Contribution of Source-Sink Theory to Conservation in Protected Areas

Newly Recognized Types of Sources and Sinks

Reproduction	Survival	
	Low	High
Low	Sink $\lambda < 1$	Refuge $\lambda > 1$
High	Attractive Sink $\lambda < 1$	Source $\lambda > 1$

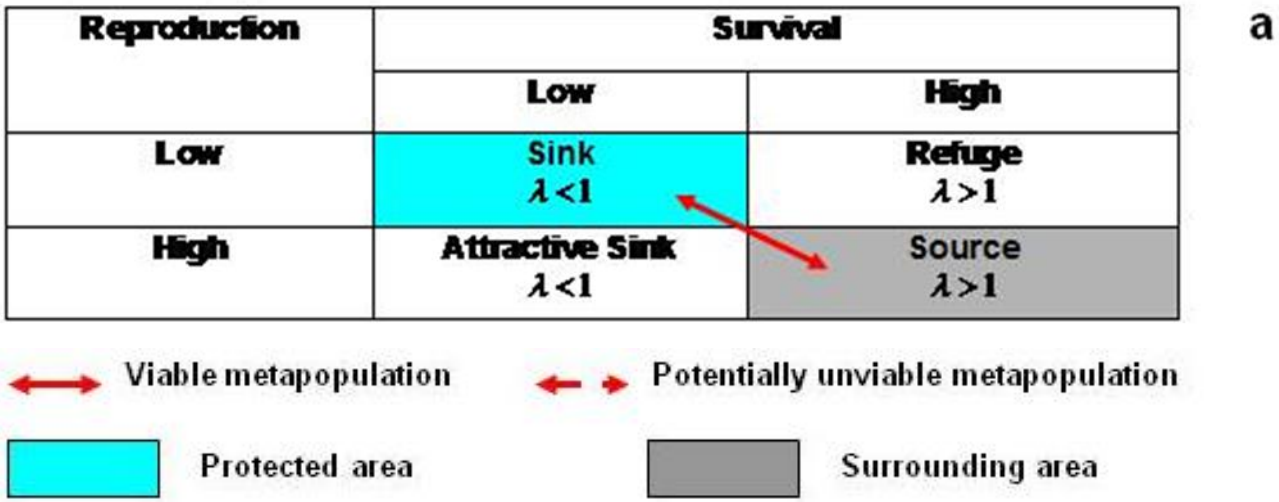
Added to source and sink are:

Refuge – places where survival is high but reproduction is relatively low, so the subpopulation is a weak source.

Attractive Sink – habitat quality is good allowing potentially high reproduction and high survival, but where either reproduction or survival are reduced by forces that are not detected by the organism (e.g., human persecution or harvest).

Delibes et al. 2001

Protected Area as Sink Vulnerable to Loss of the Source



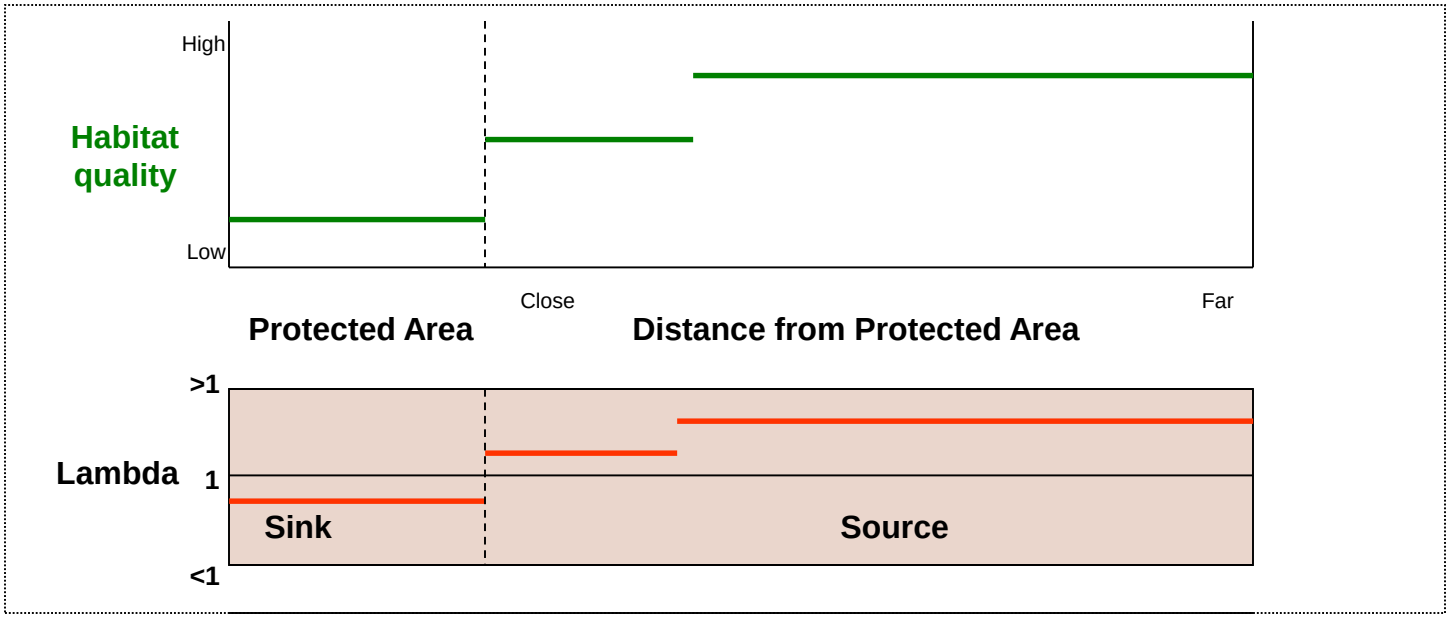
Sources and Sinks (Pulliam 1988):

