Developing a coherent network of MPA's, the California experience

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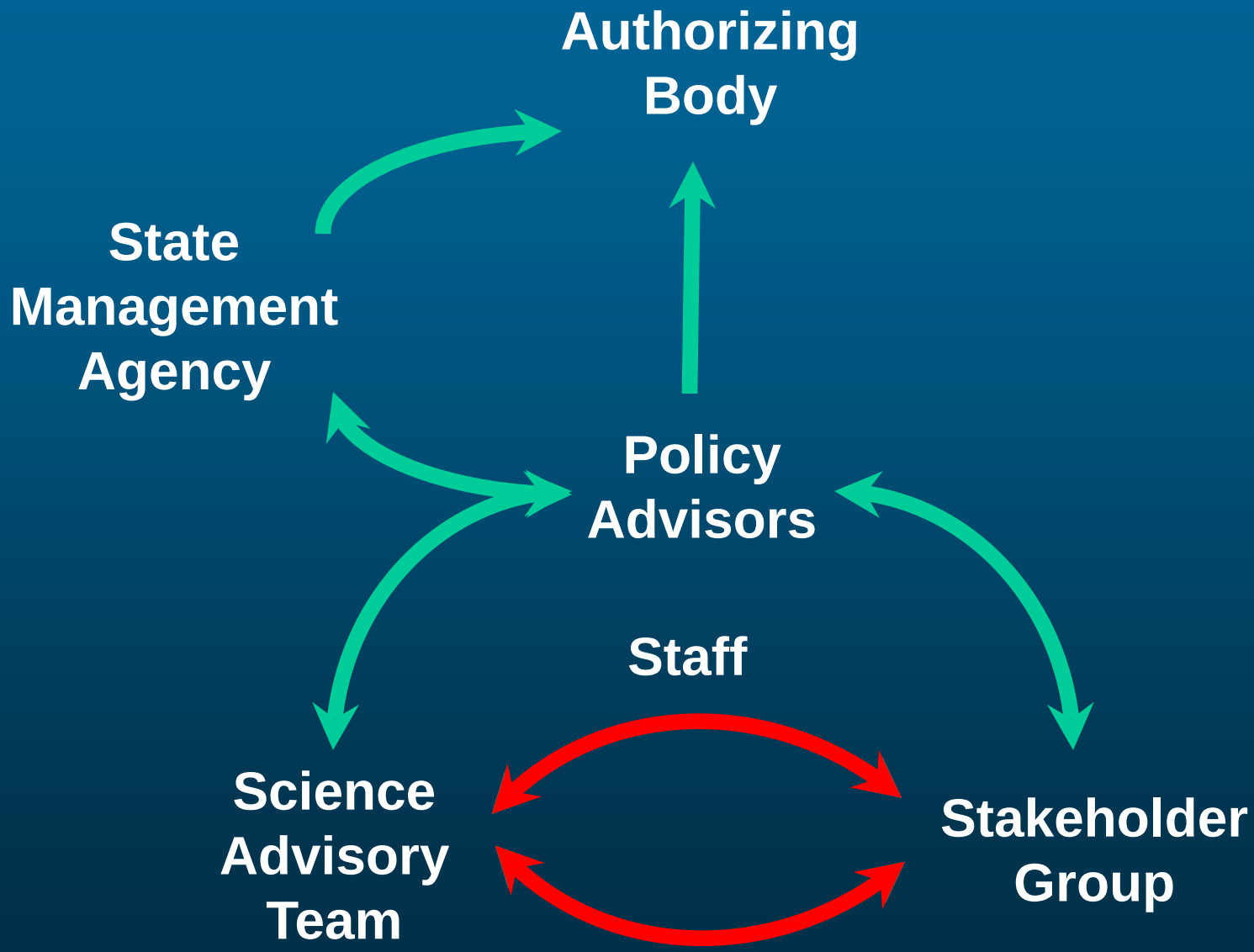
California Marine Life Protection Act

Legislative mandate for state-wide network of MPAs

Based on best readily available science

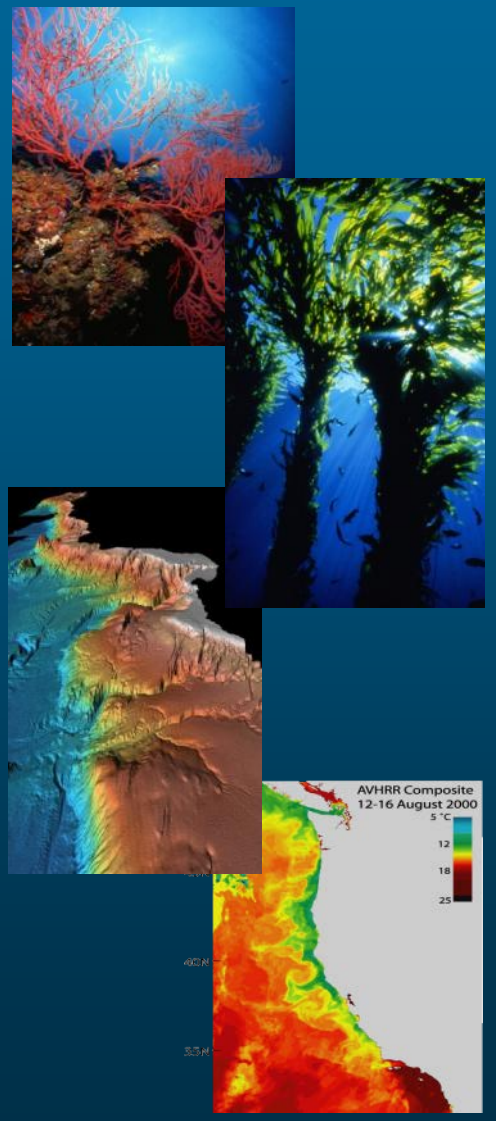
Stakeholder generated

Marine Life Protection Act - Process



CA Marine Life Protection Act Goals

1. Protect natural diversity and ecosystem functions.
2. Sustain and restore marine life populations.
3. Improve recreational, educational, and study opportunities.
4. Protect representative and unique habitats.
5. Clear objectives, effective management, adequate enforcement, sound science.
6. Ensure that MPAs are designed and managed as a network.



