

Using GIS to Assess Fishing and Socioeconomic Resilience Within Fishing Communities in Hawaii

A photograph of a marlin leaping from the ocean surface, creating a large splash. In the background, a white fishing boat is visible on the water. The sky is clear and blue.

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Pacific Islands Fisheries
Science Center

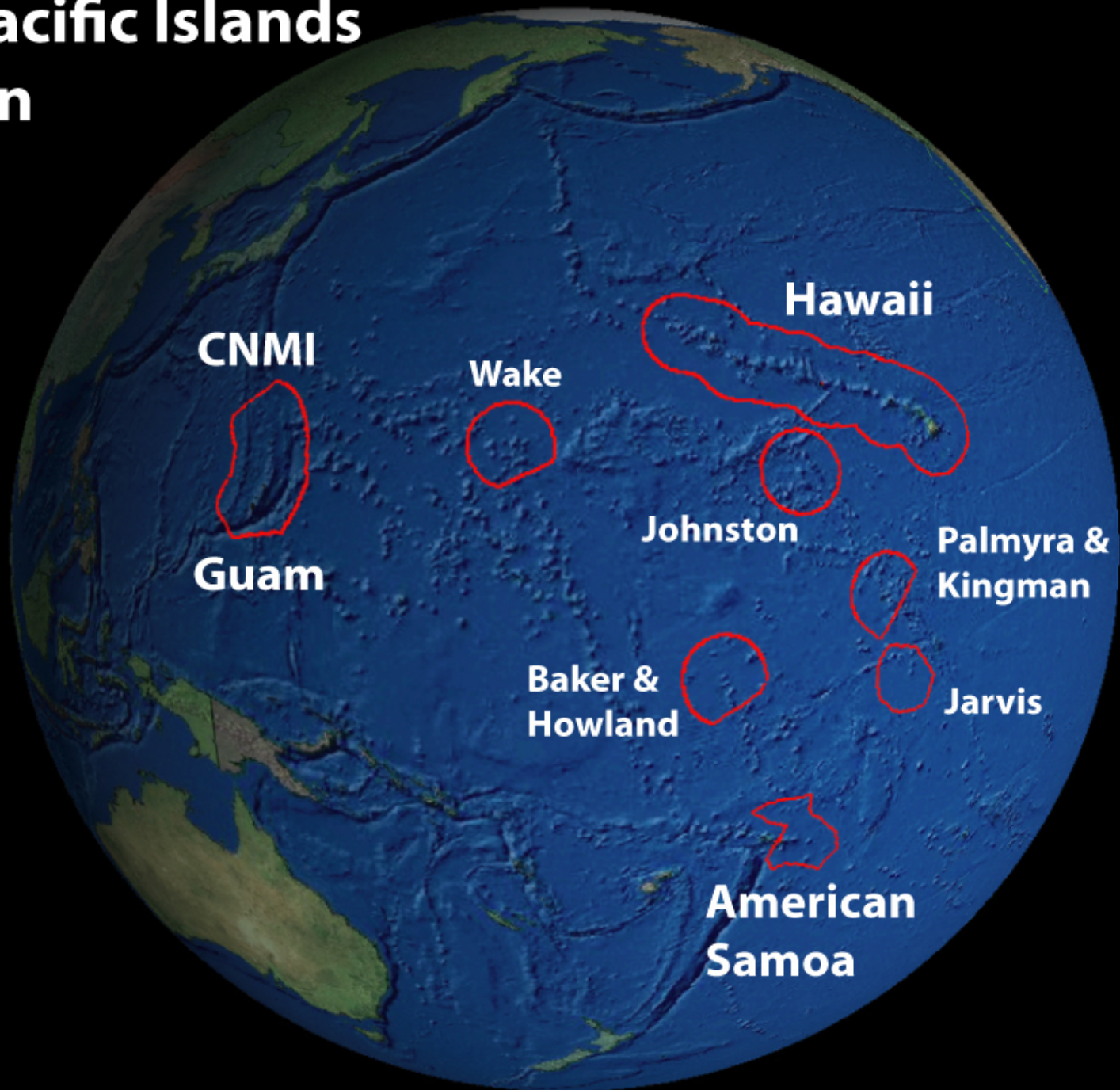
Mahalo to Kyle Ward
National Ocean Service

Outline

- Western Pacific fishing communities policy context
- Identifying sub-communities
- Fishing importance
- Socioeconomic resilience
- Next steps



The Pacific Islands Region



First Council Proposal: 1998

- Each of the island areas (Hawaii, American Samoa, Guam, Commonwealth of the Northern Marianas) is a fishing community
- 1999: NMFS agrees for flag territories; disapproves Hawaii, requesting smaller scale and additional analysis



Second Council Proposal, 2002

- For Hawaii, island is logical unit of analysis for describing community setting and assessing community-level impacts
 - Fishing and related services and industries important to all of Hawaii's inhabited islands
 - Cultural importance of fishing ubiquitous
 - Social and economic cohesion of fishery participants strongest at island level

NMFS Approves on July 3, 2003

- Broad scale of analysis for fishing community impacts could lessen likelihood of significant effects
- Increased importance of social analyses that are not place-based
- Increased importance of identifying fishing patterns and relationships at smaller scales

Considerations for Identifying Sub-Communities

- Smaller-than-island scale necessary
- Meaningful social, cultural, economic units
- Complete coverage vs. identified locations of obvious fishing importance/dependency
- Tied to available locator information to allow description of population's
 - strength and nature of ties to fishing
 - socioeconomic characteristics

Fishing for Data Sources

- Recreational fishing patterns available through HMRFS
 - Hawaii study resumed in 2001
 - Random phone survey measures effort
 - Field intercept survey measures catch
 - Zip code is only residence variable on field survey

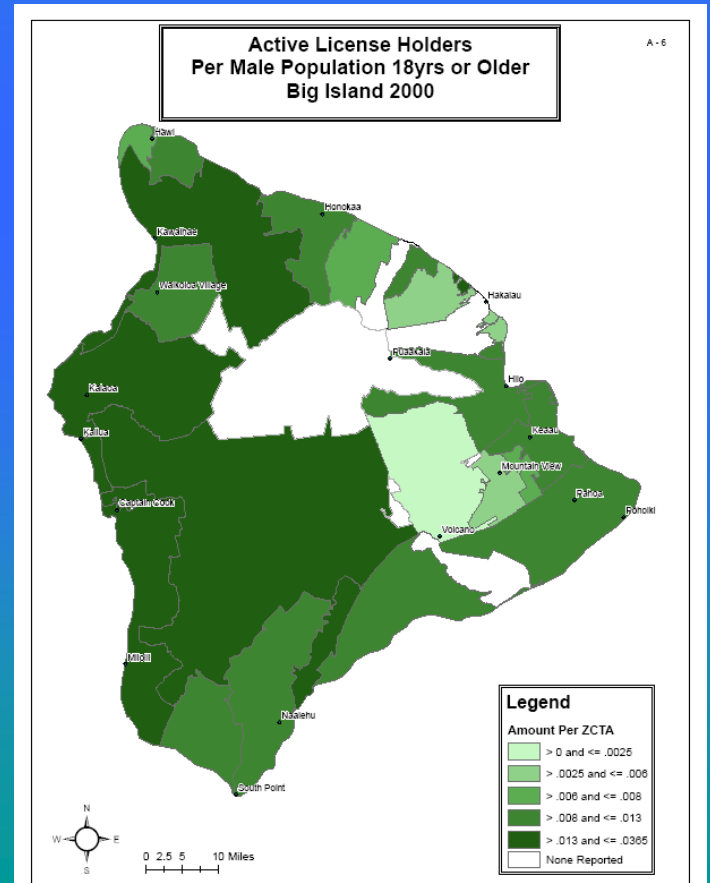
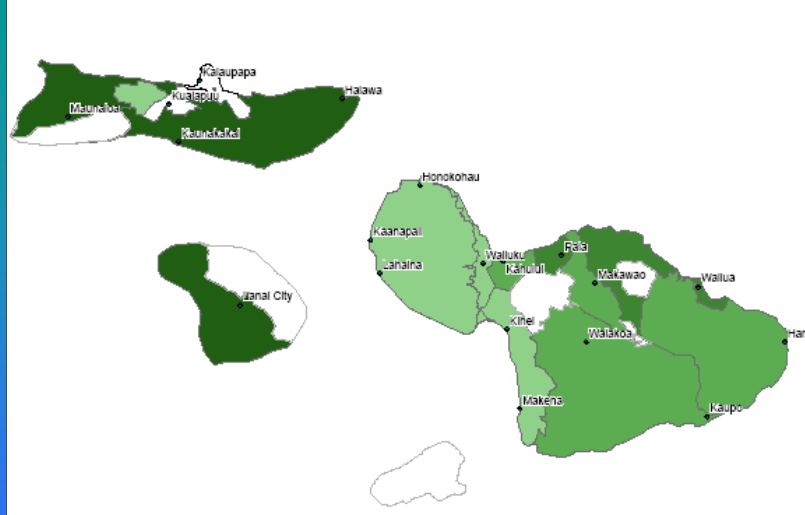
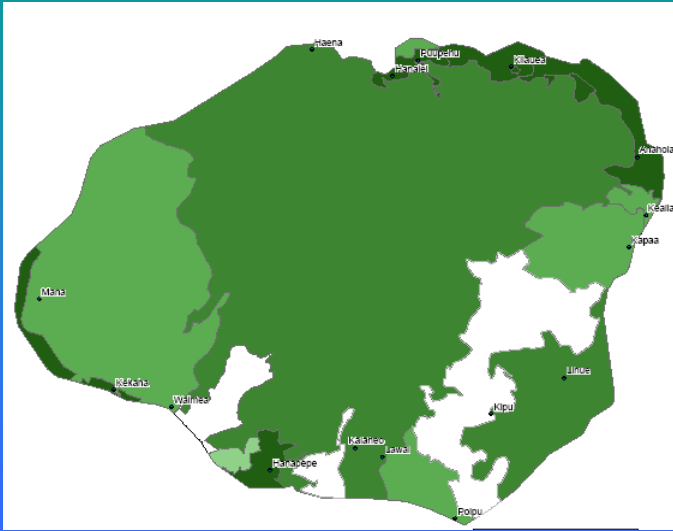


