

# Trends, Power and Sample Size:

## Lessons learned from seven years of coral reef monitoring



Jeff Miler  
William\_J\_Miller@nps.gov

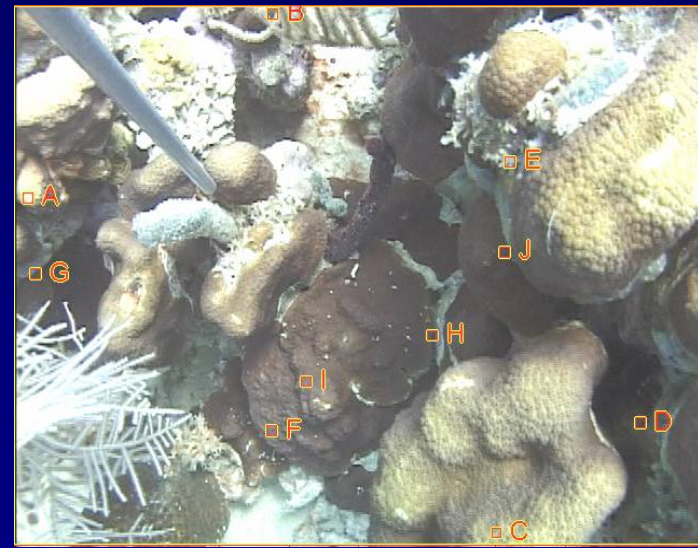
Dr. Andrea Atkinson  
Alexandra Wright  
Matt Patterson