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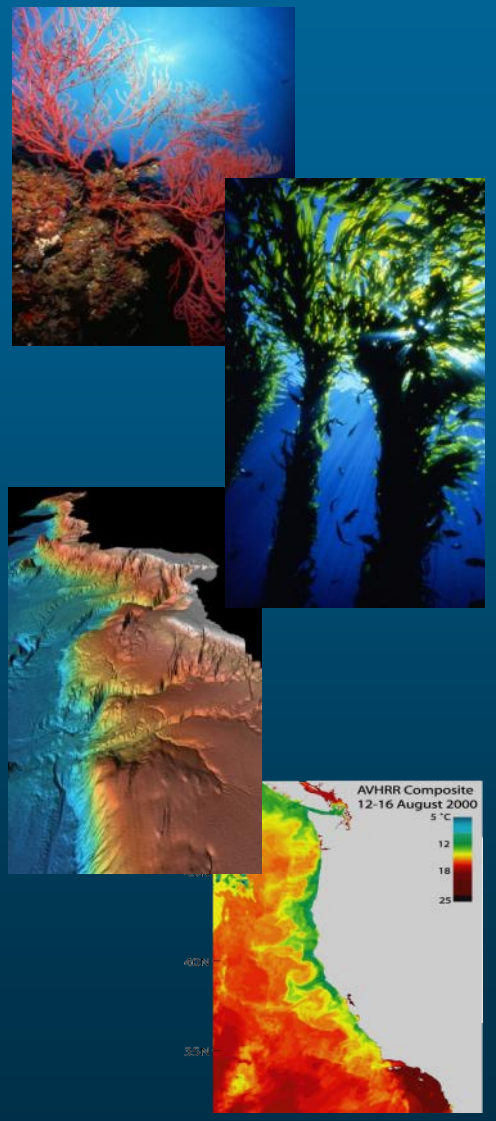

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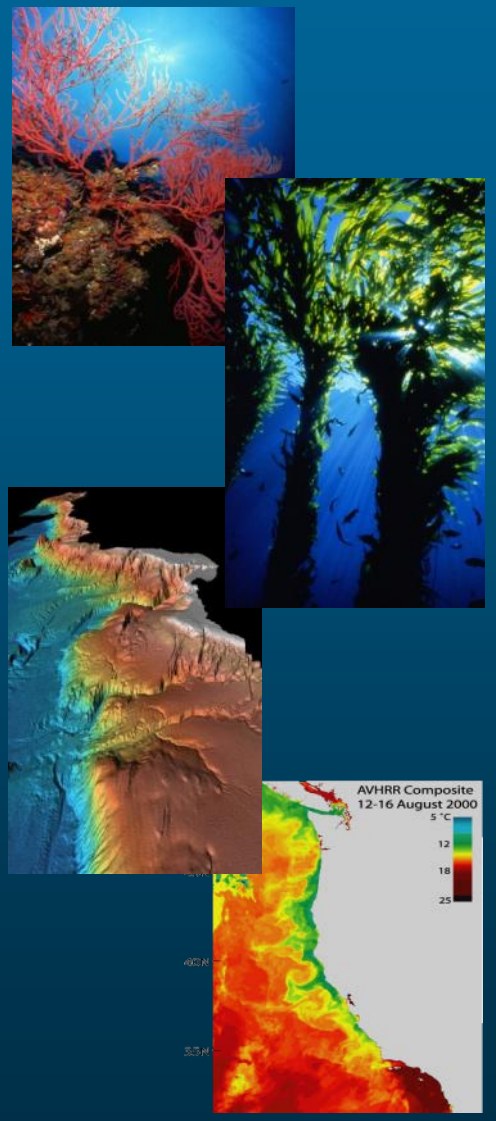


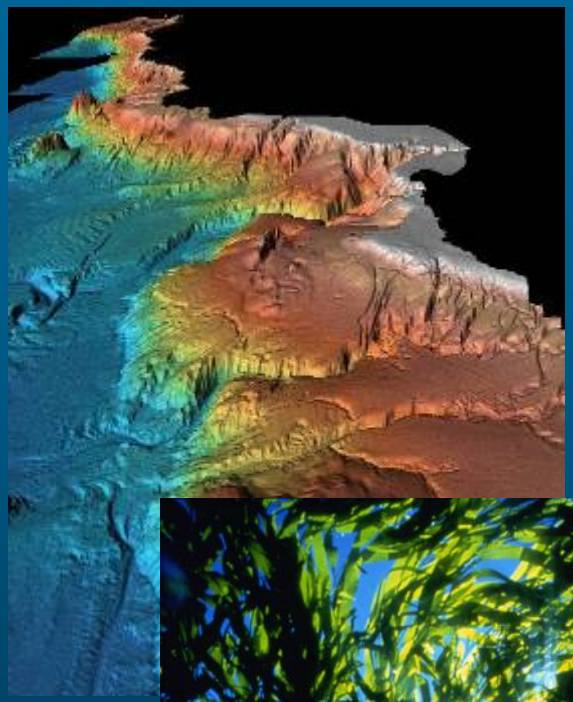
Elements of an MPA Network

- Ecosystem representation and replication
- Individual MPA size and shape
- Management (fishing restrictions)
- Connectivity (larval)

Ecosystem Representation

Identify ecosystems using:

- Bottom Type and Depth
- Living Habitats (kelps, seagrasses)
- Oceanographic features



