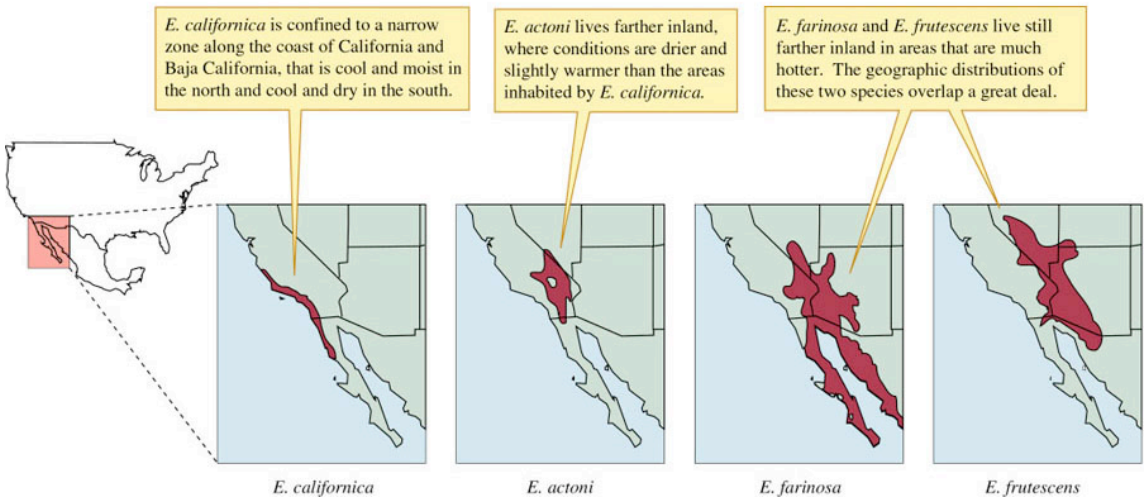
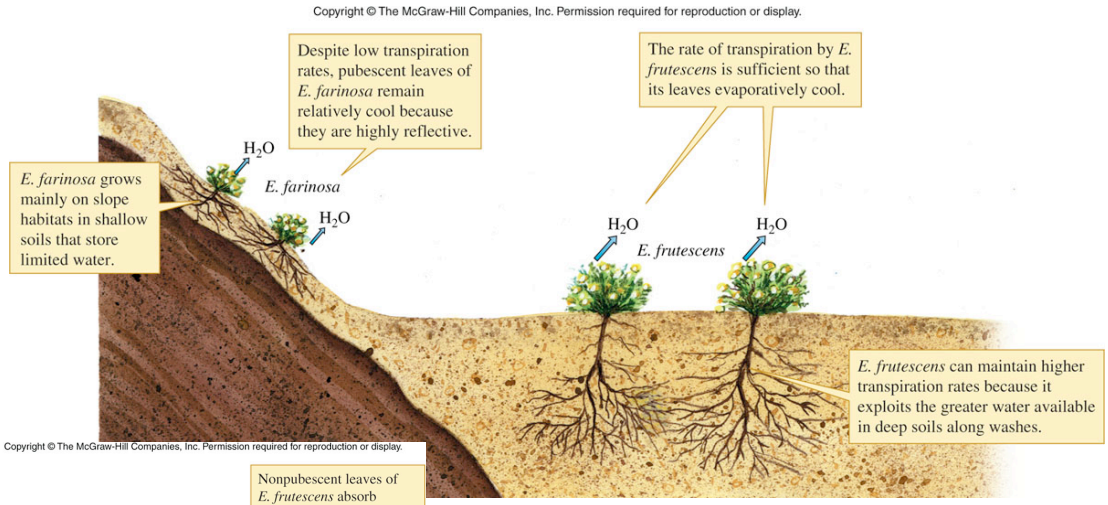
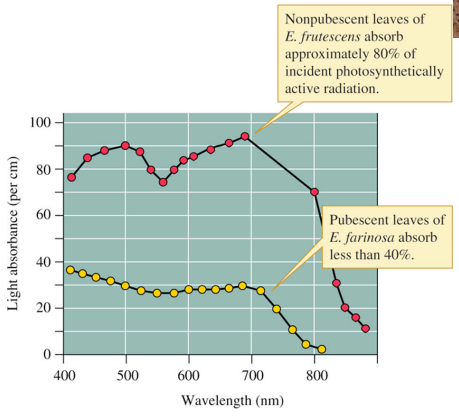
Tolerance and distribution in Encelia species



They are all closely related, how are they different?