Rob Waara  
Brian Witcher  
Dr. Kevin R.T. Whelan

**South Florida/Caribbean Network I&M Program**



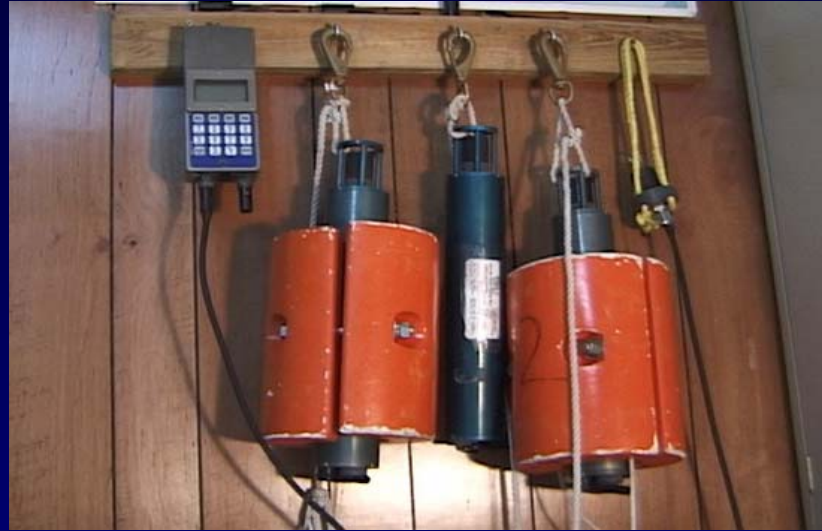
# Coral Reef Monitoring Protocol



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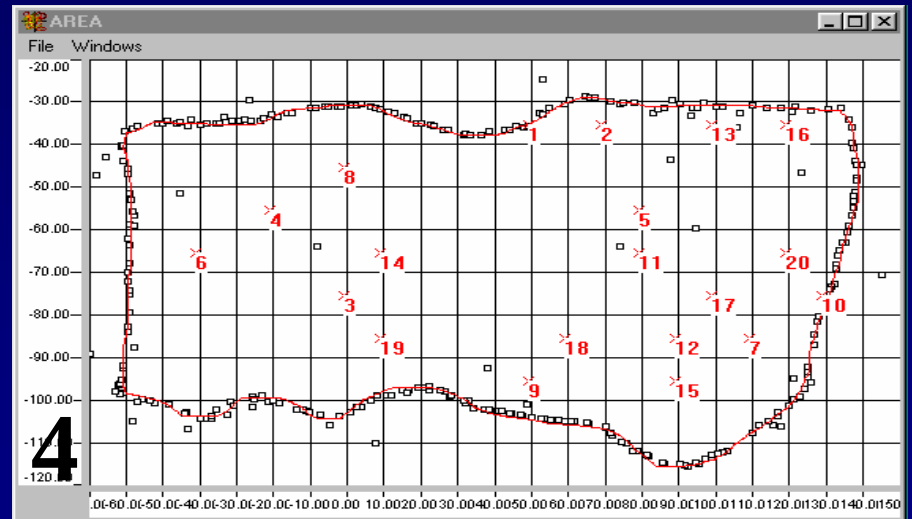
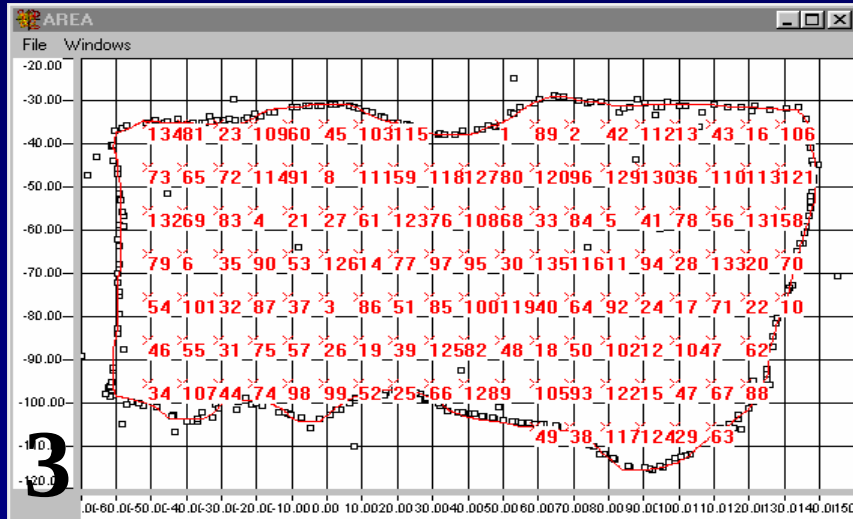
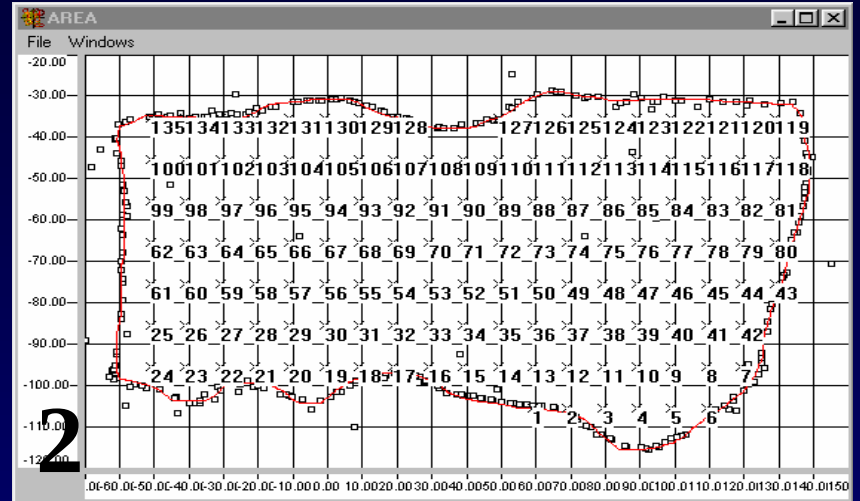
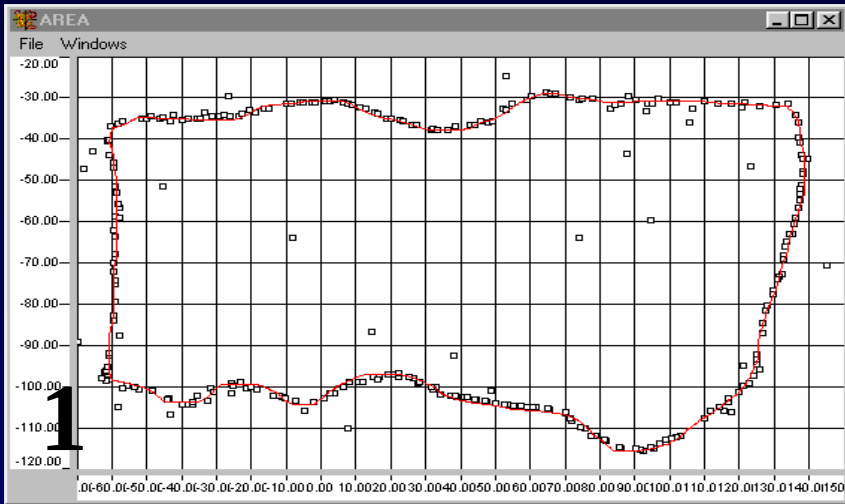
# Coral Reef Monitoring Protocol