- **A subpopulation in a sink could be sustained by dispersal from a source.**

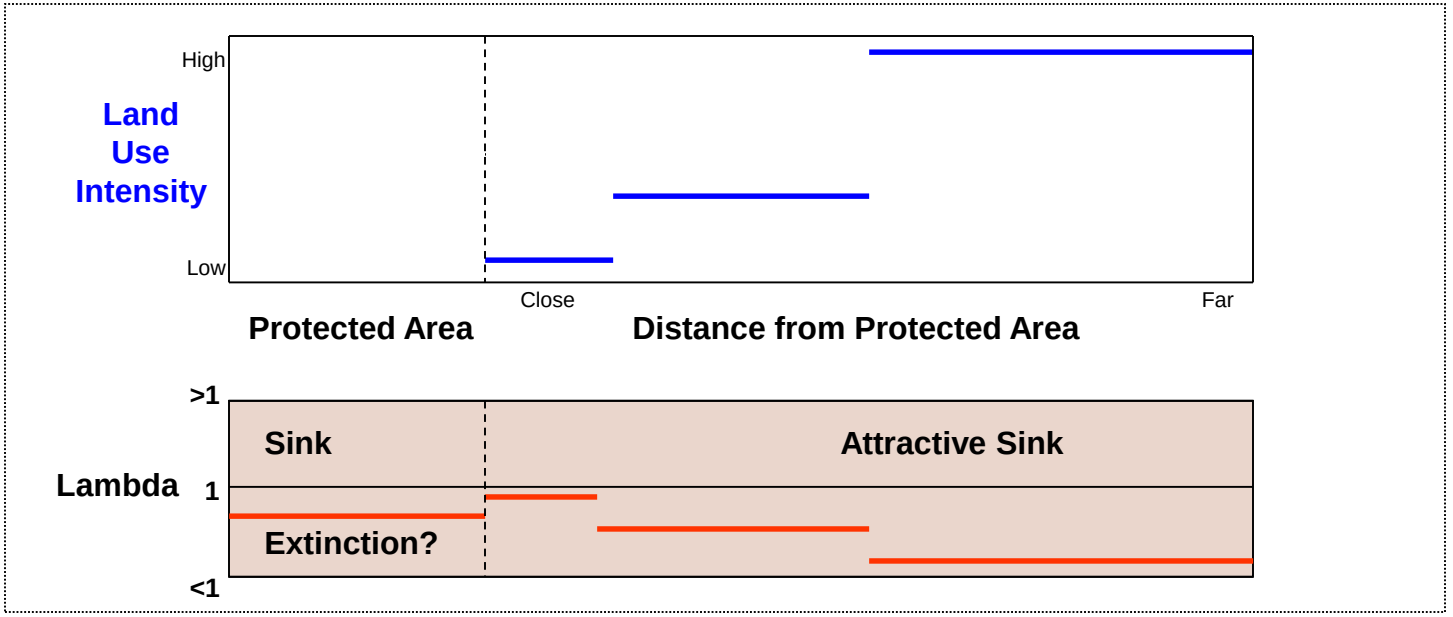
- **Loss of viability from the source due to the sink was not expected because of the assumptions that density dependent habitat selection would lead to the fittest individuals occupying the source.**