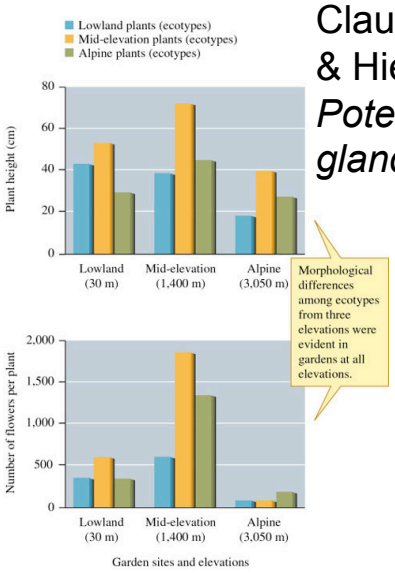
Different tolerances are part of different ecological strategies

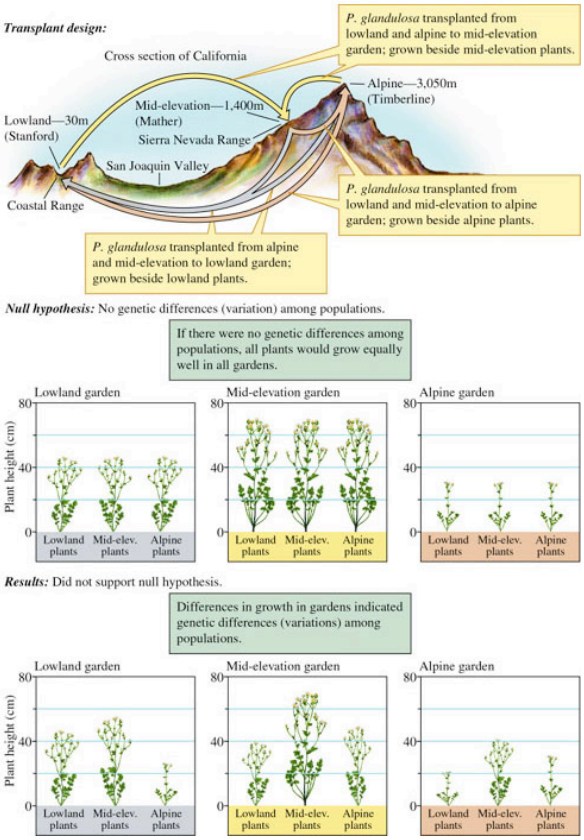
But how did they become different species?

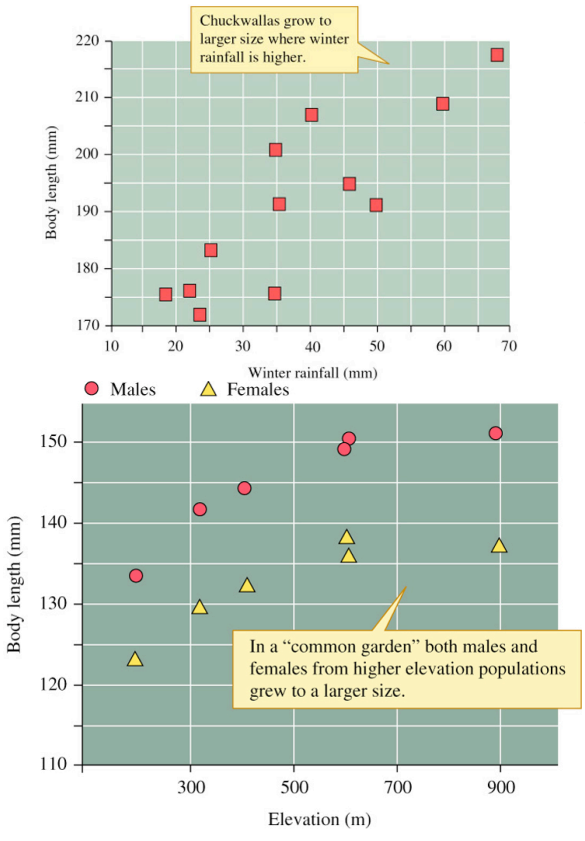
The Ecological Theatre and the Evolutionary Play
-G. Evelyn Hutchinson

