

South Florida/Caribbean Network

National Park Service
Inventory and Monitoring Division



Standard Operating Procedure CR08

Conducting Rapid Habitat Assessments—Version 2.1

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Summary

This standard operating procedure describes the procedures for conducting rapid habitat assessments (RHAs). RHAs are designed to rapidly determine whether a site would meet the criteria of an “Extensive” sub-site while recording additional easily gathered ancillary data that could be useful to benthic mapping or other efforts, including the dominant habitat structure, coarse visual estimates of major benthic groups, proportion of hardbottom versus sand, and taking underwater pictures in the four cardinal directions. If over half the substrate is hardbottom and live stony coral cover exceeds a 1–2% cover visual estimate, a line-intercept transect is conducted to provide a more accurate estimate. Visual estimates should be considered approximate for the purpose of rapidly describing a site only.

Revision Log

Revision Date	Author	Changes Made	Reason for Change	New Version #
2007	Andrea Atkinson, Jeff Miller	Filled out RHA sheet. Did 4 20m line-intercept transects in cardinal directions with points every 0.5m. Data points collected as transect tape was rolled out.	Needed to rapidly assess whether a selected point met criteria for an extensive sub-site since benthic maps were too coarse to describe benthic cover.	1.00
2009	Andrea Atkinson, Ben Ruttenberg	Tie off ends of transects first rather than collect data while rolling out tape Transect point data collected every 0.25 m instead of every 0.5m. Sand within a reef patch recorded as RSAND. Sand clearly outside a reef recorded as SSAND.	Line-intercept transect data overestimated percent coral cover compared with videography results. This difference was reduced to 3% when ends were tied off using the SCREAM team method. Increasing the points per transect increased the precision of the estimate of percent coral cover, which in turn decreased the likelihood that a site with a % coral cover high enough to be considered part of the sampling frame would not be found to be too low once monitored using videography. However inhouse tests still show that with this	1.01
2012	Andrea Atkinson	Dropped use of GRTS design. Instead use a stratified random design for initial selection of points. Dropped use of RSAND and SSAND.	GRTS design does not produce a geographically balanced design if there are areas with different final selection probabilities in sampling frame. Use of RSAND (sand inside reef) versus SSAND (sand outside reef) fundamentally did not make a difference in selecting whether a site had a high enough % coral cover for consideration as an extensive sub-site.	1.02

Revision Date	Author	Changes Made	Reason for Change	New Version #
Jan. 2015	Andrea Atkinson, Ben Ruttenberg, Jeff Miller	SOP written to meet I & M program, organization and format requirements.	Tied to I & M 2.00 version of protocol.	2.0
June 2020	Judd Patterson	SOP name changed from 8 to CR08.	Renamed according to regional guidance.	2.1

Equipment needed

The site selection is conducted in the office using software found on desktop computers. The site evaluation and survey is conducted in the field and uses the following:

- Standard dive gear
- Handheld and/or boat mounted GPS unit with site coordinates preloaded
- List of potential sites to be visited that day and/or in the region or area
- Weighted line with cave reel and float
- Transect tapes (two or more tapes of minimum 25–30 meters [82–98.4 feet each])
- Slates, pencils, and blank RHA datasheets, both RHA Habitat datasheets and RHA transect datasheets (Figures 1 and 2).

SFCN Rapid Habitat Assessment Sheet

Observer Name:

Partner Name:

1	Site:	
	Date:	
	Time:	

2	Depth (feet - use depth gauge)	
	Min *	Max *

3	Rugosity (CHECK ONLY 1)	
	Low (tallest hard structure <0.5m)	
	Medium (tallest hard structure is 0.5 - 1.5m)	
	High (tallest hard structure >1.5m)	

5	Abiotic Footprint	% cover
	Hardbottom	
	Sand	
	Rubble	

6	Biotic Footprint	% cover
	Live coral (A)	
	Gorgonians (B)	
	Sponges (C)	
	Macroalgae (D)	
	Bare/turf/uncolonized by A-D	

7	Presence/Absence	
	Macro-inverts.	P/A
	Diadema	
	Conch	
	Lobster	

8	High/Medium/Low	
	Fish Groups	H/M/L
	Planktivores	
	Herbivores	
	Mobile Inverts.	
	Piscivores	

4	Habitat Structure (Dominant = 1, Also present=2; Check only 1 dominant structure)			
	Coral Reef and Hardbottom		Uncolonized sediment	
	Spur and Groove		Sand	
	Aggregate Reef		Seagrass	Continuous ≥90%
	Scattered Coral/Rock in Unconsolidated Sediment			Patchy, 50% ≤ 90%
	Pavement			Sparse, 10% ≤ 50%
	Rock/Boulder		Macroalgae	Continuous ≥90%
	Reef Rubble			Patchy, 50% ≤ 90%
	Pavement with Sand Channels			Sparse, 10% ≤ 50%
	Aggregate Patch Reef			
	Individual Patch Reef			

9	Photo	
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Notes:

SITE:

Figure 1. Rapid Habitat Assessment Habitat Datasheet.