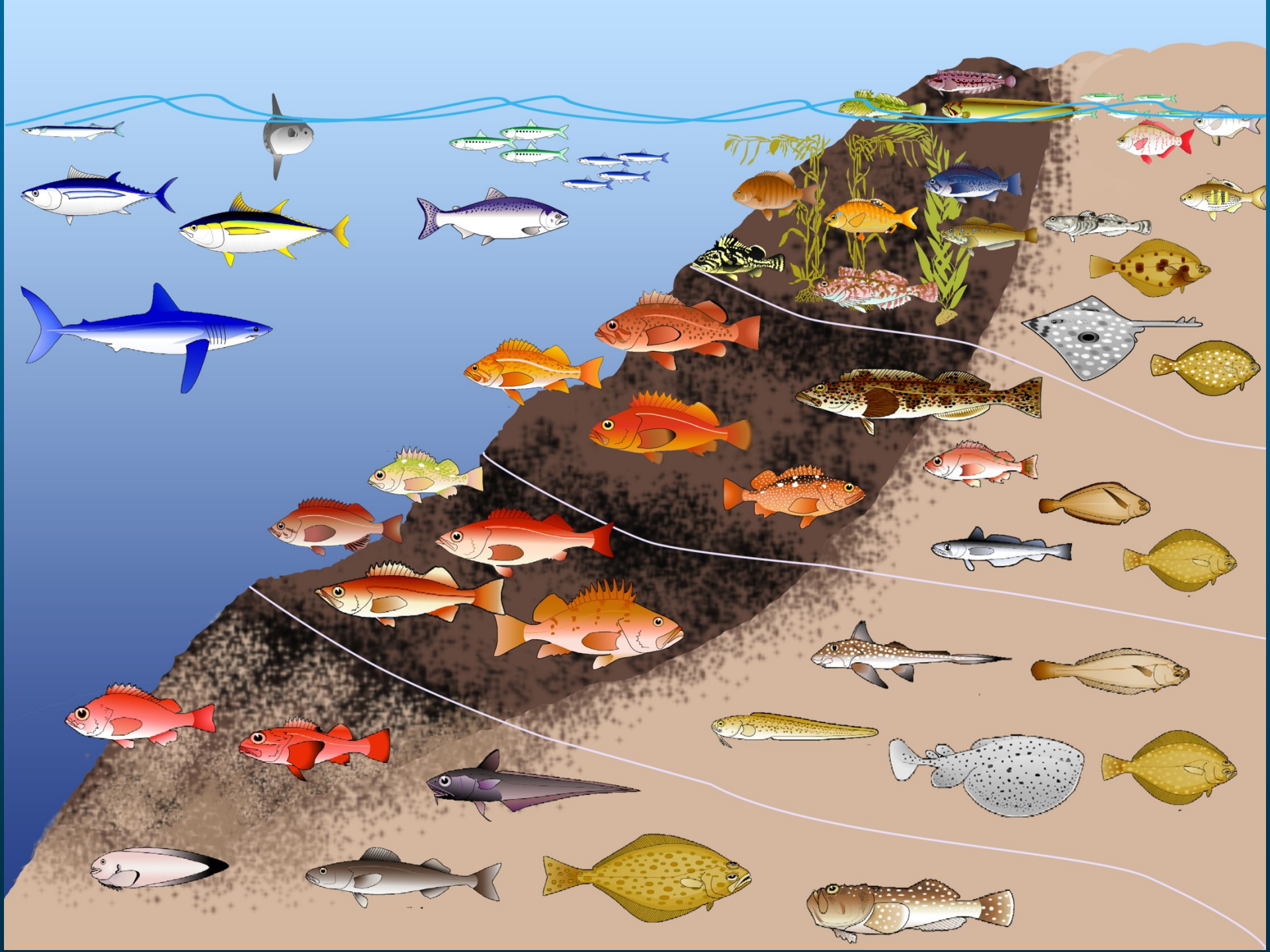
Bottom Type:

- rocky reefs
- sandy or soft bottoms
- estuaries

Depth Zones:

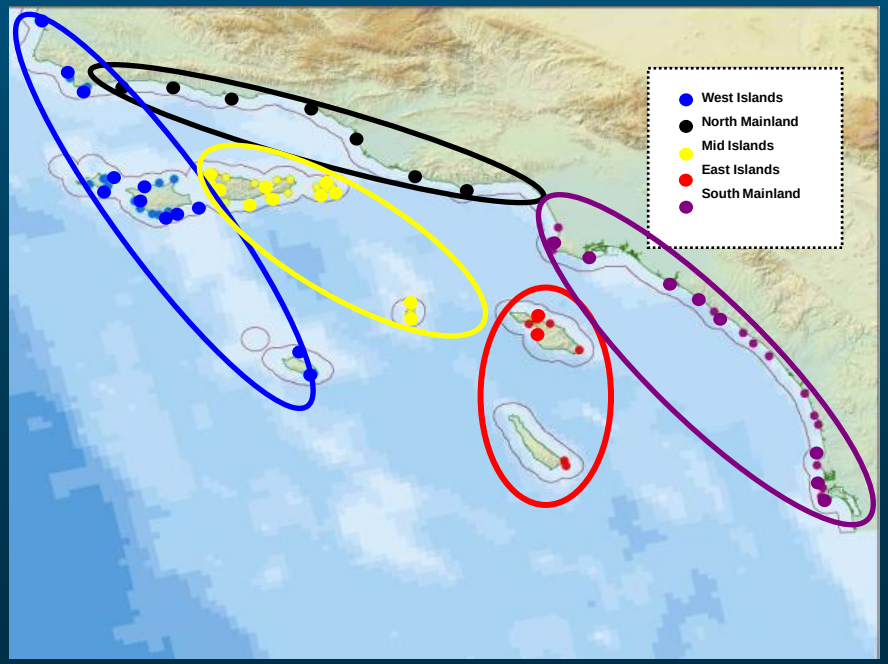
- Intertidal
- Intertidal to 30 m
- 30 to 100 m
- 100 to 200 m
- 200 m and deeper

