

# Artificial Reef Socioeconomics

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NOAA and Atlantic Marine Fisheries  
Commission

First Requirement: Avoid...

Death By

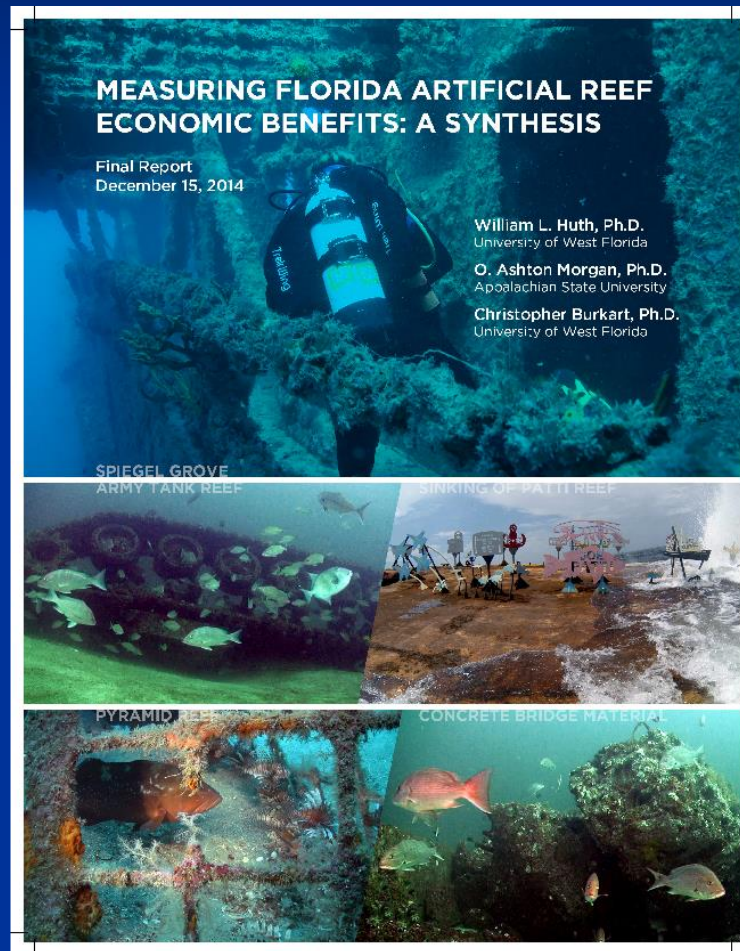


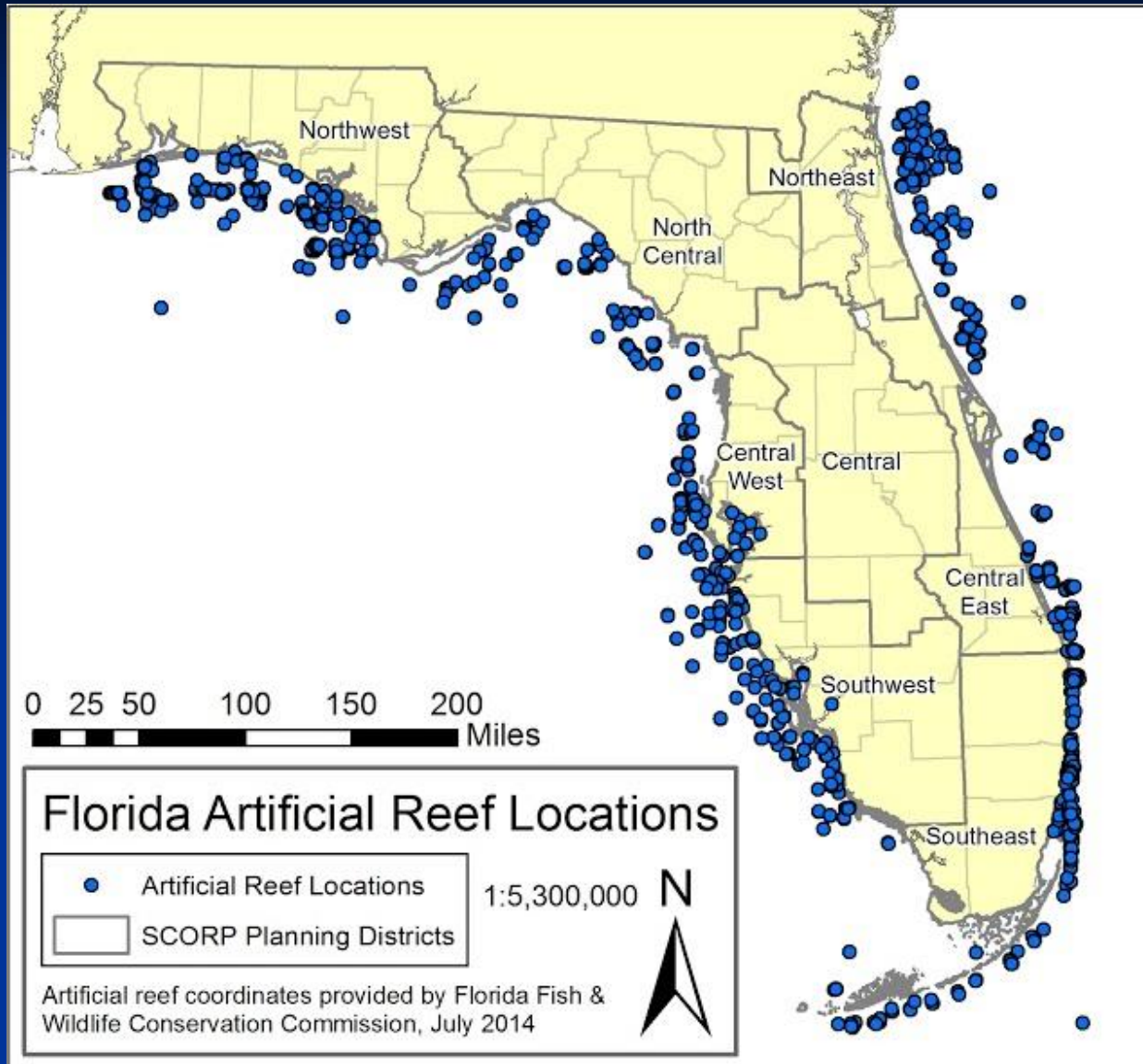