Environmental vs. Genetic variation among individuals – "Common Garden" experiments

Clausen, Keck, & Hiesey, 1940
Potentilla glandulosa





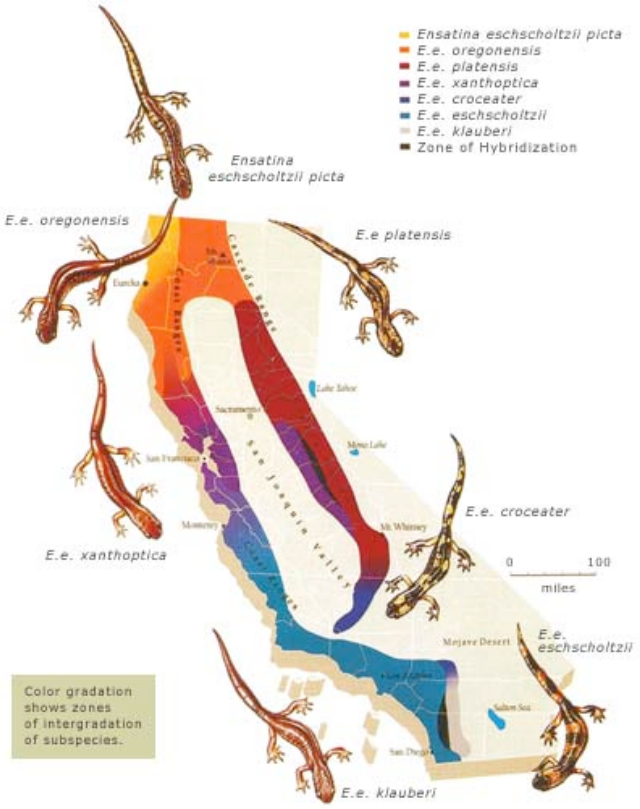


Species ranges, ecotypes, Genetic and environmental variation

"Ring Species"

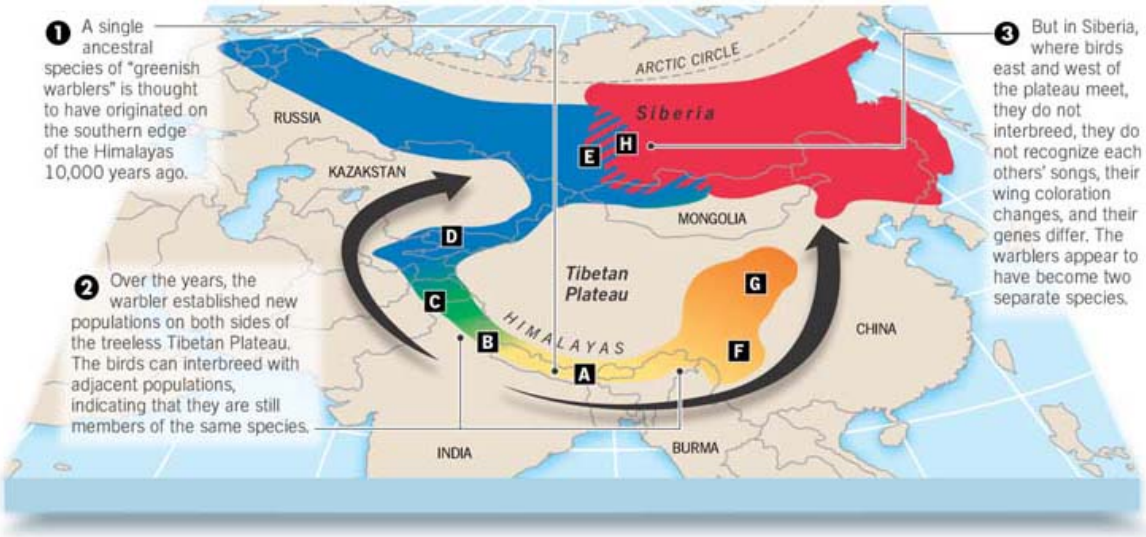
Speciation in action!

