



# Palos Verdes Kelp Forest Restoration Project

## 2015 Annual Report Appendices

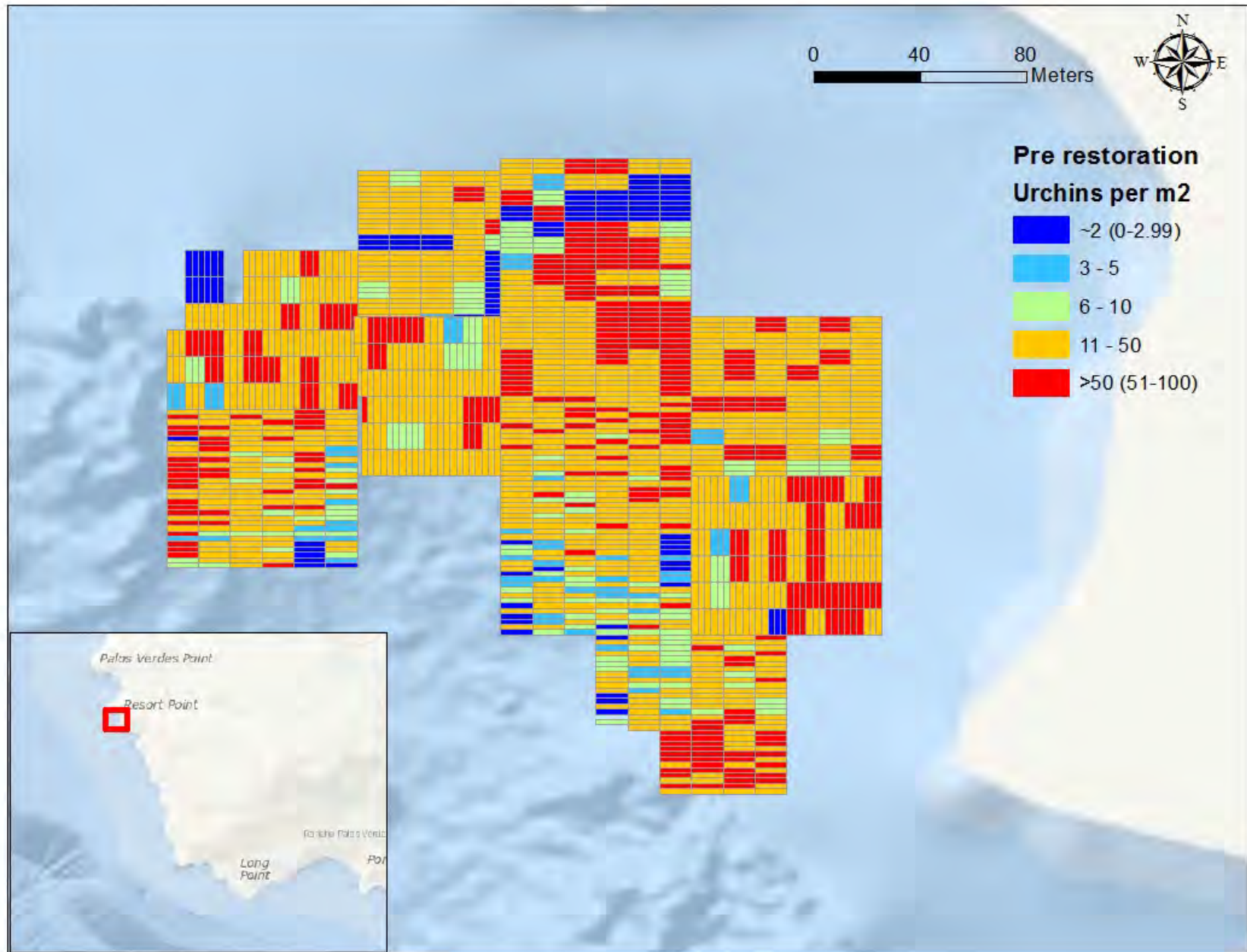
Appendix 1: Pre and Post Restoration Urchin Density Maps

Appendix 2: Photos of Restoration Blocks by Restoration Stage

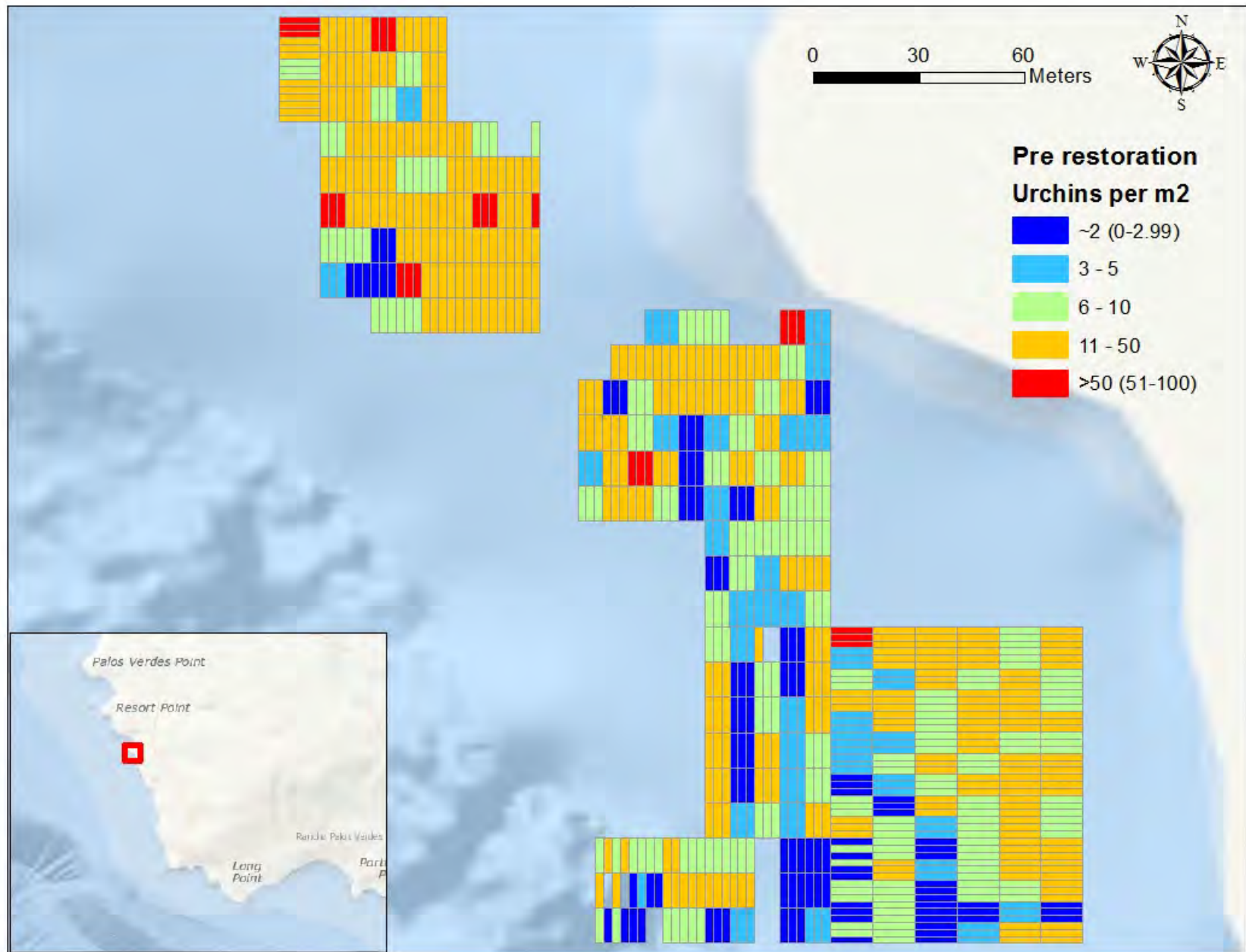
Appendix 3: List of Restoration Block Videos by Restoration Stage

Appendix 4: Aerial Photos of Restoration Sites by Restoration Stage

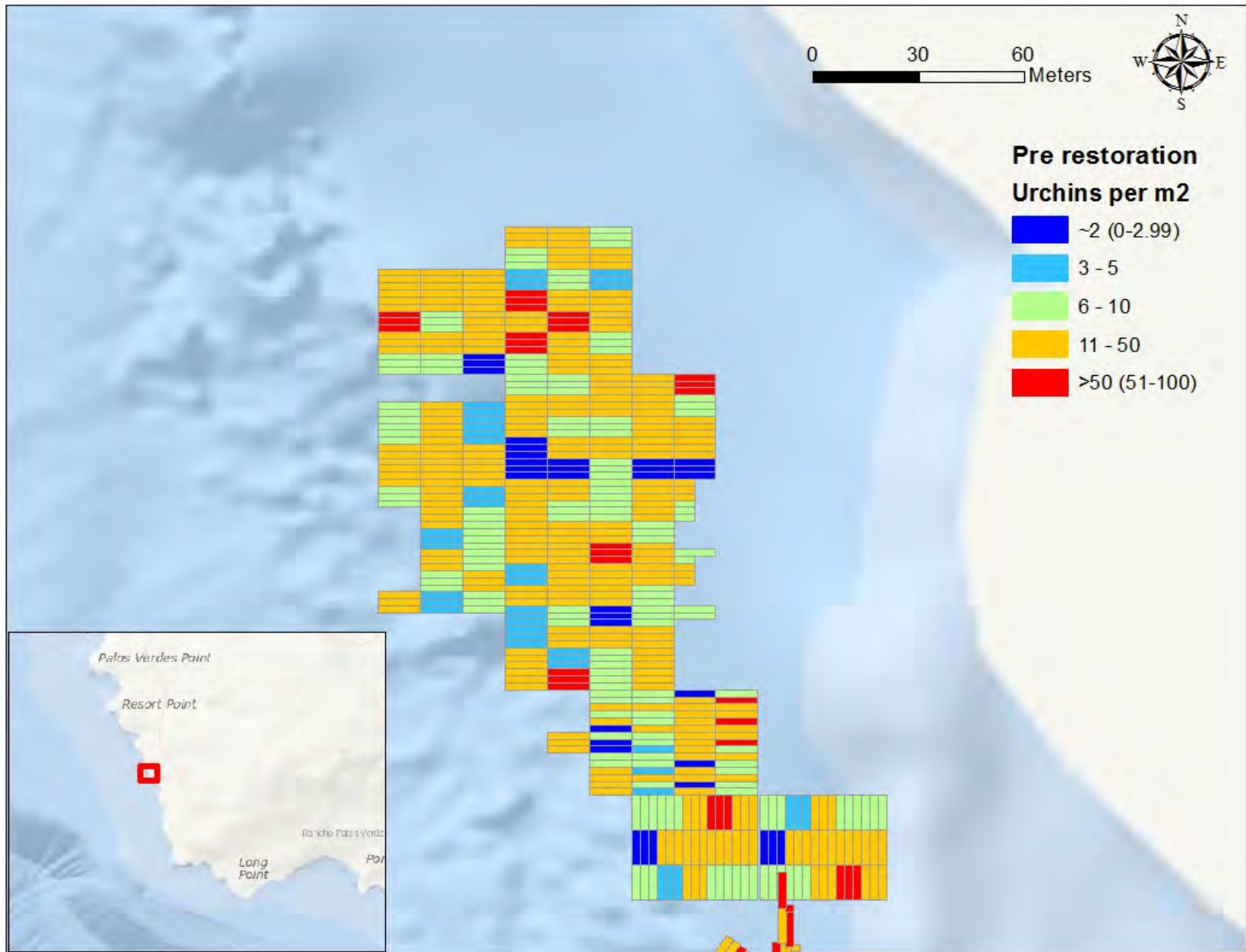
Appendix 1: Pre and Post Restoration Urchin Density Maps –July 1, 2013 through June 30, 2015