First Cut at Defining Sub-Communities: Zip Code Tabulation Areas

- New to the 2000 census
- Created to overcome some of the inherent problems of using ZIP codes as geographic areas
 - composite of census block groups that have an exact geography
 - eliminates P.O. Box-only zip codes
 - separate designation for areas that are undeveloped or consist of large inland bodies of water

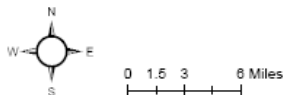
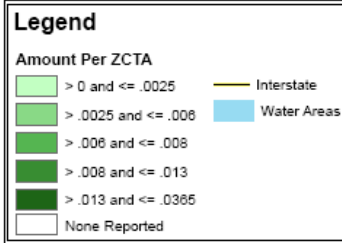
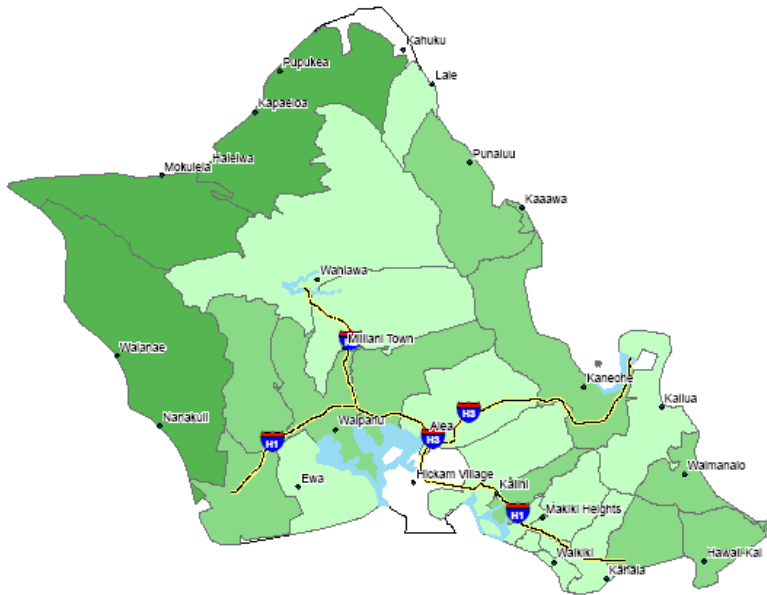
Fishing Importance

- Active CML license holders per males over age 18
- Number of days fished per capita
- Pounds caught per capita (*number of pieces also available; sales and value available from dealer database*)



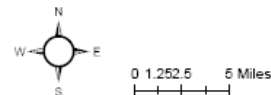
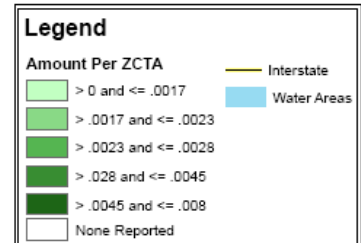
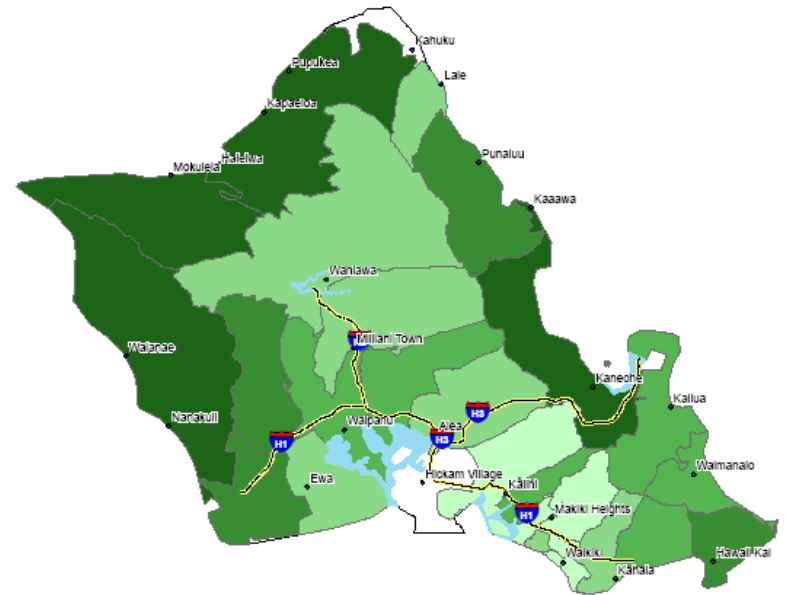
**Active License Holders
Per Male Population 18yrs or Older
Oahu 2000**

A-9

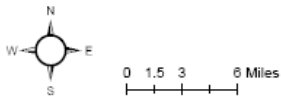
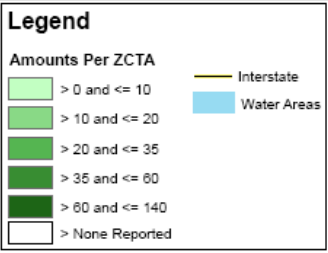
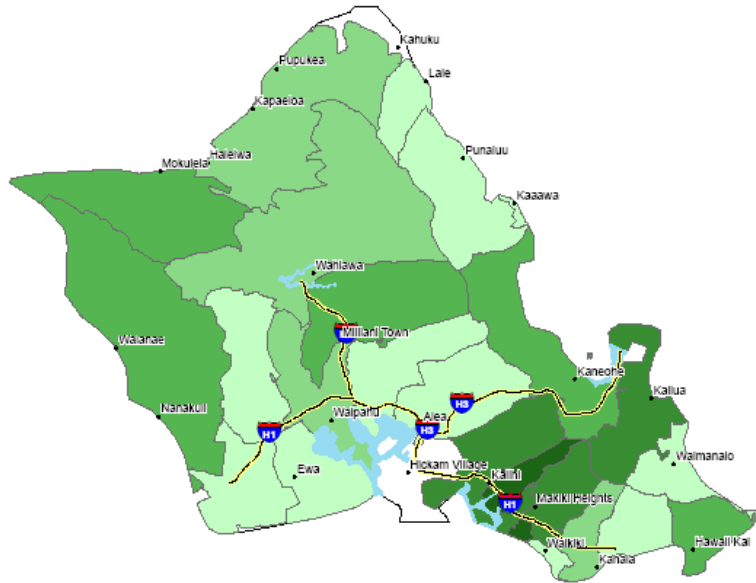


