

# Core Areas of Biological Value

for Combined Focal Species and Ecological Systems\*

based on a Marxan optimization of conservation representation and connectivity

Marxan is a spatially-explicit tool for development and evaluation of reserve networks based on explicit conservation goals (Possingham et al. 2000). The utility of Marxan is to identify a set of areas that meet user-specified goals for representation of all focal species and ecological systems while minimizing total area and maximizing within-area connectivity. An "optimal solution" is identified by iterative comparison of millions of alternative designs. A degree of stochastic variation is added using a simulated annealing algorithm so that a series of repeated scenarios may result in different sets of areas being included. Moreover, input parameters such as the goals for representation of focal species / systems and the level of connectivity also influence the set of areas identified in each scenario. Areas that are consistently identified as part of the optimal solution under a range of scenarios of goals and connectivity may be considered to have high biological value for the combined set of focal species and ecological systems, and are useful elements for the design of a regional conservation network (Pressey et al. 1994, Leslie et al. 2003).

In this analysis, focal species and ecological systems included brown and black bear, Sitka black-tailed deer, salmonids (6 species), large-tree forests, stopover sites for migratory waterbirds, nesting habitat for marbled murrelet, herring spawning and estuaries. We ran 60 scenarios using a range of boundary modifiers and goals. Each scenario involved 10,000,000 iterative comparisons of alternative designs. In each scenario "best" design was the one that met specified representation goals for all focal systems with the minimum total area and maximum connectivity.

Leslie, H., M. Ruckelshaus, I.R. Ball, S. Andelman, and H.P. Possingham. 2003. Using siting algorithms in the design of marine reserve networks. *Ecological Applications* 13:1858-1868.

Possingham, H. P., I. R. Ball and S. Andelman. 2000. Mathematical methods for identifying representative reserve networks. In: S. Feran and M. Burgman (eds). *Quantitative methods for conservation biology*. Springer-Verlag, New York, pp. 291-305.

Pressey, R.L., I.R. Johnson, and P.D. Wilson. 1994. Shades of irreducibility: towards a measure of the contribution of sites to a reservation goal. *Biodiversity and Conservation* 2:242-262.



## Relative Biological Value for Combined Focal Species and Ecological Systems\*

based on (n = 60) iterations with the Marxan spatial optimization and decision support tool

Relative Biological Value		(irreducibility index)
	Higher (Core Areas)	(0.8 - 1.0)
		(0.6 - 0.8)
		(0.4 - 0.6)
	Lower (Connectivity)	(0.2 - 0.4)

### Other Symbols:

Roads	
Biogeographic Provinces	
Value Comparison Units	
Wilderness Areas	
TTRA LUD II	

### \* Focal Species and Ecological Systems:

Terrestrial:	Freshwater:
Brown and Black Bear - summer habitat	Salmon - 5 species of Pacific salmon and steelhead
Sitka Black-tailed Deer - winter habitat	- freshwater spawning & rearing habitat
Large Tree Forest - Riparian - Upland	
Marbled Murrelet - nesting habitat	
	Coastal:
	Estuaries - emergent vegetation - tide flat / other
	Forage Fish - herring spawning

### About this map:

Areas shown on this map identify core habitats for conservation of focal species and ecosystems (listed below). The selection of these targets, their geographic stratification, and the analysis of core habitat areas has undergone extensive review, and we believe represents the best available science. While these areas do not comprise a conservation strategy by themselves, they are important building blocks around which such a strategy can be constructed. A conservation strategy should include adequate representation of the full range of biological diversity, distribution across the islands and mainland of Southeast Alaska, at a scale that allows for long-term viability and maintenance of ecological and evolutionary processes.