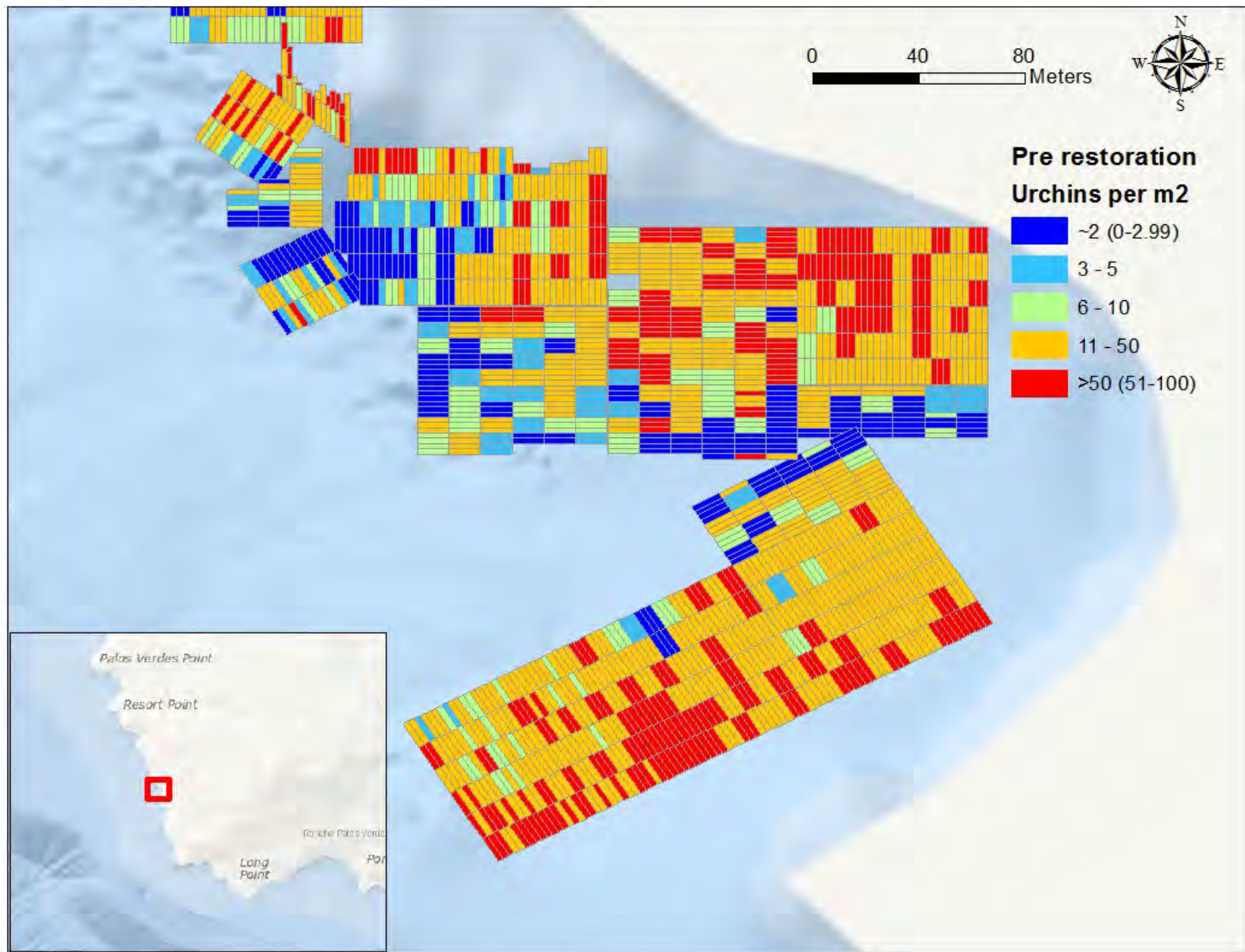
Map 1. Density of *S. purpuratus* (individuals per square meter) pre-restoration in Honeymoon Cove, Palos Verdes, California.



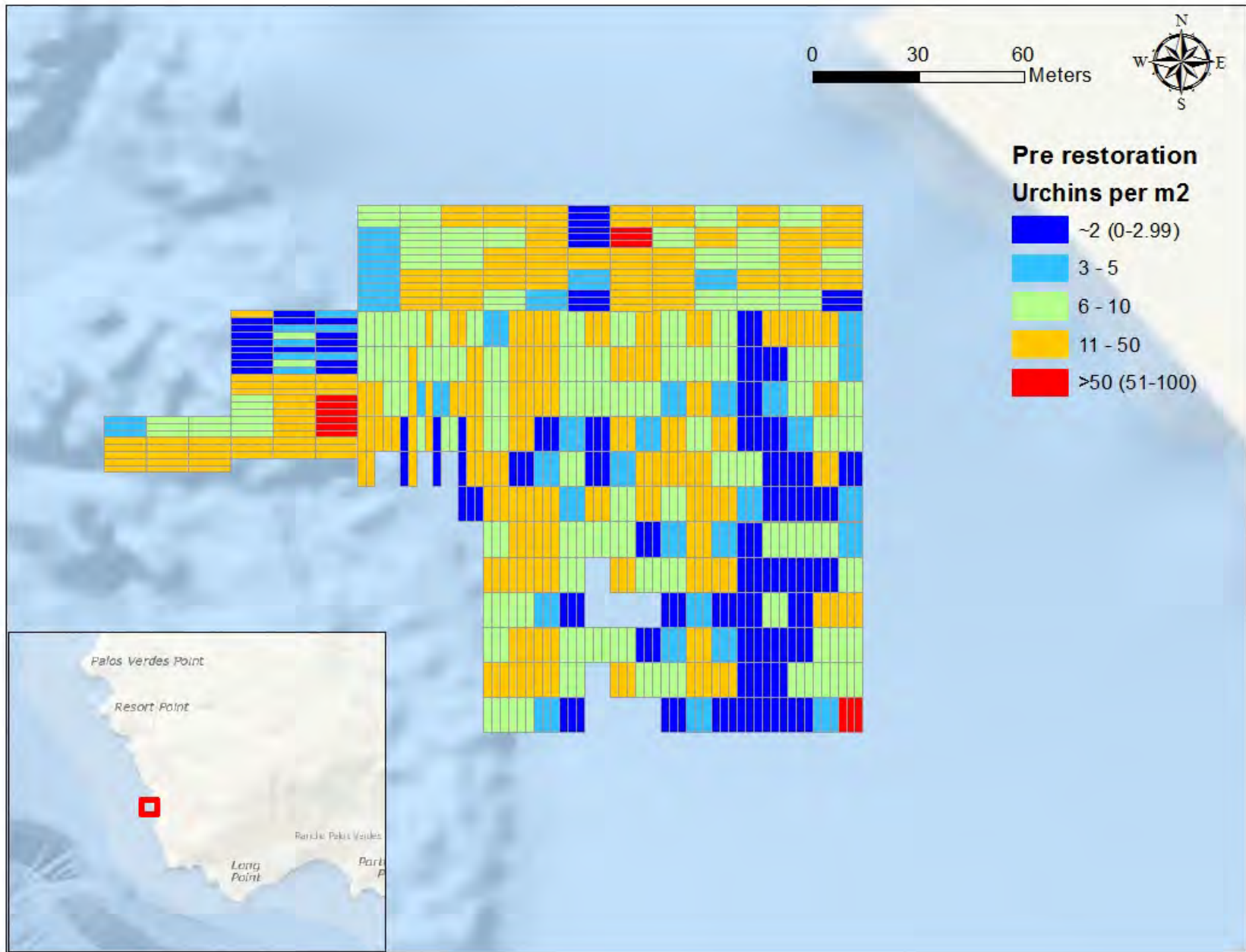
Map 2. Density of *S. purpuratus* (individuals per square meter) pre-restoration in Marguerite (north), Palos Verdes, California.



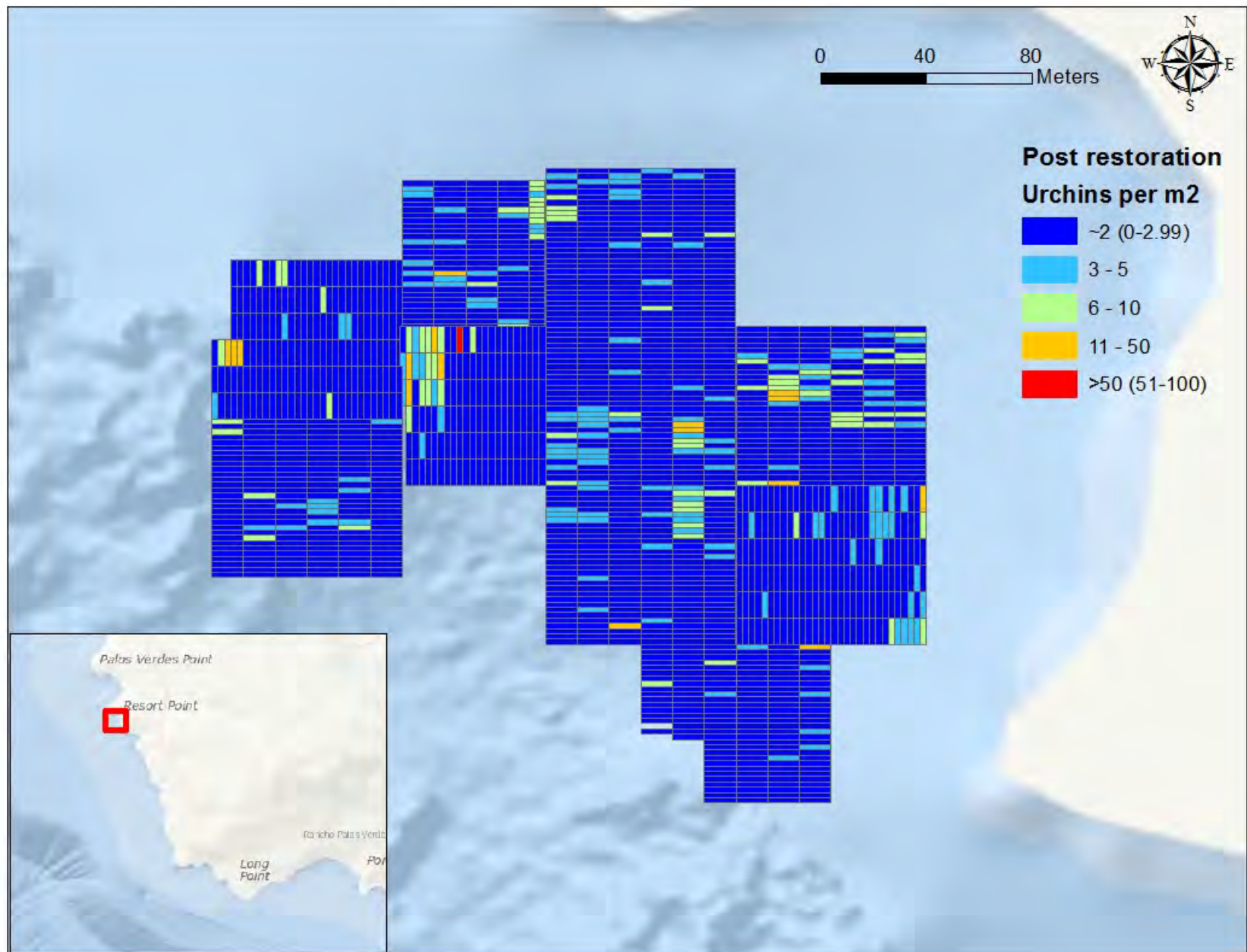
Map 3. Density of *S. purpuratus* (individuals per square meter) pre-restoration in Marguerite (south), Palos Verdes, California.



