

# SPATIAL ANALYSIS AND RESOURCE CHARACTERIZATION TOOL

## INTRODUCTION

The SPAtial Analysis and Resource Characterization (SPARC) tool was developed by NCCOS' Biogeography Branch and the National Marine Protected Areas (MPA) Center to help analyze the distribution of marine resources among MPAs and MPA networks. SPARC is designed to support conservation planning by helping coastal and ocean managers identify areas where resources of interest occur, where those areas overlap with existing MPAs, and potential gaps in resource protection.

## PURPOSE

The SPARC tool is an ArcGIS 10 add-in designed to simplify and streamline spatial analysis and to organize data layers in a structured format. Its primary analytical function is to calculate the relative distribution of spatial data inside and outside of defined spatial areas, zones or boundaries.

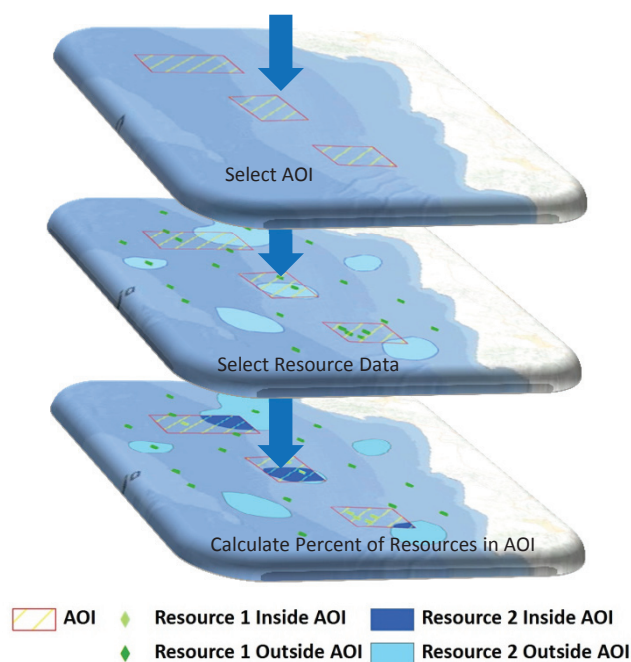
## TOOL DESCRIPTION

SPARC summarizes statistics for areas and points based on the areas of interest as defined by the user (e.g. MPAs, planning areas, or zones). It can report the coverage (percentage) of resources present inside the target areas relative to the overall regional resource extent. The tool is customized with a user-friendly graphical interface that prompts the user to select the analysis inputs and provides a simple organizational strategy to manage the input and output datasets. The tool is available online for download and is packaged with a detailed tutorial with additional technical support available through NCCOS.

SPARC also provides the capability to select the analytical area(s) of interest (AOI) based on a designated attribute or data field in the input AOI layer or to join tabular information and a spatial datasets based on a unique identifier. This feature precludes the need to subset input data, allowing the user to select multiple areas that share a common attribute (e.g., federally managed MPAs or no-take MPAs) as part of the workflow. This avoids data versioning and allows for iterative analyses based on different attributes.

Although the SPARC tool was designed to characterize resources in and around MPA boundaries, it can also be applied to inform other management decisions. For example, SPARC can be used to assess habitat types within proposed sites for offshore marine energy development or to evaluate the potential ecosystem impacts of natural disasters.

Model SPARC Workflow



NOAA's National Marine Protected Areas (MPA) Center's mission is to facilitate the effective use of science, technology, training, and information in the planning, management, and evaluation of the nation's system of marine protected areas. The MPA Center works in partnership with federal, state, tribal, and local governments and stakeholders to develop a science-based, comprehensive national system of MPAs. These collaborative efforts will lead to a more efficient, effective use of MPAs now and in the future to conserve and sustain the nation's vital marine resources.



## TOOL SUMMARY

The SPARC tool simplifies the analysis workflow of iterative spatial analyses and assists in data management via a set of linked analytical functions packaged into one toolkit. Provided below are the strengths and weaknesses as identified through initial testing of the SPARC capabilities.

### ADVANTAGES

- Offers user-friendly interface
- Requires minimal GIS expertise
- Combines sequential analysis steps into one simple tool
- Organizes data inputs, outputs and interim layers
- Eliminates need to create GIS analysis models or scripts
- Results file can be imported easily into statistical software

### TECHNICAL CONSIDERATIONS

- Requires some pre-processing and data preparation
- Does not accept raster or vector line data formats
- Limits use of quantitative data without pre-processing
- Needs accurate and consistent inputs to yield useful results
- Requires detailed review and interpretation of results
- Requires licensed software application (ESRI ArcGIS 10)

The primary consideration for use of SPARC is that the source, collection method and accuracy of the input resource data will heavily influence the utility of the output results. Spatially continuous data that cover the entire study region are preferred, as they yield the most accurate results. Data that are numerical, e.g. count of observations over time, will offer challenges to the processing and should be binned into categories for the most effective and interpretable results. Large datasets (fine scale or large spatial domain) can also compromise the analysis, so efforts should be taken to generalize (reduce number of vertices) large datasets or to subset as needed to reduce the processing load.

## SPARC IN ACTION

The MPA Center is using SPARC to analyze the representativeness of resources protected by MPAs in the coastal and marine waters off the state of California. To better understand how well California MPAs represent the breadth of the state's marine ecosystem features, resources and services, SPARC was run on a series of statewide ecological resource datasets. The example below shows the results of analysis using a dataset for kelp cover, where SPARC has calculated the relative amount of kelp cover contained within all MPAs, and within each MPA individually. SPARC has also been used to conduct an analysis of only no-take MPAs, and other analyses based on MPA attributes such as level of government. These analyses allow managers and planners to better understand where key resources like kelp are being protected, and where they are not, in order to inform present and future management decision making.

Example Results



AOI Area	184,500 km <sup>2</sup>
Kelp Area in AOI	124 km <sup>2</sup>
Kelp Area in All MPAs	66 km <sup>2</sup> (53%)
Kelp Area in No-Take MPAs	29 km <sup>2</sup> (23%)
Monterey Bay National Marine Sanctuary	27 km <sup>2</sup> (22%)
All National Marine Sanctuaries	45 km <sup>2</sup> (36%)
All State MPAs	63 km <sup>2</sup> (51%)
All Federal MPAs	51 km <sup>2</sup> (41%)

## FOR MORE INFORMATION

To learn more about SPARC applications for MPA science and analysis, visit the National MPA Center website:  
<http://www.mpa.gov>

For technical assistance or to download the SPARC tool, visit the NCCOS' website:  
<http://www.coastalscience.noaa.gov>



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