# Modeling PalEON biomass

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## Outline

- 🕕 Data
  - Overview of the data
  - Models

- Methodological details
  - Branching process details

### Goal

• Produce a model of per-species biomass at time of settlement

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#### Data

- Computed from settlement-era survey
- Working with composition, biomass, and stem density

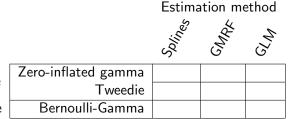
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### Models

There are two divisions for modeling biomass data:



One-stage
Two-stage

## Two-stage models

- First stage: zero/non-zero
  - Logistic regression
  - $ightharpoonup Z \sim \text{Bernoulli}(\gamma)$
- Second stage: distribution of positive biomass
  - $ightharpoonup Y|Z=1\sim \mathsf{Gamma}(\alpha,\beta)$
  - $E(Y|Z=1) = \mu = \alpha\beta = f(x, y, p_k)$

### Tweedie model

The Tweedie model is a Gamma-Poisson mixture. How to visualize a Tweedie random variable:

- Draw  $N \sim \text{Poisson}(\lambda)$
- Now make N iid draws:  $V_{\ell} \sim \mathsf{Gamma}(\alpha, \beta)$

$$\bullet \ \ Y = \sum_{\ell=1}^N V_\ell$$

# GLMs, Independent observations

## **GMRF**

# **Splines**

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