What allows ecotypes to become species?

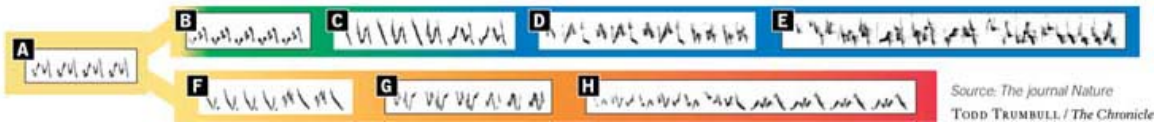


Tracing the Evolution of Species

Biologists have discovered two populations of Eurasian songbirds in Siberia that show the strongest evidence yet of having evolved from a single ancestral species into two distinct ones. The map below shows the present ranges of the birds around the Tibetan Plateau, with gradations of color indicating where gradual changes have evolved between one subspecies and another.



Singing a new song Sound spectrograms show how the warblers' songs at various locations on the map (A through H) become more complex until, where the two populations occupy the same range (at E and H), they can no longer recognize each others' songs.



Source: The journal Nature

TODD TRUMBULL / The Chronicle

MARMOTS ON GREAT BASIN MOUNTAINTOPS: USING GENETICS TO TEST A BIOGEOGRAPHIC PARADIGM

CHRIS H. FLOYD,[1,3] DIRK H. VAN VUREN,[1] AND BERNIE MAY[2]

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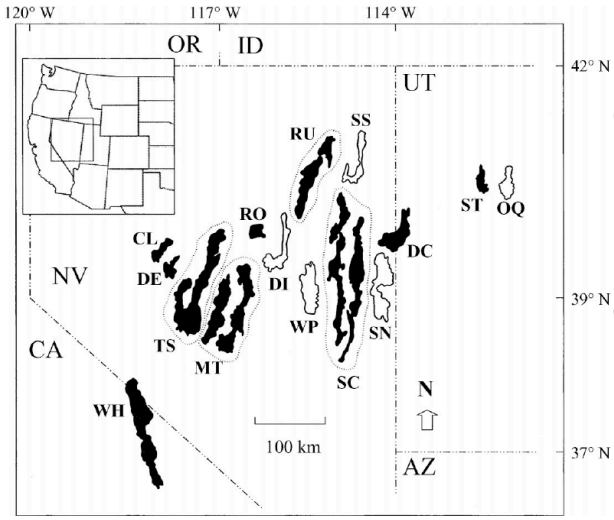
Vol. 105, No. 945 The American Naturalist September–October 1971

MAMMALS ON MOUNTAINTOPS: NONEQUILIBRIUM INSULAR BIOGEOGRAPHY

JAMES H. BROWN*

Department of Zoology, University of California, Los Angeles, California 90024



"Apparently, the present rate of immigration of boreal mammals to isolated mountains is effectively zero."

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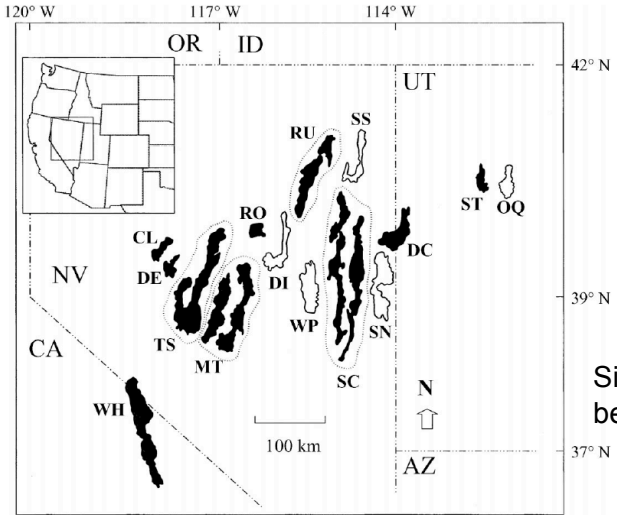


"Apparently, the present rate of immigration of boreal mammals to isolated mountains is effectively zero."