Protected Areas as Sinks Maintained by External Sources

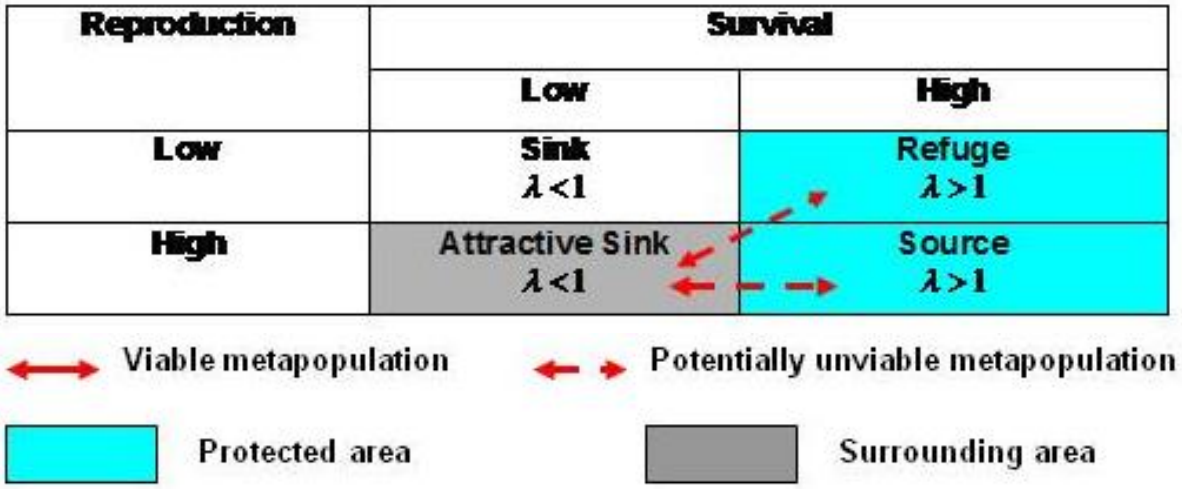
Natural Condition



Land Use Effect



Protected Area as Source at Risk from Attractive Sink



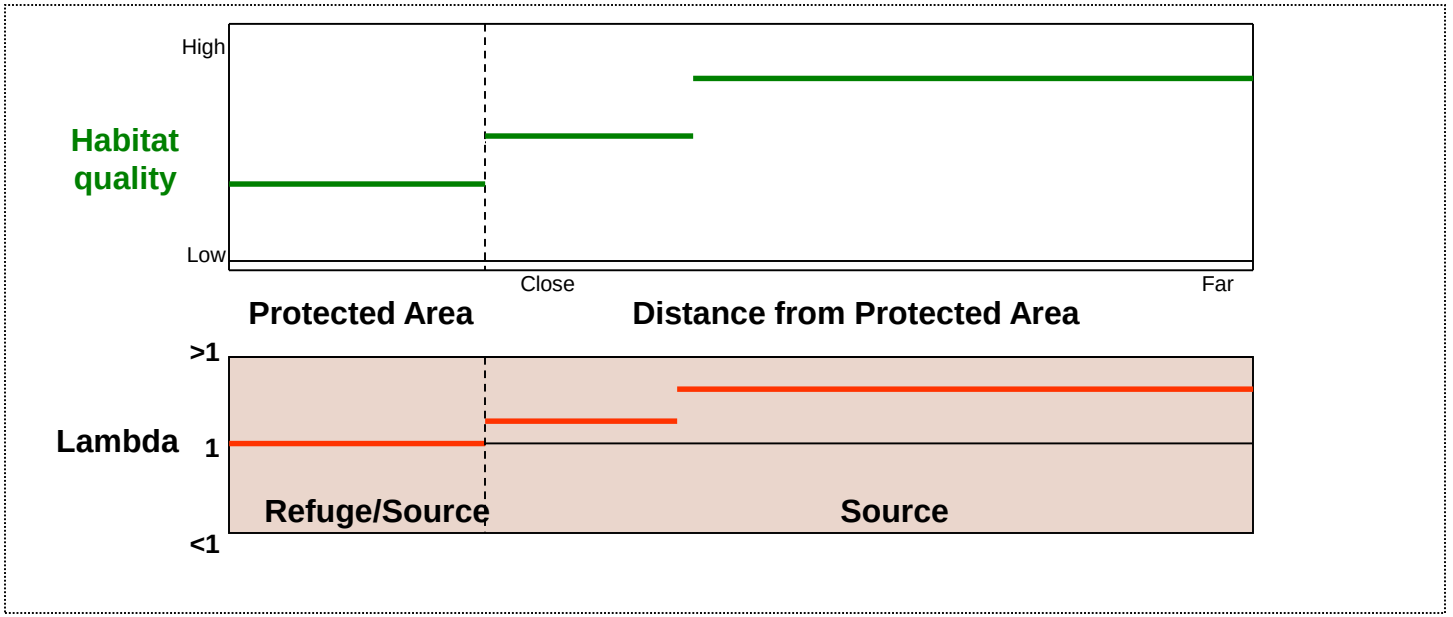
Sources and Attractive Sinks (Gunderson et al. 2001):