**Active License Holders
Per Male Population 18yrs or Older
Oahu 2000
(categorized for Oahu only)**

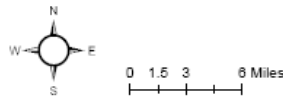
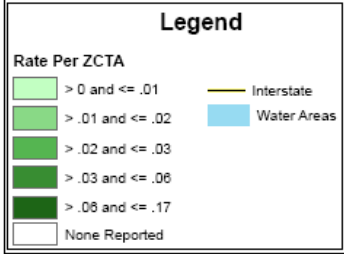
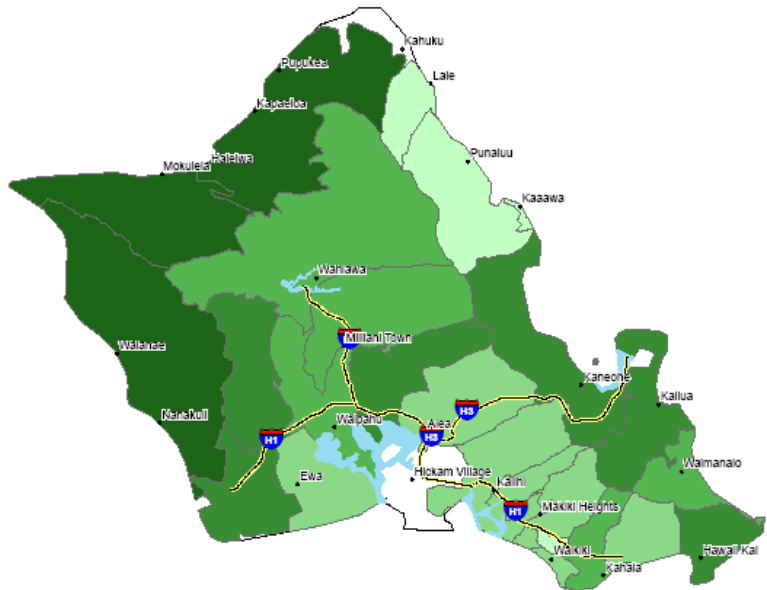
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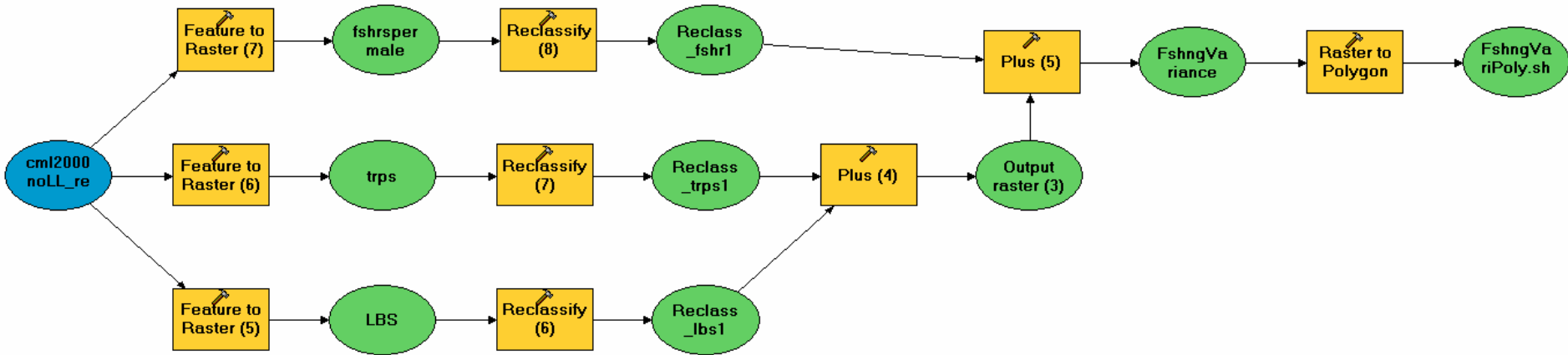
**Pounds of Fish Landed Per Capita
Oahu 2000
(categorized for Oahu only)**



**Number of Days Fished Per Capita
Oahu 2000
(categorized for Oahu only)**



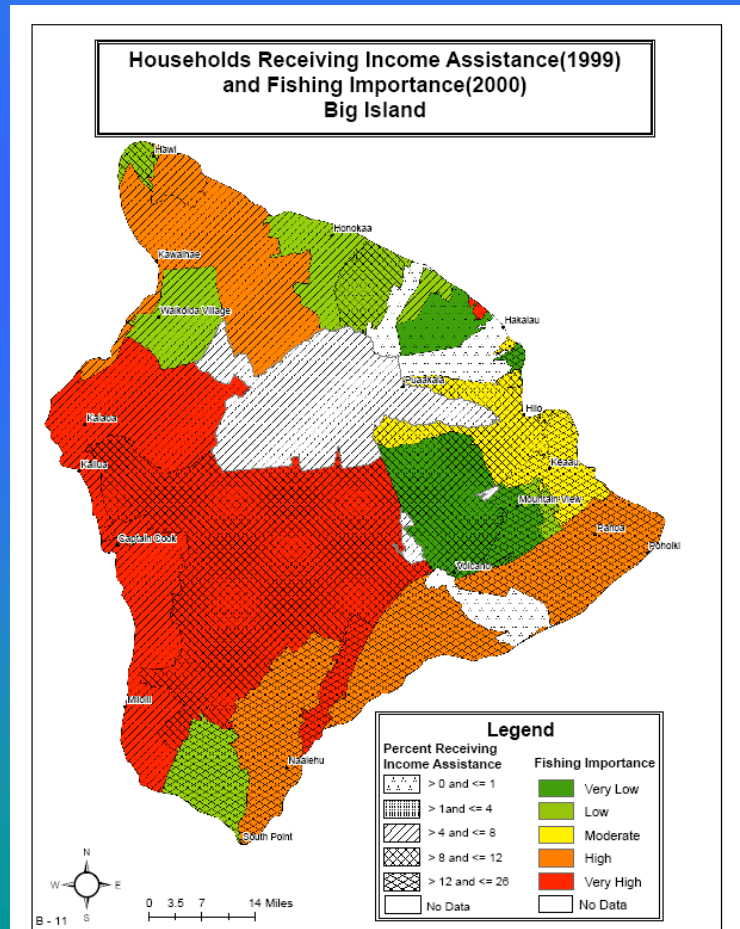
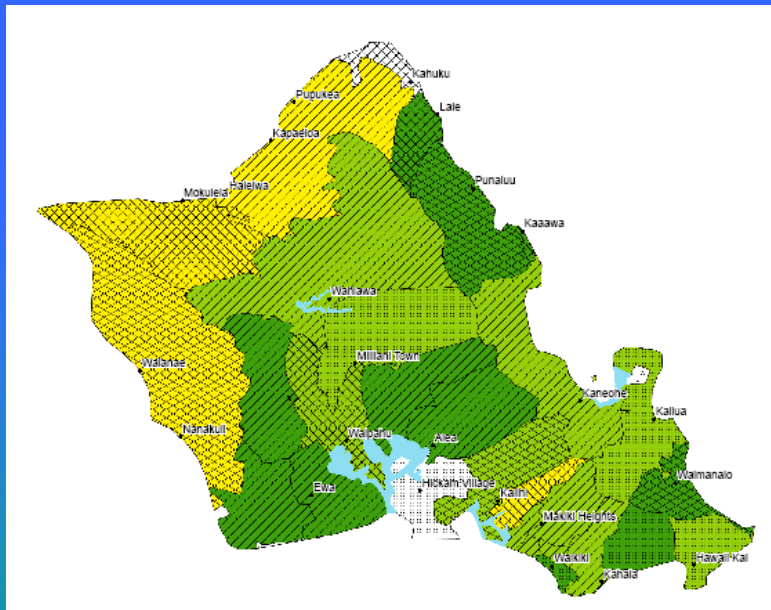
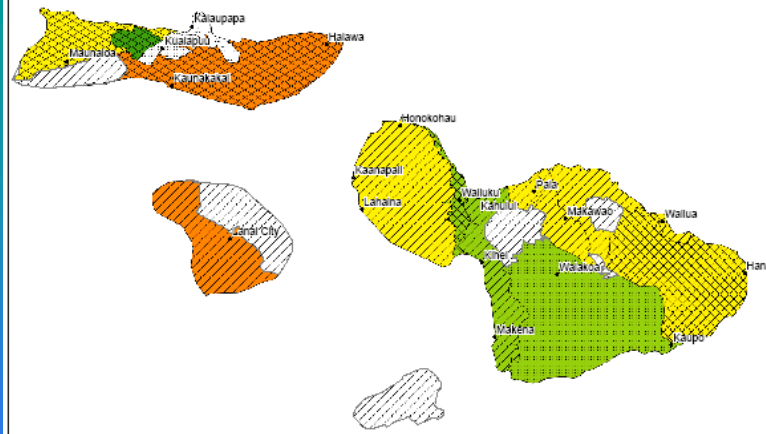
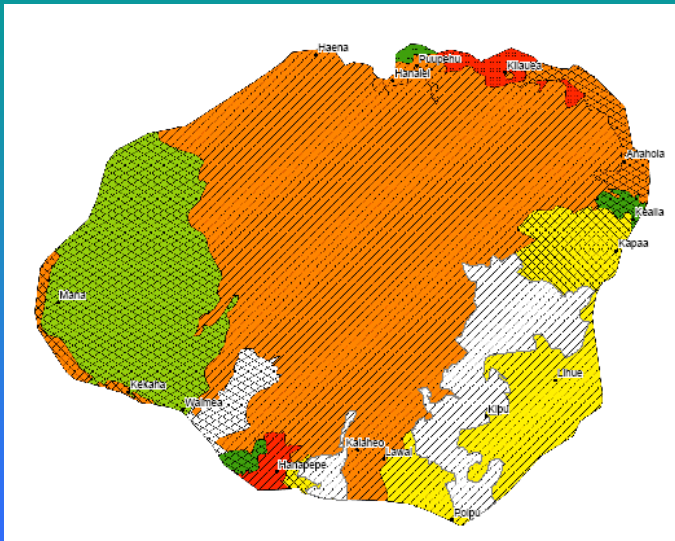
Fishing Importance Flow Diagram and Reclassification Examples



