

FLORIDA KEYS NATIONAL MARINE SANCTUARY  
RESEARCH & EDUCATION PERMITS

GUIDELINES FOR SUBMITTING PERMIT REPORTS  
Interim Report & Final Report

Please submit all the requested information electronically (MS Word, rich text format, or PDF) to Scott Donahue ([Scott.Donahue@noaa.gov](mailto:Scott.Donahue@noaa.gov)), and Joanne Delaney ([Joanne.Delaney@noaa.gov](mailto:Joanne.Delaney@noaa.gov)).

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Permittee name and contact information (affiliation, address, phone, fax, e-mail):

Caitlin Lustic  
The Nature Conservancy  
127 Industrial Road, Suite D  
Big Pine Key, FL 33043  
(305) 872-7071 x110  
(305) 872-7072 fax  
[clustic@tnc.org](mailto:clustic@tnc.org)

Type of report: (contents are the same)

Interim report

Final report

### **Introduction**

Healthy coral reefs provide coastal protection, are centers of high biodiversity, and support a wide range of recreational and commercially important species of fish and invertebrates. In recent decades, there have been significant declines in the populations of the important reef building staghorn coral, *Acropora cervicornis*. The current project, funded by the 2009 American Recovery and Reinvestment Act (ARRA), is a regional effort aimed at aiding in the recovery of populations of threatened acroporid coral. These corals have relatively fast growth rates and can be easily propagated. This project will help to restore natural acroporid communities through the maintenance and establishment of nurseries in Florida and the USVI. Nurseries are being maintained or established within eight distinct sub-regions with the purpose of propagating the species and creating as many new colonies as feasible given limits on resources. Each of these nurseries are being managed by TNC or one of our partners: University of Miami RSMAS, Nova Southeastern University, Coral Restoration Foundation, Florida Fish and Wildlife Research Institute, Mote Marine Lab, and University of the Virgin Islands.

Over the course of the past two months, nursery-reared corals have been transplanted onto reefs that are known to have supported acroporid communities, with the hope that these corals will contribute to the reseeded of natural reefs. This report outlines the initial outplanting completed by Coral Restoration Foundation, Florida Fish and Wildlife Conservation Commission, and Mote Marine Laboratory within the Florida Keys National Marine Sanctuary.

## **Methodology**

### *Outplanting - General:*

Corals were chosen for outplanting based on their condition in the nursery. All corals outplanted met the following criteria:

1. For *A. cervicornis*, had at least 5 cm of linear growth;
2. For *A. palmata*, were at least 5cm in diameter;
3. Showed no visible signs of disease or injury;
4. Had 100% live tissue; and
5. Showed robust coloration, suggesting good health.

Corals were removed from the nursery and transported to the outplant site in seawater in a shaded, protective case to avoid injury, direct sunlight, or additional stress.



Corals are brought to the surface for transport to an outplant site.



Corals being transported to the outplant site in seawater.

All corals were outplanted either on a cement puck or disk, securely fastened to a nail driven into the substrate, or securely fastened directly to the substrate. The decision of how to outplant each coral depended on how the coral was grown in the nursery and its growth pattern.

### *Monitoring:*

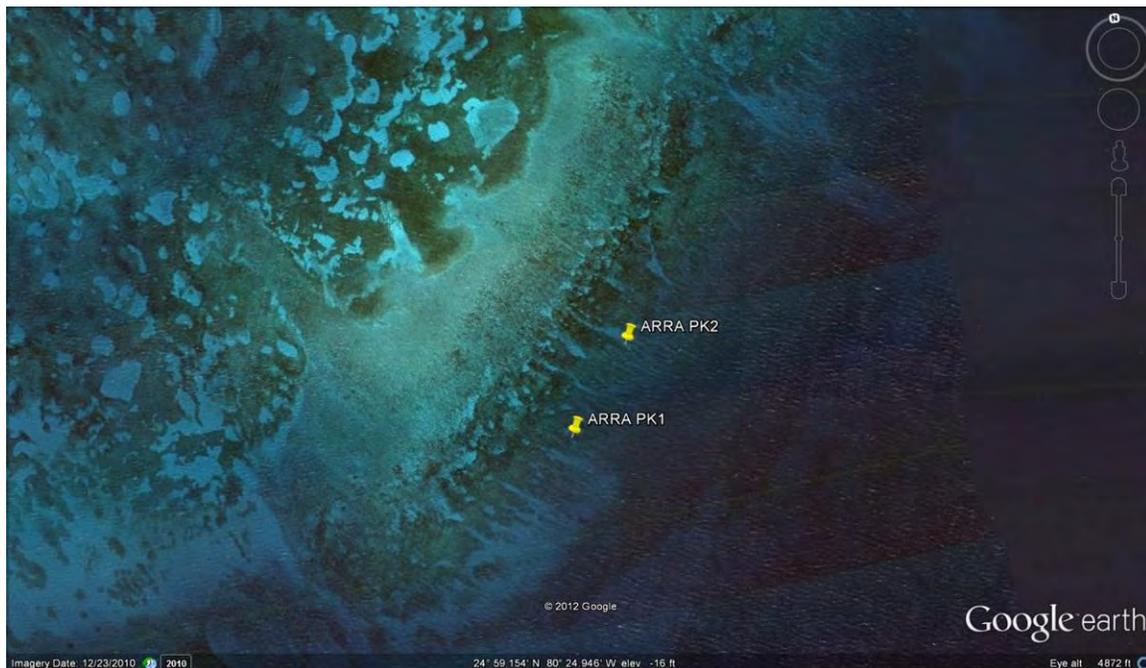
Monitoring of the outplanted corals will be completed at one month post-outplanting and again between 3 and 6 months post-outplanting. At each site, 5 replicates of each genotype will be monitored to give a representative sample of the entire site. Corals will be monitored for survivorship and condition. Maintenance at the site will include removal of predators (snails and fireworms) and reattachment of broken fragments.