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# Coral Reef Monitoring Protocol



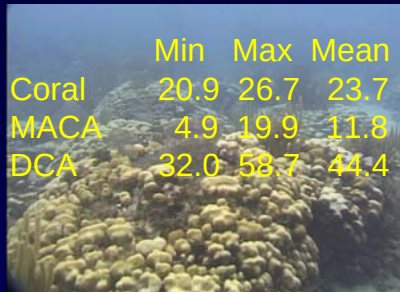
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# Virgin Islands National Park



# Virgin Islands National Park

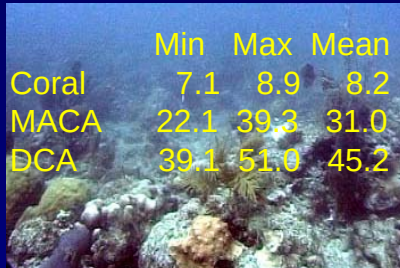


Mennebeck Reef  
Virgin Islands NP  
Sampled: 2000-2005  
Area= 12,495 m<sup>2</sup>

Increase ( $p=0.0432$ )



Haulover Reef  
Virgin Islands NP  
Sampled: 2003-2005  
Area= 13,568 m<sup>2</sup>

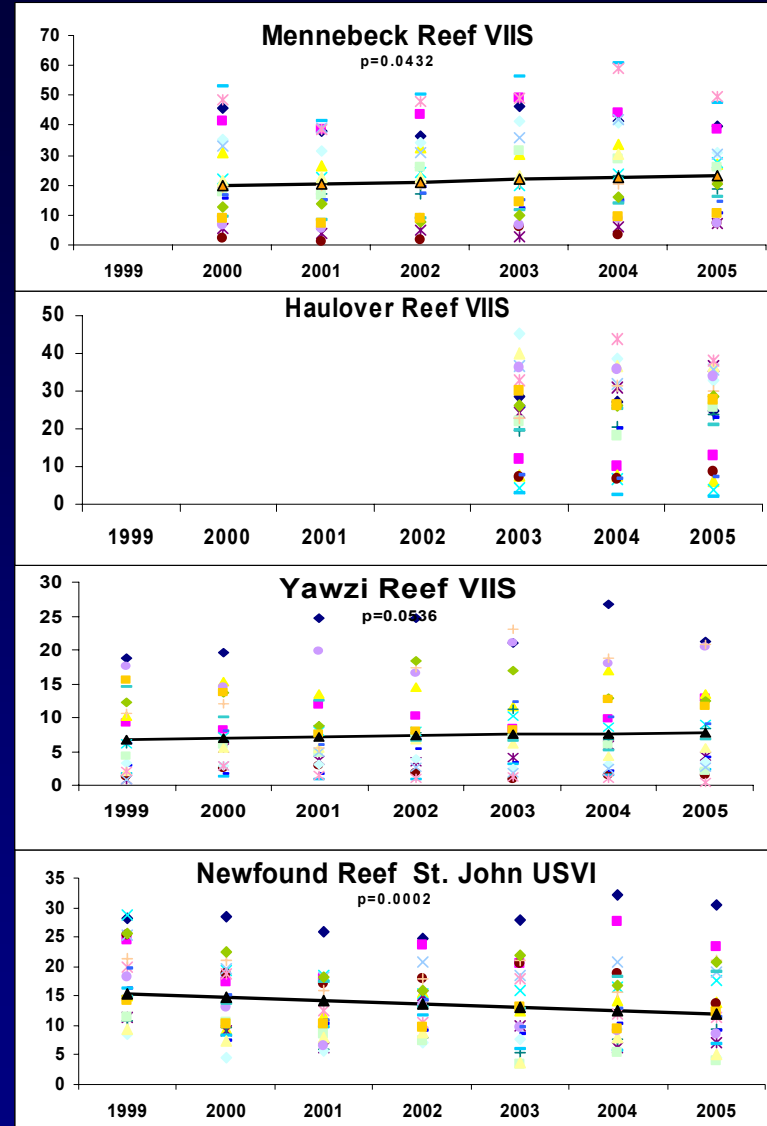


Yawzi Reef  
Virgin Islands NP  
Sampled: 1999-2005  
Area= 7,125 m<sup>2</sup>

Increase ( $p=0.0536$ )