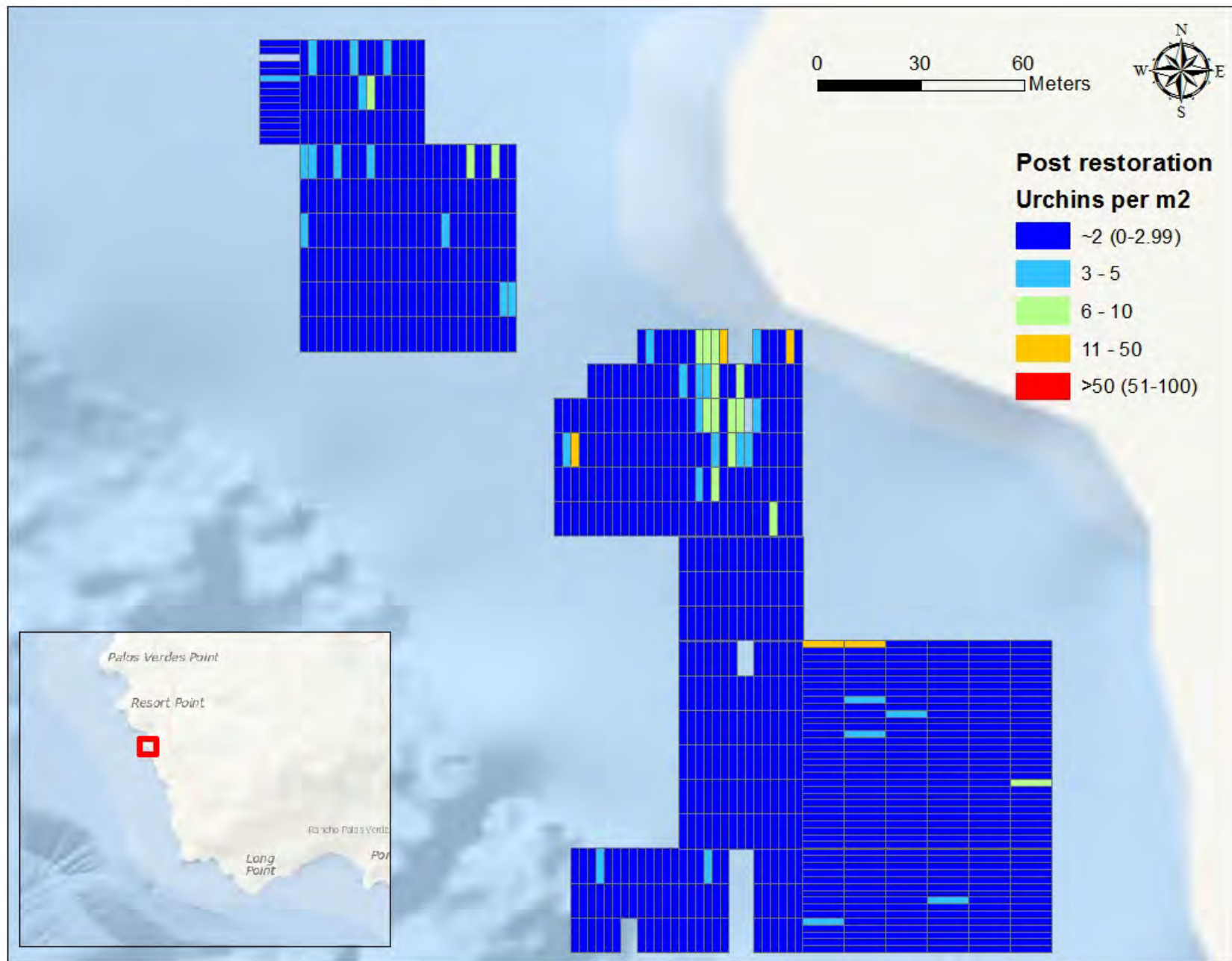
Map 4. Density of *S. purpuratus* (individuals per square meter) pre-restoration in Underwater Arch Cove, Palos Verdes, California.



Map 5. Density of *S. purpuratus* (individuals per square meter) pre-restoration in Hawthorne, Palos Verdes, California.

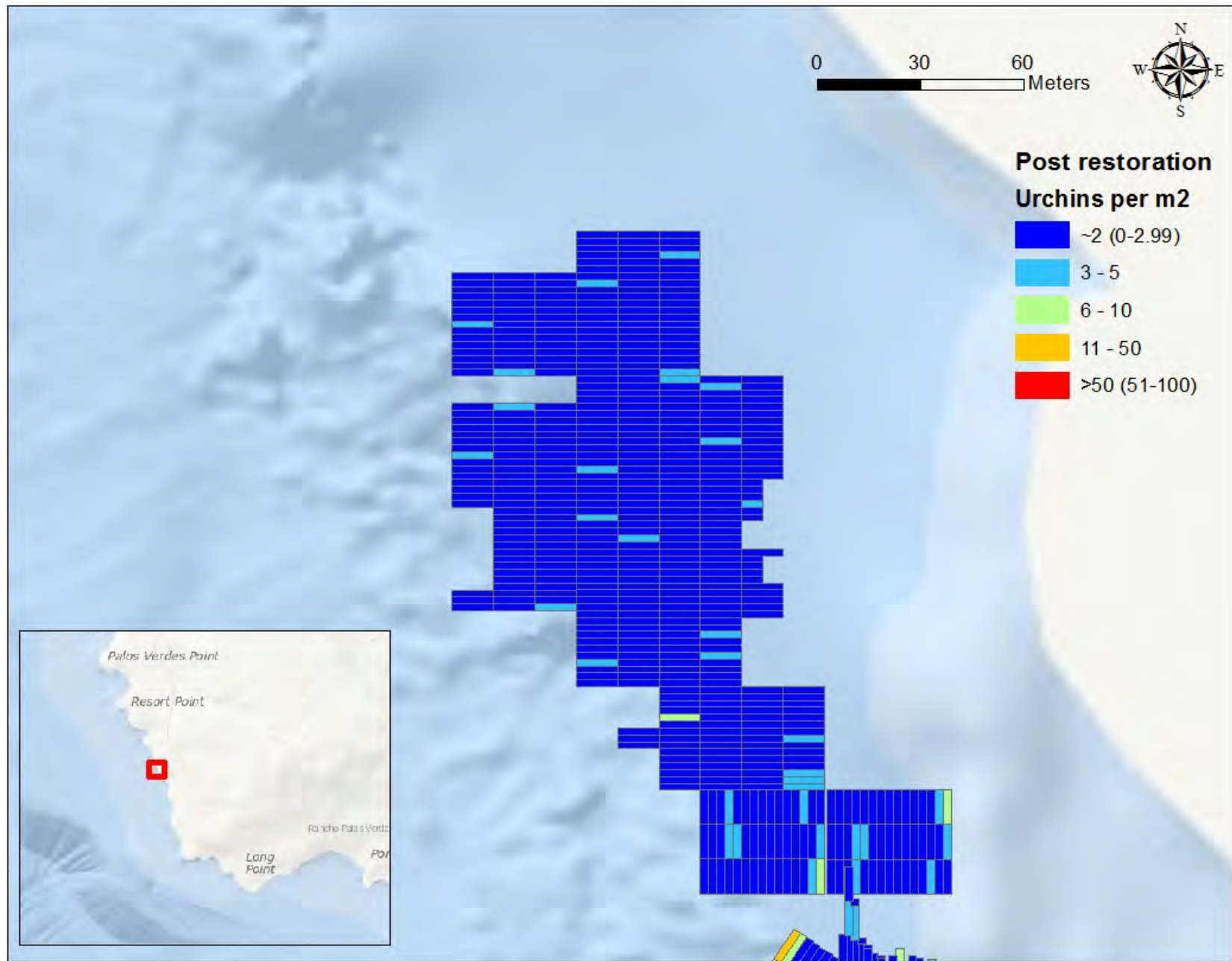


**Map 6.** Density of *S. purpuratus* (individuals per square meter) post-restoration in Honeymoon Cove, Palos Verdes, California.

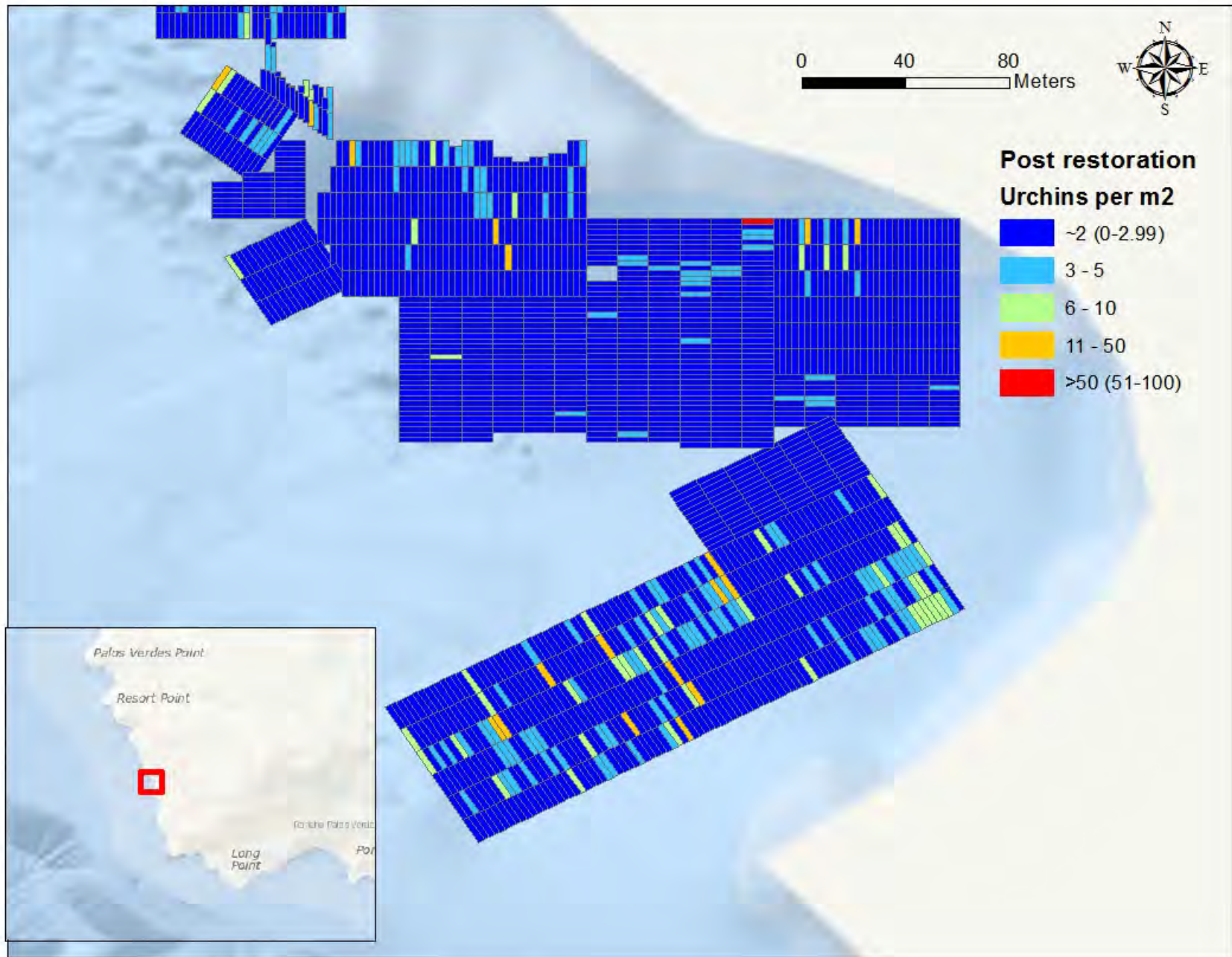


**Map 7.** Density of *S. purpuratus* (individuals per square meter) post-restoration in Marguerite (north), Palos Verdes, California.