## Results To Date

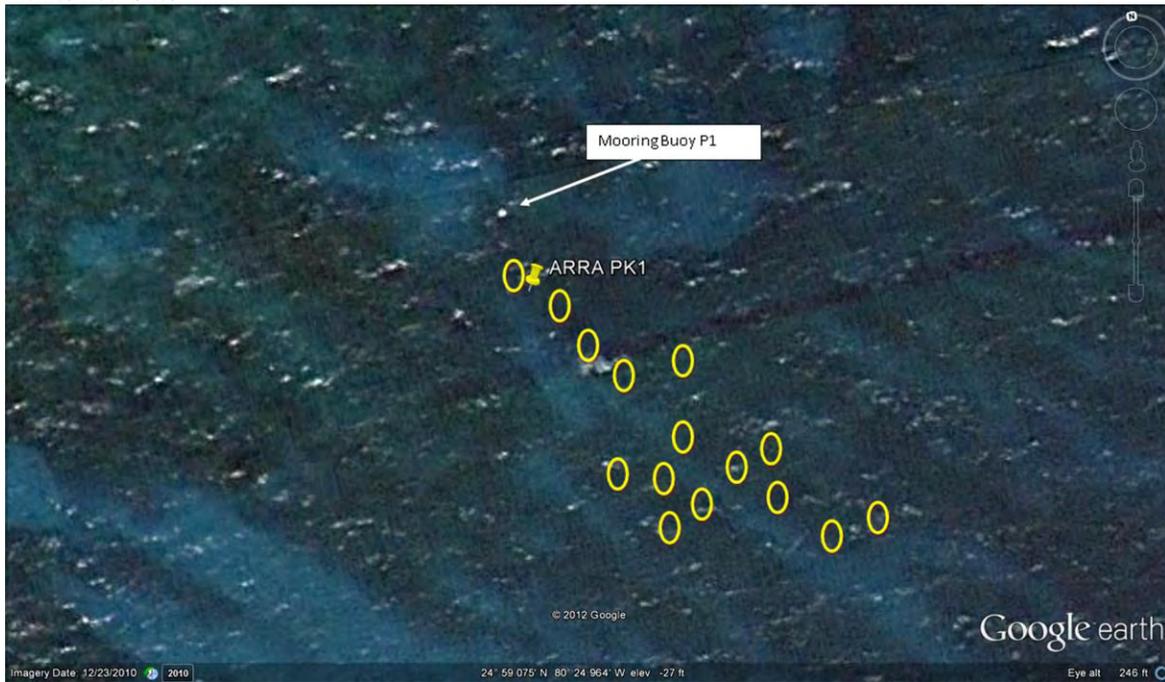
### *Upper Keys*

Outplanting in the Upper Keys took place in April and May 2012. A total of 1215 corals representing 17 distinct genotypes were outplanted to four reefs. All sites were planted in arrays of at least ten different genotypes, with five arrays of 10 specific genotypes replicated across all four sites. All outplanted corals represented the original 20 genotypes that were collected from wild colonies, and the corals were all grown on tree nurseries. All outplanted corals were at least 10 cm in length, and most were between 25cm and 50cm. Corals were secured on the reef with epoxy.

