

NameOfSession

YourName

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## **1 Why use mathematical Models**

## **2 Why use a model**

- inform approaches
- see which data is better
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## **3 Two types of model**

- Mechanistic models aim to explain the processes or mechanisms underlying patterns or phenomena in empirical data: these models have a theoretical basis
- inferential/empirical models establish the existence of statistically significant, non-random patterns or phenomena in empirical data: no assumptions made about the processes or mechanisms that generate the patterns (THEY LACK A THEORETICAL BASIS).

## **4 MECHANISTIC VS INFERENTIAL MODEL FITTING**

- MECHANISTIC MODEL: THE LYNX-HARE CYCLES IS DRIVEN BY DENSITY DEPENDENT GROWTH IN HARES
- INFERENTIAL MODEL: the lynx and hare cycles have a significant asynchrony (period shift) of  $y$  years
- It's not one or the other, Both types of models play a role in science (E.g., inferential models find patterns, and mechanistic models can be identified off of the back of that)
- You cannot develop theory without data.

- Most ecological models are inferential (why? Establishing the existence of general patterns/phenomena. We are forced to be interested in forecasting rather than explaining).

## 5 What are mechanisms

$$\frac{dN}{dt} = rN \left(1 - \frac{N}{K}\right)$$

where:

$N$  is the population size,

$r$  is the intrinsic growth rate, and

$K$  is the carrying capacity.

## 6 modelling and fitting models to data and building

- use bio knowledge to construct
- see if agrees with data
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