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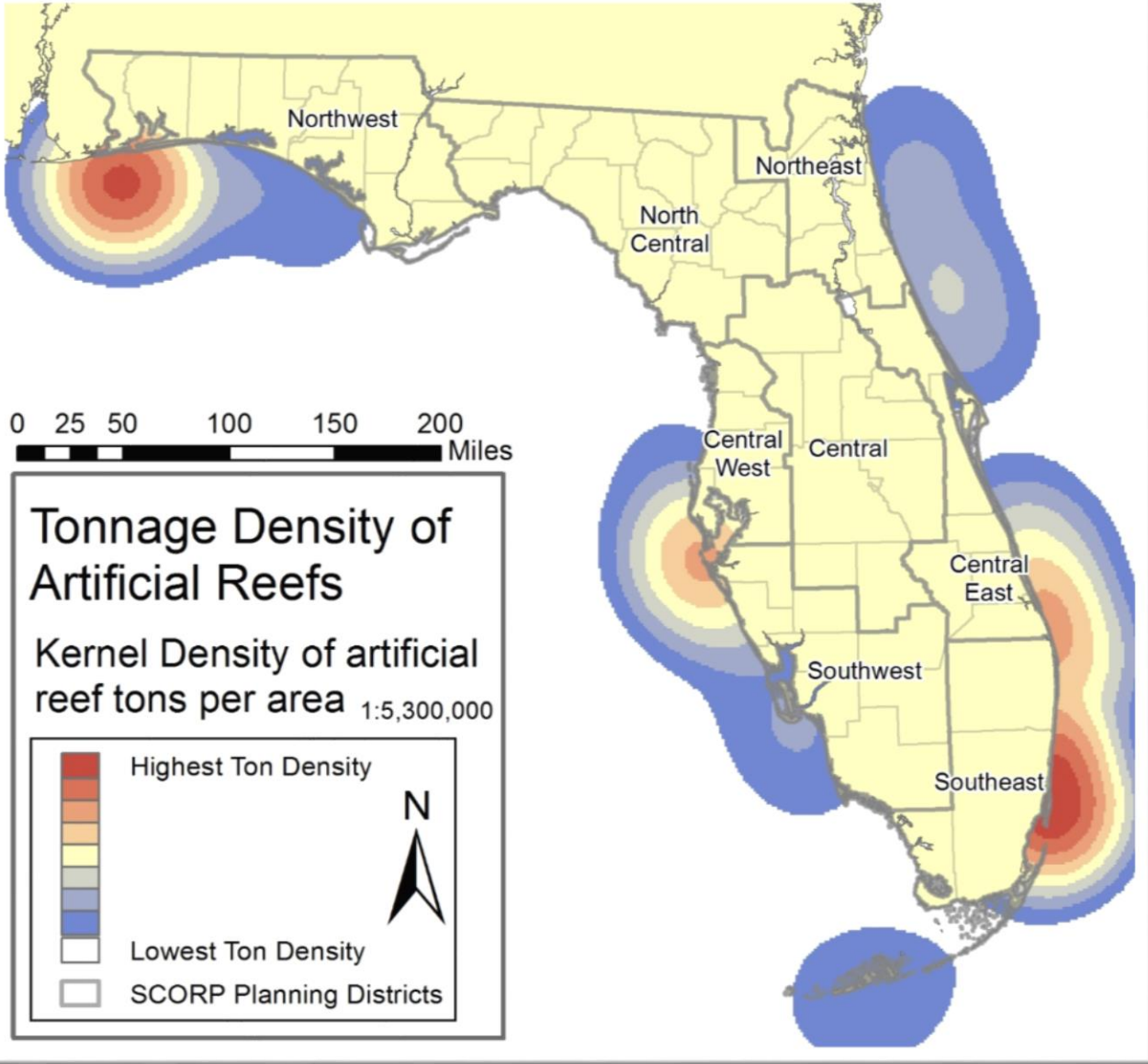
# Artificial Reef Socioeconomics Overview: Everything but the Kitchen Sink (and porcelain products might work in quantity with sufficient vertical relief)