Newfound Reef  
Outside Virgin Islands NP  
Sampled: 1999-2005  
Area= 13,768 m<sup>2</sup>  
Decrease ( $p=0.0002$ )



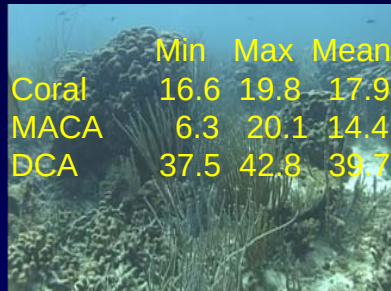
# Buck Island Reef National Monument



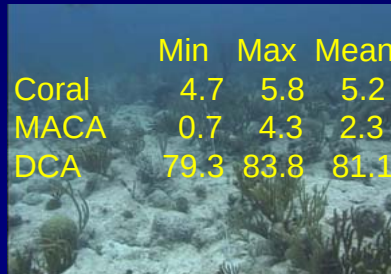
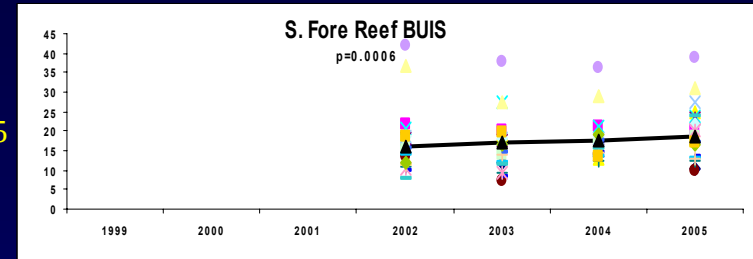
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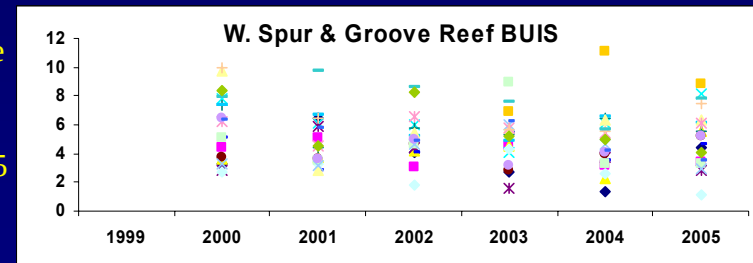
# Buck Island Reef National Monument



S. Fore Reef  
Buck Island RNM  
Sampled: 2000-2005  
Area= 26,365 m<sup>2</sup>  
Increase  
( $p=0.0006$ )

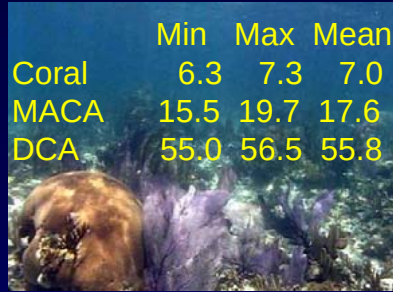


W. Spur and Groove  
Reef  
Buck Island RNM  
Sampled: 2002-2005  
Area= 40,753 m<sup>2</sup>

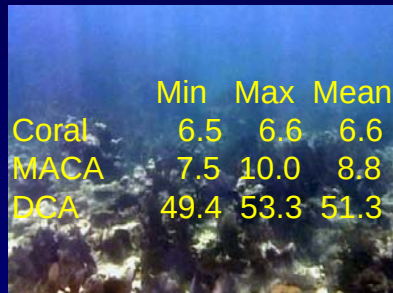
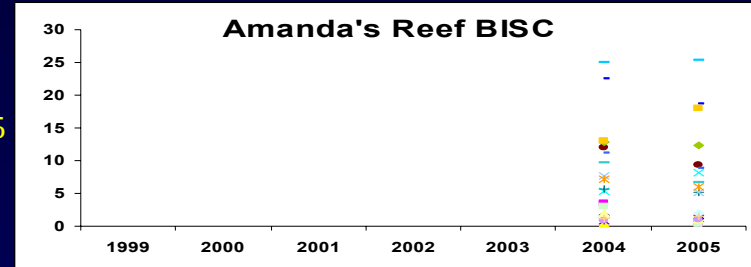