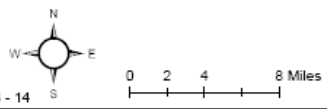
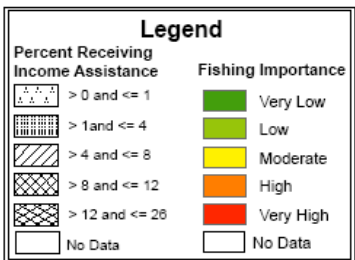
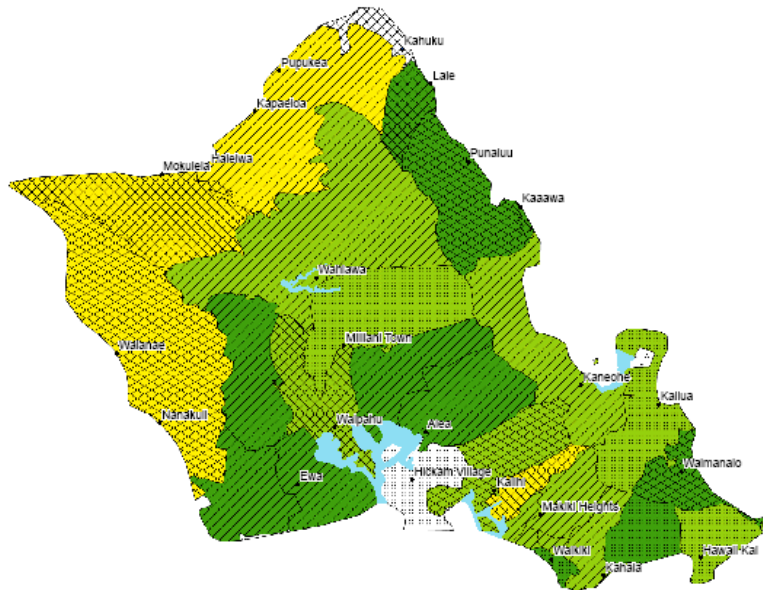
ZCTA	Area	Pounds Per Capita	Reclass: Pounds Per Capita	License Holders Per Male Over 18	Reclass: License Holders Per Male Over 18	Days Fished Per Capita	Reclass: Days Fished Per Capita	Over All Fishing Importance
96792	Waianae	27.6	6	0.007	3	0.13	4	13
96825	Hawaii Kai	20.8	6	0.003	2	0.05	2	10
96795	Waimanalo	7.9	3	0.002	1	0.02	1	5
96744	Kaneohe	21	6	0.004	2	0.05	2	10
96717	Punaluu	7.6	3	0.004	2	0.008	1	6
96740	Kailua (Big Island)	76.85	8	0.023	10	0.39	10	28
96720	Hilo (Big Island)	15.7	5	0.009	5	0.1	3	13

Socioeconomic Resilience

- 2000 Census:
 - Median household income
 - Households with income assistance
 - Poverty status
 - Education level

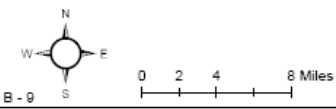
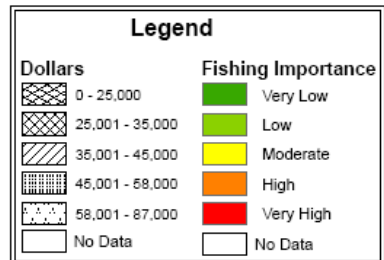
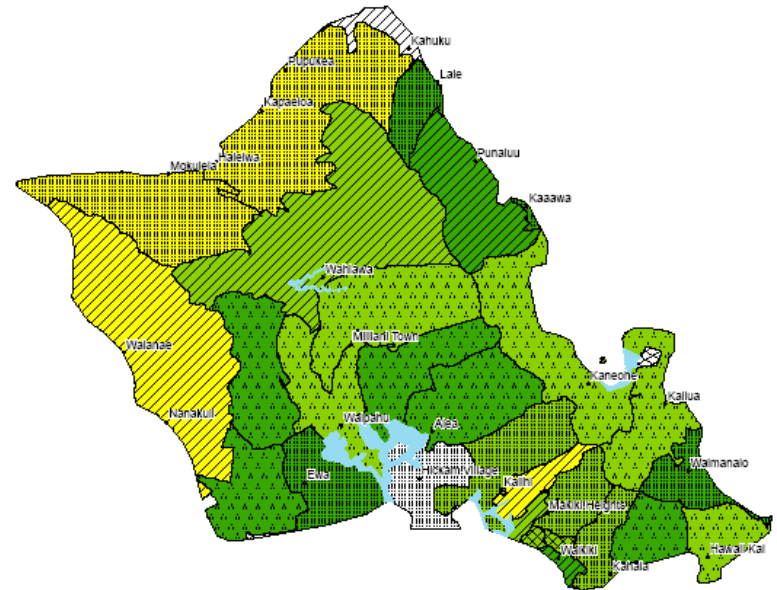