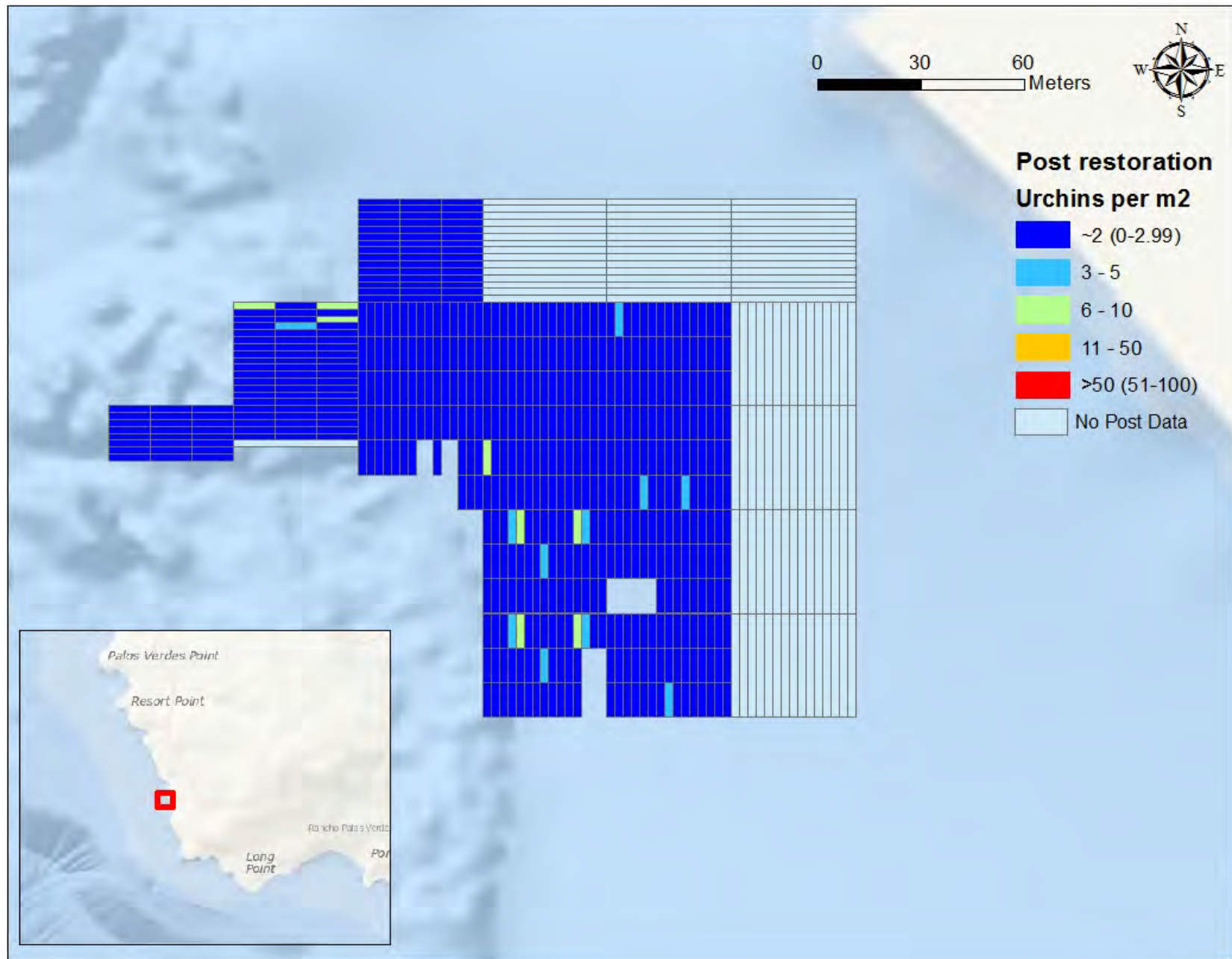




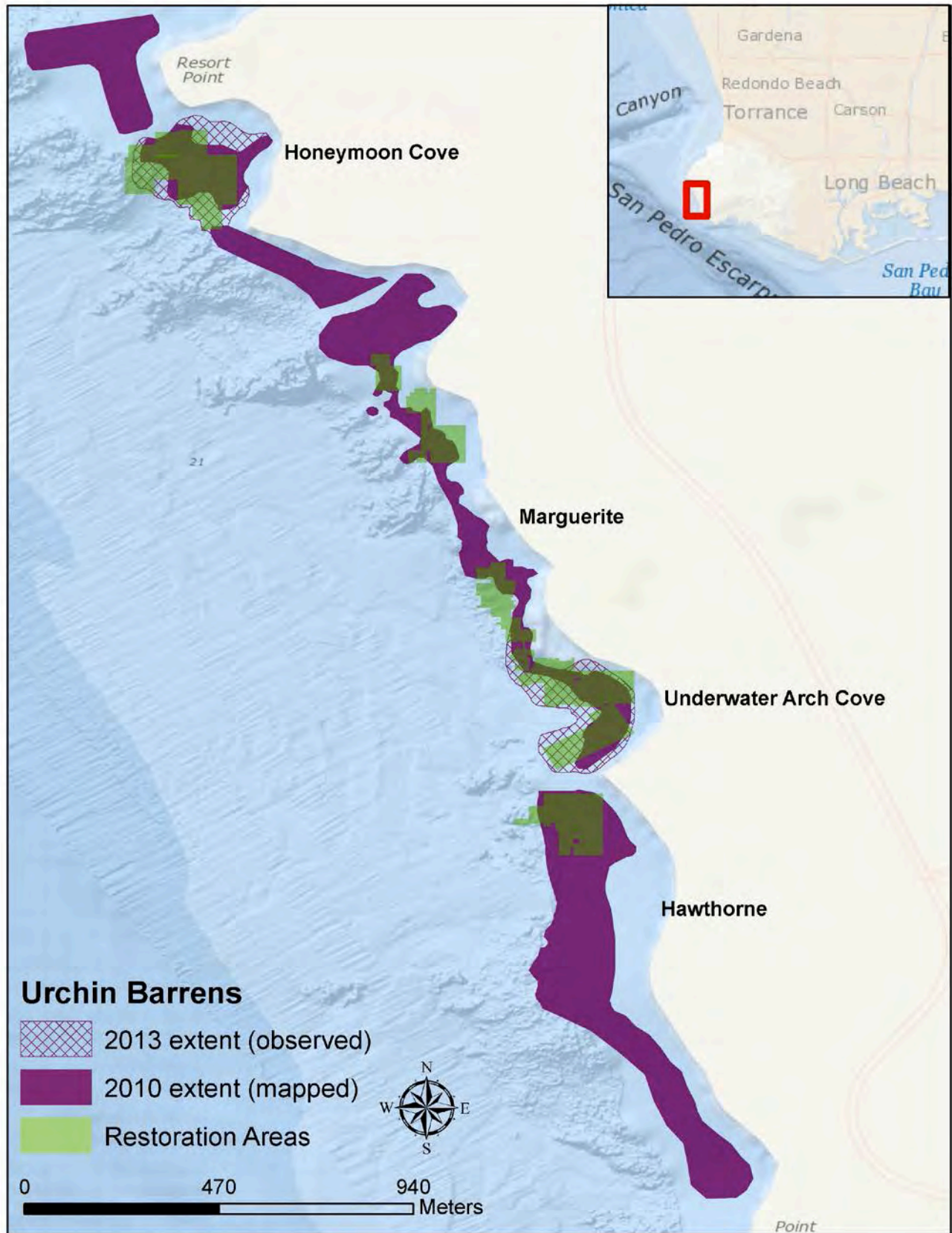
**Map 8.** Density of *S. purpuratus* (individuals per square meter) post-restoration in Marguerite (south), Palos Verdes, California.



**Map 9.** Density of *S. purpuratus* (individuals per square meter) post-restoration in Underwater Arch Cove, Palos Verdes, California.



**Map 10.** Density of *S. purpuratus* (individuals per square meter) post-restoration in Hawthorne, Palos Verdes, California



**Map 11.** Urchin barrens as mapped in 2010 and observed in 2013, representing a possible expansion and/or shift of urchin barrens. Overview of the project area along the Palos Verdes Peninsula showing the urchin barren extent mapped in 2010 and the observed expansion of the urchin barrens in Honeymoon and Underwater Arch Coves from a series of surveys conducted in summer and fall of 2012. The locations of current restoration activity are in green.

## Appendix 2: Photos of Restoration Blocks by Restoration Stage

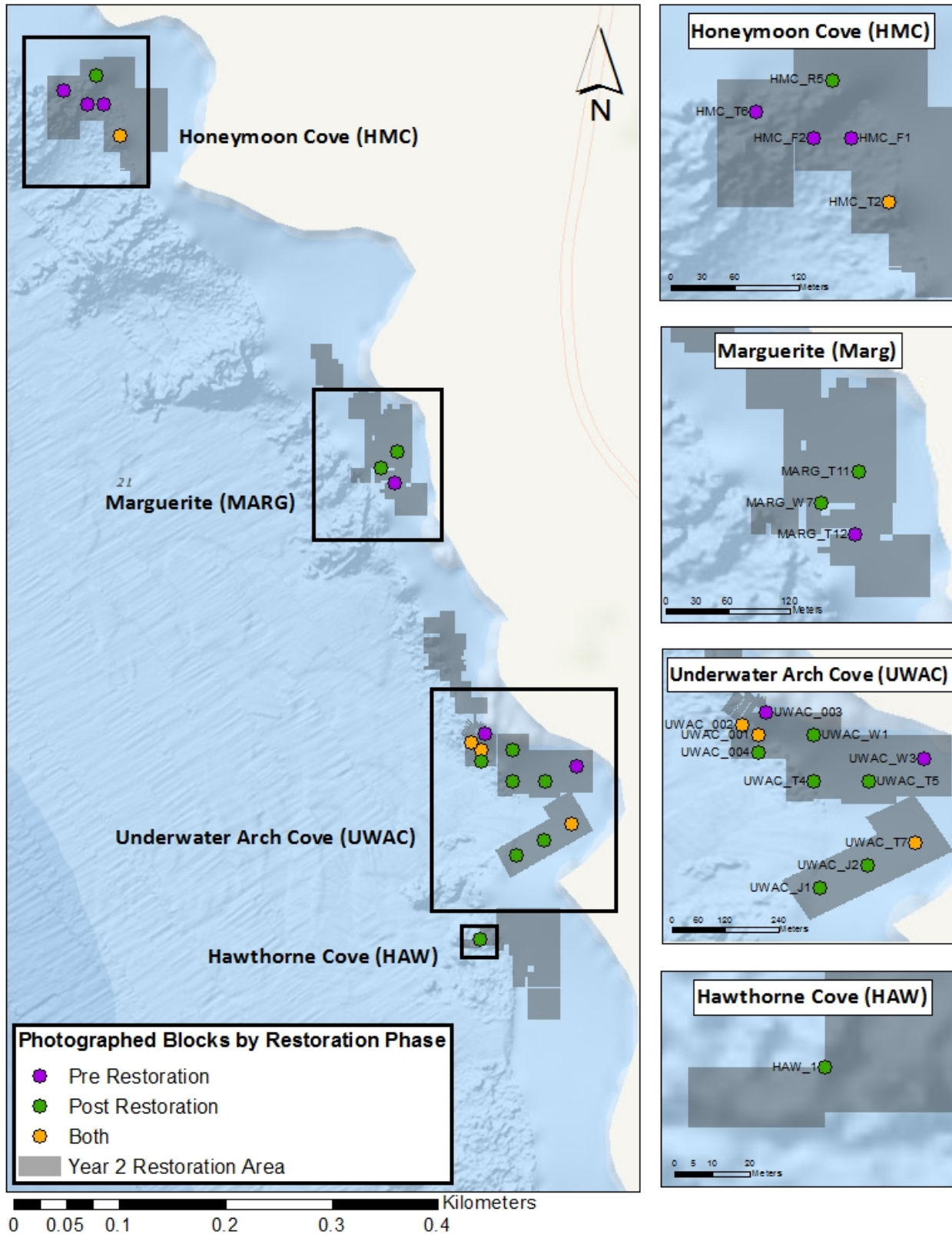
Link to high resolution photos and video:  
available upon request

All report photo and video files are titled according to the following format: "Figure/Video Number"\_"Site Code"\_"Block Code Start – Block Code Finish (If Different)"\_"Restoration Status (Pre/Post)"\_"Date (year-month-day)"\_"Number in Series"

Coordinates for photographed restoration blocks are listed in the table below and geospatially displayed in Map 12.

Site	Block	Lat	Long
Hawthorne	1	33.750640	-118.416420
Honeymoon	F1	33.764800	-118.424058
Honeymoon	F2	33.764800	-118.424381
Honeymoon	R5	33.765297	-118.424221
Honeymoon	T2	33.764260	-118.423734
Honeymoon	T6	33.765027	-118.424869
Marguerite	T11	33.758916	-118.418114
Marguerite	T12	33.758374	-118.418144
Marguerite	W7	33.758645	-118.418437
Underwater Arch	J1	33.752060	-118.415686
Underwater Arch	J2	33.752330	-118.415125
Underwater Arch	T4	33.753314	-118.415756
Underwater Arch	T5	33.753314	-118.415108
Underwater Arch	T7	33.752600	-118.414563
Underwater Arch	W1	33.753855	-118.415756
Underwater Arch	W3	33.753584	-118.414460
Underwater Arch	001	33.753855	-118.416404
Underwater Arch	002	33.753980	-118.416590
Underwater Arch	003	33.754124	-118.416310
Underwater Arch	004	33.753655	-118.416404

# Reference Map of Photographed Restoration Blocks by Site



Map 12. Reference Map of Photographed Restoration Blocks by Site.

