klimaat voor ruimte
climate changes spatial planning

Adapt, move or perish
Genetic processes in fragmented populations under climate change

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Background

Metapopulation theory and models have been used to understand population persistence in fragmented habitats and to model optimal habitat configuration. However, genetics of metapopulations is relatively poorly developed. Population genetics of small and isolated populations, and the consequences of loss of genetic diversity, are dealt with in conservation genetics, but this field excludes populations that occur in a metapopulation structure.
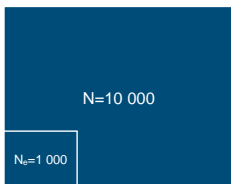
Problem

This gap in understanding of genetic processes in metapopulations hinders our evaluation of the extinction risk of current structured populations. This is especially urgent in view of climate change, when range shifts or selection and adaptation should prevent population extinction.

Conservation Genetics:

Minimum Viable Population size for isolated populations

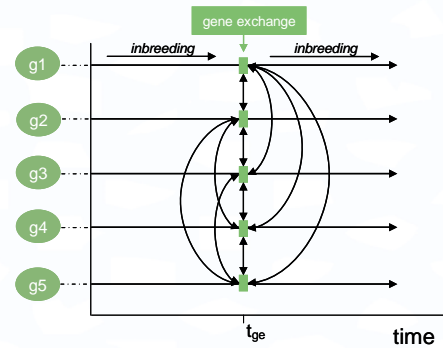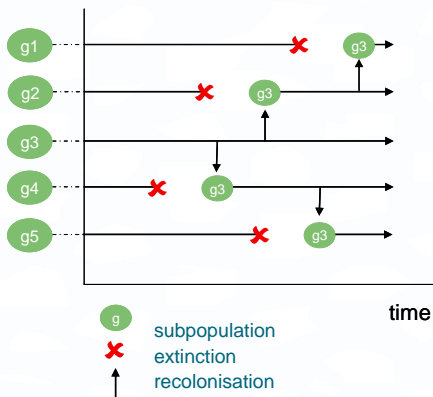*Examples of metapopulation dynamics affecting genetic diversity:*

1. structure draining genetic diversity from the metapopulation.

2. a structure increasing genetic diversity relative to N, e.g. in zoos.

Objective

In this PhD project we will use a spatially explicit metapopulation model to simulate genetic processes in fragmented populations under climate change for the Dutch National Ecological Network (EHS), to determine:

- whether ecological networks can sustain genetic diversity of populations in the long term, depending on species' life history traits and network characteristics.
- which investments in expansion and connectivity of areas in the EHS are necessary to prevent loss of genetic diversity under climate change.

METAPHOR:

existing tool for simulation of metapopulation demography

design genetic module:	plants:	animals:
diploid species	seed bank	longevity
codominant alleles	self-fertilisation	overlapping generations
realistic mutation levels	clonal growth	social structure

METAPHOR + genetic module:

"METAPHOR says I need a wife"

simulating metapopulation demography & genetics

- stochastic
- individual based
- spatially explicit
- including landscape matrix
- including ecological information