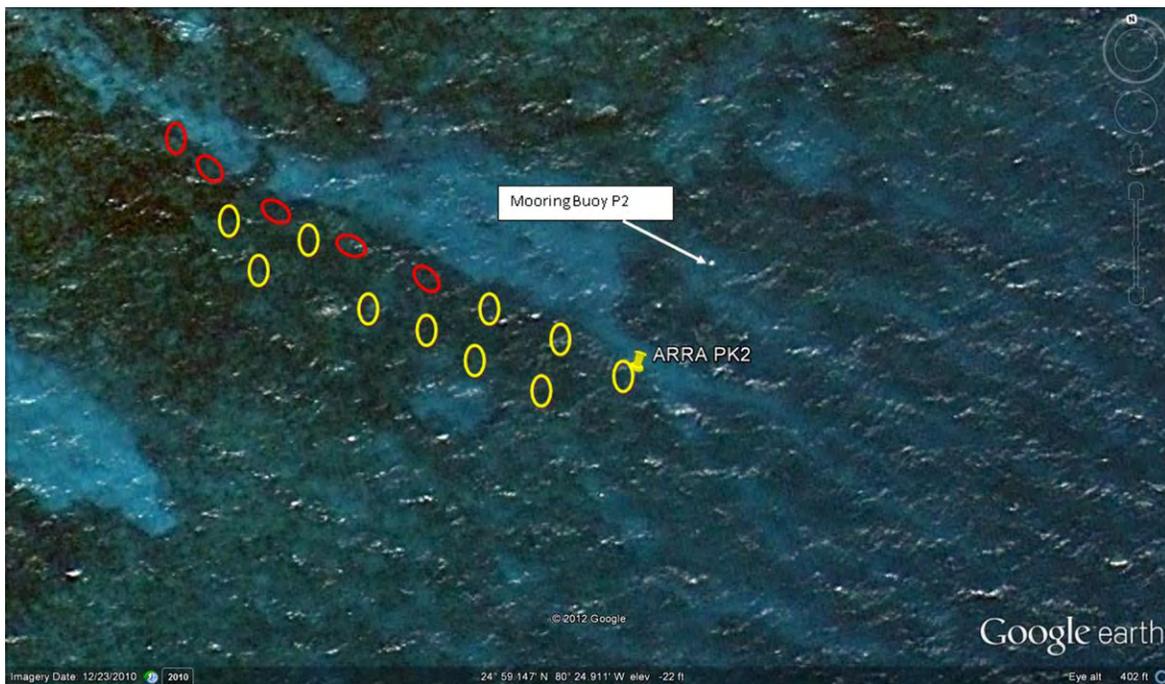
Reef	Site #	GPS Coordinates N	GPS Coordinates W	Number of Genotypes	Number of Corals	Site Depth	Date Completed
Pickles Reef	1	24.98462	-80.4161	10	150	20	April 23, 2012
	2	24.98575	-80.41513	10	150	20	April 24, 2012
Conch Reef	CNC Tags	24.95507	-80.45777	14	235	20-22	May 12 and May 21, 2012
	CN1 and CN2	24.95598	-80.45717	10	80	20	April 28, 2012
Molasses Reef	M8	25.00992	-80.37473	14	300	15-20	May 22-24, 2012
Key Largo Dry Rocks	3 and 4	25.12242	-80.29752	11	140	15	May 30-31, 2012
	1 and 2	25.12285	-80.29745	11	160	10-15	May 30-31, 2012



Pickles Reef Sites



Pickles Reef Site 1. Each array contains the following ten genotypes: U1, U3, U17, U44, U51, U53, U54, U55, U59, and U61.



Pickles Reef Site 2. Each array contains ten genotypes. The red arrays are marked with larger tags for future monitoring purposes. All arrays have the following genotypes: U1, U3, U17, U44, U51, U53, U54, U55, U59, and U61.



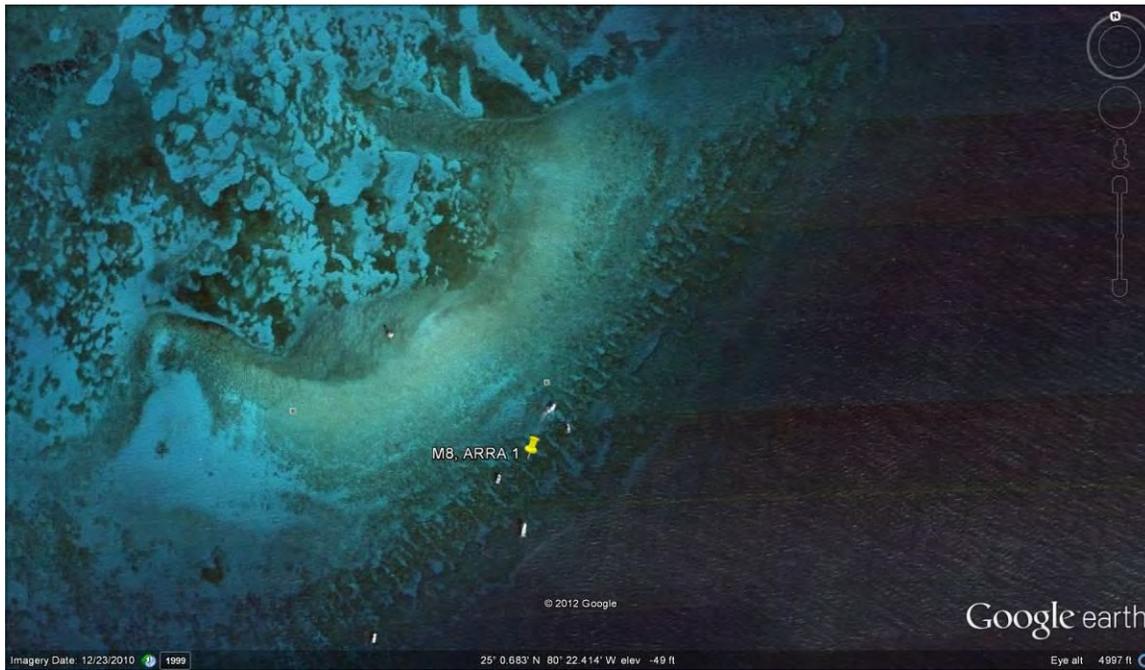
Conch Reef Sites.