# South Florida National Parks

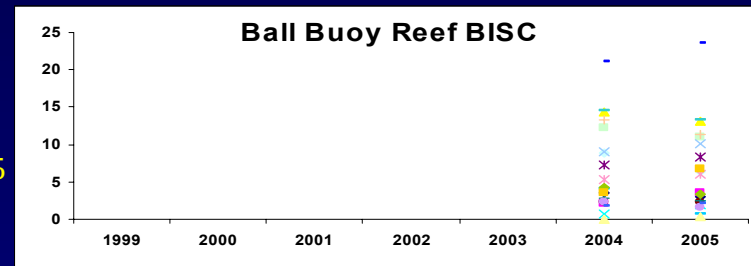
## Biscayne NP



Amanda's Reef  
Biscayne NP  
Sampled: 2004-2005  
Area= 20,240 m<sup>2</sup>



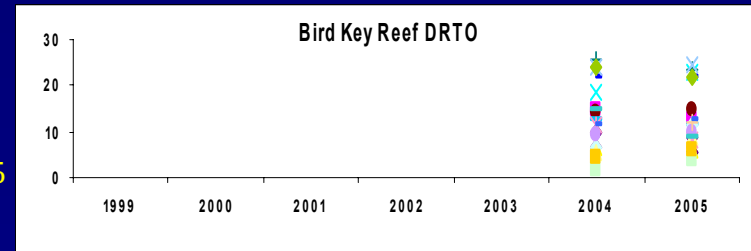
Ball Buoy Reef  
Biscayne NP  
Sampled: 2004-2005  
Area= 14,136 m<sup>2</sup>



## Dry Tortugas NP



Bird Key Reef  
Dry Tortugas NP  
Sampled: 2004-2005  
Area= 26,365 m<sup>2</sup>



# 2005 Coral Bleaching Event

S. Fore Reef, BUIS



95.6% coral  
cover bleached

Tektite, VIIS



90.2% coral  
cover bleached

Haulover, VIIS



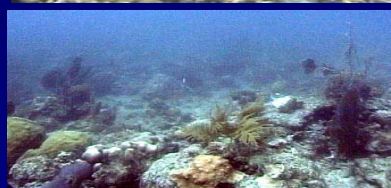
96.4% coral  
cover bleached

Mennebeck, VIIS



93.6% coral  
cover bleached

Yawzi, VIIS



70.9% coral  
cover bleached

Newfound, STJ



91.8% coral  
cover bleached

# Power – detect trend 25% over 5 years

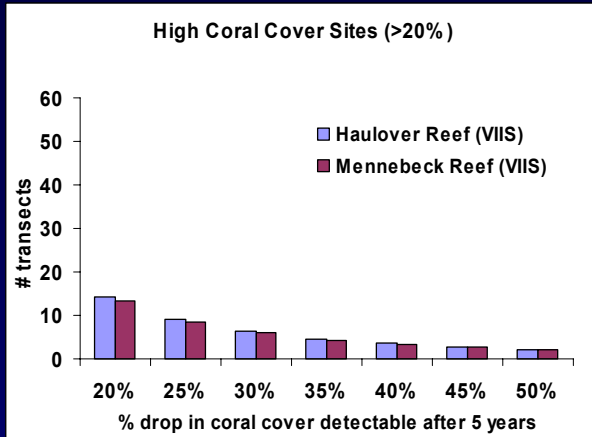
( $\alpha = 0.05$ , 20 permanent transects)

| Site (Park/Location)            | Power | Mean Coral Cover |
|---------------------------------|-------|------------------|
| Newfound Reef (STJ).....        | 92%   | 13.6%            |
| Yawzi Reef (VIIS).....          | 74%   | 7.3%             |
| Haulover Reef (VIIS).....       | 96%   | 22.3%            |
| Mennebeck Reef (VIIS).....      | 97%   | 23.7%            |
| W. Spur and Groove (BUIS) ..... | 76%   | 5.2%             |
| S. Fore Reef (BUIS).....        | 99%   | 17.9%            |
| Amanda's Reef (BISC).....       | 57%   | 7.0%             |
| Ball Buoy Reef (BISC).....      | 70%   | 6.6%             |
| Bird Key Reef (DRT0).....       | 91%   | 12.9%            |



