui

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

Stream Rating

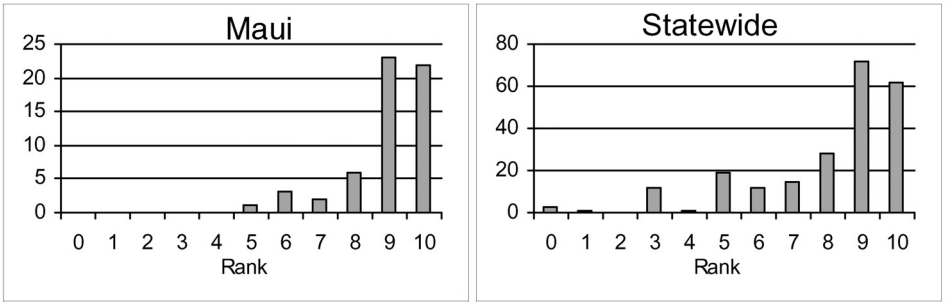
10



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

Stream Rating

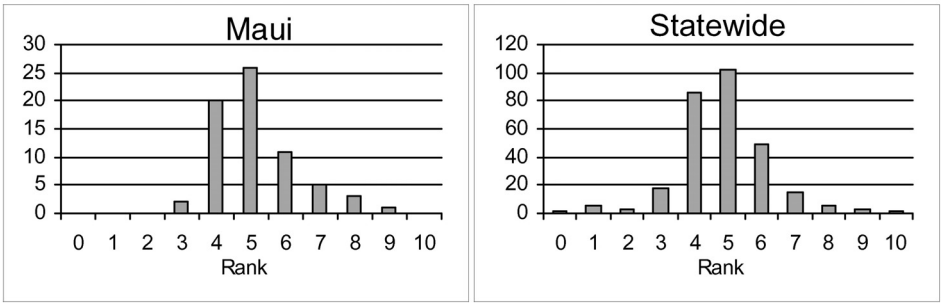
7



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

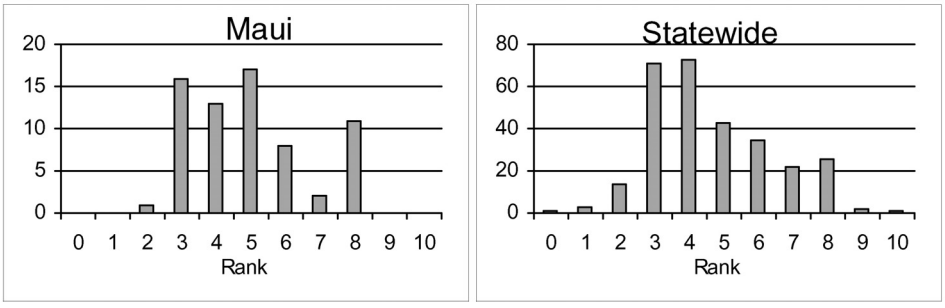
7



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

Stream Rating

8

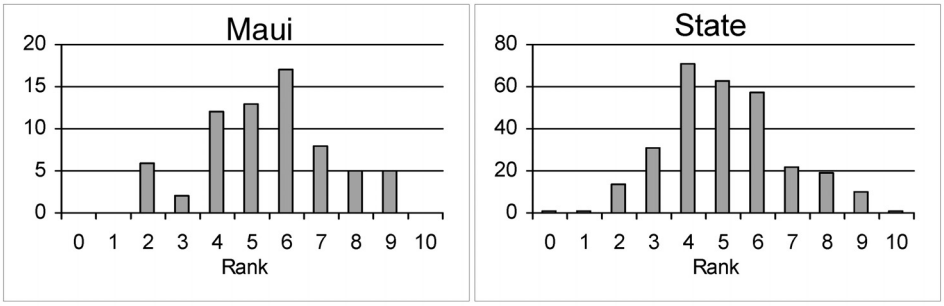


OVERALL RATING: Pi‘ina‘au, Maui

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

Watershed Rating

9

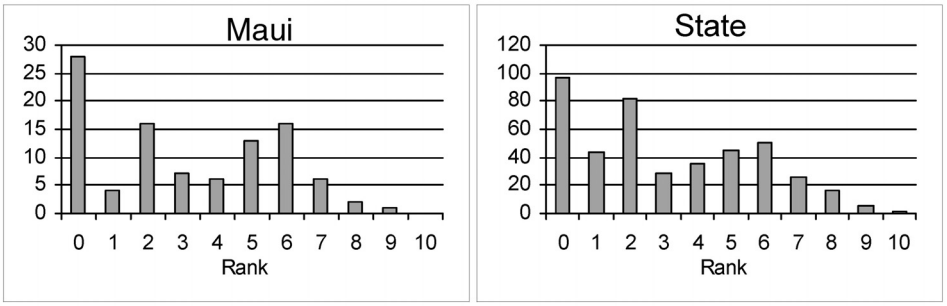


RATING STRENGTH: Pi‘ina‘au, Maui

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

9



REFERENCES

1963. Shima, S.I. Limnological Survey for Introduction of Exotic Species of Fish.

1980. Parrish, J.D. Numerical equivalents of biological data in the Lentipes report.

1980. Timbol, A.S., Sutter, A.J. and J.D. Parrish. Distribution and Relative Abundance of the Endemic Freshwater Goby, Lentipes concolor in Hawaii. Hawaii Cooperative Fishery Research Unit.

1980. Timbol, A.S., Sutter, A.J. and J.D. Parrish. Distribution, Relative Abundance, and Stream Environment of Lentipes concolor (Gill, 1860), and Associated Fauna in Hawaiian Streams.

1989. Kinzie III, R.A. Species Profiles: Life Histories and Environmental Requirements of Coastal Vertebrates and Invertebrates, Pacific Ocean Region, Report 3, Amphidromous Macrofauna of Island Streams. Technical Report EL-89-10.

1990. Hau, S. Skippy Hau Databook No. 311 Volume 3.

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. Drift/Benthic from 1991 to 1995, Skippy Hau Data Book.

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

1992. Brasher, A.M. Aquatic Monitoring Survey of Hanawi Stream, Makapipi Stream and Palauhulu Stream Maui, Hawaii.

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

1995. Hau, S. Skippy Hau Freshwater Clams.

1996. Hau, S. Skippy Hau Databook.

1997. Brasher, A.M. Aquatic Monitoring Survey of Hanawi Stream, Makapipi Stream and Palauhulu Stream Maui, Hawaii.

2000. Burky, A.J., Way, C.M., Hau, S. and M.E. Benbow. The Occurrence of the freshwater Clams, Musculium partumeium (Say) and Pisidium casertanum (Poli) (Bivalvia: Sphaeriidae), in the Hawaiian Islands. Micronesia 33 (1/2). 161-164.

2000. Dendel. P. Aquatic Monitoring Survey of Hanawi Stream, Makapipi Stream and Palauhulu Stream Maui, Hawaii.

2001. Radtke, R.L, Kinzie, III, R.A. and D.J. Shafer. Temporal and Spatial Variation in Length of Larval Life and Size Settlement of the Hawaiian Amphidromous Goby Lentipes concolor. The Journal of Fish Biology, Vol. 59. 928-938.

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.

2005. Gingerich, S.B. and R.H. Wolff. Effects of Surface-Water Diversions on Habitat Availability for Native Macrofauna, Northeast Maui, Hawaii.

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.