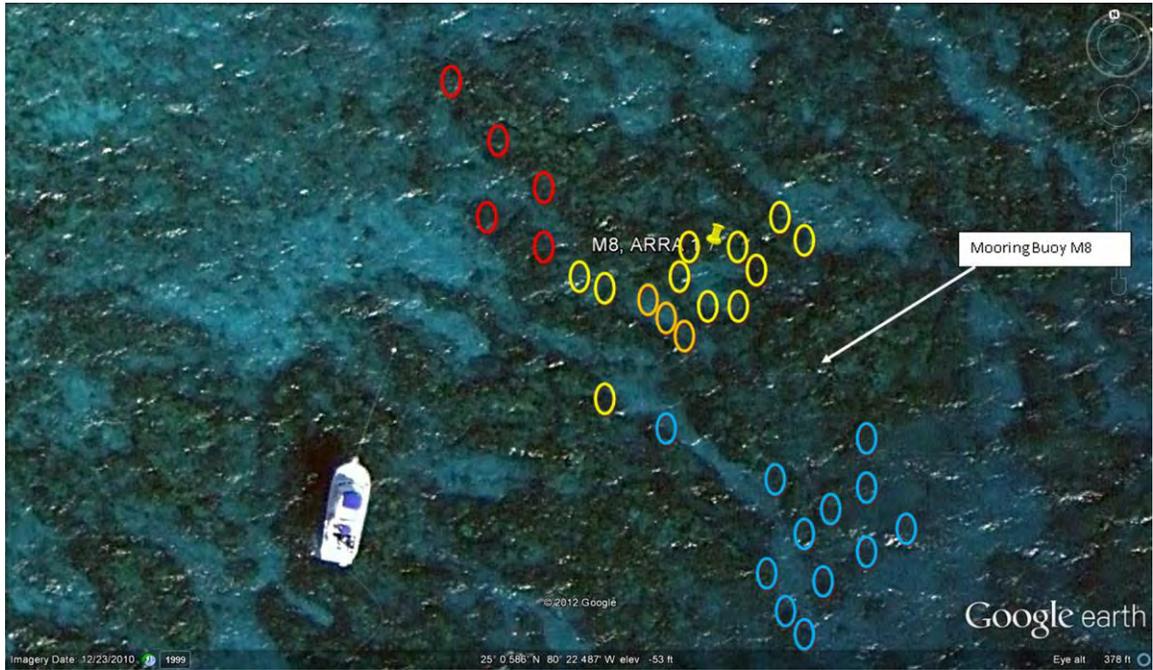
CNC Tags. The red and two orange arrays contain ten different genotypes: U1, U3, U17, U44, U51, U53, U54, U55, U59, and U61. The yellow arrays contain 11 genotypes: U1, U3, U51, U53, U55, U57, U59, U61, U62, U63, and U64.



Conch Reef CN1 and CN2. All arrays contain the same 10 genotypes: U1, U3, U17, U44, U51, U53, U54, U55, U59, and U61.



Molasses Reef.



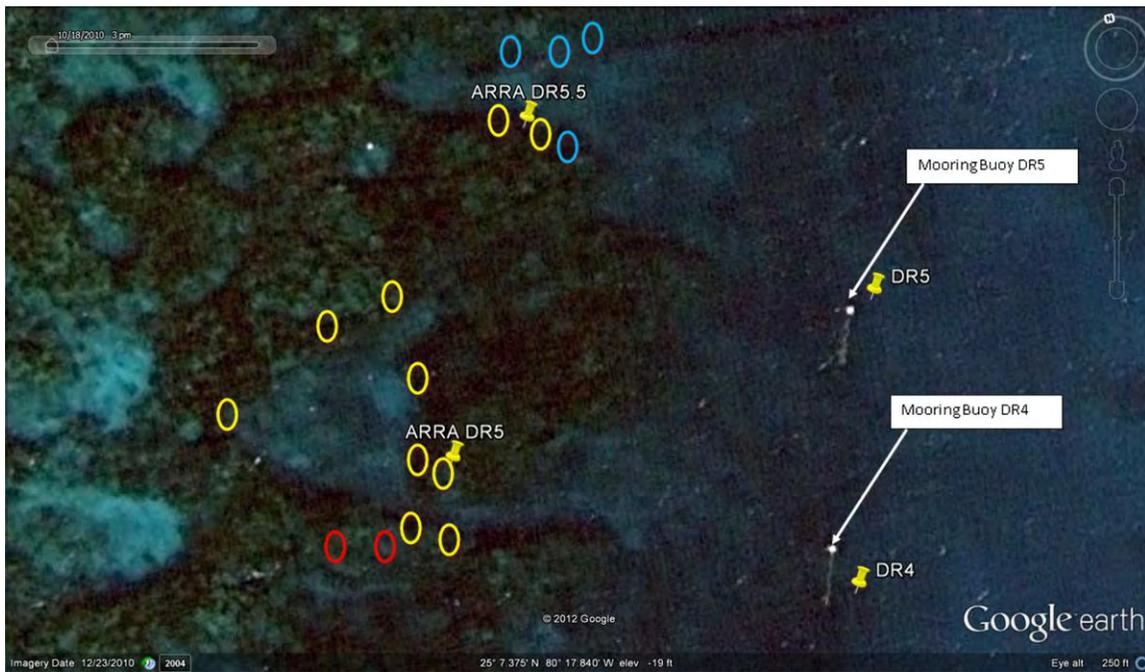
Site M8. The red arrays contain the following 10 genotypes: U1, U3, U17, U44, U51, U53, U54, U55, U59, and U61. The orange arrays contain the following ten genotypes: U1, U3, U17, U44, U51, U53, U55, U59, U60, and U64. The yellow arrays contain the following ten genotypes: U1, U3, U17, U44, U51, U53, U55, U58, U59, and U61. The blue arrays contain the following ten genotypes: U1, U3, U17, U44, U51, U53, U55, U56, U59, and U61.