Economics is threaded throughout the fishery management process and Magnuson-Stevens requires attention to the environmental, sociological, and economic aspects of fisheries... artificial reefs impact each of those performance elements.

# Artificial Reefs in Florida







Prepared for:  
Florida Fish and Wildlife Conservation Commission



ORISKANY AIRCRAFT CARRIER  
JOE PATTI REEF



PYRAMID REEF



REEF BALL



# Reef User Valuation

- Valuing artificial reefs is important in investment decision making and includes calculating economic impact and value along with other ecosystem service contributions.
- Reef stakeholders include those engaged in infrastructure development and reef users; commercial and recreational fishing and diving.



# Artificial Reef Economics 101

**Public Good:** A good that is non-rival and non-excludable. Your consumption doesn't reduce mine and we can consume it at will. Also a common property resource (tragedy of the commons).

**Consumer Surplus:** The benefit (Value) to consumers from paying a price less than what they were willing to pay. Travel Cost, CVM

**Economic Impact:** Direct impact is the expenditure injection, indirect/induced impacts are multiples of the initial expenditure and when combined yield total impact. Models: IMPLAN, REMI, MONASH.

# REMI Artificial Reef Economic Impacts: Florida Fishing and Diving

	Jobs	%	Output(\$M)	%	Income(\$M)	%	State Revenue (\$M)
Fishing	25,821	66	2,100.00	67	859.38	67	171.94
Diving	13,297	34	1,033.57	33	416.44	33	78.00
Total	39,118	100	3,133.57	100	1,275.82	100	249.94

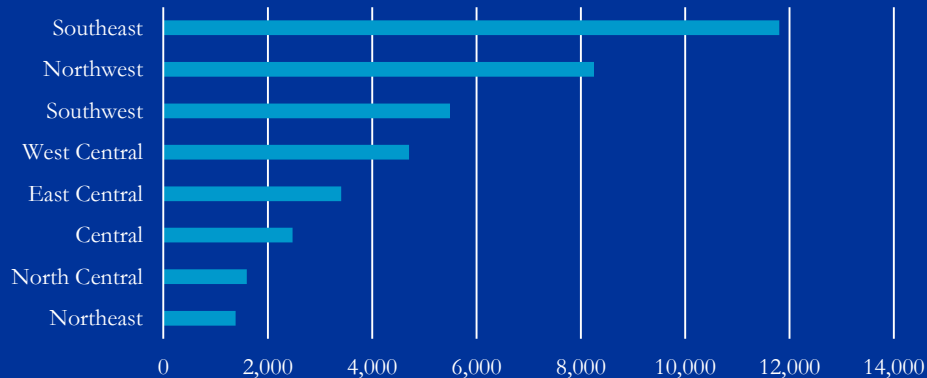
Results from the modeling indicated that fishing and diving activity on Florida artificial reefs

- Supports 39,118 jobs for Floridians.
- Generates \$3.1 billion of economic output.
- Accrues \$1.3 billion in income to Floridians.
- Produces \$250 million in state revenues for Florida.
- Endows reef users with a use value or consumer surplus of over \$700 million.

