

# Gap-Crossing Decisions by Red Squirrels in Fragmented Forests

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## Objective

To study factors for decisions by red squirrels (*Tamiasciurus hudsonicus*) to cross gaps in fragmented forests.



Forest-clearcut edge at central Mitkof Island study site, Tongass National Forest, Alaska. Logging is the primary land use.

## Rationale

- Knowing how mammals move in fragmented forests can aid in location of reserves and corridors.
- Questions exist about which factors control decisions of mammals to cross gaps in their preferred habitats.



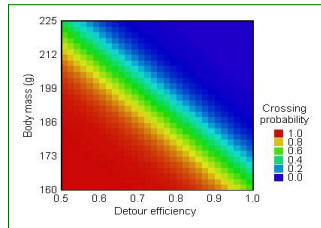
Translocation of individual squirrels across gaps for release and subsequent tracking.

## Hypotheses

- Efforts to minimize predation risk, energy expenditures, or encounters with territorial conspecifics were hypothesized to control crossing decisions.
- Predation risk was assumed higher in clearcuts than in forests because of lower overstory cover and lack of trees for escape.
- Energy expended per distance traveled was assumed higher in clearcuts due to higher shrub stem densities.
- Conspecific encounter rates were lower in clearcuts than forests.

## Methods

- Documented home ranges and territorial behaviors of squirrels living near clearcuts less than 10 years old.
- Induced movement by translocating individuals across gaps.
- Used radio-telemetry to document homing paths.
- Conducted call-back surveys along clearcut perimeters to determine conspecific defense levels.
- Used logistic regression to relate extrinsic factors, such as gap size, and intrinsic factors, such as body mass, to gap crossing probability.



Determinants of gap-crossing: Relationship between detour efficiency, body mass, and gap-crossing probability, based on logistic regression.

## Results and Discussion

- Of 30 squirrels translocated at 5 clearcuts, 11 crossed clearcuts and 19 detoured along forested routes.
- Gap crossing probability was inversely related to squirrel body mass and detour efficiency ( $\eta_D$ ):

$$\eta_D = \frac{\text{Direct distance home}}{\text{Indirect distance home}}$$

- Lighter squirrels were more likely to cross clearcuts. Squirrels in poor condition may take more risks when moving.
- Squirrels were more likely to cross if detours were long, suggesting that squirrels assess distances of detours and that predation risk, energetics, or both influence crossing decisions.
- Squirrels choosing forested routes avoided the route with the greatest number of highly defended territories.
- Non-significant factors were crossing distance, clearcut size, clearcut age, and individual's territorial behavior.

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