Households Receiving Income Assistance(1999) and Fishing Importance(2000) Oahu



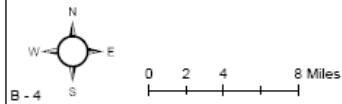
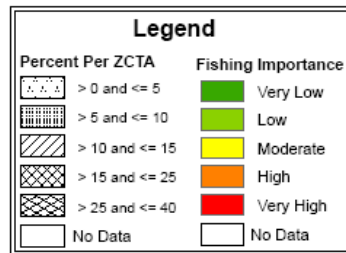
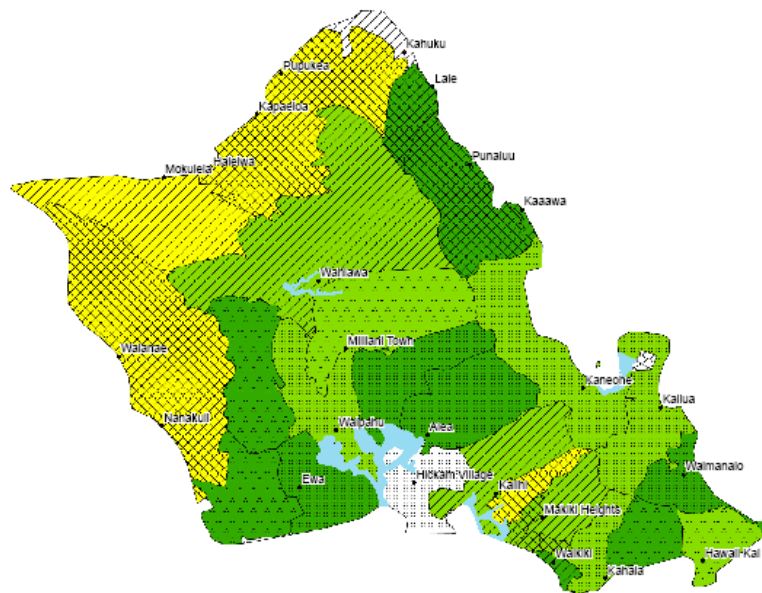
B - 14

Median Household Income(1999) and Fishing Importance(2000) Oahu



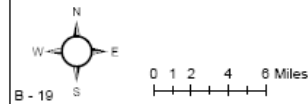
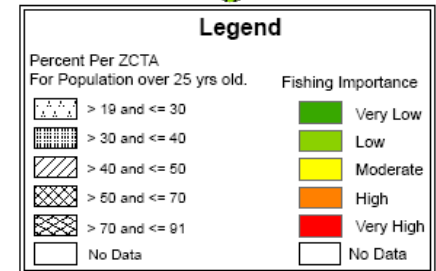
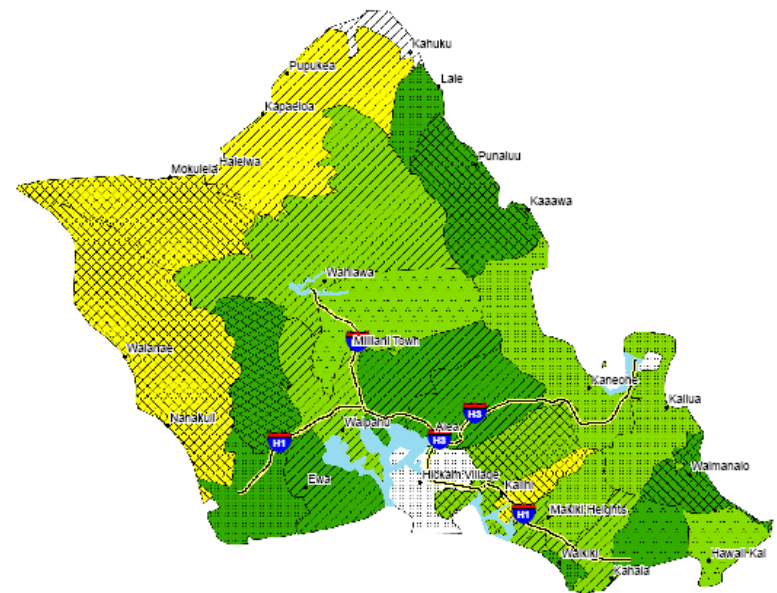
B - 9