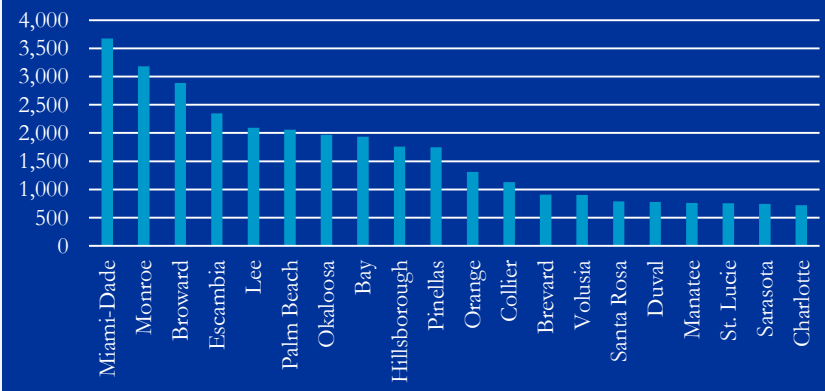
# Regional Artificial Reef Diving and Fishing Economic Impact

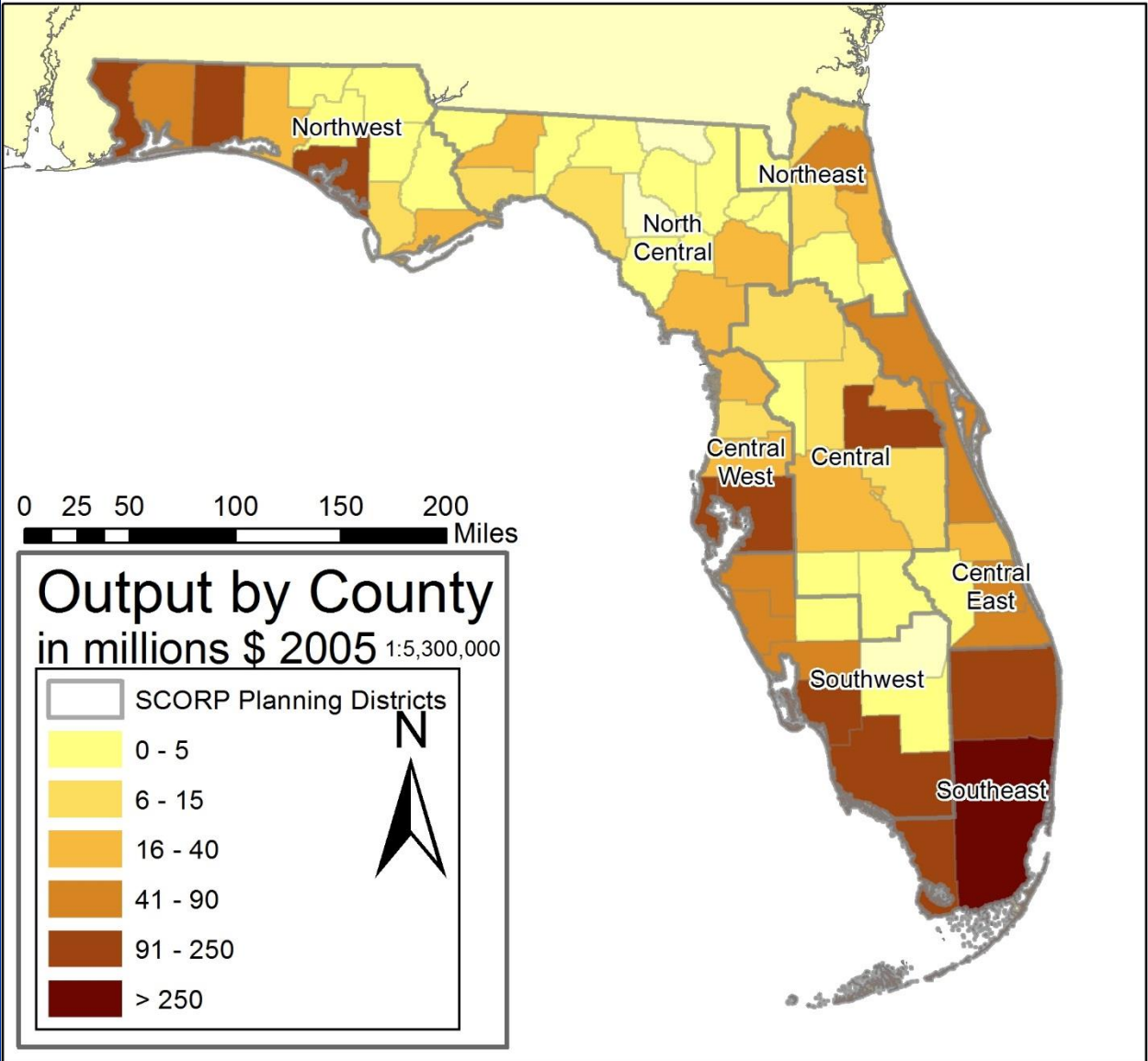
	Jobs	Percent	Output (\$m)	Percent	Income (\$m)	Percent
Northwest	8,253	21.10	533.34	17.02	200.56	15.72
North Central	1,595	4.08	99.18	3.17	36.80	2.88
Northeast	1,381	3.53	126.95	4.05	49.35	3.87
Central West	4,705	12.03	406.85	12.98	153.29	12.02
Central	2,477	6.33	250.95	8.01	97.11	7.61
Central East	3,407	8.71	250.37	7.99	99.74	7.82
Southwest	5,495	14.05	416.10	13.28	181.75	14.25
Southeast	11,805	30.18	1,049.81	33.50	457.22	35.84
<b>Florida</b>	<b>39,118</b>		<b>3,133.55</b>		<b>1,275.82</b>	