RHA TRANSECT DATA SHEET

Observer Name:

Partner Name:

Site:

Date/Time:

Transect (N,S,E,W):

Meter	Cover	Meter	Cover
0.25		10.25	
0.5		10.5	
0.75		10.75	
1		11	
1.25		11.25	
1.5		11.5	
1.75		11.75	
2		12	
2.25		12.25	
2.5		12.5	
2.75		12.75	
3		13	
3.25		13.25	
3.5		13.5	
3.75		13.75	
4		14	
4.25		14.25	
4.5		14.5	
4.75		14.75	
5		15	
5.25		15.25	
5.5		15.5	
5.75		15.75	
6		16	
6.25		16.25	
6.5		16.5	
6.75		16.75	
7		17	
7.25		17.25	
7.5		17.5	
7.75		17.75	
8		18	
8.25		18.25	
8.5		18.5	
8.75		18.75	
9		19	
9.25		19.25	
9.5		19.5	
9.75		19.75	
10		20	

Transect (N,S,E,W):

Meter	Cover	Meter	Cover
0.25		10.25	
0.5		10.5	
0.75		10.75	
1		11	
1.25		11.25	
1.5		11.5	
1.75		11.75	
2		12	
2.25		12.25	
2.5		12.5	
2.75		12.75	
3		13	
3.25		13.25	
3.5		13.5	
3.75		13.75	
4		14	
4.25		14.25	
4.5		14.5	
4.75		14.75	
5		15	
5.25		15.25	
5.5		15.5	
5.75		15.75	
6		16	
6.25		16.25	
6.5		16.5	
6.75		16.75	
7		17	
7.25		17.25	
7.5		17.5	
7.75		17.75	
8		18	
8.25		18.25	
8.5		18.5	
8.75		18.75	
9		19	
9.25		19.25	
9.5		19.5	
9.75		19.75	
10		20	

Figure 2. Example of Rapid Habitat Assessment Transect Datasheet.

Procedures

Site selection

1. Clearly define the focal habitat to be monitored at the start: e.g., restricting monitoring to reefs with initial stony coral cover of minimally at least 5% (or at least 3%) using videography, between 2–30 meters (6.6–98.4 feet [ft]) deep, and whether this is a focal reef area such as Loggerhead Forest or is to investigate differences inside and outside a managed area such as the DRTO Research Natural Area. Carefully define what is considered “non-habitat” as well, e.g., greater than 50% sand, pavement, low-relief, low cover linear reef.
2. Identify a useful benthic habitat map and mapped habitat categories and/or imagery, SONAR data, LIDAR data, and bathymetry layers. The South Florida/Caribbean Network (SFCN) has found that focusing on areas mapped as “high relief spur and groove,” “reef terrace,” “individual patch reefs” and “aggregate patch reefs” and in some cases linear reef can be useful in locating high coral cover areas in Dry Tortugas National Park and Biscayne National Park. Preliminary field investigations are recommended to evaluate the accuracy and usefulness of the mapped categories and/or how to translate boundaries visible in imagery into mapped potential habitat for investigation.
3. Delineate the potential habitat using ArcGIS (See SOP CR07 *Selecting and locating random sampling points using GPS—Version 2.1* (SFCN 2025a) for instructions for creating a polygon of using ArcGIS).
4. Determine the number of targeted extensive sub-sites. Typically, five sub-sites are recommended. Fewer sites are possible, but the level of change detectable should be examined prior to site installation.
5. Randomly choose points within the delineated potential habitat by choosing one or some combination of the following approaches: (**Note**—SFCN has found that if there is a different probability of some sites being thrown out as non-habitat in some portions of the study area than in others [e.g., part of the map is more accurate than another or contains more of a habitat type likely to have extensive sub-sites meeting the criteria], then a GRTS design is not recommended which is an alternative way of achieving a spatially balanced design).
 - a. If area is very large, then break the study area into sections of approximate equal size. If the goal is to select five extensive sub-sites, then divide the sample area into five sections of approximately equal size. Use ArcGIS to randomly select at least ten potential extensive sub-sites per section. If upon field investigation with the rapid habitat assessment (next section), the first extensive sub-site does not meet the selection criteria defined in step 1, continue to investigate the second randomly selected point and so on.
 - b. If there is a desire to have different selection probabilities in different strata, and then combine multiple strata for a park-wide trend analysis, then overlay the map with a

40 × 40 meter (131.2 × 131.2 ft) grid. For example, in Dry Tortugas National Park there was initially a desire to be able to roll all extensive sub-site results from inside the RNA and outside the RNA together into a parkwide trend analysis. To do so, a 40 × 40 meter (131.2 × 131.2 ft) grid was laid over the park. The grid was also nested within the NOAA/University of Miami /NPS fish monitoring grid so that correlations could be made to fish data. This allows a weighted stratification analysis to be conducted like the reef fish monitoring approach (Brandt et al. 2009). Keep grid cells that have at least 50% of the defined habitat. If the area is very large, then break the study area into multiple sections as described above. Randomly select an excessive number of grid cells for investigation with the rapid habitat assessment field methodology as defined below. Maintain a record of the sample selection process, e.g., the original number of grid cells designated as habitat and the number of cells visited before the required number of extensive sub-sites were found. These are used to estimate the actual amount of habitat that meets the criteria available and the selection probabilities. Methods of analysis using this approach are provided in Brandt et al. (2009) for fish but the analysis approach is very similar. **Note:** The South Florida/Caribbean Network started with this approach in Dry Tortugas NP. However subsequently it was determined that management preferred reporting by the different areas rather than a single park-wide answer was preferable, e.g., separate analysis for trends for Inside RNA, Outside RNA, Bird Key Reef, Loggerhead Forest, Santa's Village. Thus, the details of analyzing using the weighted finite sample frame are not provided in this protocol and the user is referred to Brandt et al. (2009).