- **Rate of dispersal from source patches can increase in the presence of sink patches, there by reducing metapopulation population growth.**

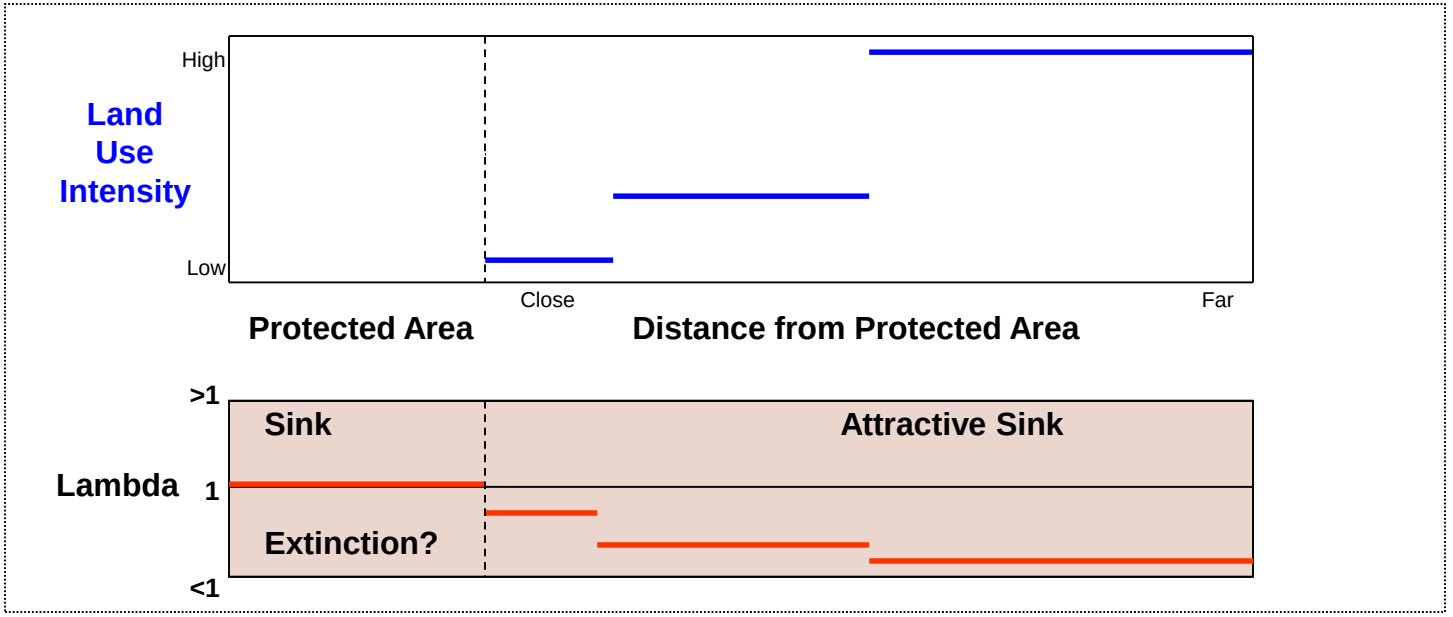
- **" Such mortality sinks, sometimes also termed traps, may represent an actual conservation problem when animals are harvested or persecuted in habitats surrounding reserves".**