Total Artificial Reef Jobs by Florida Region



Jobs: Fishing and Diving, Top 20 Florida Counties





# Modeling Methods

- Valuation requires measuring willingness to pay which can be accomplished through contingent valuation and travel cost models of user stated and revealed preferences.
- Regular stakeholder attitude and opinion assessments regarding reefs can be inputs into fishery management modeling, policy formation, and decision making.

# Artificial Reef Economic Value

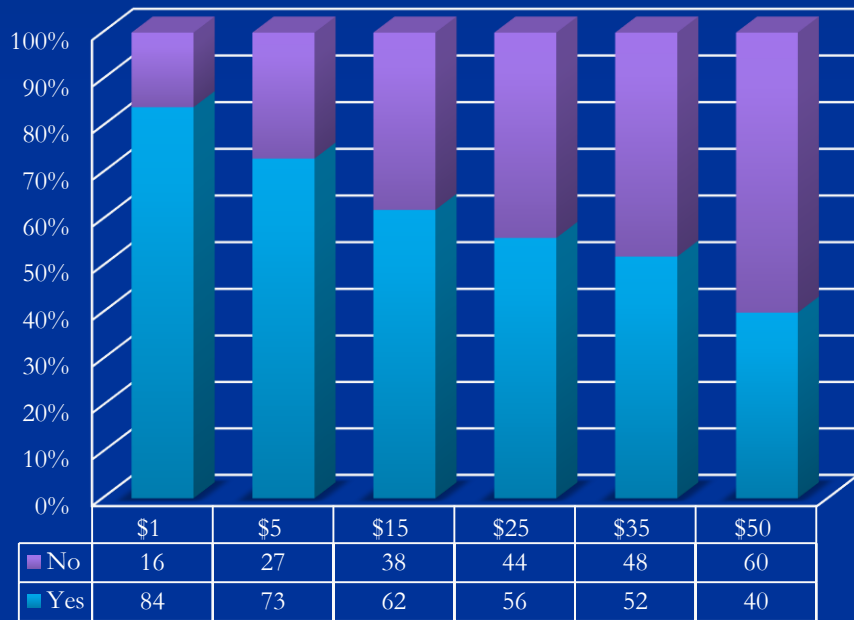
## ■ Contingent Valuation (Referendum method)

“Suppose that the Florida Legislature increases the funding available to Florida Fish and Wildlife to support new artificial reef development around the state but requires local areas to share in the cost of the new reefs and that cost share would take the form of an increase in your saltwater fishing license fee of  $\$fee$ . If a local referendum of Florida fishing license holders was held on the fee increase and if at least 50% vote for the fee it will be put into practice would you vote FOR the fee increase?”

