

California Master Plan Science Advisory Team
Parallel Processes Work Group
Draft Layperson's Guide to Interpreting MARXAN Model
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Model Name

MARXAN 2.0: Optimized solver for selection / modification marine protected area (MPA) networks.

Description of the Model

Numerical, spatially explicit optimization model used to design marine reserve networks that represent a proportion of habitat types across depth zones while minimizing impacts on commercial and recreational fisheries.

Specific Assumptions of the Model

Model is parameterized using habitat targets resulting from stakeholder packages. Model is then run for each package with the specific purpose of informing stakeholders how impacts to commercial and recreational fishing (in terms of relative importance) can be reduced while maintaining an equal amount of habitat as originally protected under specific package.

Considers all MPAs as no-take reserves therefore the model potentially overestimates impacts to commercial and recreational fisheries.

Specific Parameters Utilized

- Habitat targets (expressed as proportion of total to be protected)
 - Habitat targets parameterized using stakeholder packages
- Consumptive use areas
 - Cost data derived from weighted average value across all commercial and recreational fisheries

Model Limitations

- Can not optimize using population dynamics/viability as an objective.
- Does not consider spacing guidelines
- Only considers impacts based on existing, perceived value of fishing grounds rather than optimizing effort based on placement of reserves.

Types of Output

- Spatially explicit optimized reserve locations based on multiple objectives.
- Summary statistics for habitats protected and economic impacts
- Results can be easily integrated with other population modelling and evaluated on performance in terms of population dynamics.

Examples and General Interpretations of the Model Output

Results can be presented in map form, over-layed with packages used to parameterize each run. Stakeholders can then visually evaluate differences between packages and model runs to

determine what adjustments to boundaries, or removal/addition of MPAs would minimize impacts to commercial and recreational fisheries while maintaining specific habitat protections.

How can specific outputs from this model inform the MLPA planning and decision-making process? How does this model address the guidelines with respect to evaluation of MPA proposals?

- Not meant to evaluate the MPA proposals rather to inform stakeholders how specific adjustments to proposals can reduce relative impacts to commercial and recreational fisheries while maintaining an equal or better distribution of habitat types.
- Can be used to “fine tune” proposals.

How and what MLPA question or goal does the model address? *Specific goals of the MLPA are listed below.*

1. To protect the natural diversity and abundance of marine life, and the structure, function, and integrity of marine ecosystems.
2. To help sustain, conserve, and protect marine life populations, including those of economic value, and rebuild those that are depleted.
5. To ensure that California's MPAs have clearly defined objectives, effective management measures, and adequate enforcement, and are based on sound scientific guidelines.