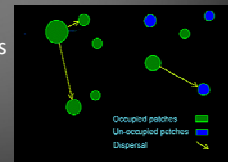


Proposed OTB research

Tara Cornelisse
Ph.D. Student
Environmental Studies
UCSC

Metapopulation Dynamics

- Populations separated by space
- Each experiences different patch characteristics
 - Area, isolation, habitat quality
- For management, important to consider both entire metapopulation and individual patch context
 - Currently unoccupied areas



Metapopulation Dynamics

- A basic assumption of metapopulation theory is that small and isolated patches have a lower colonization rate and experience greater **extinction** probability as a result of
 - environmental stochasticity
 - demographic stochasticity
 - inbreeding depression

Patch characteristics

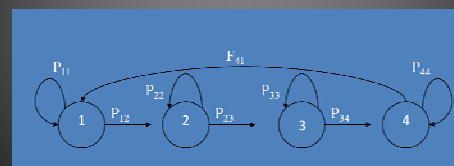
- Spatial
 - Area and isolation, connectivity
 - GIS analyses
- Patch quality
 - Soil type, % bare ground, climate
- How do the two relate to each other?
- How do they relate to population status?
- How can we up the carrying capacity?

Population status

- Population Viability Analysis (PVA)
 - How do small or isolated habitat patches affect population viability of the OTB?
 - How is this related to habitat quality?
- Inbreeding depression
 - Gene flow within and between populations
 - Migration
 - How do small or isolated habitat patches affect individual genetic health relative to the metapopulation as a whole?

PVA: the use of quantitative methods to predict the future status of a population or metapopulation of conservation concern

- Stage-class model with 4 stages



Results of PVA

- Intrinsic rate of growth for each population and growth over time
 - Will the population increase, decrease, or stay
- Sensitivity analysis
 - Determine which stage has the largest affect on population growth rate over time
 - Ex. low survivorship of the 3rd instar (P_{33}) and the 3rd instar into the adult (P_{34}), due to lack of prey
 - If P_{44} is limiting the population due to the high direct mortality from human activity.
 - Can focus conservation efforts to improve the survivorship or fecundity of the most limiting stage

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Inbreeding Depression

- Small or isolated patch → increase incidence of mating with relatives → decrease genetic variation (heterozygosity) → decrease fitness
- Can measure heterozygosity
 - Enzyme analysis, microsatellites
- Need to bleed adult OTBs- can do this non-lethally and return them to population

Results of Inbreeding Depression

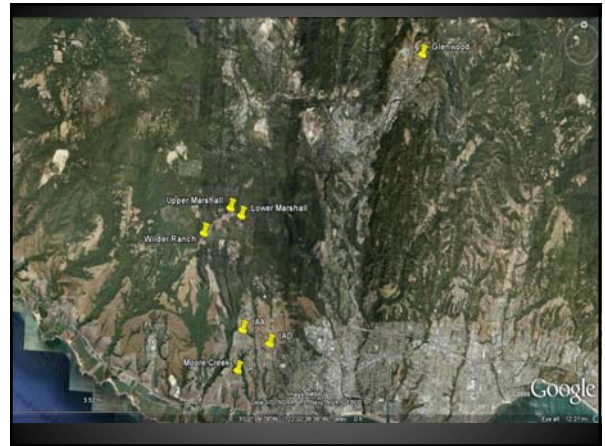
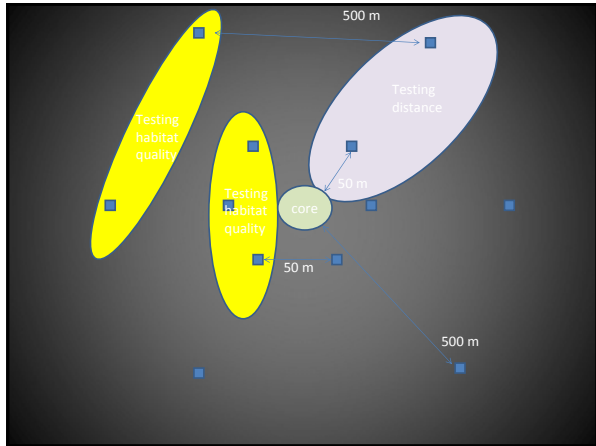
- Which populations are more closely related and thus connected
- Populations with lower fitness and thus higher probability of extinction
 - Management: increase the connectivity of genetically depauperate populations
 - Increase connectivity between genetic “source” populations to the rest of the metapopulation
 - Decide where to introduce individuals and from which sources to relieve inbreeding depression

Disturbance

- | Types | Properties |
|------------|----------------|
| • Scraping | • Timing |
| • Grazing | • Extent |
| | –SLOSS |
| | • Connectivity |

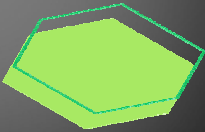
Measuring the effect

- Number of larvae burrows
 - Oviposition site choice
- Vegetation response
 - Less dense, more habitat
- Percent bare ground
 - More % bare, more habitat



Temperature augmentation

- Pilot this season at Upper and Lower Marshall
- Scrape inside
 - Have control structures as well
 - Plastic with holes in it?
 - Netting
- Track vegetation



Unoccupied Patches

- Create habitat to
 - Encourage colonization, increase numbers
 - See if will come to created habitat
 - Test the importance of temporary unoccupied patches