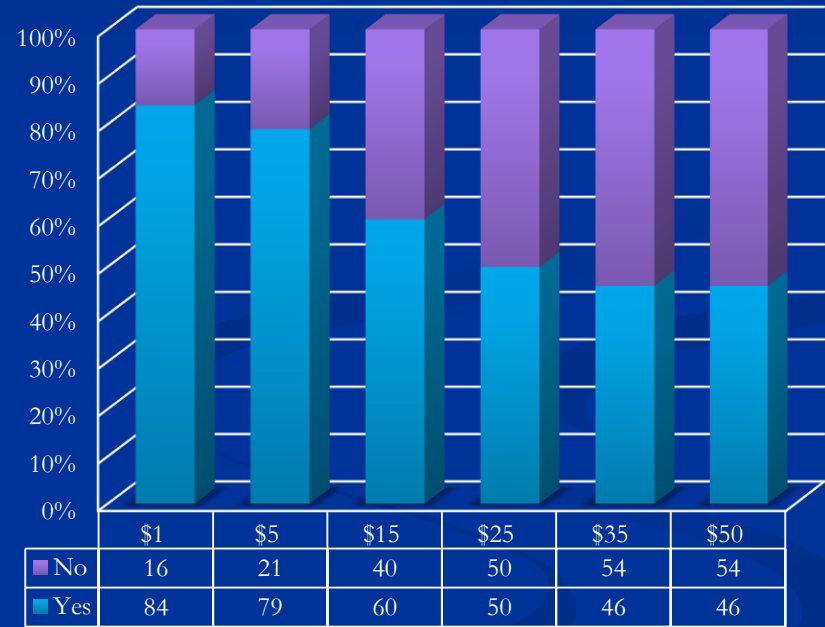
- where  $\$fee$  was varied randomly across research participants with each participant receiving either a fee increase of either \$1, \$5, \$15, \$25, \$35, or \$50.

# Willingness to Pay (WTP) for New Artificial Reefs: Referendum Results

Resident



Nonresident



# Fishing and Diving Use Values

Fishing		Number	Annual WTP (\$)				Use Value (\$M)			
			Mean	Lower Bound	Upper Bound	Turnbull	Mean	Lower Bound	Upper Bound	Turnbull
Licenses	Res.	926,481	32.47	30.31	34.65	26.47	30.1	28.1	32.1	24.5
	Nonres.	143,413	31.78	27.76	36.67	25.08	4.6	4.0	5.3	3.6
						Total	34.7	32.1	37.4	28.1
Charter Boats	Res.	619,954	26.47	26.47	26.47	26.47	16.4	16.4	16.4	16.4
	Nonres.	1,403,396	25.08	25.08	25.08	25.08	35.2	35.2	35.2	35.2
						Total	51.6	51.6	51.6	51.6
						Total Fishing Use Value (\$M)	86.3	83.7	89.0	79.71

		Number of Divers	Mean Trips	Total Trips	WTP \$/trip	Use Value (\$M)
Diving	Resident	581,897	4.00	2,327,588	200.00	465.5
	Nonresident	797,414	1.00	797,414	200.00	159.5
					Dive Total	625.0

Total Annual Use Value/ Consumer Surplus: \$711.3 Million



# Data Acquisition to Support Socioeconomic Modeling

- Valuation and assessment can be accomplished using state fishing license databases and the National Angler Registry to recruit and manage an online research panel to provide statistically representative sampling using survey instruments designed to address fishery management and artificial reef issues.
- Similar to commercial vendors: Knowledge Networks.

