

Metapopulation Concept

Subpopulations of a species connected by dispersal events which facilitate persistence of at risk subpopulations over time either through:

- recolonization (turnover)
- rescue

Based on two primary ecological/conservation principles/generalizations:

Extinction rates decline with increasing population size.

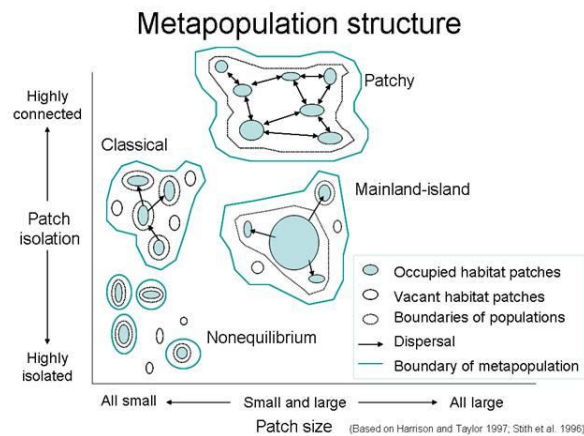
Immigration and recolonization rates decline with increasing isolation

Metapopulation Models

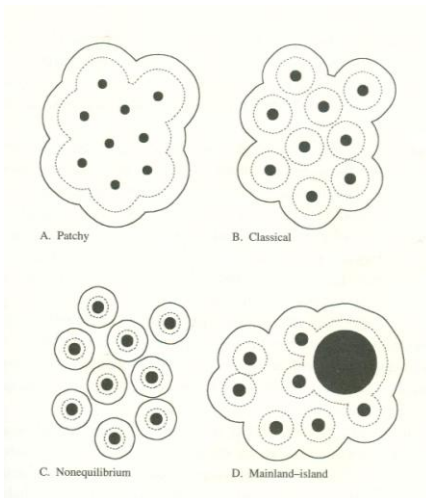
Each population has a projection matrix

Individuals move between populations (dispersal – researcher sets rate based on literature or other knowledge)

Matrices can be correlated, degree of correlation related to what metapopulation structure is being considered



Metapopulation Models

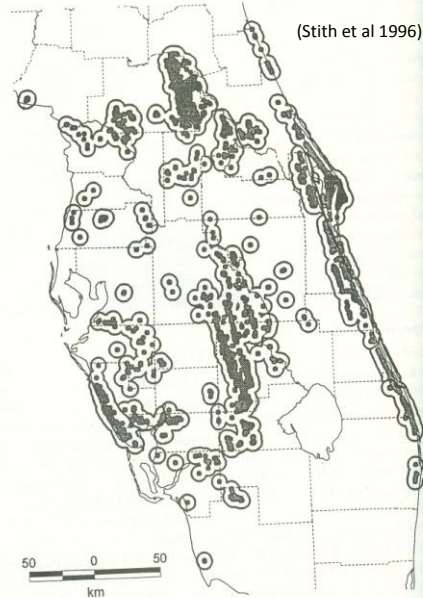


(Stith et al 1996)

Figure 9.4. Schematic depiction of different kinds of metapopulations illustrating use of dispersal-distance buffers to predict recolonization rates among subpopulations. Thin dotted lines separate functional subpopulations based on frequency of dispersal beyond them. Solid lines separate metapopulations based on poor likelihood of dispersal among them. **A.** Patchy metapopulation. All patches are enclosed by a single thin dotted line, indicating that they are sufficiently close to function as a single subpopulation. The thick solid line shows the outer boundary of this patchy metapopulation. **B.** Classical metapopulation. Thin dotted lines enclose small subpopulations (islands) that are extinction-prone but are sufficiently close to neighboring islands for recolonization to occur. All islands are within a single metapopulation, represented by the thick solid line enclosing all patches. **C.** Nonequilibrium metapopulations. Each patch is enclosed by a separate thick solid line, indicating that each functions as a separate metapopulation due to the large interpatch distances. Each metapopulation is highly extinction prone due to its small size. **D.** Mainland-island metapopulation. A large mainland-size patch and several small patches are enclosed by a thin dotted line, indicating that they function as a single subpopulation. Four other small patches are enclosed by separate, thin dotted lines, indicating that they function as separate subpopulations. All patches are within a single metapopulation, represented by the thick solid line.



Different areas across the range of a single species may exhibit various metapopulation structures.



(Stith et al 1996)

Figure 9.7. Statewide Florida scrub jay distribution map with dispersal buffers. Shaded areas depict subpopulations of jays within easy dispersal distance (3.5 km) of one another. Thick outer lines delineate demographically independent metapopulations separated from each other by at least 12 km.