

Modeling in Fish and Wildlife Ecology

What is a model?

- An abstraction that represents some process of interest (nature).
- A hypothesis clearly stated



$$\rightarrow N_{t+1} = N_t \left[1 + R \left(1 - \frac{N_t}{K} \right) \right]$$

“All models are wrong, but some are useful”
George E.P. Box, statistician

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Types of models

- Deterministic – fixed, given input will always produce the same output
- Stochastic – there is randomness, unpredictability. Outputs vary



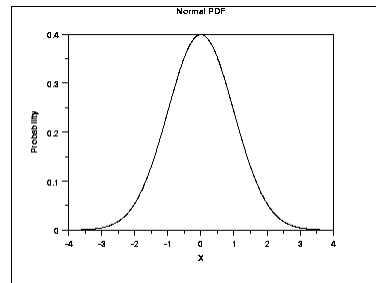
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Randomness is formalized as a probability distribution.

- With a measure of central tendency (mean)
- Measure of dispersion (sd, se)
- Area under the curve sums to 1



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Modeling Terms

• **Response Variable (Y)** : item of interest, what we want to predict

- Observed data: $y_1, y_2, y_3, \dots, y_n$

• **Predictor Variable (X)** : measure(s)/information we use to predict Y

- Observed data: $x_1, x_2, x_3, \dots, x_n$

• **Model** : specify the mathematical relationships within a model including those between predictor variables and the response variable



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Model Structure

Probability mass function function (equation) that calculates the probability that a random draw (event) from a discrete variate Y will take the value of y .

$$f(y) = \Pr\{Y = y\}$$



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Model Structure

Probability density function For a continuous variate Y the area under the pdf (equation) between 2 points y_L, y_U is the probability that a random draw (event) y will lie between y_L and y_U