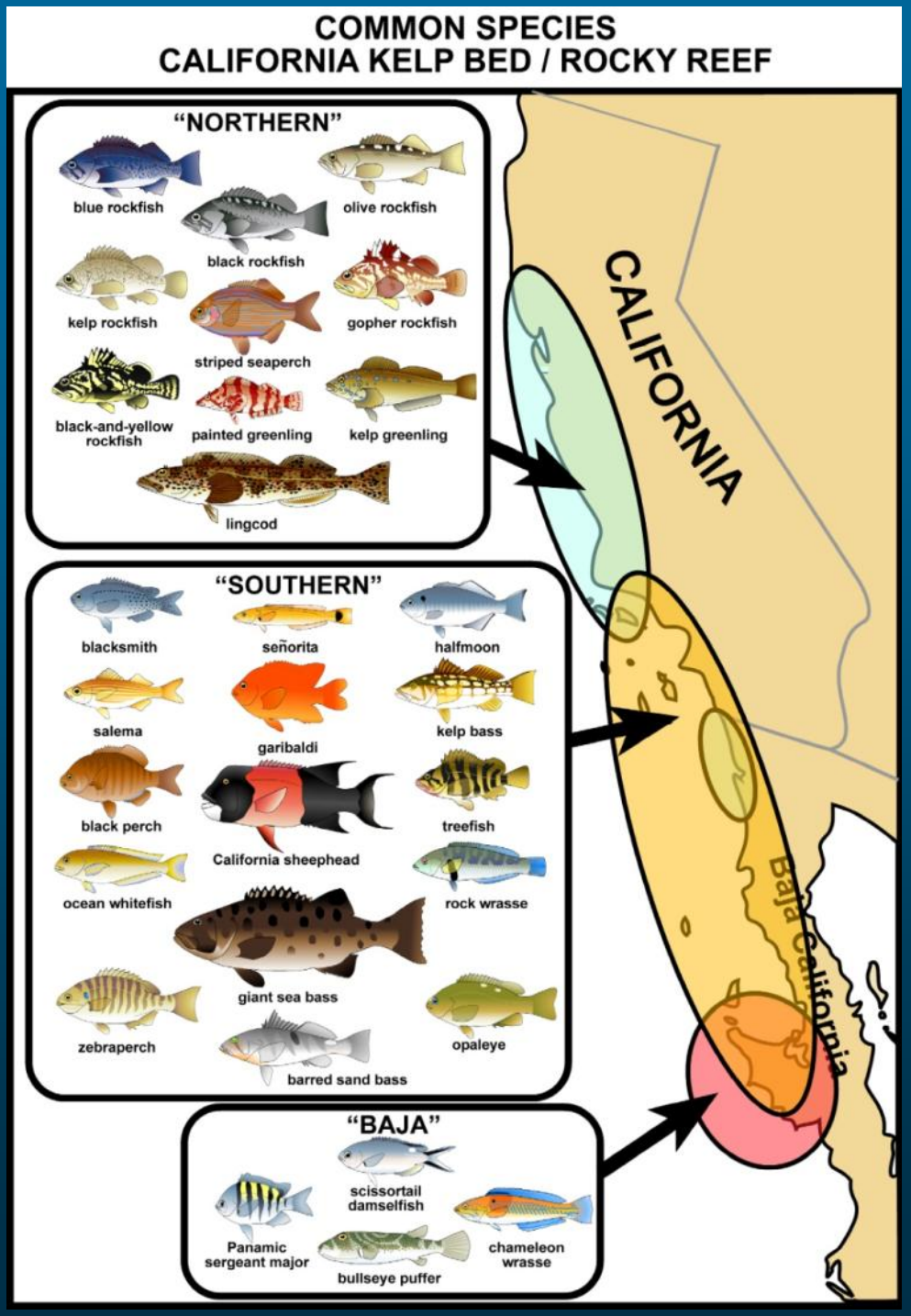
Biogenic: **kelp forests,** seagrass beds, marsh



Geographic Differences Within Ecosystems

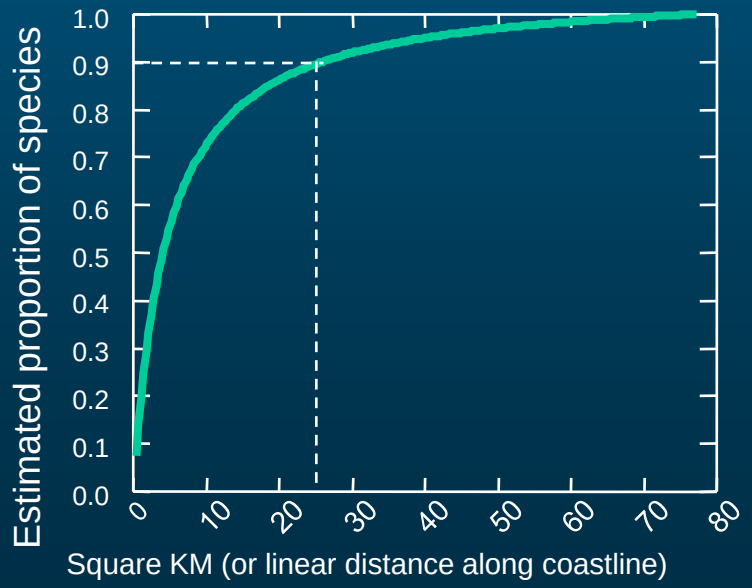
Marine communities vary at multiple scales



