

Fragmentation Effects

SLOSS debate. Is it better to have a single large reserve, or several small reserves of equal size?

Single Large: (1) Decreases edge effects.

$$(2) S = CA^z$$

(3) Species with large area requirements.

Several Small: (1) Can be easier to implement with interests that compete with conservation

(2) Can increase diversity of habitats protected

(3) Can buffer against catastrophic loss of one population (esp. disease)

Best of both: (1) Network of large and small reserves that are functionally connected by corridors or stepping stones.

(2) Creates metapopulations of protected species.

(Ohead: Primack 4.6)

Experimental studies of fragmentation –reveal that not all species are affected to the same degree (not surprising, but important).

1. Kansas Fragmentation Project. 12 ha fragmented into S, M, L patches. Plants and small mammals monitored. Responses differed strongly within rodent guild.

(2 Oheads: distributions of 4 rodent species across fragment sizes)

2. Blandy Experimental Farm (U Virginia). Compare experimentally fragmented landscape with a neighboring control landscape. Monitor rodents. Very different response for voles and mice.

(2 Oheads: responses of *Microtus* and *Peromyscus*, frag vs. control)

So responses to fragmentation differ...

Generally, what species will be most affected by ***fragmentation*** itself (isolating fragmentation effects from habitat loss).

A. Most obviously, species that have large area requirements:

1. ***LARGE SPECIES*** (live at a large absolute spatial scale)

2. **MIGRATORY SPECIES** (large seasonal movements)
3. **CARNIVORES** (locally wide ranging)

B. Also, recall Rabinowitz's "three axes of rarity" from British plant data:

1. Endemism - limited geographic range
2. Specialism - specific habitat requirements
3. Sparseness - low population density under all conditions

Will types of rarity affect vulnerability to fragmentation effects? Yes.

Specialist and endemic species are likely to be patchily distributed –they are *already* fragmented, and have evolved under that condition. Unless fragmentation disrupts patterns of migration among the populations that remain, it will have fewer effects than it will on those that are continuously distributed.

Plants (or animals) that are rare in either of the first two senses seem unlikely to be greatly affected by habitat fragmentation, except to the extent that habitat fragmentation leaves them *outside* a fragment. To put it another way, they will be affected by habitat *loss*, but habitat **fragmentation** per se may have little impact on either the migration rate among populations or the sizes of local populations.

But **SPARSE** species are likely to be affected by fragmentation. Already low population sizes are made smaller, and connections with other populations are disrupted (further reducing the effective size of the population).