Site: Honeymoon Cove



Figure 1 (Site: Honeymoon, Block: F1, Date: 02/05/2014, Pre Restoration, GPS: 33.7648, -118.4240578)



Figure 2 (Site: Honeymoon, Block: F2, Date: 07/12/2014, Pre Restoration, GPS: 33.7648, -118.424381)



Figure 3 (Site: Honeymoon, Block: F2, Date: 07/12/2014, Pre Restoration, GPS: 33.7648, -118.424381)



Figure 4 (Site: Honeymoon, Block: R5, Date: 09/24/2015, Post Restoration, GPS: 33.765297, -118.424221)





Figure 5 (Site: Honeymoon, Block: R5, Date: 09/24/2015, Post Restoration, GPS: 33.765297, -118.424221)



Figure 6 (Site: Honeymoon, Block: T2, Date: 02/21/2014, Pre Restoration, GPS: 33.76426047, -118.423734)



Figure 7 (Site: Honeymoon, Block: T2, Date: 03/21/2014, Post Restoration, GPS: 33.76426047, -118.423734)



Figure 8 (Site: Honeymoon, Block: T2, Date: 03/21/2014, Post Restoration, GPS: 33.76426047, -118.423734)



Figure 9 (Site: Honeymoon, Block: T2, Date: 05/02/2014, Post Restoration, GPS: 33.76426047, -118.423734)



Figure 10 (Site: Honeymoon, Block: T2, Date: 05/02/2014, Post Restoration, GPS: 33.76426047, -118.423734)



Figure 11 (Site: Honeymoon, Block: T6, Date: 05/02/2014, Pre Restoration, GPS: 33.765027, -118.424869)



Figure 12 (Site: Honeymoon, Block: T6, Date: 05/02/2014, Pre Restoration, GPS: 33.765027, -118.424869)

Site: Marguerite



Figure 13 (Site: Marguerite, Block T11, Date: 07/16/2015, Post Restoration, GPS: 33.758916, -118.418114)



Figure 14 (Site: Marguerite, Block T11, Date: 07/16/2015, Post Restoration, GPS: 33.758916, -118.418114)

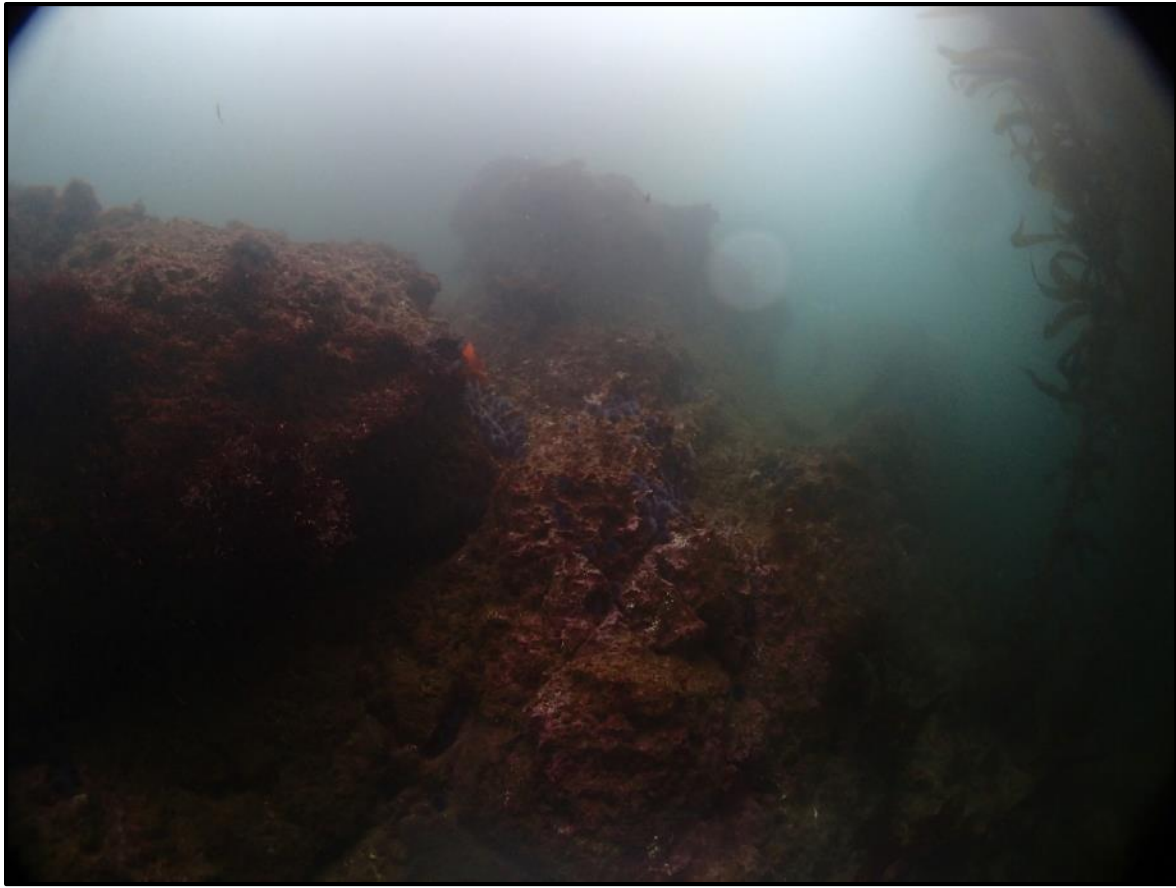


Figure 15 (Site: Marguerite, Block T12, Date: 03/12/2015, Pre Restoration, GPS: 33.758374, -118.418144)

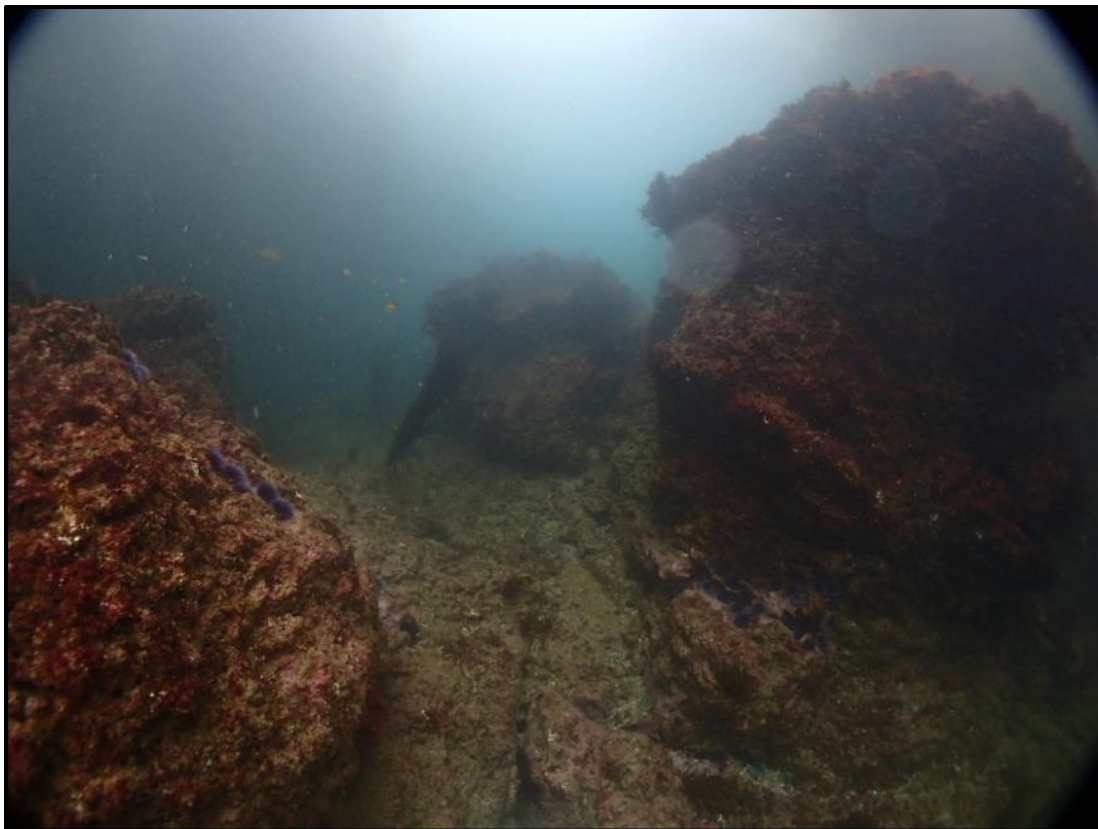


Figure 16 (Site: Marguerite, Block T12, Date: 06/12/2015, Pre Restoration, GPS: 33.758374, -118.418144)

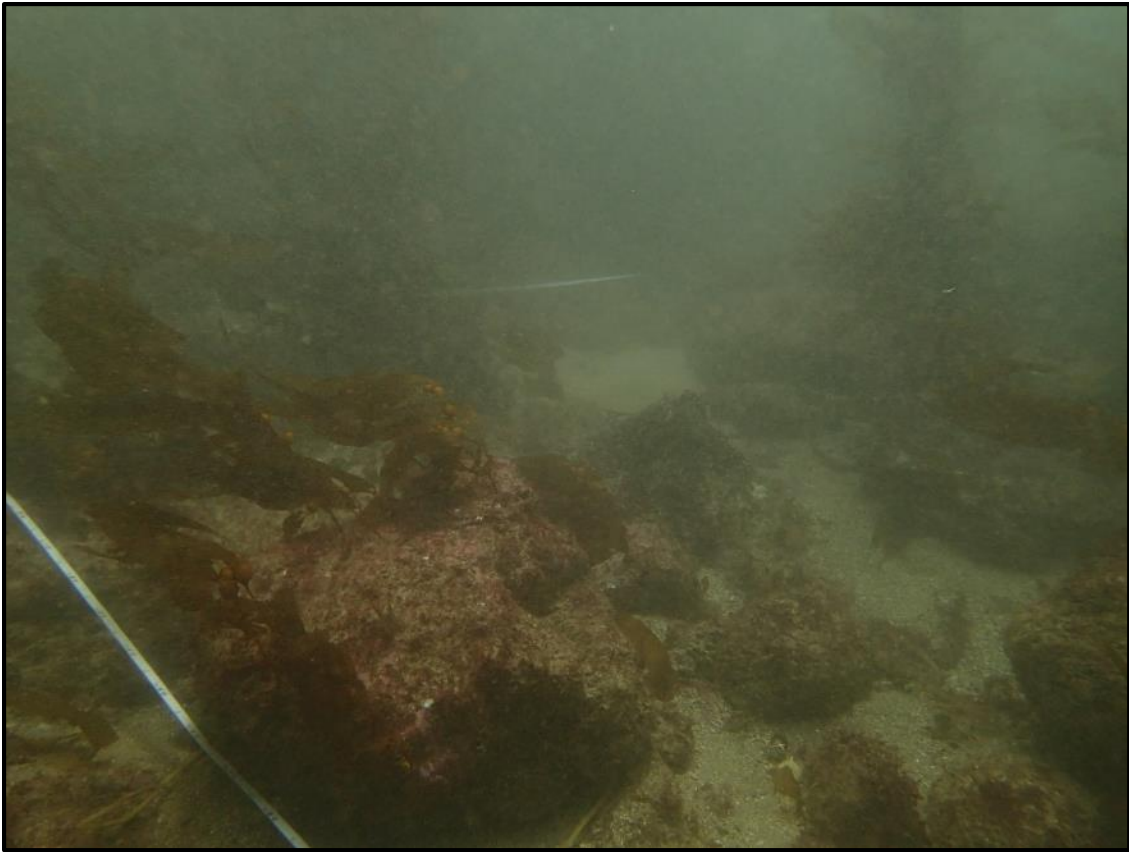


Figure 17 (Site: Marguerite, Block W7, Date: 08/07/2015, Post Restoration, GPS: 33.758645, -118.418437)