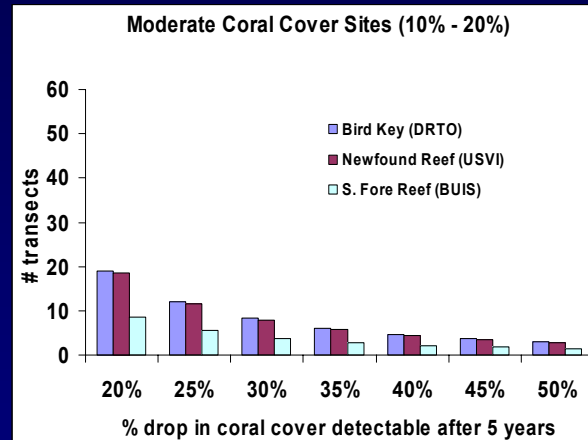
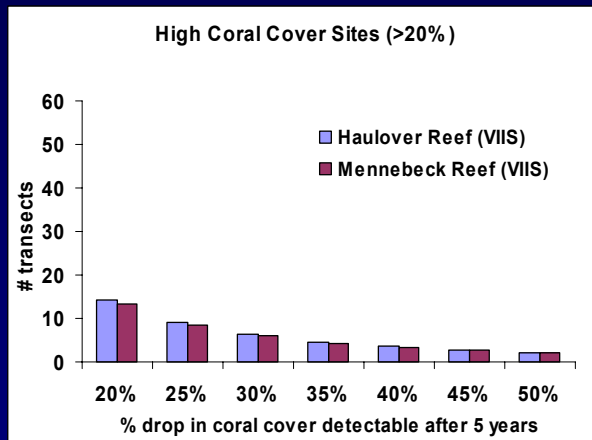
# Power – # of transects needed

( $\alpha = 0.05$ , 80% power)



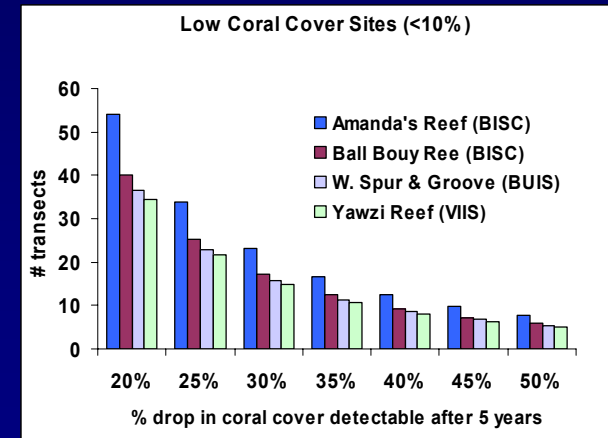
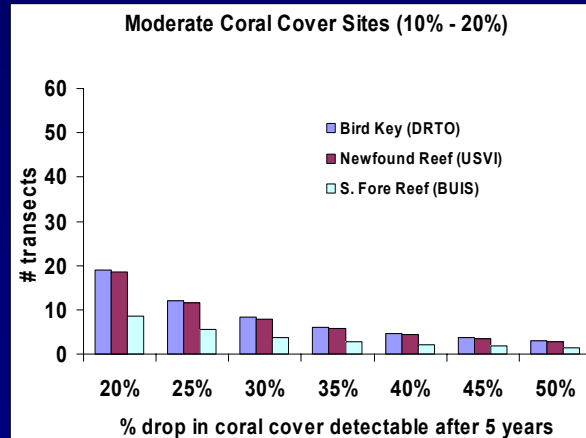
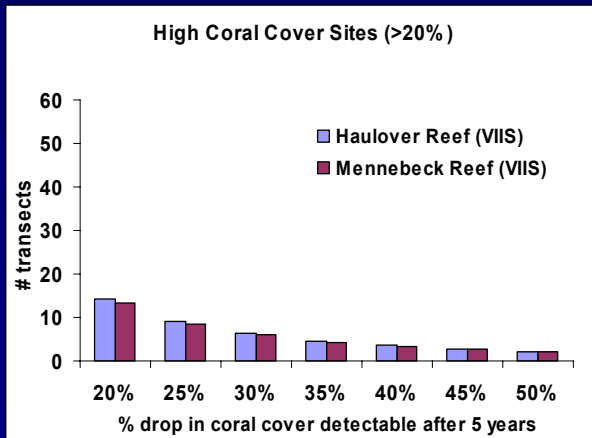
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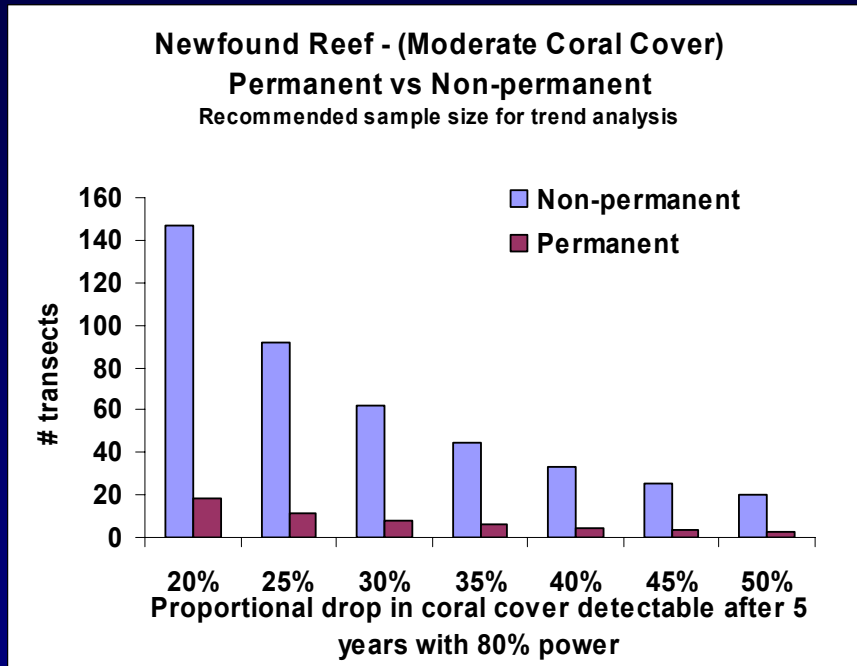
( $\alpha = 0.05$ , 80% power)