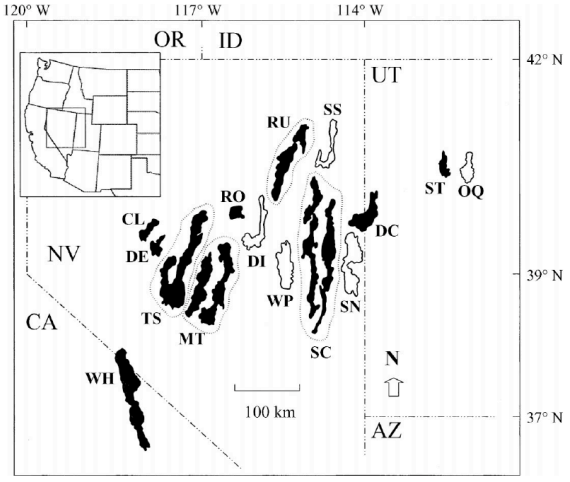
Since Pleistocene warming, basins have become impassable

Floyd's test : Genetic isolation by distance

Alternative Hypotheses - what are the expectations

Brown's prediction

Floyd's prediction



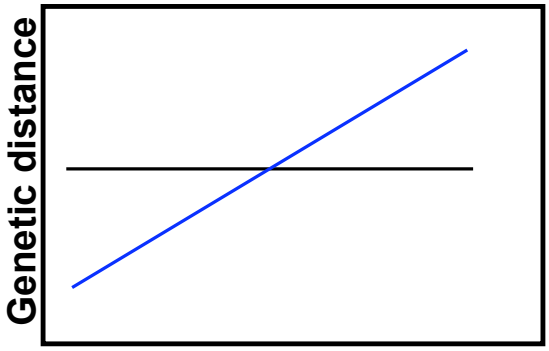
Since Pleistocene warming basins have become impassable

7000 - 10000 years

1500 - 2200 Marmot generations

Floyd's test : Genetic isolation by distance

Alternative Hypotheses - what are the expectations



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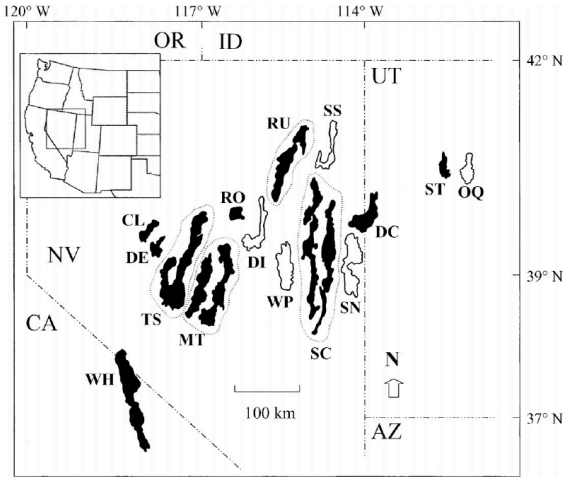
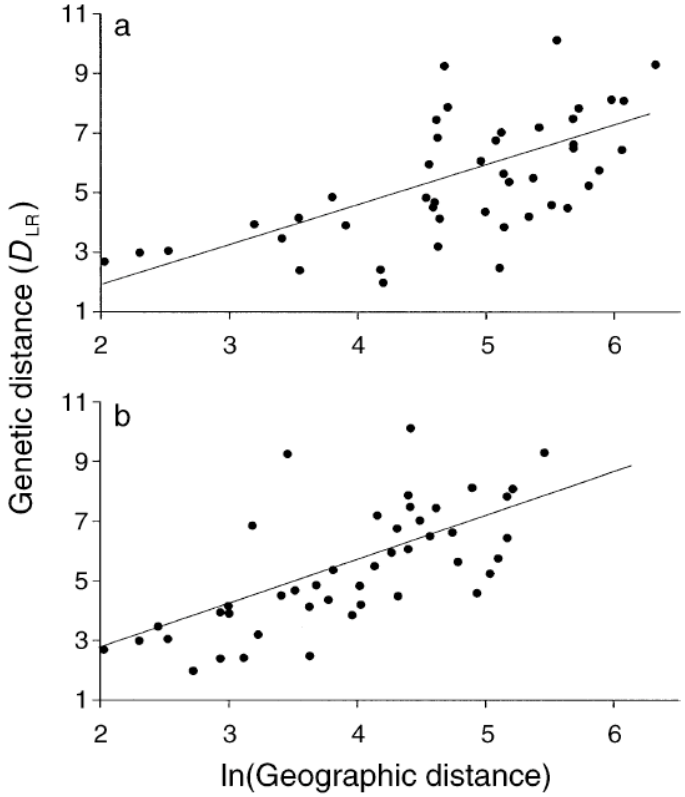