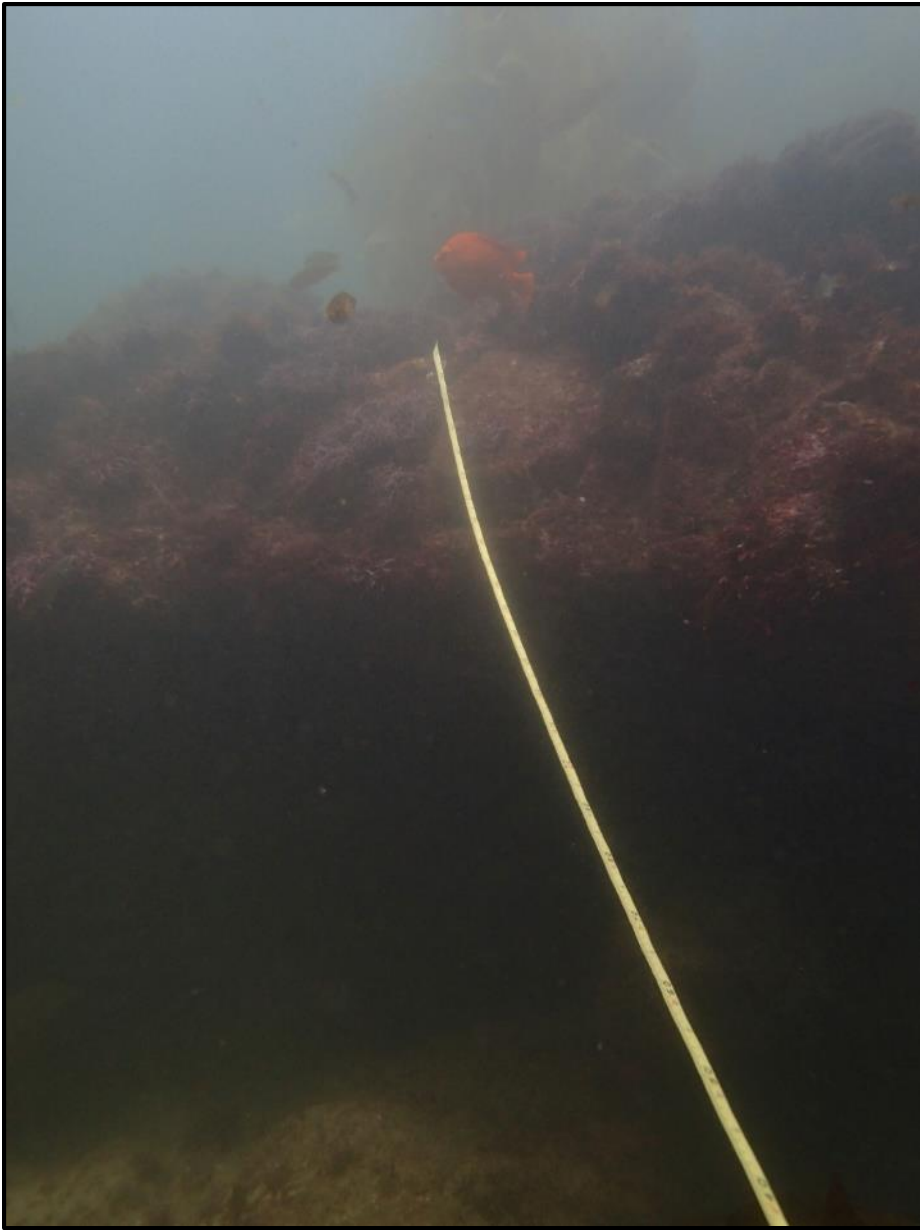


Figure 18 (Site: Marguerite, Block W7, Date: 08/07/2015, Post Restoration, GPS: 33.758645, -118.418437)

Site: Underwater Arch Cove



Figure 19 (Site: Underwater Arch Cove, Block 001, Date: 07/17/2013, Pre Rest, GPS: 33.753855.-118.416404)



Figure 20 (Site: Underwater Arch Cove, Block 001, Date: 07/17/2013, Pre Rest, GPS: 33.753855.-118.416404)



Figure 21 (Site: Underwater Arch Cove, Block 001, Date: 08/09/2013, Pre Rest, GPS: 33.753855.-118.416404)



Figure 22 (Site: Underwater Arch Cove, Block 001, Date: 08/09/2013, Pre Rest, GPS: 33.753855.-118.416404)



Figure 23 (Site: Underwater Arch Cove, Block 001, Date: 08/09/2013, Pre Rest, GPS: 33.753855.-118.416404)

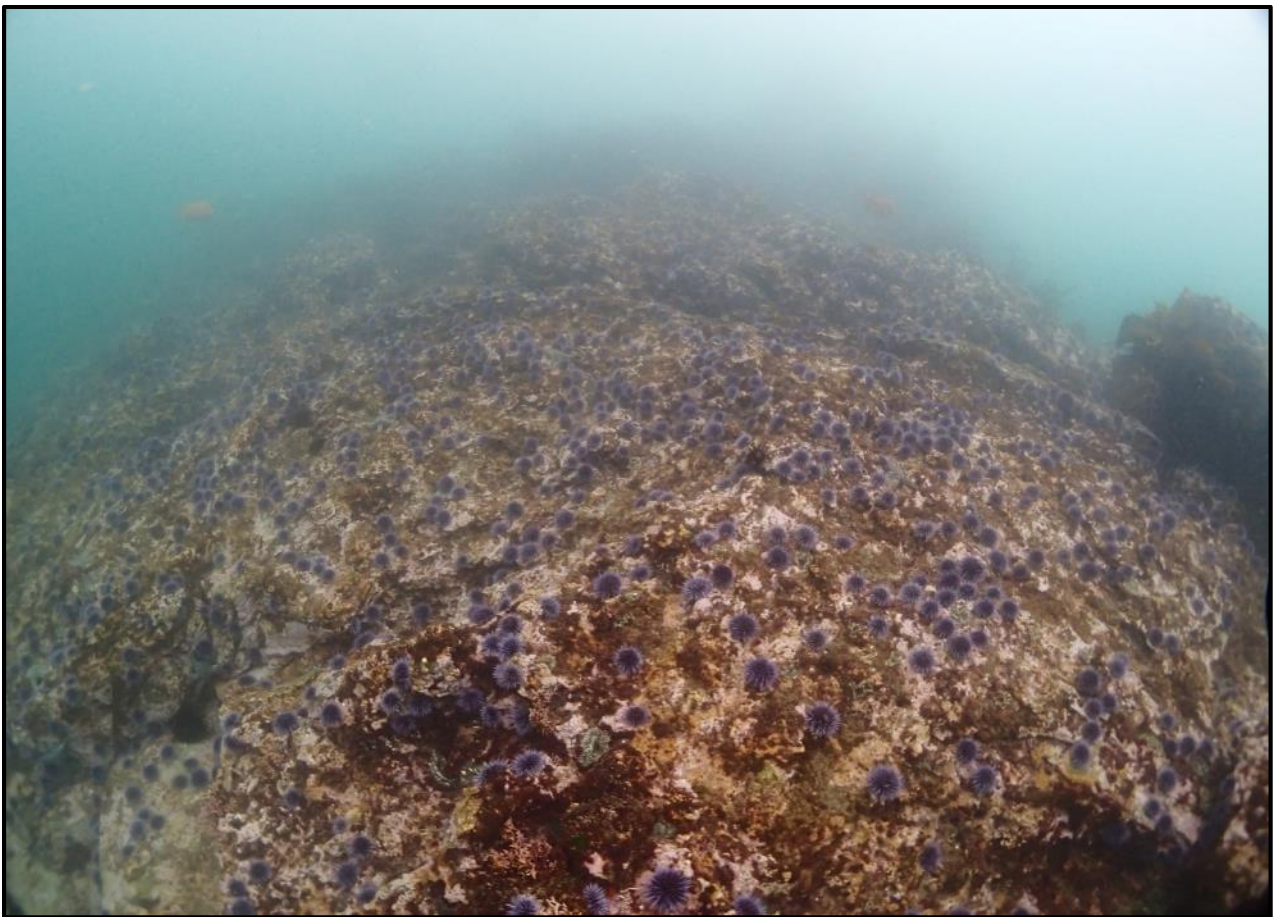


Figure 24 (Site: Underwater Arch Cove, Block 001, Date: 08/09/2013, Pre Rest, GPS: 33.753855.-118.416404)



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Figure 25 (Site: Underwater Arch Cove, Block 001, Date: 08/28/2013, Post Rest, GPS: 33.753855.-118.416404)



© Tom Boyd Images 2013

Figure 26 (Site: Underwater Arch Cove, Block 001, Date: 08/28/2013, Post Rest, GPS: 33.753855.-118.416404)



© Tom Boyd Images 2013

Figure 27 (Site: Underwater Arch Cove, Block 001, Date: 08/28/2013, Post Rest, GPS: 33.753855.-118.416404)



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Figure 28 (Site: Underwater Arch Cove, Block 002, Date: 08/28/2013, Pre Rest, GPS: 33.75398, -118.41659)



Figure 29 (Site: Underwater Arch Cove, Block 002, Date: 08/28/2013, Pre Rest, GPS: 33.75398, -118.41659)



Figure 30 (Site: Underwater Arch Cove, Block 002, Date: 08/28/2013, Pre Rest, GPS: 33.75398, -118.41659)



© Tom Boyd Images 2013

Figure 31 (Site: Underwater Arch Cove, Block 002, Date: 08/28/2013, Pre Rest, GPS: 33.75398, -118.41659)



© Tom Boyd Images 2013

Figure 32 (Site: Underwater Arch Cove, Block 002, Date: 08/28/2013, Pre Rest, GPS: 33.75398, -118.41659)





Figure 33 (Site: Underwater Arch Cove, Block 002, Date: 09/07/2013, Pre Rest, GPS: 33.75398, -118.41659)



Figure 34 (Site: Underwater Arch Cove, Block 002, Date: 09/07/2013, Pre Rest, GPS: 33.75398, -118.41659)

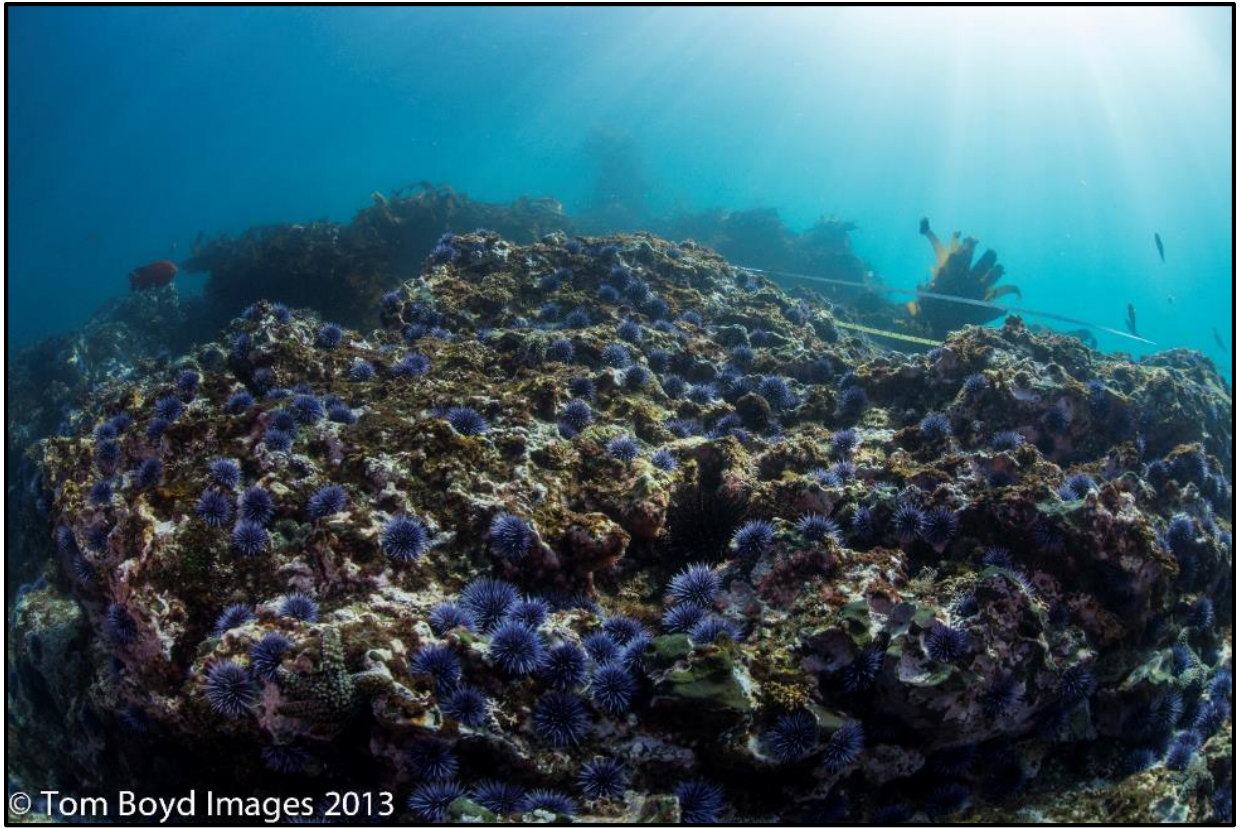


Figure 35 (Site: Underwater Arch Cove, Block 002, Date: 09/07/2013, Pre Rest, GPS: 33.75398, -118.41659)