[www.knowledgenetworks.com/ganp/](http://www.knowledgenetworks.com/ganp/)

# REMI Spending Input Data: Saltwater Fishing License Database Surveys

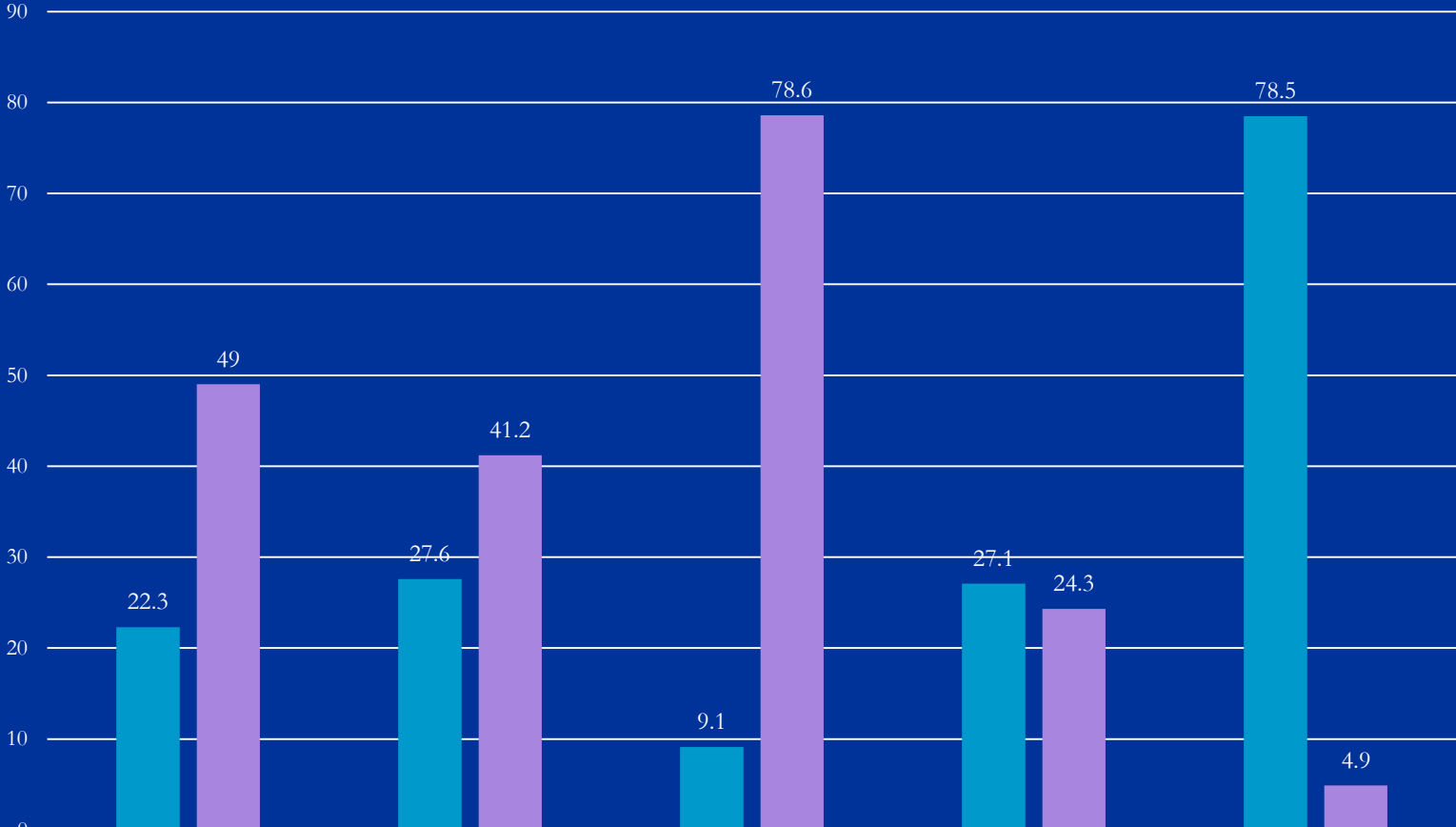
## ■ Florida Saltwater Fishing License Database Surveys

Saltwater Fishing License Group	Email Address Available?		Total
	Yes	No	
Florida Resident	510,589	415,892	926,481
Nonresident	68,598	74,733	143,331
Charter Boat Operator	1,162	2,668	3,830
Totals	580,349	493,293	1,073,642

# Florida Resident Attitudes and Opinions about Artificial Reefs (N=4,467)

Statements	Disagree				Agree			
	SD	MD	WD	NAD	SA	MA	WA	DK
The number of public artificial reefs sites in the area I fish is about right.	13	21.9	14.1	19.2	2.4	13	6.9	9.5
The diversity of public artificial reef types in the area I fish is about right.	9.9	18.1	13.2	21.1	2.6	16.1	8.9	10
The State of Florida is investing too many resources in the development of new artificial reefs.	43.5	28.1	7	10.9	1.3	1.5	1.3	6.3
I would rather fish on an artificial reef than a natural bottom reef.	4.6	9.1	10.6	42.7	8.8	10.9	7.4	5.9
Artificial reefs supply fish habitat and increase the volume of desirable species available to be caught.	3	0.9	1	6.1	51.2	22	5.3	10.5