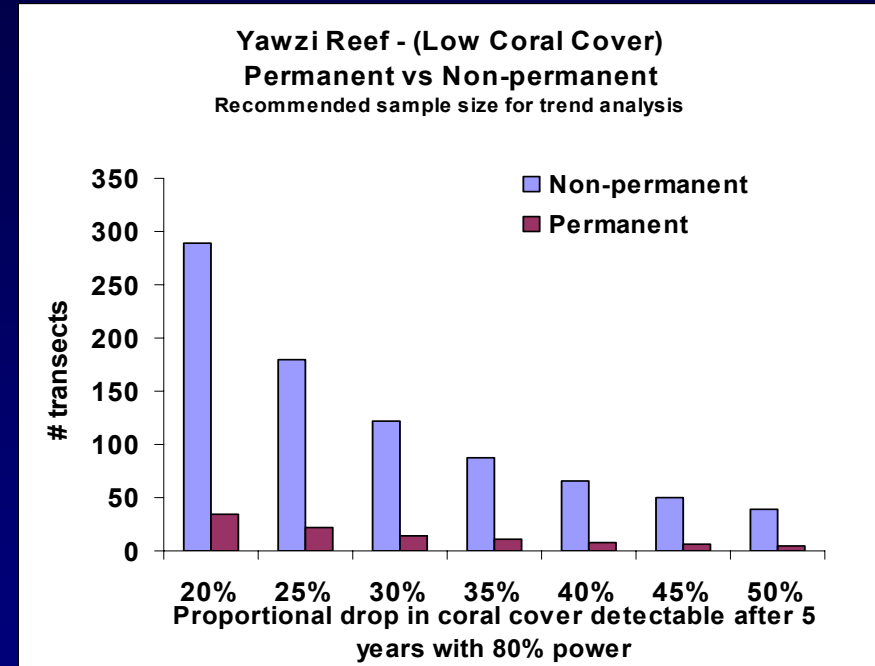
# Sample Size Comparison

## Permanent vs. Non-permanent Transects

( $\alpha = 0.05$ )



20 non-permanent transects: 21% power  
92 non-permanent transects: 80% power



20 non-permanent transects: 14% power  
181 non-permanent transects: 80% power