Figure 36 (Site: Underwater Arch Cove, Block 002, Date: 10/16/2013, Post Rest, GPS: 33.75398, -118.41659)



Figure 37 (Site: Underwater Arch Cove, Block 002, Date: 10/16/2013, Post Rest, GPS: 33.75398, -118.41659)

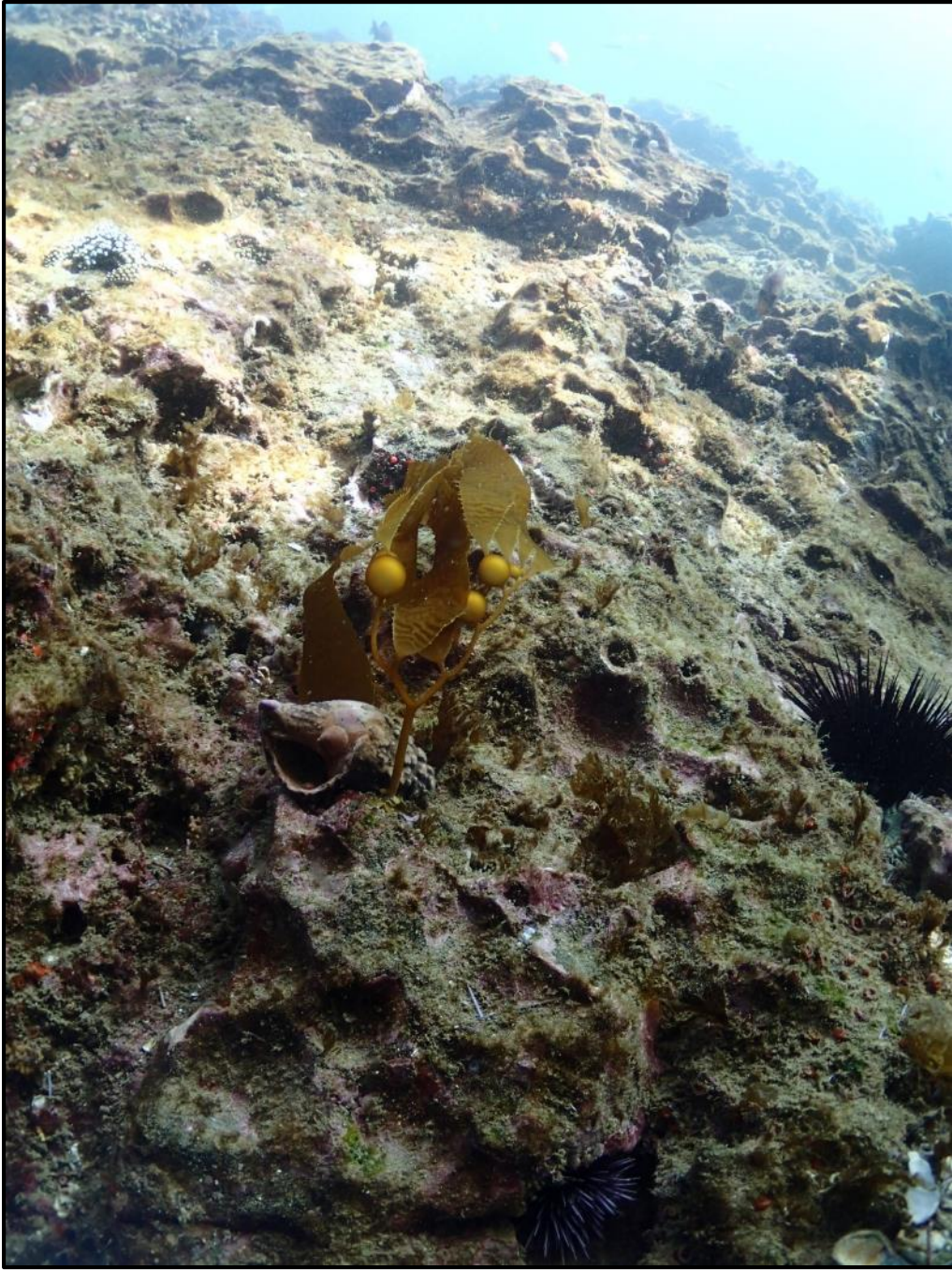


Figure 38 (Site: Underwater Arch Cove, Block 002, Date: 10/16/2013, Post Rest, GPS: 33.75398, -118.41659)

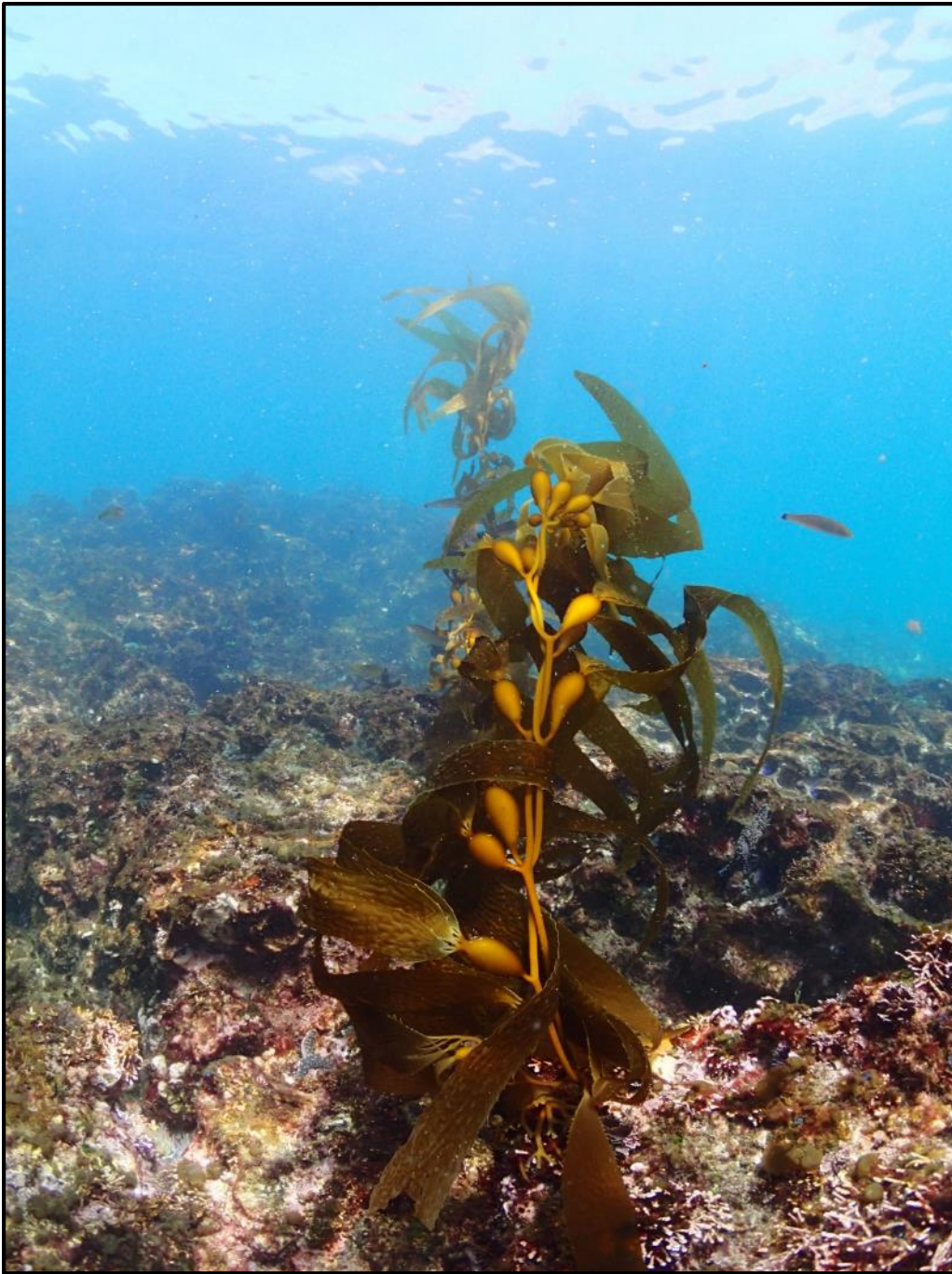


Figure 39 (Site: Underwater Arch Cove, Block 002, Date: 10/16/2013, Post Rest, GPS: 33.75398, -118.41659)



Figure 40 (Site: Underwater Arch Cove, Block 003, Date: 11/25/2013, Pre Rest, GPS: 33.754124, -118.41631)



Figure 41 (Site: Underwater Arch Cove, Block 003, Date: 11/25/2013, Pre Rest, GPS: 33.754124, -118.41631)



Figure 42 (Site: Underwater Arch Cove, Block 004, Date: 11/13/2013, Post Rest, GPS: 33.753655, -118.416404)



Figure 43 (Site: Underwater Arch Cove, Block J1, Date: 07/12/2014, Post Rest, GPS: 33.75205979, -118.4156861)



Figure 44 (Site: Underwater Arch Cove, Block J1, Date: 08/05/2014, Post Rest, GPS: 33.75205979 , -118.4156861)



Figure 45 (Site: Underwater Arch Cove, Block J1, Date: 08/05/2014, Post Rest, GPS: 33.75205979 , -118.4156861)





Figure 46 (Site: Underwater Arch Cove, Block J1, Date: 08/05/2014, Post Rest, GPS: 33.75205979 , -118.4156861)



Figure 47 (Site: Underwater Arch Cove, Block J1, Date: 08/05/2014, Post Rest, GPS: 33.75205979 , -118.4156861)

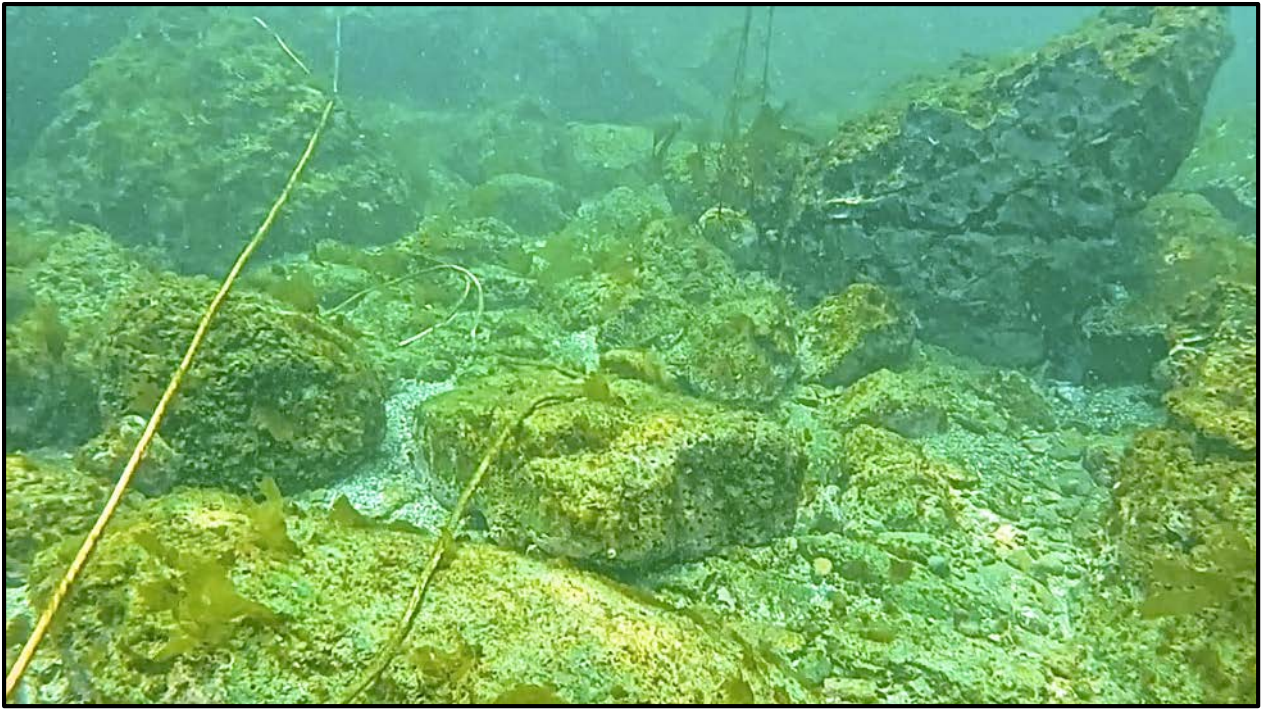


Figure 48 (Site: Underwater Arch Cove, Block J1, Date: 08/05/2014, Post Rest, GPS: 33.75205979 , -118.4156861)