Protected Areas as Sources Vulnerable to Attractive Sinks

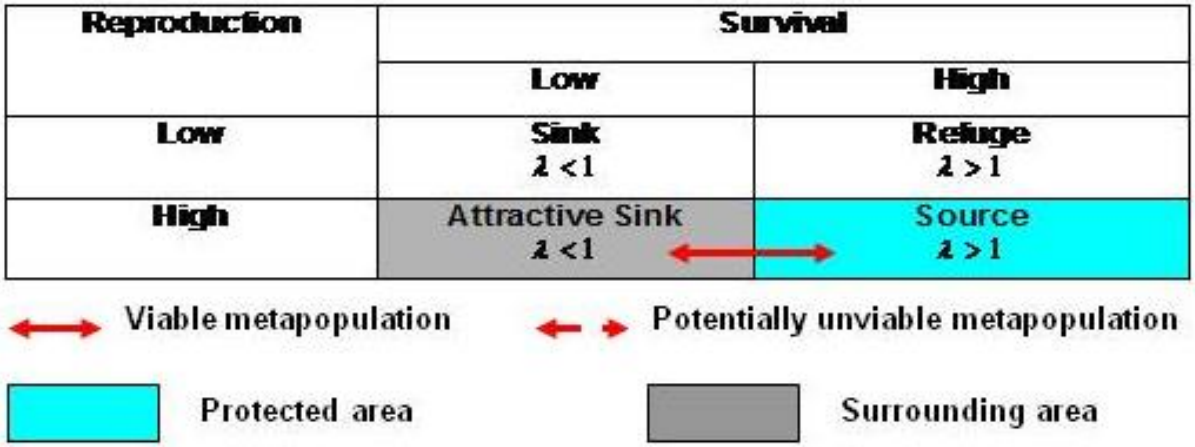
Natural Condition



Land Use Effect



Protected Area as Source to allow Sustainable Harvest in Surroundings

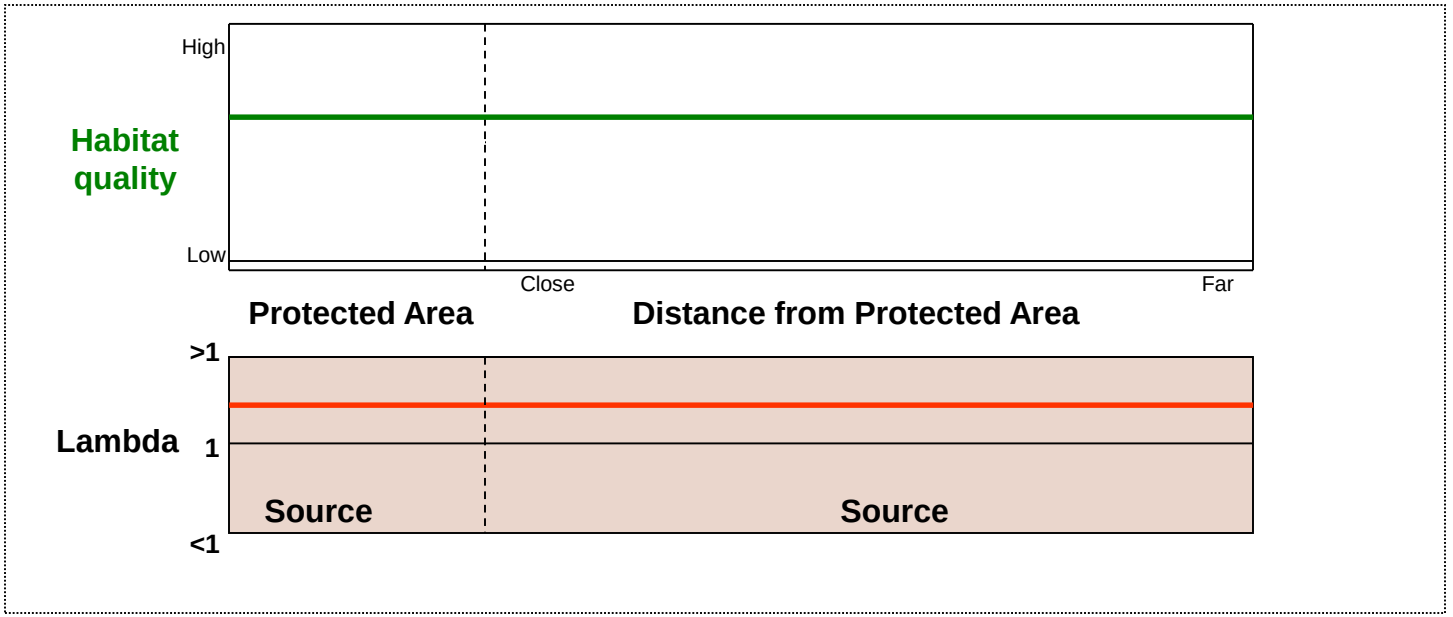


Sources and Sustainable Harvest:

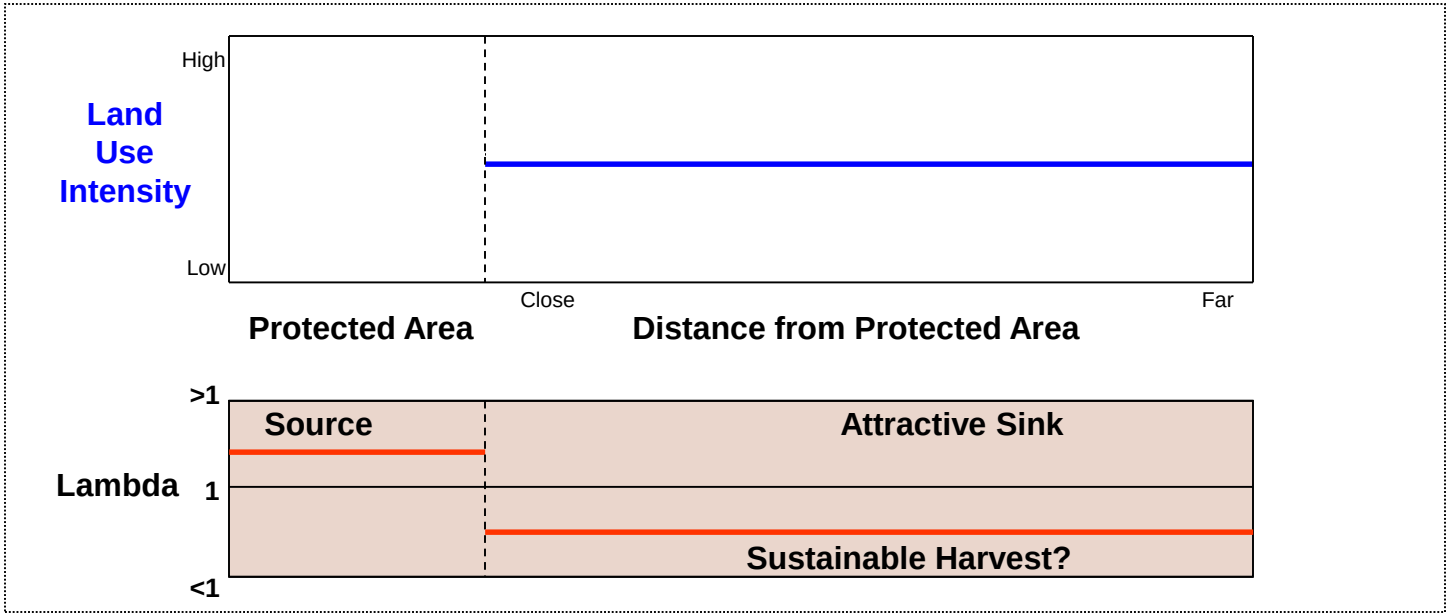
- **Mortality levels in the sinks are managed to allow the protected area to function as a source.**

Protected Areas as Sources for Harvest

Natural Condition



Land Use Effect



Conclusions

Concept is being widely considered for protected area establishment and management in three primary ways:

Protected Area	Surrounding	Issue
Sink	Source	Extinction in PA due to loss of source
Source	Attractive Sink	Extinction in PA due to human induced mortality in surroundings
Source	Attractive Sink	PA used to provide for sustainable harvest in surroundings

Adequate demographic data are available for relatively few species.

Spatially-explicit demographic models are not widely used.

Specific applications and evaluations are few.

Promise of greater contribution in the future.