**Percent Persons Below Poverty Status(1999)
and Fishing Importance(2000)
Oahu**



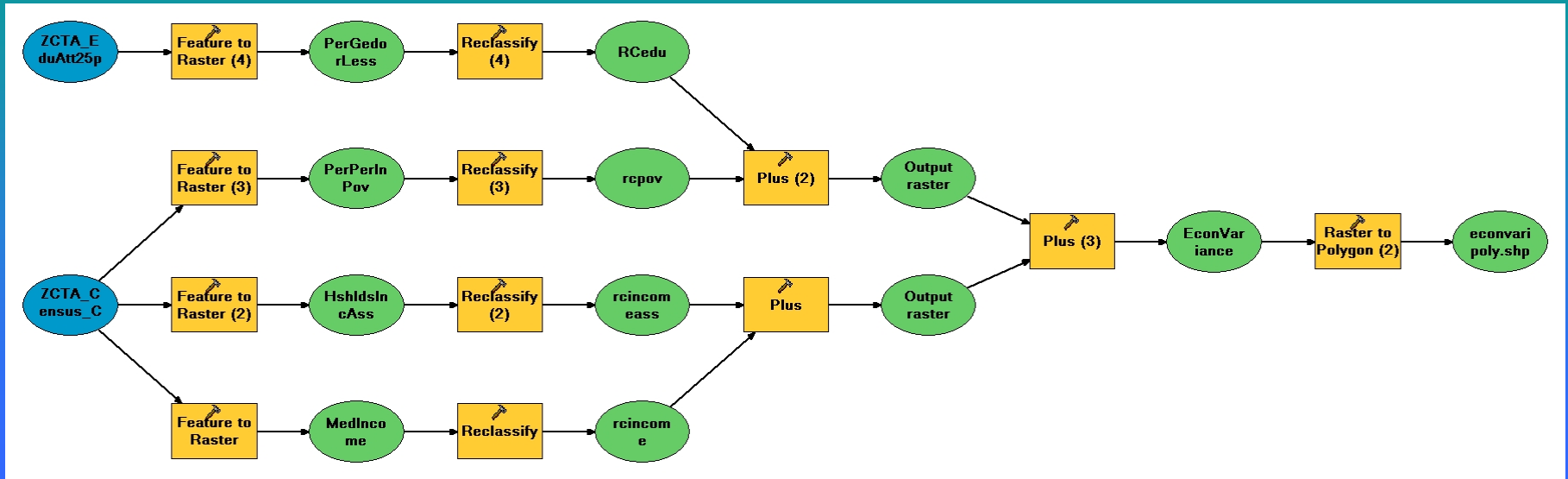
B - 4

**Education Status: High School Diploma(GED) or Less
and Fishing Importance
Oahu 2000**

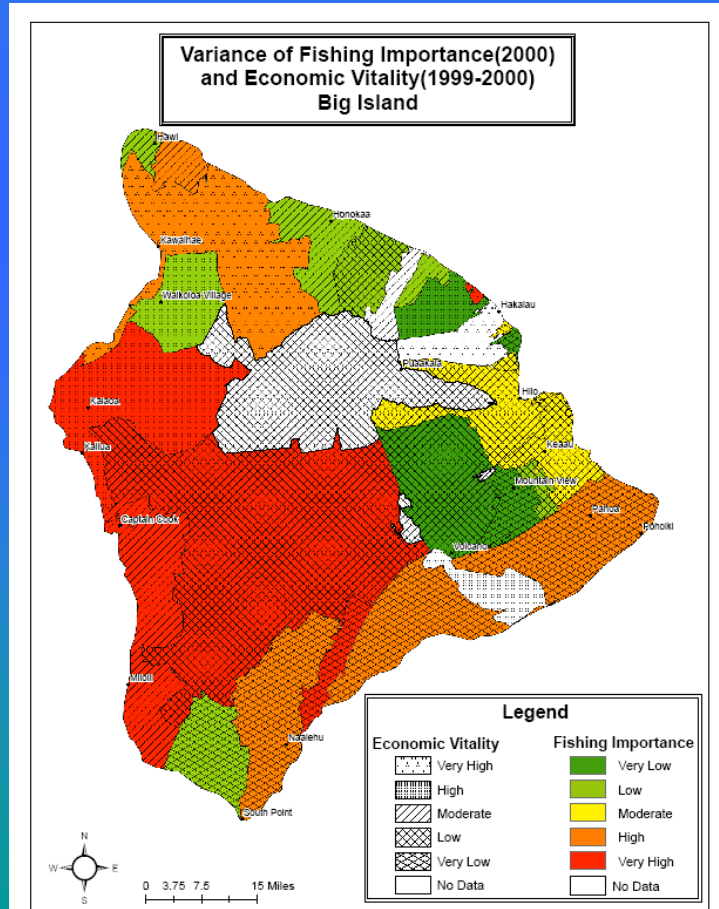
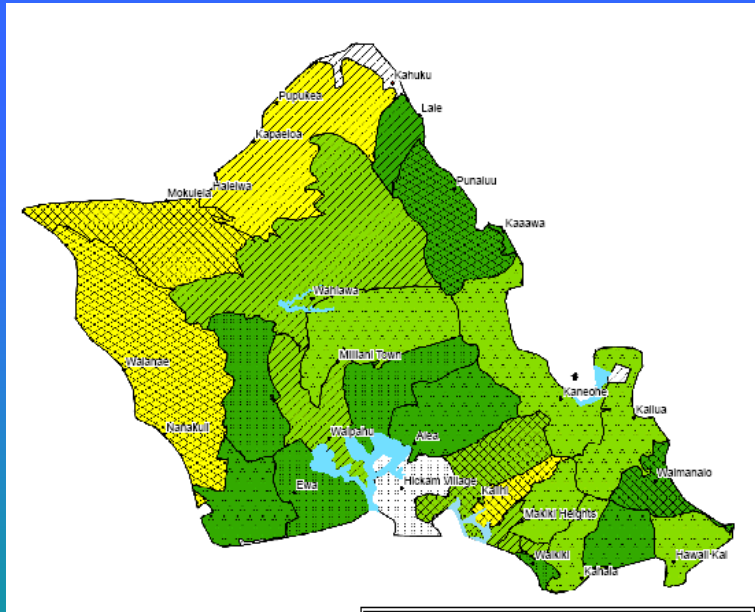
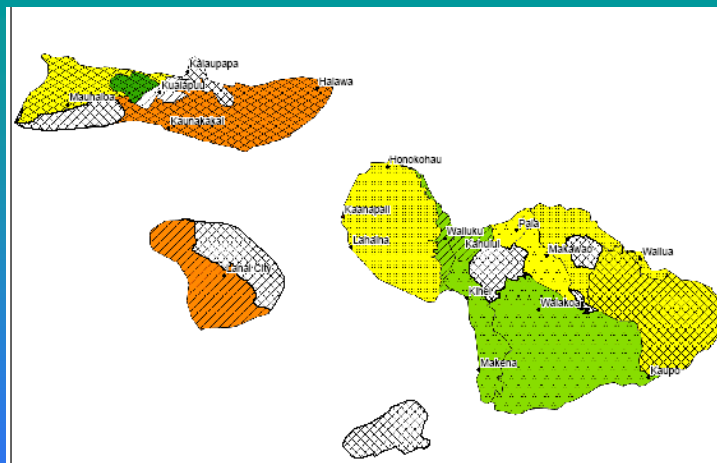
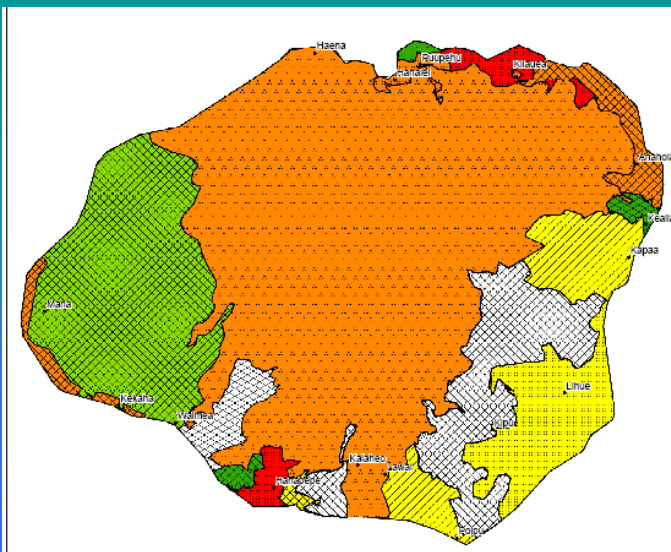


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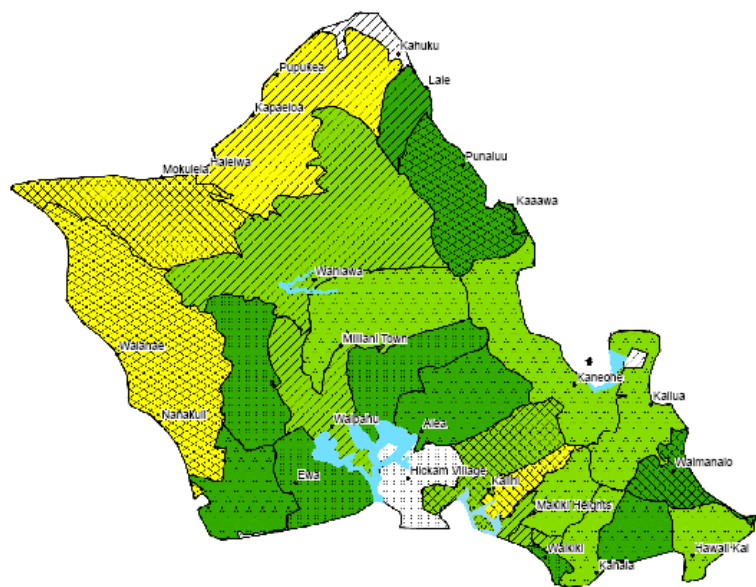
Socioeconomic Flow Diagram and Resilience Table



Area	Percent Persons Below Poverty Status	ReClass: Percent Below Poverty Status	Median House Hold Income	Reclass Median House Hold Income	Percent Income Assistance	Reclass Percent Income Assist.	Education: High School Diploma or Less	Reclass: High School Diploma or Less	Composite Score
Waianae	21.8	9	42401	5	25.5	10	0.67	9	33
Hawaii Kai	4	3	81028	1	2.3	1	0.23	1	6
Wiamanalo	9.8	4	49242	4	13.1	8	0.62	9	25
Kaneohe	5.3	3	68666	1	5.6	3	0.38	2	9
Punaluu	20.8	9	36832	7	16.2	9	0.51	6	31
Kailua (Big Island)	8.75	4	48264	4	5.5	3	0.42	3	14
Hilo (Big Island)	16.8	8	39290	6	9.6	8	0.45	5	27



**Variance of Fishing Importance(2000)
and Economic Vitality(1999-2000)
Oahu**



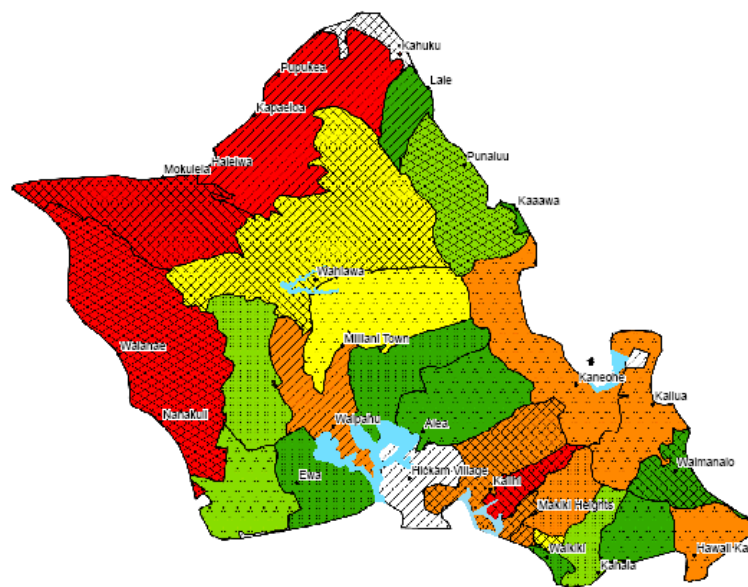
Legend

Economic Vitality	Fishing Importance
Very High	Very Low
High	Low
Moderate	Moderate
Low	High
Very Low	Very High
No Data	No Data



