

Corridor ecology: a snapshot

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Outline of remarks

1. Definitions of corridor
 - a) Structural
 - b) Functional
2. Advantages of corridors
3. Potential disadvantages

Corridor definitions

- Corridors imply connections between entities, but how do we know if we have a wildlife corridor? And how do we know how to build one if we want one?
- Structural definitions are popular.
 1. Based on linearity in shape, physical connection between patches of same community-type, physiognomic distinctiveness from adjacent matrix, and especially visibility on aerial photos.
 2. May be continuous or stepping-stone.

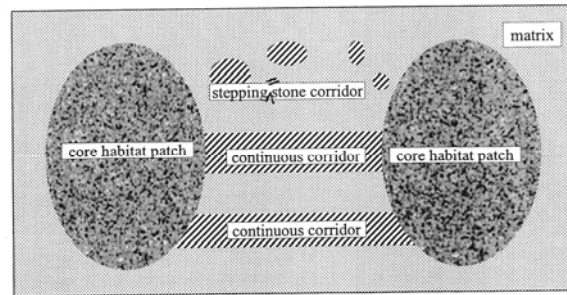
Definitions, cont.

3. May be natural or man-made.
- Functional definition
 1. Does a presumptive corridor actually serve as a conduit for movement of organisms?
 2. A corridor must enhance movements beyond what is possible through adjacent matrix, or assist in crossing a barrier to movements.
 3. May not be visible in aerial photos, or may be visible, but not functional as corridor.

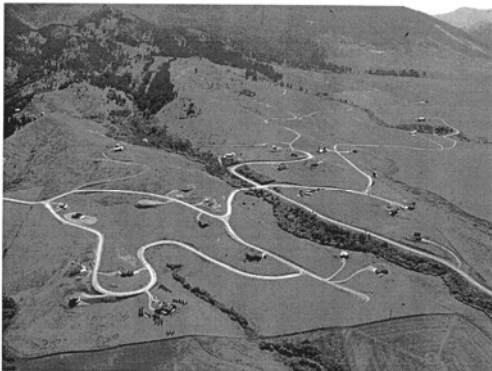
Definitions, concluded

- If a presumptive corridor is to be useful in conservation, it must function as a corridor, not necessarily look like one.
- It can be natural or man-made, or mixed.
- Such a functional definition means that corridors encompass a wide range of structures ranging from scent trails and culverts to huge swaths of natural habitat that connect similar communities on a continental scale.

Schematic representation of two habitat patches connected by two continuous corridors and a stepping-stone corridor



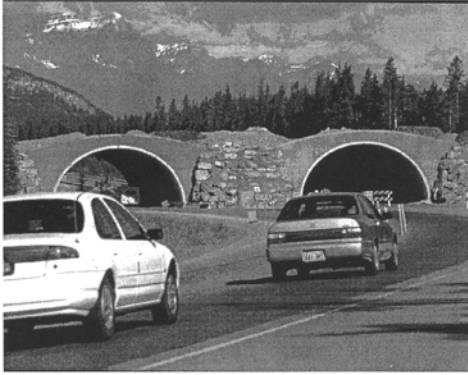
Riparian corridor in exurban development, Bridger Mountains, near Bozeman, Montana



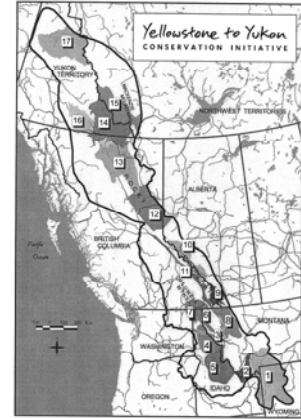
A culvert undercrossing, trans-Canada highway, Banff National Park; built in 1998



**Wildlife overpass across trans-Canada highway,
Banff National Park, Alberta**



**Yellowstone to
Yukon
Conservation
Initiative:**
**connecting the
Rocky Mountain
spine with 17
critical core and
corridor areas**



**Road sign signaling seasonal road closure to allow newts to
cross a major park road to reach a breeding stream; Tilden
Park, Contra Costa Co., Calif.**



Advantages of corridors

- ❖ Fragmentation leads to decreasing sizes of remaining habitat patches.
- ❖ Small fragments generate small populations of the organisms living in the patches.
- ❖ Small populations are at high risk of extinction for demographic, genetic, and stochastic reasons.
- ❖ Connecting such fragments through corridors or other means produces a metapopulation structure which has a much improved chance for sustainability.