Figure 49 (Site: Underwater Arch Cove, Block J1, Date: 08/14/2014, Post Rest, GPS: 33.75205979 , -118.4156861)



Figure 50 (Site: Underwater Arch Cove, Block J2, Date: 06/17/2014, Pre Rest, GPS 33.7523302, -118.4151245)



Figure 51 (Site: Underwater Arch Cove, Block J2, Date: 07/12/2014, Pre Rest, GPS 33.7523302, -118.4151245)



Figure 52 (Site: Underwater Arch Cove, Block J2, Date: 07/12/2014, Post Rest, GPS 33.7523302, -118.4151245)



Figure 53 (Site: Underwater Arch Cove, Block J2, Date: 08/14/2014, Post Rest, GPS 33.7523302, -118.4151245)



Figure 54 (Site: Underwater Arch Cove, Block J2, Date: 08/14/2014, Post Rest, GPS 33.7523302, -118.4151245)



Figure 55 (Site: Underwater Arch Cove, Block T7, Date: 07/29/2014, Pre Rest, GPS 33.7526, -118.414563)



Figure 56 (Site: Underwater Arch Cove, Block T7, Date: 07/29/2014, Pre Rest, GPS 33.7526, -118.414563)

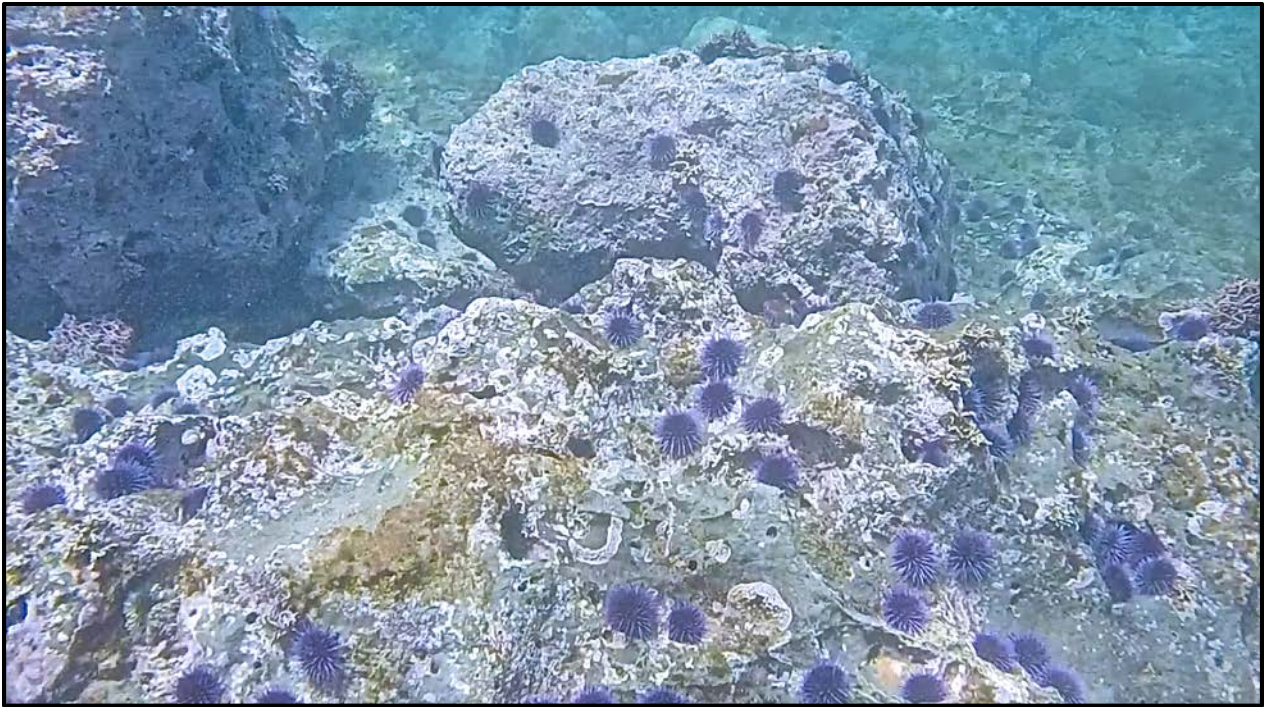


Figure 57 (Site: Underwater Arch Cove, Block T7, Date: 07/29/2014, Pre Rest, GPS 33.7526, -118.414563)



Figure 58 (Site: Underwater Arch Cove, Block T7, Date: 07/29/2014, Pre Rest, GPS 33.7526, -118.414563)



Figure 59 (Site: Underwater Arch Cove, Block T7, Date: 08/14/2014, Pre Rest, GPS 33.7526, -118.414563)





Figure 60 (Site: Underwater Arch Cove, Block T7, Date: 08/05/2014, Post Rest, GPS 33.7526, -118.414563)



Figure 61 (Site: Underwater Arch Cove, Block T7, Date: 08/05/2014, Post Rest, GPS 33.7526, -118.414563)



Figure 62 (Site: Underwater Arch Cove, Block W1, Date: 08/05/2014, Post Rest, GPS 33.753855, -118.4157562)



Figure 63 (Site: Underwater Arch Cove, Block W1, Date: 08/05/2014, Post Rest, GPS 33.753855, -118.4157562)



Figure 64 (Site: Underwater Arch Cove, Block W3, Date: 07/11/2014, Pre Rest, GPS 33.753584, -118.41446)



Figure 65 (Site: Underwater Arch Cove, 100 meter transect, Date: 11/13/2013, Pre Restoration, GPS: 33.75398, -118.41659)

Site: Hawthorne Cove



Figure 66 (Site: Hawthorne, Block: 1, Date: 01/16/2015, Post Restoration, GPS: 33.75064, -118.41642)

### Appendix 3: List of Restoration Block Videos by Restoration Stage

1. Video 1 (Site: Honeymoon Cove, Block: T2, Date: 02/21/2014, Pre Restoration, GPS: 33.76426047, -118.423734)
2. Video 2 (Site: Marguerite, Block: T11, Date: 07/23/2015, Post Restoration, GPS: 33.758916, -118.418114)
3. Video 3 (Site: Marguerite, Block: T12, Date: 06/12/2015, Pre Restoration, GPS: 33.758374, -118.418144)
4. Video 4 (Site: Marguerite, Block: W7, Date: 08/07/2015, Post Restoration, GPS: 33.758645, -118.418437)
5. Video 5 (Site: Underwater Arch Cove, Block: 001, Date: 08/09/2013, Pre Restoration, GPS: 33.753855, -118.416404)
6. Video 6 (Site: Underwater Arch Cove, Block: 001, Date: 08/09/2013, Pre Restoration, GPS: 33.753855, -118.416404)
7. Video 7 (Site: Underwater Arch Cove, Block: T4-J1, Date: 08/01/2014, Post Restoration, GPS: Begin, 33.753314, -118.415756 – end, 33.75205979, -118.4156861)
8. Video 8 (Site: Underwater Arch Cove, Block: T5, Date: 07/11/2014, Post Restoration, GPS: 33.753314, -118.4151082)
9. Video 9 (Site: Underwater Arch Cove, Block: W1, Date: 07/03/2014, Post Restoration, GPS: 33.753855, -118.4157562)

Appendix 4: Aerial Photos of Restoration Sites by Restoration Stage



Figure 67 (Site: Honeymoon Cove, Date: 11/07/2013, Pre Restoration, GPS: 33.794, -118.376)



Figure 68 (Site: Honeymoon Cove, Date: 11/07/2013, Pre Restoration, GPS: 33.794, -118.376)



Figure 69 (Site: Honeymoon Cove, Date: 04/28/2015, Post Restoration, GPS: 33.794, -118.376)



Figure 70 (Site: Honeymoon Cove, Date: 04/28/2015, Post Restoration, GPS: 33.794, -118.376)



Figure 71 (Site: Marguerite, Date: 04/28/2015, Restoration In Progress, GPS: 33.757, -118.418)

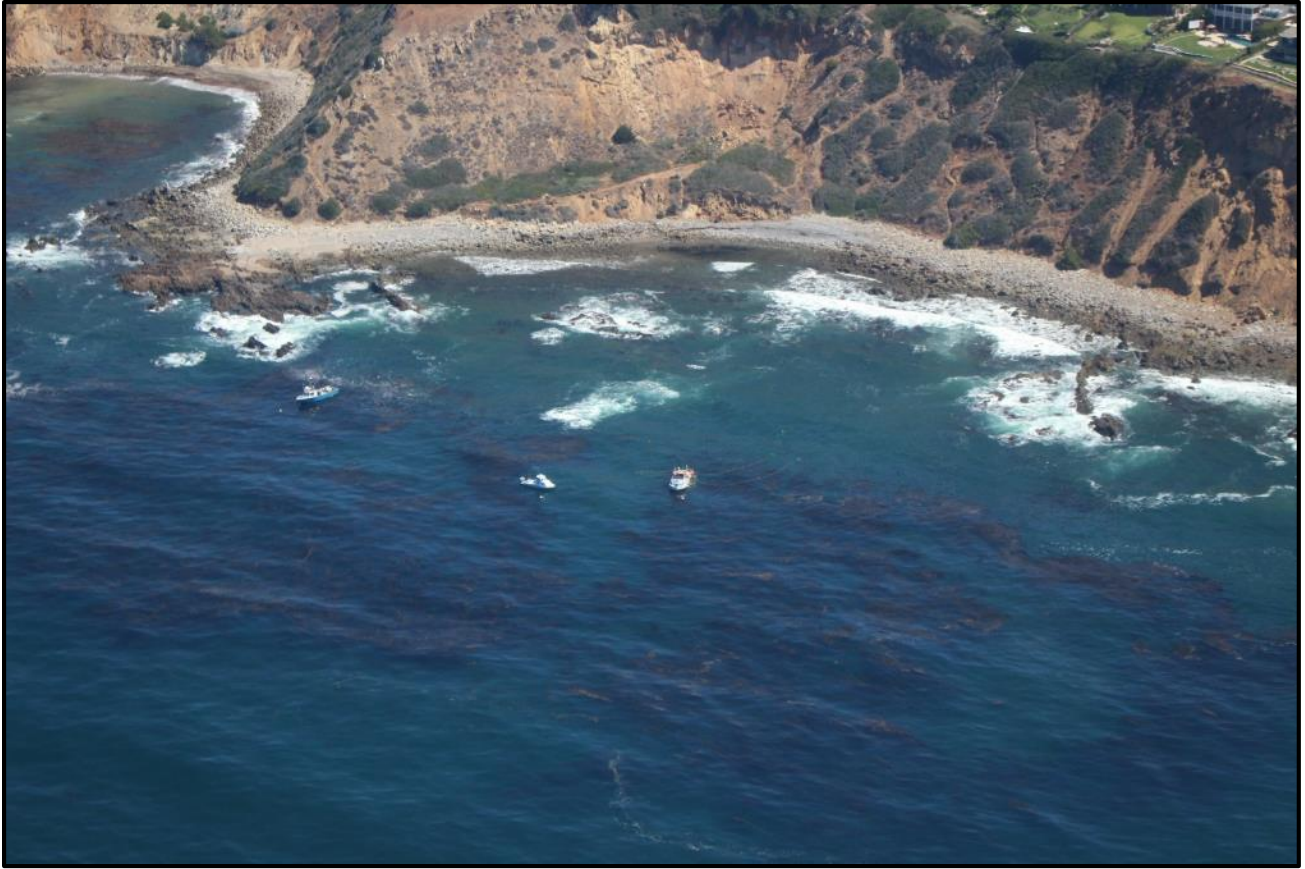


Figure 72 (Site: Marguerite, Date: 04/28/2015, Restoration In Progress, GPS: 33.757, -118.418)





Figure 73 (Site: Marguerite, Date: 04/28/2015, Restoration In Progress, GPS: 33.757, -118.418)



Figure 74 (Site: Underwater Arch Cove, Date: 11/07/2013, Pre Restoration, GPS: 33.752, -118.415)



Figure 75 (Site: Underwater Arch Cove, Date: 04/28/2015, Post Restoration, GPS: 33.752, -118.415)



Figure 76 (Site: Hawthorne, Date: 04/28/201, Restoration In Progress, GPS: 33.747, -118.414)