Key Largo Dry Rocks.



DR3 and DR4 Site. The red arrays contain the following ten genotypes: U1, U3, U17, U44, U51, U53, U54, U55, U59, and U61. The blue arrays contain the following ten genotypes: U1, U3, U17, U44, U51, U53, U54, U55, U56, and U59.



DR1 and DR2 Site. The red arrays contain the following ten genotypes: U1, U3, U17, U44, U51, U53, U54, U55, U59, and U61. The blue arrays contain the following ten genotypes: U1, U3, U17, U44, U51, U53, U54, U55, U56, and U59. The yellow arrays contain the following ten genotypes: U1, U3, U17, U44, U51, U53, U54, U55, U56, and U59.

Parent colony locations.

Name	GPS Coordinates N	GPS Coordinates W
U1	24.95903	-80.49078
U3	24.9574	-80.49238
U17	25.00253	-80.42318
U44	24.98812	-80.46372

U51	24.9816	-80.4438
U53	24.95338	-80.48663
U54	24.95252	-80.48878
U55	24.9463	-80.4708
U56	24.83218	-80.64077
U57	24.83053	-80.64377
U58	24.8317	-80.64195
U59	24.81312	-80.66913
U60	24.81293	-80.66957
U61	25.14002	-80.31463
U62	25.13558	-80.28930
U63	25.12995	-80.2947
U64	25.13983	-80.29525