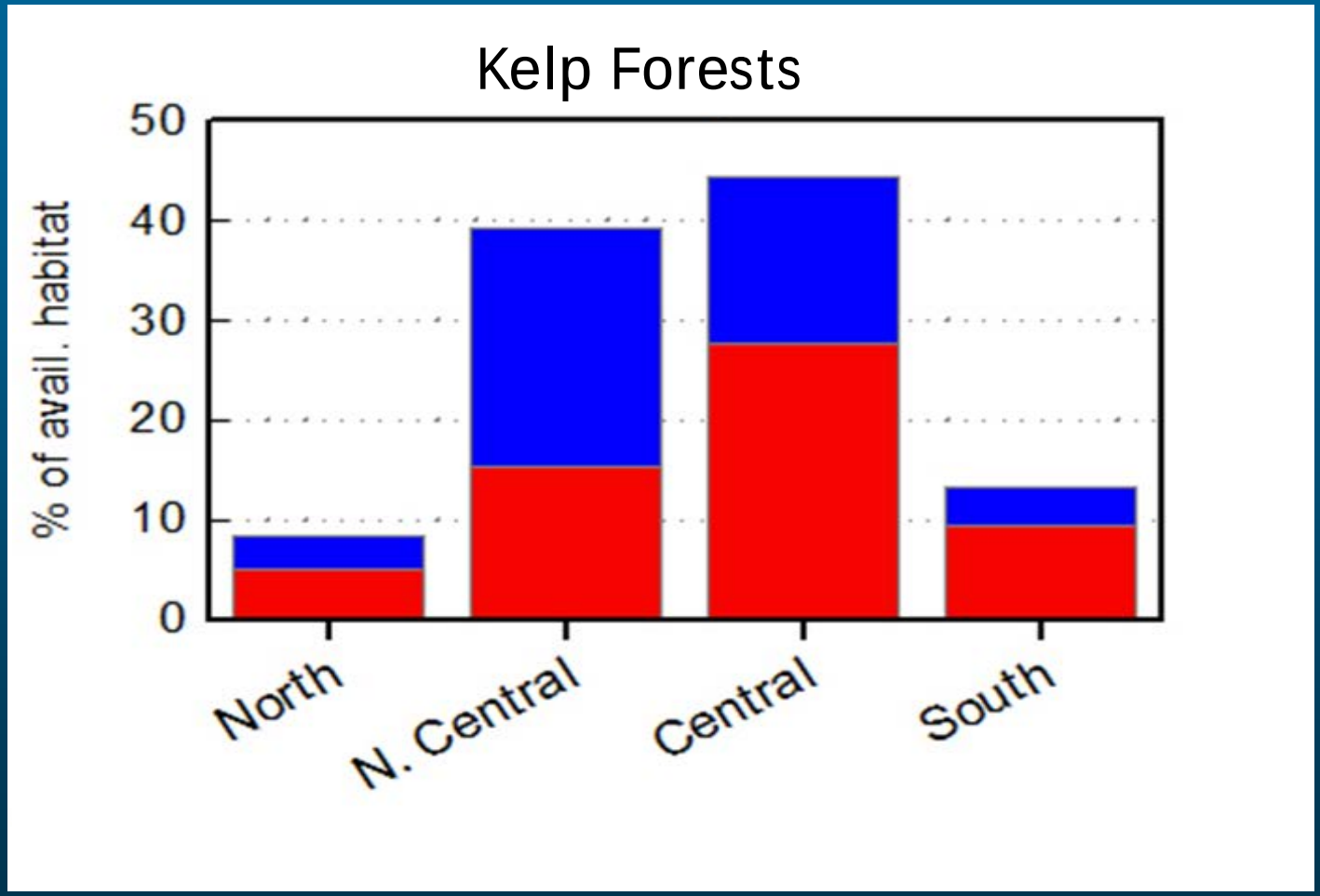


Ecosystem Replication Guidelines

- Each key ecosystem represented in at least **three to five replicate MPAs** within large-scale **biogeographic region**
- Each ecosystem represented in at least **one replicate** MPA within each smaller-scale **bioregion**
- Habitat adequacy: replicates determined by species-area curves →



Ecosystem Representivity and Replication



Percent representivity not targeted!
Emerged from replication and spacing guidelines

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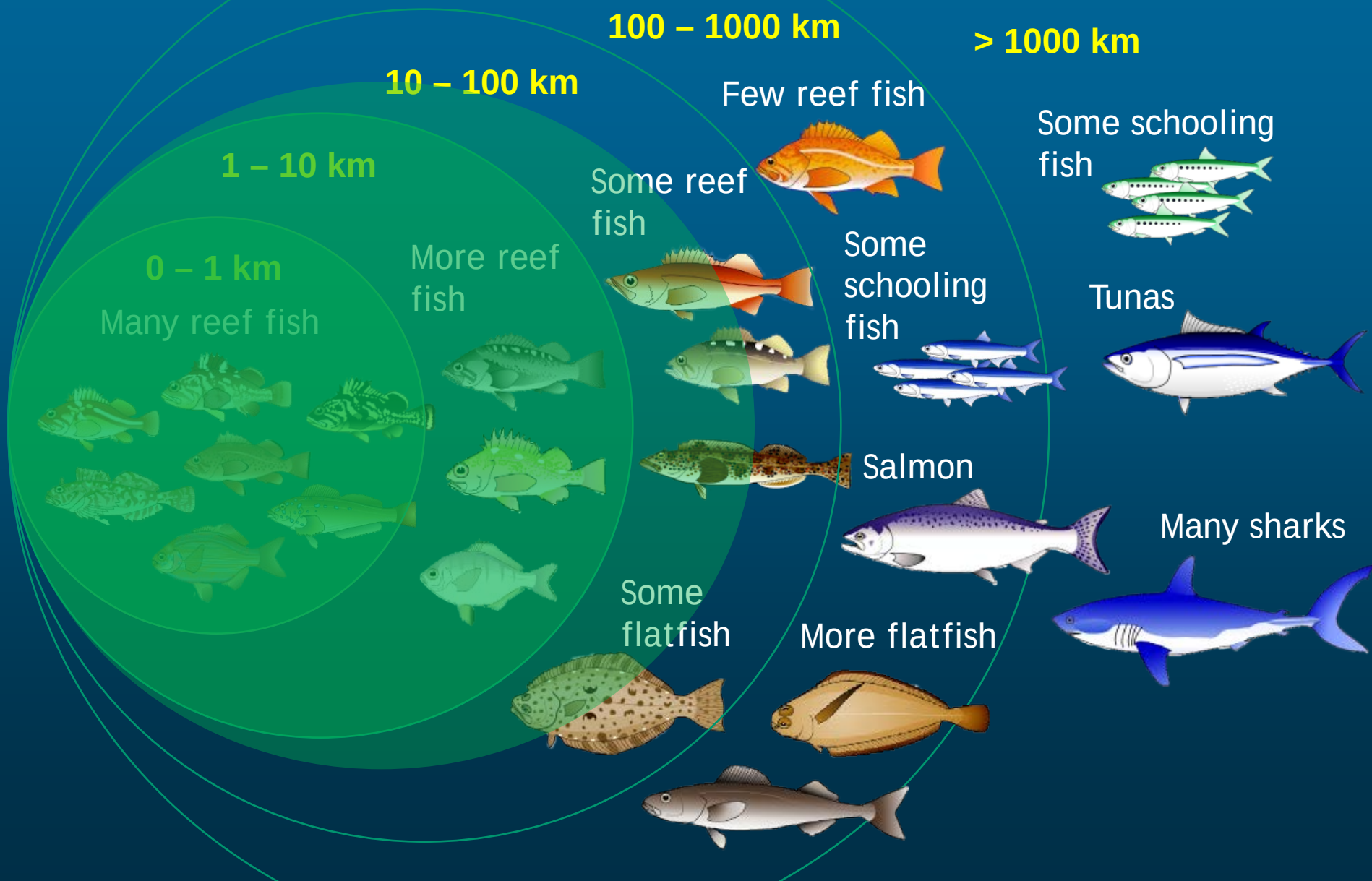
Individual MPA Size



Size and Shape

- Synthesis of fish home ranges
  median alongshore movement < 1.0 (0-5) km

- Many species migrate across depth (fishes, lobster)
  State offshore boundary = 5.5 km

- Provide range of minimum and preferred ranges
  (preferred captures most of the demersal fishes)