Metapopulations and metacommunities

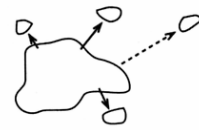
- ❖ Persistence of metapopulations (and hence metacommunities) depends on two things.
 1. Risk of demic extinction (population in a fragment) = mortality rate.
 2. Rate of colonization of empty fragments = birth rate
- ❖ Movements among patches influence both death and birth rates, and so are critically important in this equation.
- ❖ Births (colonizations) must exceed or equal deaths for persistence of metapopulation.

Four types of metapopulations

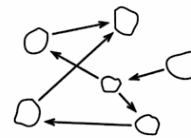
A. Patchy



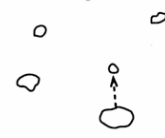
B. Core-Satellite



C. Levins' Classic



D. Non-Equilibrium



Potential disadvantages of corridors

- ❖ Disadvantages are less well understood than the advantages.
- ❖ While advantages generally exceed the disadvantages, understanding the possible negative consequences of corridors can help us to avoid them.
- ❖ Artificial or heavily human modified corridors are more likely to suffer negative effects than natural corridors. A culvert that helps mountain lions cross a freeway may not meet its objectives if it simply leads the lions into a suburban area.

What are some potential disadvantages?

1. Edge effects
 - a. Since corridors are often narrow, they may be largely or entirely edge in character.
 - b. There is thus an increase in the total amount of edge in a given area.
 - c. Edges may not be suitable for dispersal of interior species (those that avoid edges), and may increase the impact of predators, parasites, or competitors that either are attracted to edges or penetrate patches from the matrix.
2. Community drift – changes in the community composition within the connected patches because of differential use of corridors
 - a. Change in community-type over time
 - b. Disruption of strong coactions may lead to cascade of extinctions.

Disadvantages, cont.

3. Invasion of exotic species
 - a. Access through corridor, from the edge, or from the matrix
 - b. Spread among patches
4. Invasion of deleterious native species
 - a. Access to patch facilitated for predators, parasites, and competitors that negatively impact target species within the patch that may be too few or too unhealthy to withstand their impact
 - b. Virulence of pathogens may increase with connectedness.
5. Demographic impacts
 - a. Spillover predation or parasitism
 - b. Corridors as demographic sinks
 - c. Synchrony among patches increases chances of metapopulation extinction
 - d. Connected patches may support predators or parasites which could not persist if patches were isolated.
 - e. Increased exposure to human depredations: humans are edge creatures themselves and hunt preferentially in corridors.

Disadvantages, cont.

6. Social impacts
 - a. Corridors may be inadequate for dispersal of social groups.
 - b. Social fence effect of residents living in corridors.
7. Genetic impacts
 - a. Outbreeding depression
 - b. Loss of local adaptation
 - c. Hybridization between taxonomic units
 - d. Genetic "swamping" of rare species by invading exotic
8. Conflicting scientific objectives
 - a. Corridor projects must be clear about objectives, priorities, and realistic possibilities, egs. provision of habitat or conduit; target species, land acquisition realities.

Disadvantages, cont.

- b. Target species requirements vs metacommunity conservation
- c. Urgent short-term objectives versus long-term sustainability
- d. Alternative conservation strategies (corridors, matrix improvements, translocations)
9. Economic impacts
 - a. Costs of acquisition and construction
 - b. Costs of maintenance
 - c. Costs of monitoring
 - d. Lost opportunity costs
 - e. Unforeseen negative impacts on adjacent matrix
 - f. Benefits generally ignored (education, aesthetics, research, increases in quality of life, biodiversity conservation, recreation, ecosystem services, employment opportunities)

Conclusion

- Sometimes our best efforts end badly, but mostly we can look forward to achieving significant improvements in the human predicament. Keep trying!

A mule deer in Utah whose dispersal attempt was unsuccessful