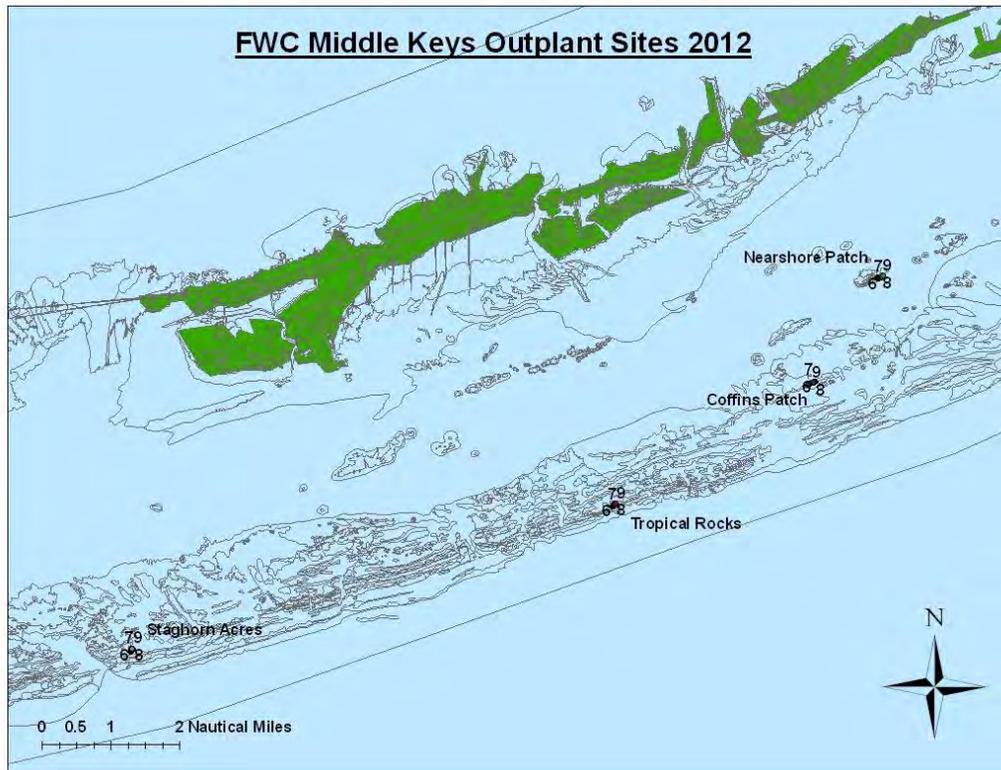
© CRF/Tim Grollmund

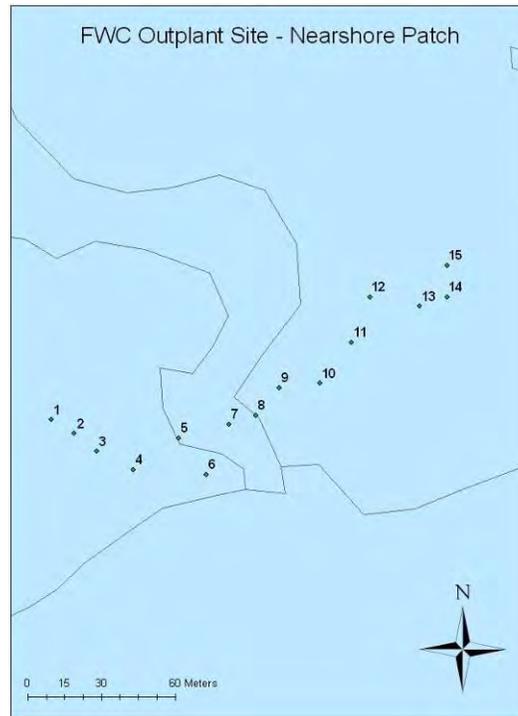
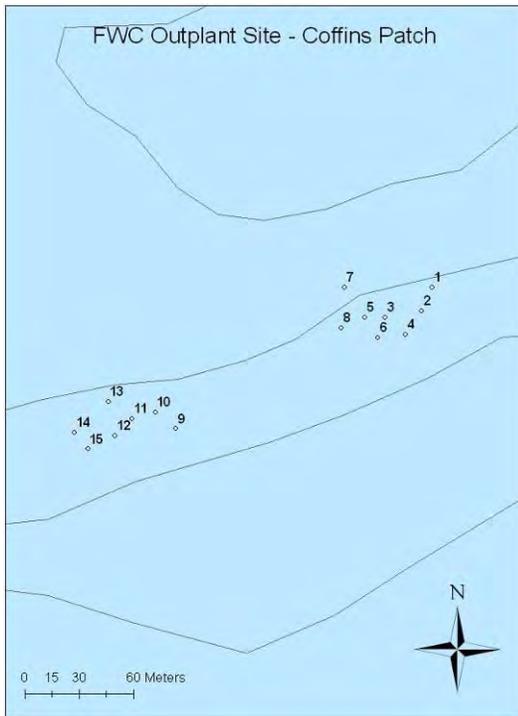
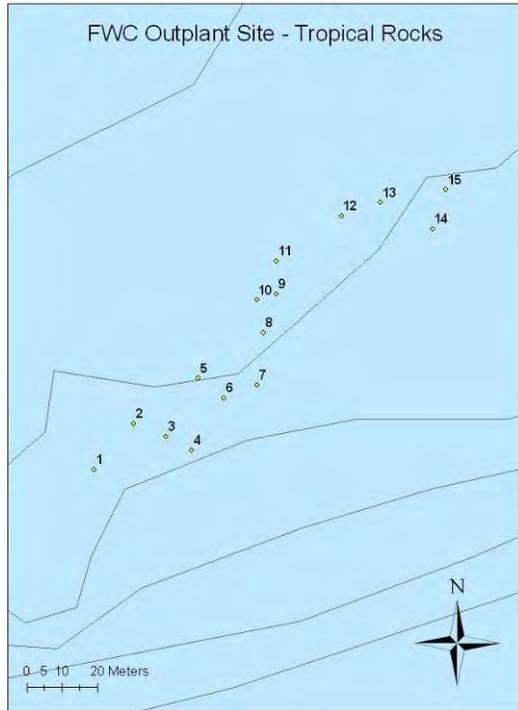
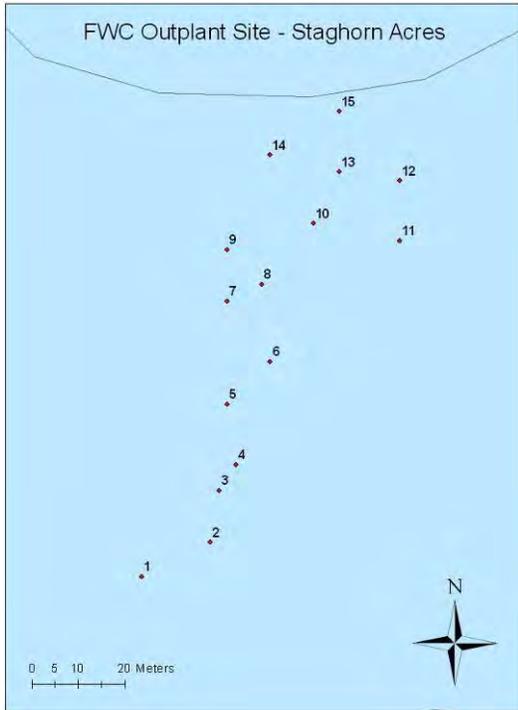
Outplanting a coral at Molasses Reef.

### *Middle Keys*

Outplanting in the Middle Keys took place in April and May 2012. A total of 780 corals representing 13 distinct genotypes were outplanted to four reefs. Due to the limited number of coral colonies available in the Middle Keys nursery, FWC chose to outplant corals collected from the Upper and Lower Keys nursery. At each site, 15 different arrays were completed. Each array had 13 fragments - 8 fragments (representing 7 different genotypes) from the Upper Keys nursery that were collected from parent colonies in the Middle Keys and 5 fragments (representing 4 different genotypes) from the Lower Keys nursery. Fragments of 4 different size classes (5-10 cm, 10-20 cm, 20-50 cm, and 50-100 cm) were outplanted.