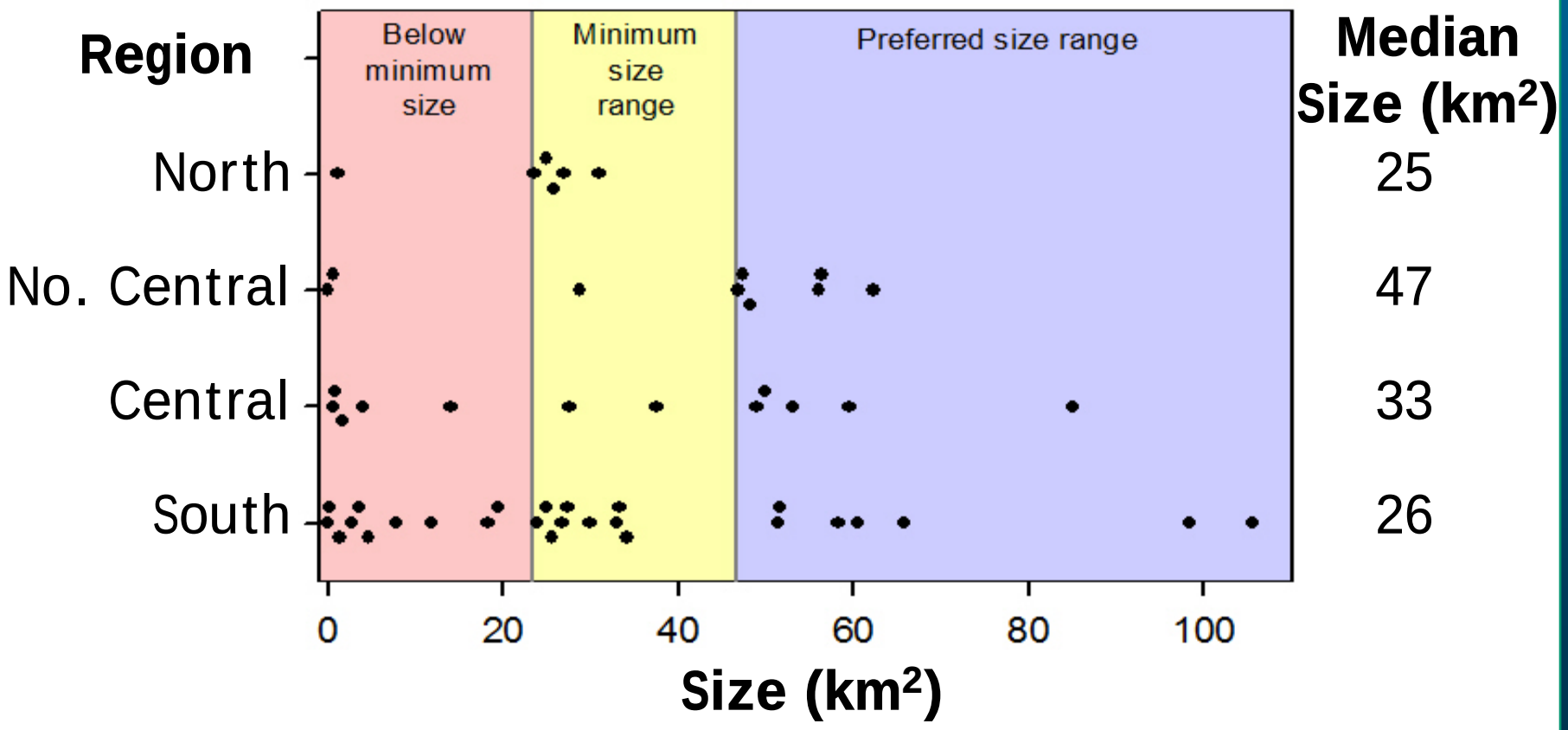
Size and Shape

- Reserves must be large enough to **contain adult movement**

- **Extend across depths** onshore to offshore to accommodate movement

- **Minimum** size = 25 - 50 sq km
  Preferred size = 50 - 100 sq km

Size Assessment
MPAs of Adequate Protection



Birds and Mammals

- Reserves unlikely to be large enough to contain adult movement
- Protect critical habitat and sensitive life stages
- Special closures to prevent human disturbance