### Artificial Reef Attitudes

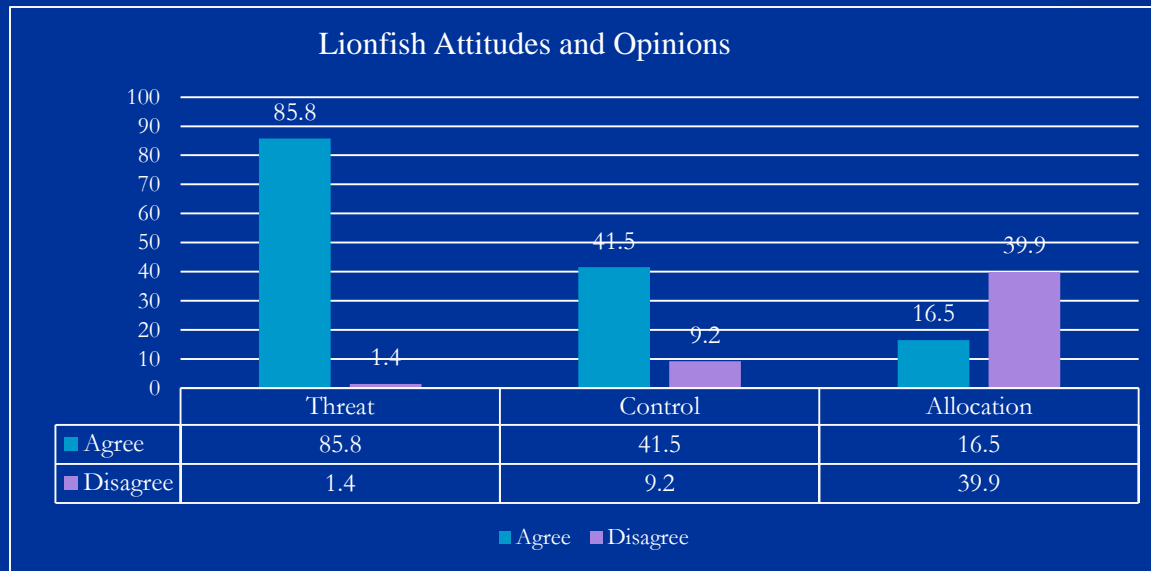


	Quantity	Diversity	Investment	AvN	Biomass
■ Agree	22.3	27.6	9.1	27.1	78.5
■ Disagree	49	41.2	78.6	24.3	4.9

■ Agree ■ Disagree

# Florida Resident Lionfish Attitudes and Opinions

	SA	A	NAD	D	SD
The lionfish is a serious threat to native species along the Florida coastline.	64.1	21.7	12.8	0.6	0.8
There are effective methods that could be used to control lionfish populations.	16.2	25.3	49.2	6.4	2.8
Government agencies are allocating the right amount of resources to lionfish control.	5.1	11.4	43.5	24.3	15.6



bullets kill people  
and presentations!



It's not death-by-powerpoint it's death-by-bulletpoint.



# Socioeconomic Discussion Items

- Economic value and economic impact
- Triple bottom line measures with added artificial reef fishery performance measures (see Anderson et al., 2015)
- Funding and return on investment: public good aspects, common property resource
- User attitudes and preferences: artificial (public and private), natural reefs, alternative structures, materials, placement

# Discussion Items (Continued)

- Reef Users: fishing, diving, and spear fishing, gear, effort, resident and nonresident
- Reef use and natural vs artificial relationships
- Online statistically representative artificial reef consumer research panel using state fishing license databases and the NOAA National Saltwater Angler Registry: survey research



# Discussion Items (Continued)

- Lionfish impacts and threat
- Ecosystem services and valuation
- Artificial reef fishery management issues (see, Bortone et al., 2011)
- Existing research sharing and clearinghouse (see FWC reef literature)

# Not the Best Deployment Strategy



What about this: CTUs  
<http://strikelinescharts.com/>





Thank You, Questions?  
Contact us: [whuth@uwf.edu](mailto:whuth@uwf.edu)