Floyd's result

What about scale?

What about history?



Next?

Cage match?

"Apparently, the present rate of immigration of boreal mammals to **isolated** mountains is effectively zero."

Survivorship curves

Everything dies, but on different schedules

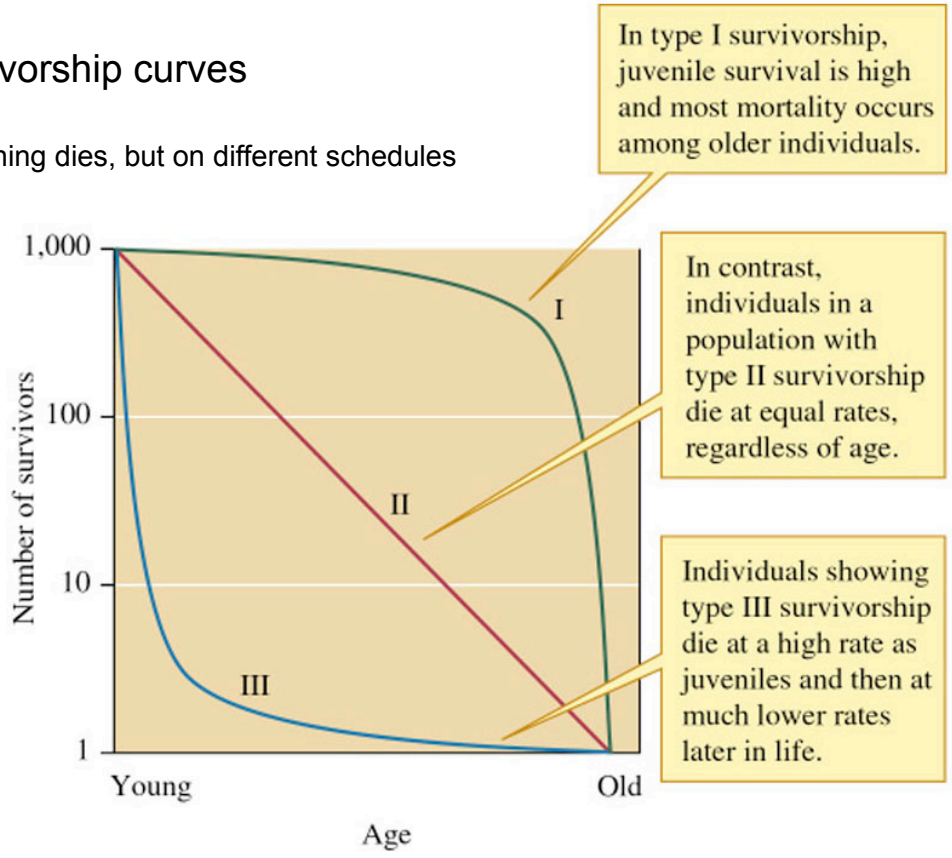


Table 10.1

Combining survivorship with seed production by *P. drummondii* to estimate net reproductive rate, R_0

Age (days) x	Number surviving to day x n_x	Proportion surviving to day x l_x	Average number of seeds per individual during time interval m_x	Multiplication of l_x and m_x $l_x m_x$
0–299	996	1.0000	0.0000	0.0000
299–306	158	0.1586	0.3394	0.0532
306–13	154	0.1546	0.7963	0.1231
313–20	151	0.1516	2.3995	0.3638
320–27	147	0.1476	3.1904	0.4589
327–34	136	0.1365	2.5411	0.3470
334–41	105	0.1054	3.1589	0.3330
341–48	74	0.0743	8.6625	0.6436
348–55	22	0.0221	4.3072	0.0951
355–62	0	0.0000	0.0000	0.0000

0
299
306
313
320
327
334
341
348
355

Data from Leverich and Levin 1979.