Non-copyrighted stuffed bird here

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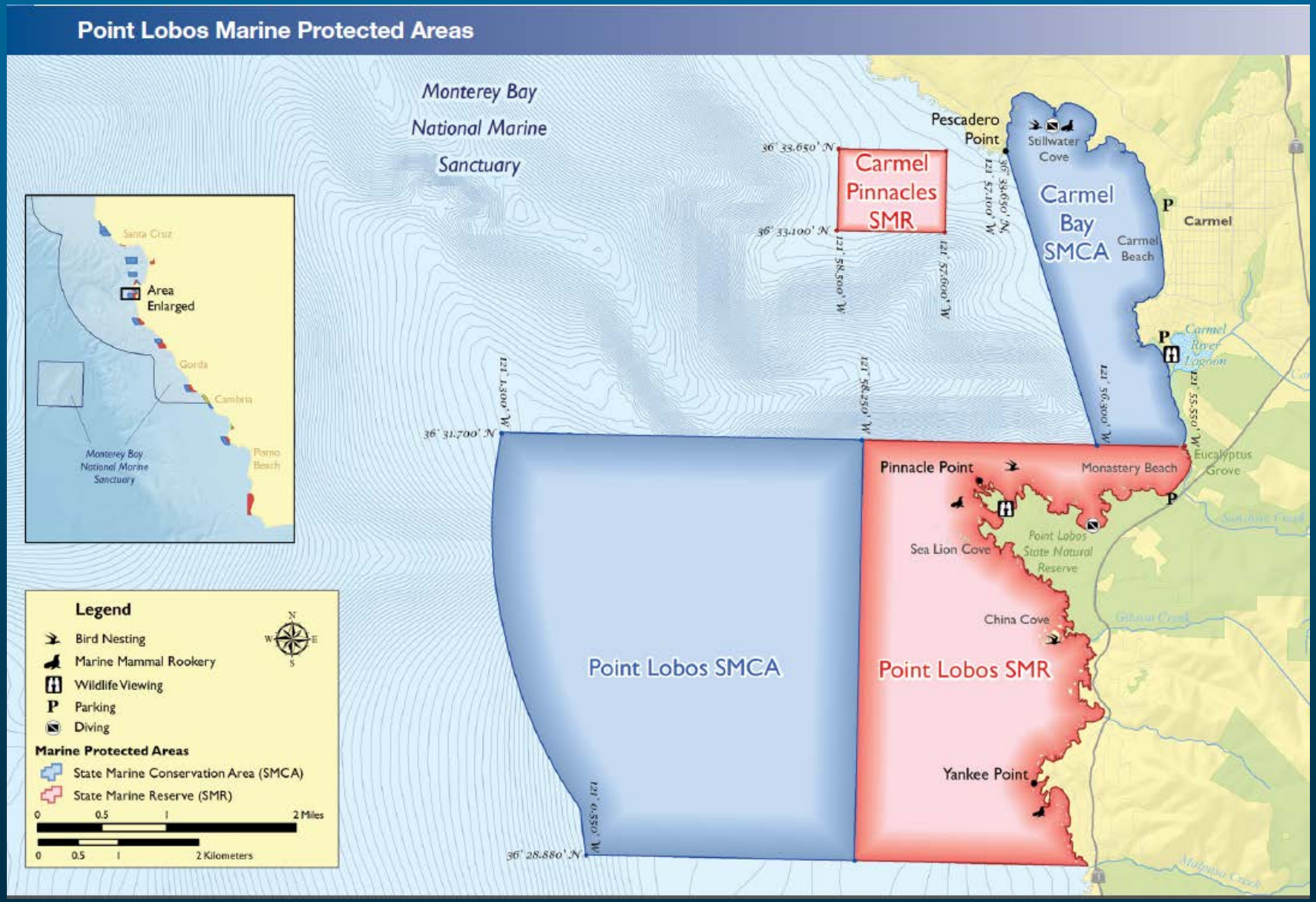
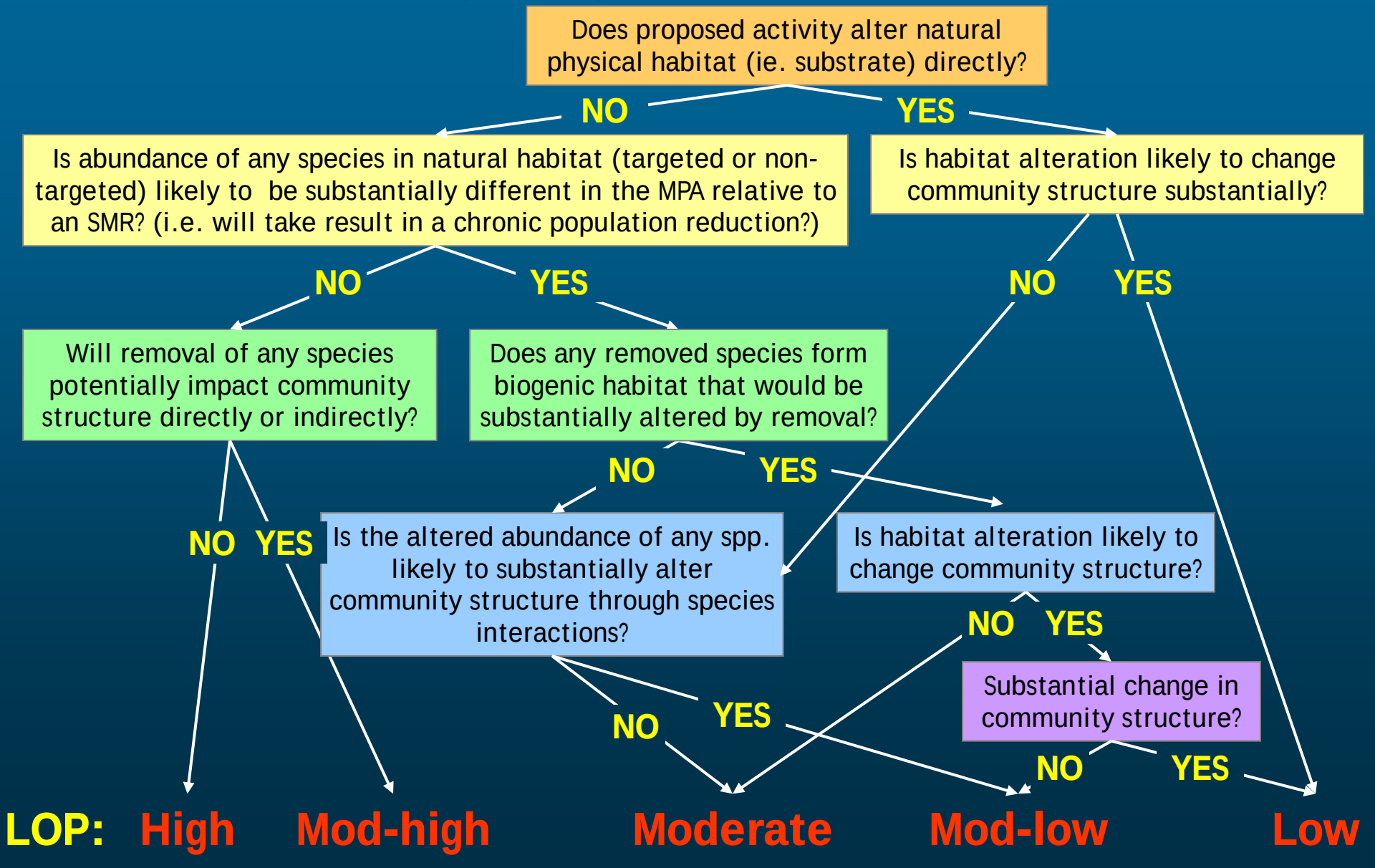
Management: Levels of Protection



Decision Tree for Determining Level of Protection (LOP) of Conservation Areas



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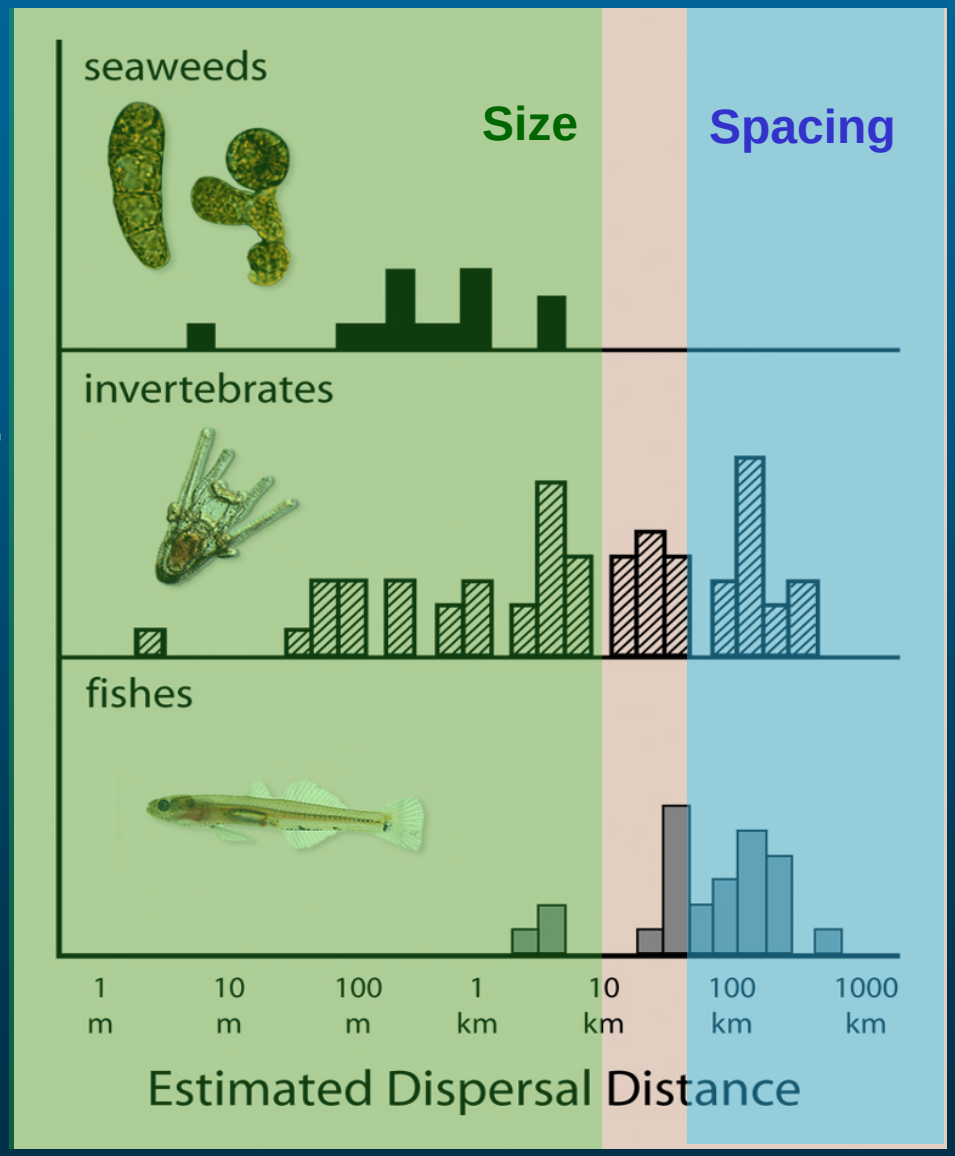
Characteristics of Networks