0 2 4 8 Miles

**Variance of Fishing Importance(2000)
and Economic Vitality(1999-2000)
Oahu
(categorized for Oahu only)**



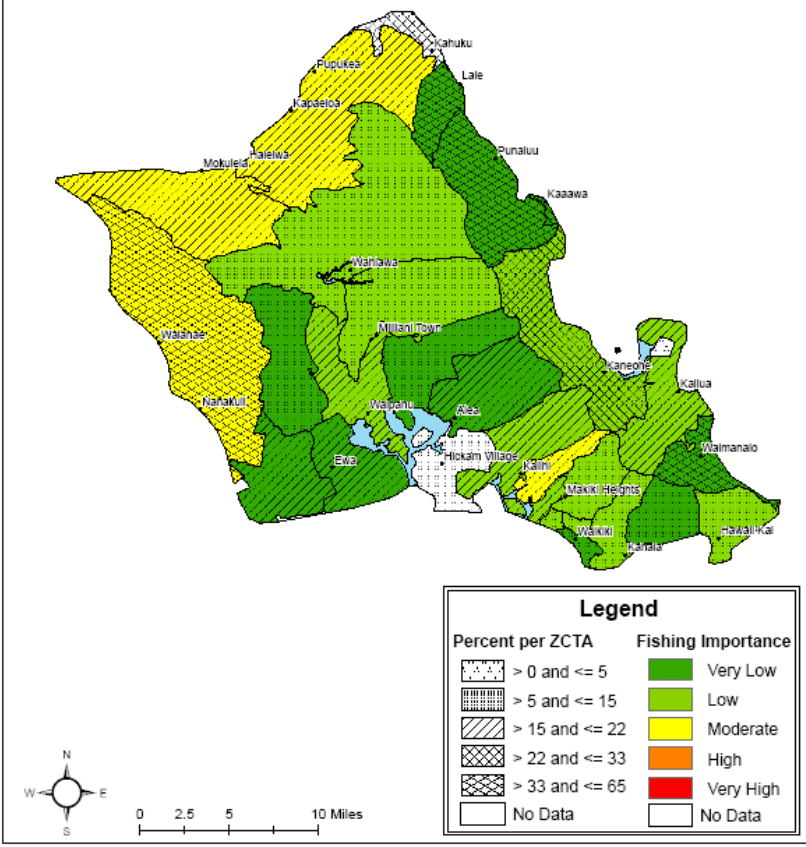
Legend

Economic Vitality	Fishing Importance
Very High	Very Low
High	Low
Moderate	Moderate
Low	High
Very Low	Very High
No Data	No Data

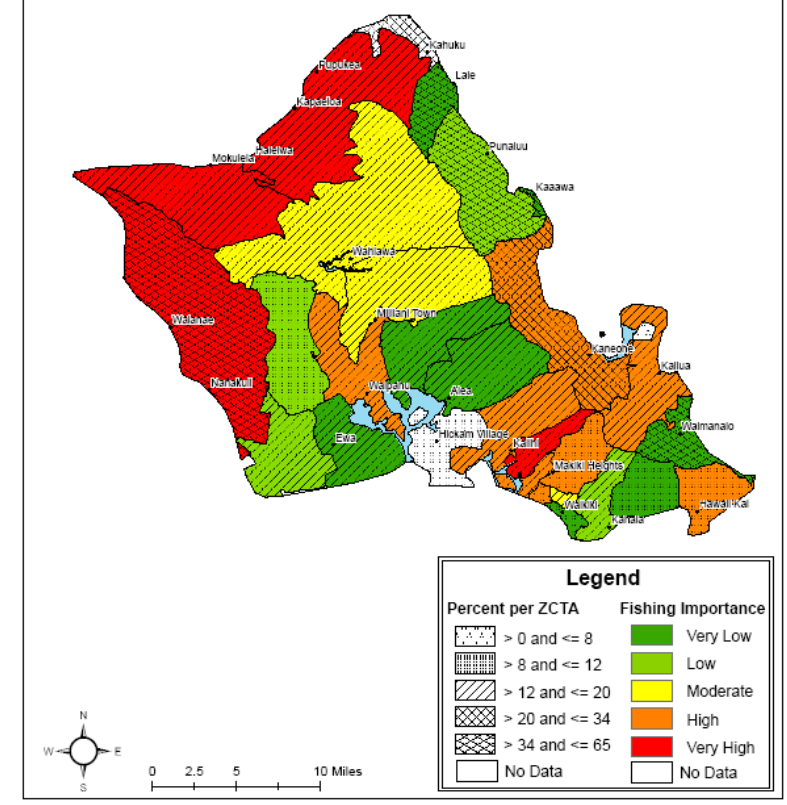


0 2 4 8 Miles

Percent Hawaiian or Pacific Islander and Fishing Importance
Oahu 2000



Percent Hawaiian or Pacific Islander and Fishing Importance
Oahu 2000
(categorized for Oahu only)

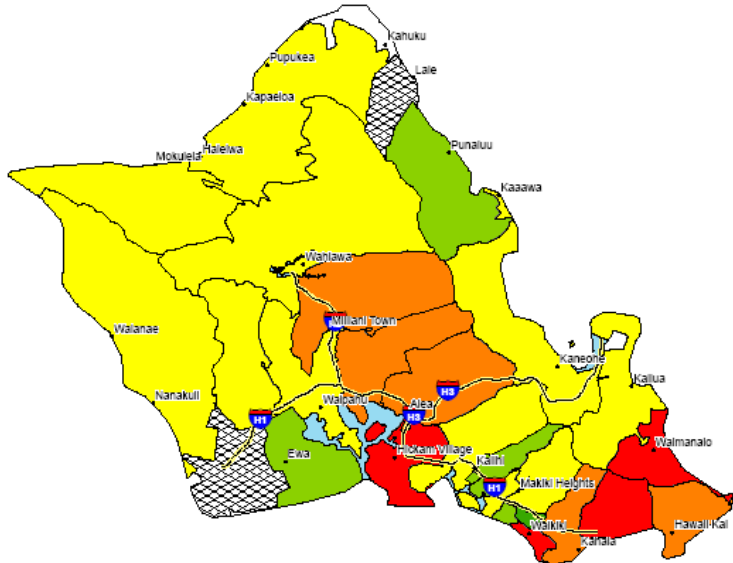


Other Demographic Analyses

Trend Analyses

C - 18

**Percent Change in Number of Days Fished
1995 to 2004
Oahu**



Legend

Standard Deviation Percent Change

- < -1.5 Std. Dev.
- 1.5 - 0.5 Std. Dev.
- 0.5 - 0.5 Std. Dev.
- 0.5 - 1.5 Std. Dev.
- > 1.5 Std. Dev.
- >100% change (excluded from sample)
- No Data