Each individual leaves an average of 2.4177 offspring.

$R_0 = \sum l_x m_x = 2.4177$

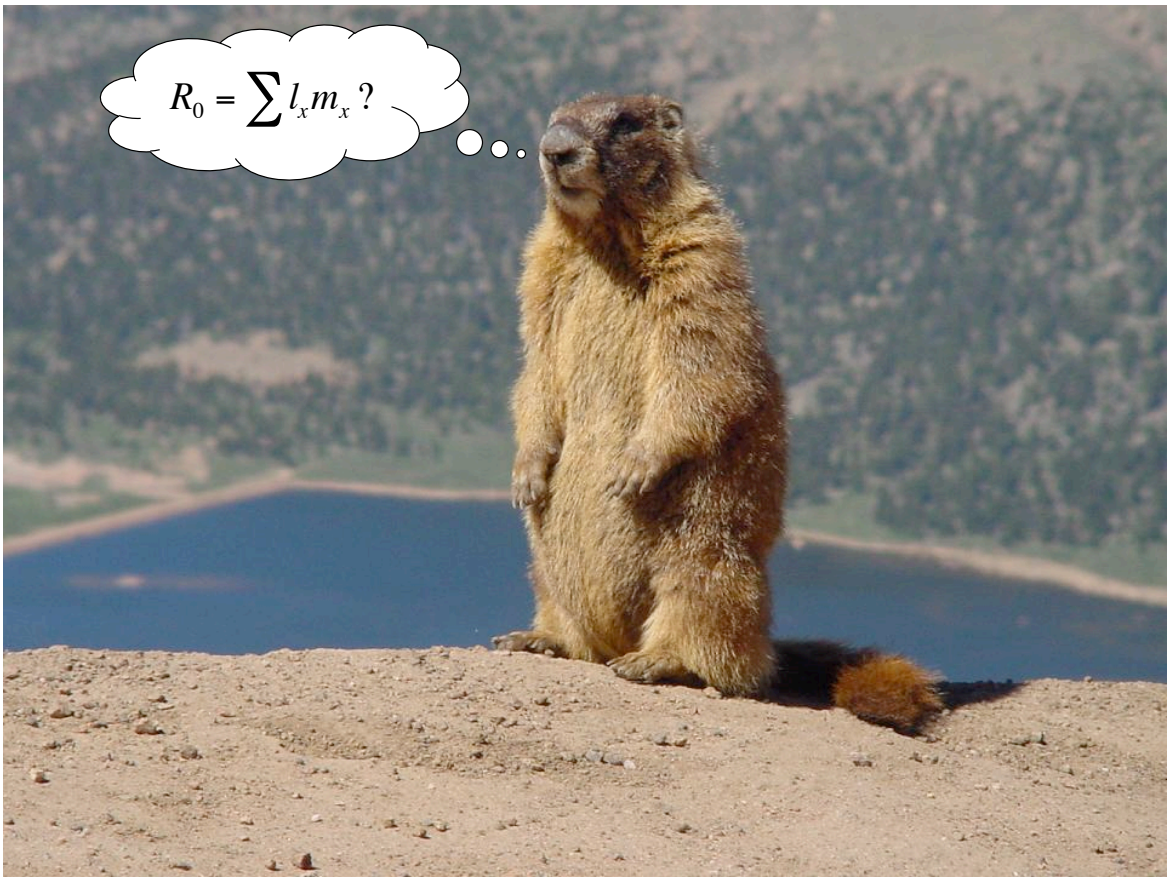
$T = \frac{\sum x l_x m_x}{R_0}$

The value of R_0, which is greater than 1.0, indicates that this population of *P. drummondii* is growing.

Summing the final column yields R_0, the net reproductive rate per individual.

Life table

What are the units of R_0?
What are the units of T?


$R_0 = \sum l_x m_x$?