Single large reserve

dispersal of young

Network of smaller reserves - same overall size

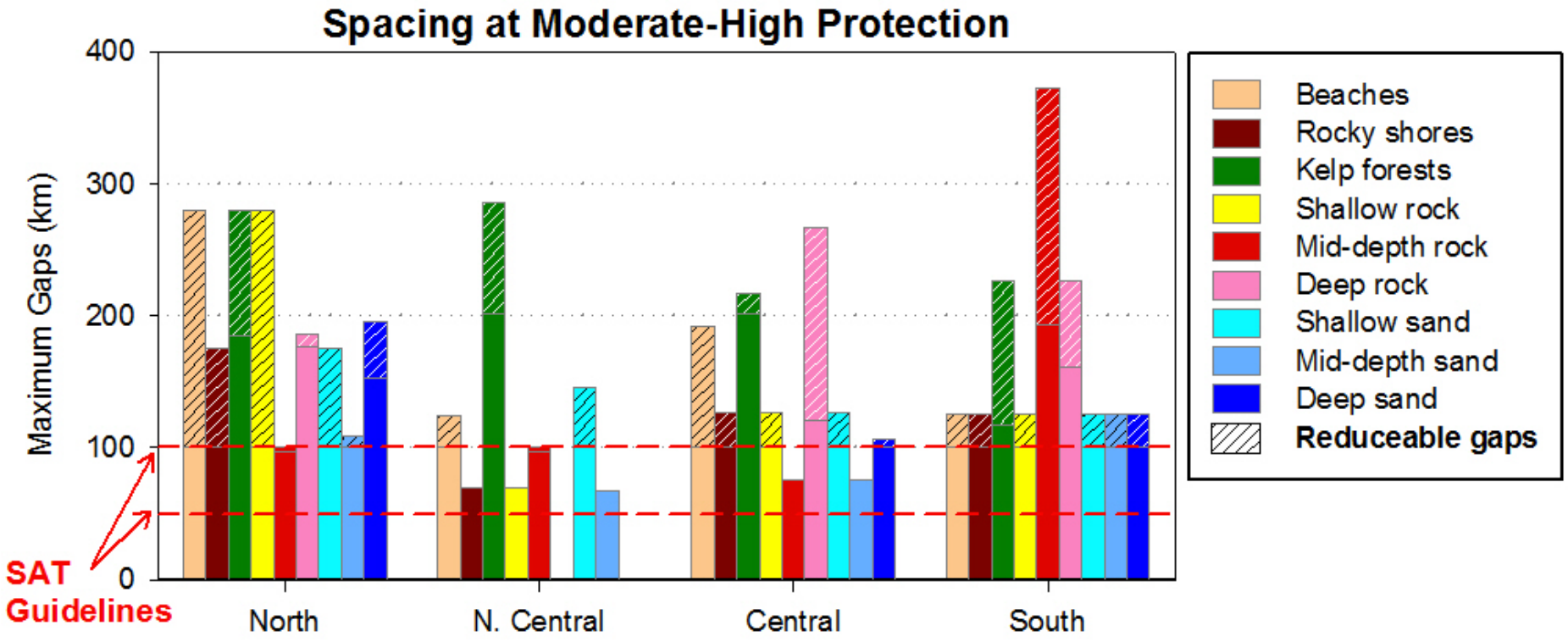
Size and Spacing Guidelines



Data from Kinlan and Gaines 2003, PISCO 2007

- Size:
  - 5-10 km, minimum
  - 10-20 km, preferred
  - Intertidal to deep waters
- Spacing:
  - 50 – 100 km apart
- Size and spacing are inter-related
  - smaller MPAs should be closer together
  - larger MPAs may be spaced farther apart

Evaluation of MPA Spacing
Five Different Proposed MPA Networks



The Product:

- MPAs established between 2007 and 2012
- 63 no-take reserves;
  1291 km^2
  9.4% of state waters
- 124 MPAs total;
  2197 km^2
  16% of state waters

Tools for Creating MPA networks

- Rules of thumb
- Stakeholder design – Marine Map
- Optimality algorithms (e.g., MARXAN)
- Connectivity-based multispecies population models
- Bioeconomic trade-off models (yield vs. biomass)

Additional resources on the MLPA

Saarman, E. et al. 2013. The role of science in supporting marine protected area network planning and design in California. Ocean and Coastal Management 74:45–56.

Gleason, M. et al. 2013. Designing a statewide network of marine protected areas in California: achievements, costs, lessons learned, and challenges ahead. Ocean and Coastal Management 74:90–101.

Botsford, L.W., J.W. White, M.H. Carr, and J.E. Caselle. 2014. Marine protected area networks in California, USA. *In:* Johnson, M.L. and J. Sandell (editors): Marine Managed Areas and Fisheries. *Advances in Marine Biology* 69:205-251.