Statistics

Minimum -84%
Maximum 95%
Mean -14

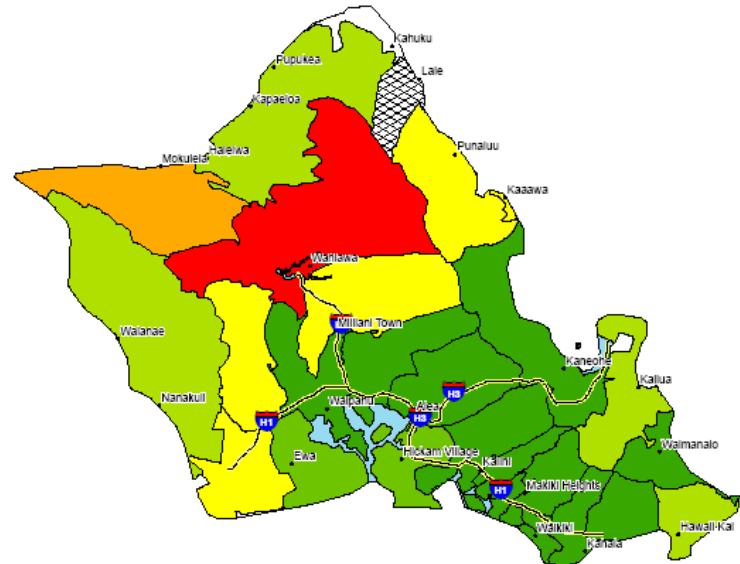
- Interstate
- Water Areas



0 1.252.5 5 Miles

C - 14

**Percent Change in Pounds of
Fish Caught 1995 to 2004
Oahu**



Legend

Percent Change Per ZCTA

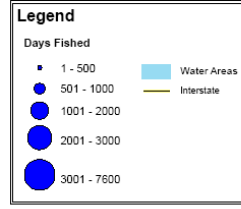
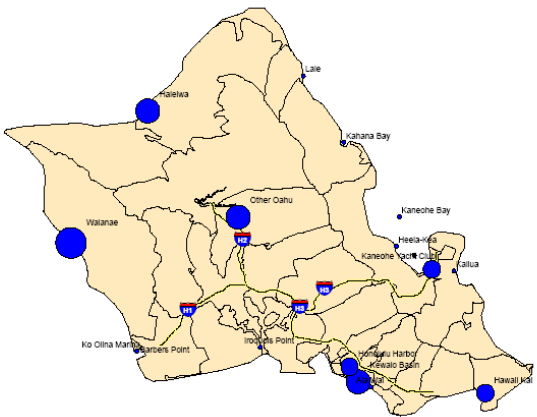
- > -100 and <= -75
- > -75 and <= -50
- > -50 and <= -25
- > -25 and <= 0
- > 0 and <= 25
- > 25 and <= 50
- > 50 and <= 100
- > 100 Increase
- None Reported

- Interstate
- Water Areas

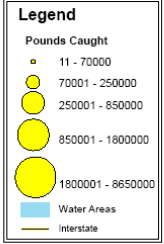
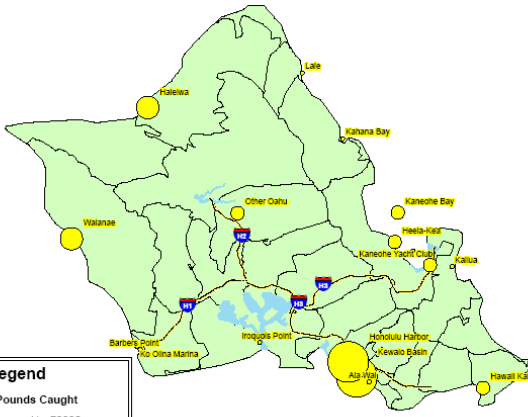


0 1 2 4 Miles

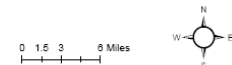
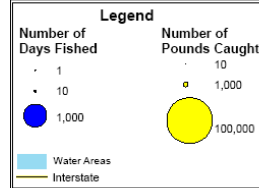
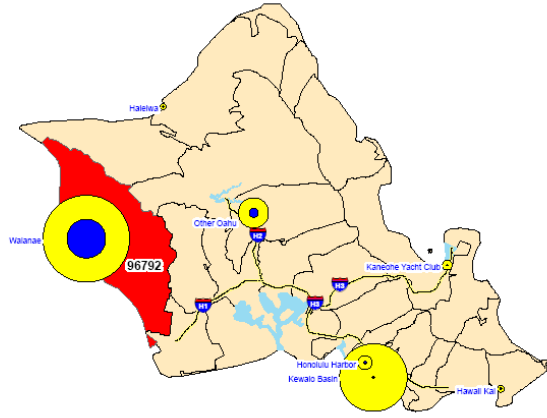
Days Fished by Port
Oahu 2000



Pounds Landed by Port
Oahu 2000



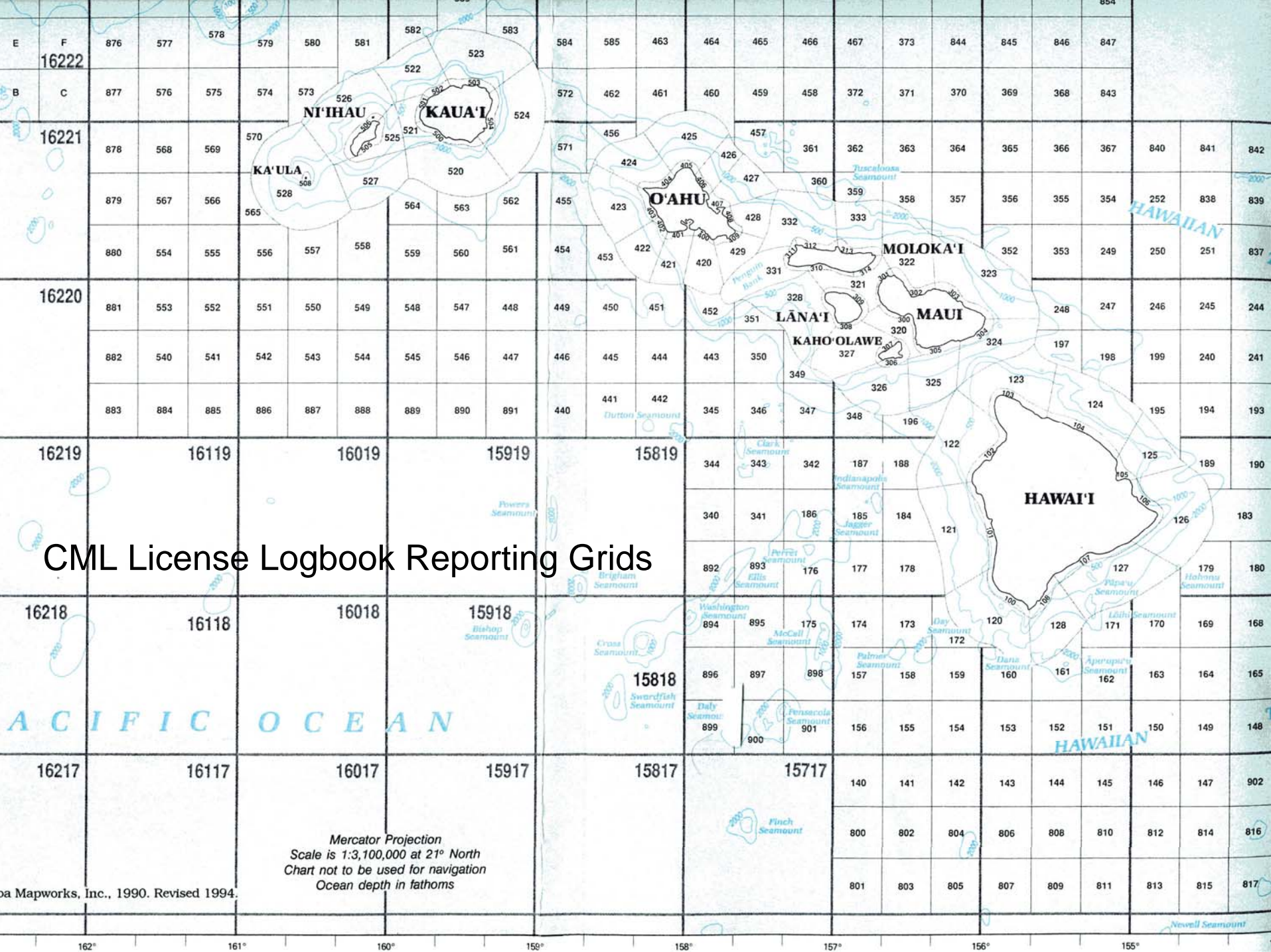
Ports Visited by Licenseholder Residence:
ZCTA 96792



Fishing Port Analyses

What Happens Next

- Evaluate and refine current fishing variables, models, and language
- Evaluate and refine current socioeconomic variables, models and language
- Ground-truth and peer review
- Incorporate fishing location, fish species, and value variables



CML License Logbook Reporting Grids

Mercator Projection
 Scale is 1:3,100,000 at 21° North
 Chart not to be used for navigation
 Ocean depth in fathoms

NOAA Mapworks, Inc., 1990. Revised 1994.

162° 161° 160° 159° 158° 157° 156° 155°