Site	GPS Coordinates N	GPS Coordinates W	Number of Genotypes	Number of Corals	Site Depth	Date Completed
Coffin's Patch	24.68668	-80.961483	13	195	10-21	April 11, 2012
Nearshore Patch	24.71177	-80.946500	13	195	15-22	May 16, 2012
Staghorn Acres	24.62110	-81.127416	13	195	19-29	May 15, 2012
Tropical Rocks	24.65637	-81.010716	13	195	16-25	April 10, 2012







Newly outplanted corals in the Middle Keys, demonstrating two different methods. The first is attached to a nursery puck which has been epoxied to the reef while the second is affixed with epoxy and a masonry nail.

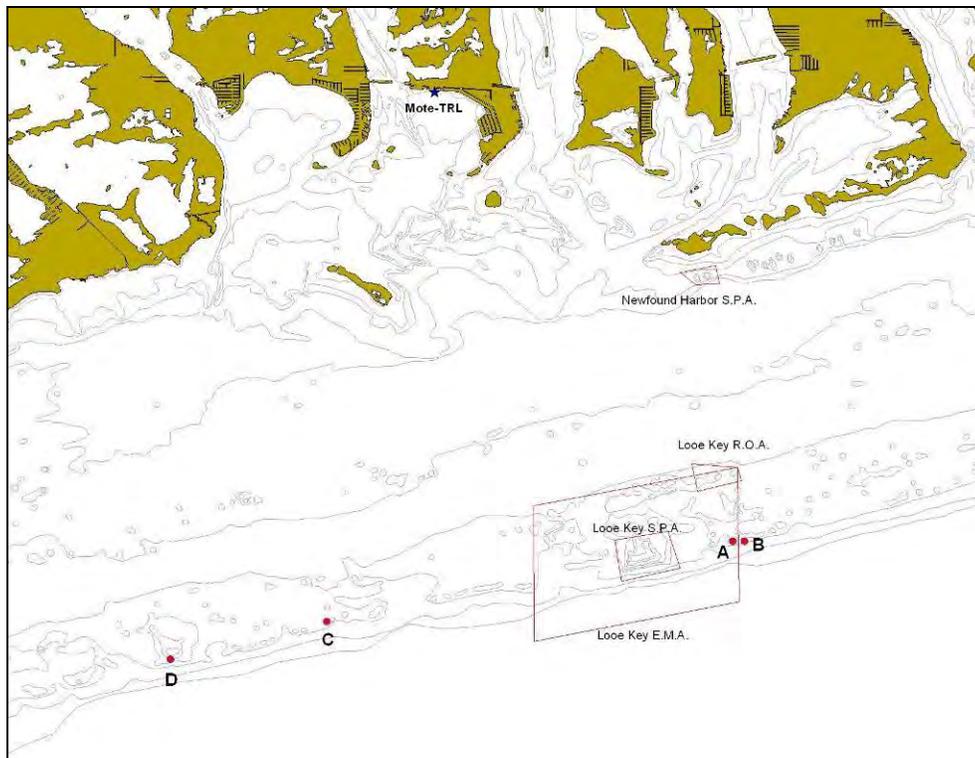
#### Parent colony locations.