- c. If using patch reefs, then the network recommends restricting random selection to patch reefs of 800 square meters (2,625 square feet [ft²]) or larger as this is the minimum size an extensive sub-site will fit on. This restriction still allows 84% of the patch reef habitat to be included in the potential sample frame of Biscayne NP for example.

Site evaluation

1. Once an appropriate list is generated, points are uploaded onto GPS units (handheld, boat-mounted, or both). Before each field day, a list of potential points should be chosen that are logistically feasible and follow safe diving practices, such that deeper sites are visited in the morning and shallower sites are visited in the afternoon.
2. To visit a site, use the navigation feature of the GPS unit to approach as closely as possible to the point, ideally within 10 feet (3 meters [m]).
3. Once the boat is less than 10 feet (3 m) from the point, another team member should deploy a weighted line attached to a cave reel and float. The end of the line is attached to a soft weight (~3 lbs [1.4 kilograms]) using cable ties, and the reel made loose. The weight is quickly lowered over the side of the boat when the point is reached, and the reel tightened after the weight hits bottom, being sure to leave plenty of slack to allow the reel and float to move with the current such that the weight does not 'bounce' along the bottom and will stay in

place. The boat is then anchored upcurrent of the buoy or a driver remains on board to ‘live boat.’ The team lead will make this decision based on available personnel and local conditions.

4. Depending on the conditions, depth, and habitat expectations, the team may deploy snorkelers to evaluate the site before anchoring and entering the water on SCUBA. The team should make an initial visual assessment of the habitat visible from the point of the weight marker (typically a 15–20-meter [49.2–65.6 ft] diameter circle), fill out the datasheet in Figure 1 and determine if the site warrants a full transect-based RHA. Visual estimates of percent cover are approximate and should be agreed upon by snorkeler or diver team. For descriptions of habitat structure categories, team members should review “Development of a system for classification of habitats in estuarine and marine environments (SCHEME) for Florida” (Madley et al. 2002).
5. Generally, if the majority (> 50%) of habitat is hardbottom and live coral cover is estimated at greater than 1–2%, a full RHA should be conducted, i.e. both a qualitative habitat assessment (Figure 1) and quantitative line-intercept transect assessment (Figure 2) are conducted. If these conditions are not met, the snorkelers/divers should examine the site and fill out the Rapid Habitat Assessment Habitat datasheet only (Figure 1). Additionally, depth contours should be evaluated. If precipitous/rapid or steep changes in depth (> 20 feet [6 m] depth change within 10 feet [3 m] distance) occur, and/or if these steep areas are a mix of hardbottom and softbottom, then a modified RHA (Habitat datasheet only) can be conducted.

Site survey

1. If the team lead and/or snorkelers/divers determine that the site is likely to have greater than 1–2% live coral cover, a full rapid habitat assessment should be conducted. The full assessment consists of four transects of 20 meters (65.6 ft) each run in cardinal directions.
2. Divers enter the water near the surface float marking the GPS point of the site after anchoring or while ‘live boating’ (to be determined by the team lead) and descend to the bottom near the weight on the weighted line.
3. If two divers are used, each will lay and survey two transects. Additional divers may be used to survey transects and/or lay transect lines
4. Divers tie off the transects as close to the weight as possible, ideally using an outcrop of dead coral or other non-living feature, and run them the four cardinal directions (north, south, east, west).
5. The far ends of transects (after 20 meters [65.6 ft] are laid out) are again tied off to dead coral outcrops or other non-living features, taking care to make them as straight and tight as possible.
6. Once the transects are tied off, surveyors return to the origin and begin the survey. At every 0.25 meters (starting at 0.25 meters [0.8 ft]), surveyors record the species/functional group of

the primary benthic organism occupying space directly underneath the transect tape. If current/surge is present and the transect moves, the surveyor should attempt to determine where the mean point around the transect movement and record the organism/benthic cover under that point.

7. Species/functional group codes follow those used in the database (see Appendix A in SOP CR12 *Conducting analysis of HD images—Version 2.1* (SFCN 2025b)).
8. The surveyor proceeds along the transect until reaching meter 20 (65.6 ft), for a total of 80 points per transect. The surveyor then reels in the transect tape and begins the next transect.
9. The process continues until all four transects have been surveyed.
10. Surveyors retrieve all tapes and ascend following safe diving practices, ideally up the anchor line if the boat is anchored, or up the float line if another team member is ‘live boating.’

Literature Cited

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