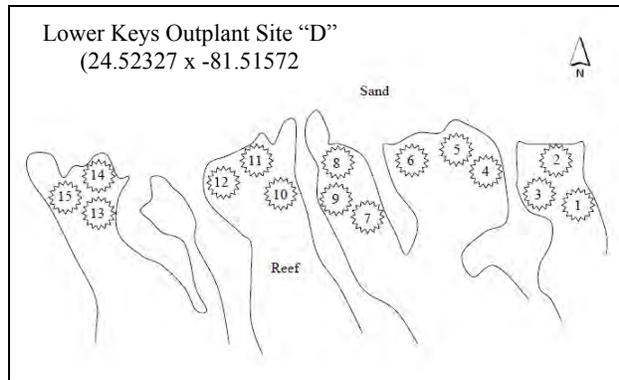
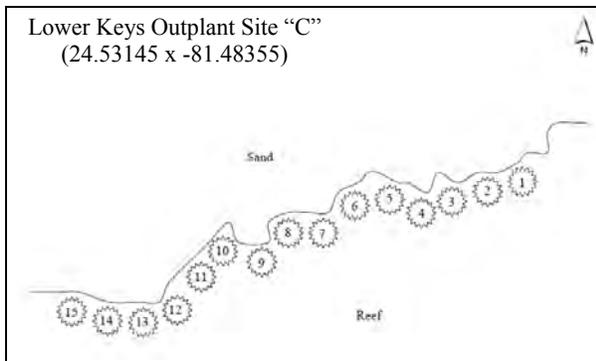
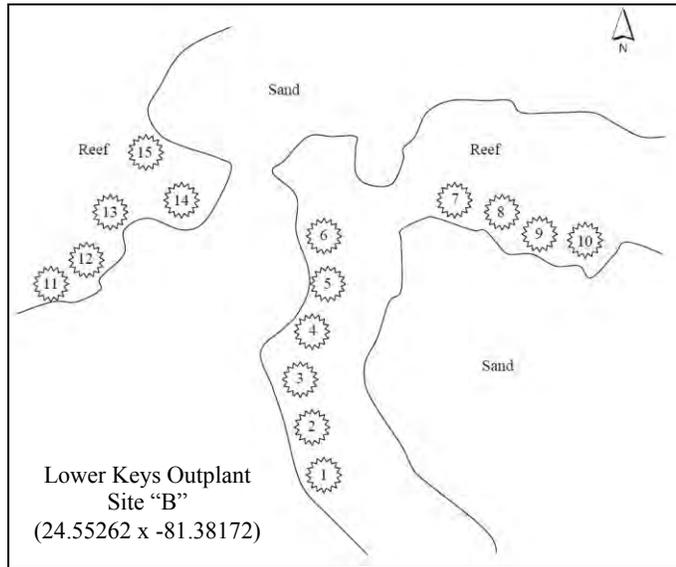
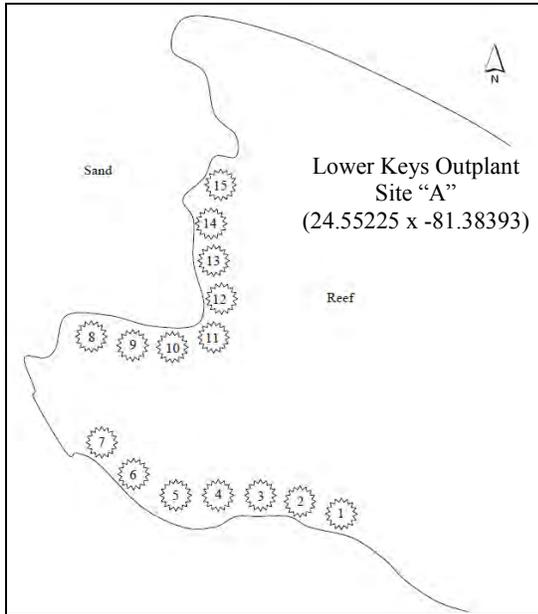
Name	Nursery	GPS Coordinates N	GPS Coordinates W
UK-81 (M-1)	Upper Keys	24.72166	-80.92795
UK-82 (M-2)	Upper Keys	24.7204	-80.92913
UK-83 (M-3)	Upper Keys	24.71347	-80.94463
UK-84 (M-4)	Upper Keys	24.71178	-80.94585
UK-85 (M-5)	Upper Keys	24.71182	-80.94595
UK-86 (M-6)	Upper Keys	24.71067	-80.94825
UK-87 (M-7)	Upper Keys	24.71853	-80.93087
(24, 39, 41)	Lower Keys	24.55320	-81.43758
(28, 50)	Lower Keys	24.54854	-81.53308
UK-88 (M-10)	Upper Keys	24.69772	-80.97055
(11, 32, 33, 34)	Lower Keys	24.53865	-81.44358
6	Lower Keys	24.52298	-81.52043
40	Lower Keys	24.55320	-81.43758

### *Lower Keys*

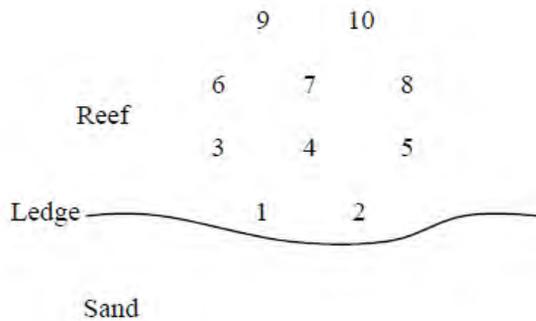
During April and May 2012, a total of 600 corals were outplanted to reefs throughout the Lower Keys. Ten distinct genotypes were outplanted in 15 arrays at each site. Corals were affixed using epoxy at the base and a masonry nail. All corals were between 5 and 10 cm in length at time of outplant.

Site	GPS Coordinates N	GPS Coordinates W	Number of Genotypes	Number of Corals	Site Depth	Date Completed
A	24.55225	-81.38393	10	150	17-22	April 25, 2012
B	24.55262	-81.38172	10	150	18-23	May 25, 2012
C	24.53145	-81.48355	10	150	17-22	May 8, 2012
D	24.52327	-81.51572	10	150	18-23	May 16, 2012





Note: Each 'array' is comprised of 10 colonies arranged in 4 rows, with one representative from each of the 10 genotypes per array.



Parent colony locations

Name	GPS Coordinates N	GPS Coordinates W
C1460	24.52735	-81.49895
L	24.58353	-81.43298
C1363	24.53865	-81.44358

AH	24.52298	-81.52043
C1369	24.54770	-81.45696
C1170	24.54873	-81.53297
C1459	24.56860	-81.32650
C1368	24.56150	-81.40788
C1504	24.57268	-81.33147
C1374	24.55320	-81.43758



Corals are outplanted at a Lower Keys site.