Precipitation Chemistry Hubbard Brook
A hierarchical bayesian analysis

Shannon LaDeau

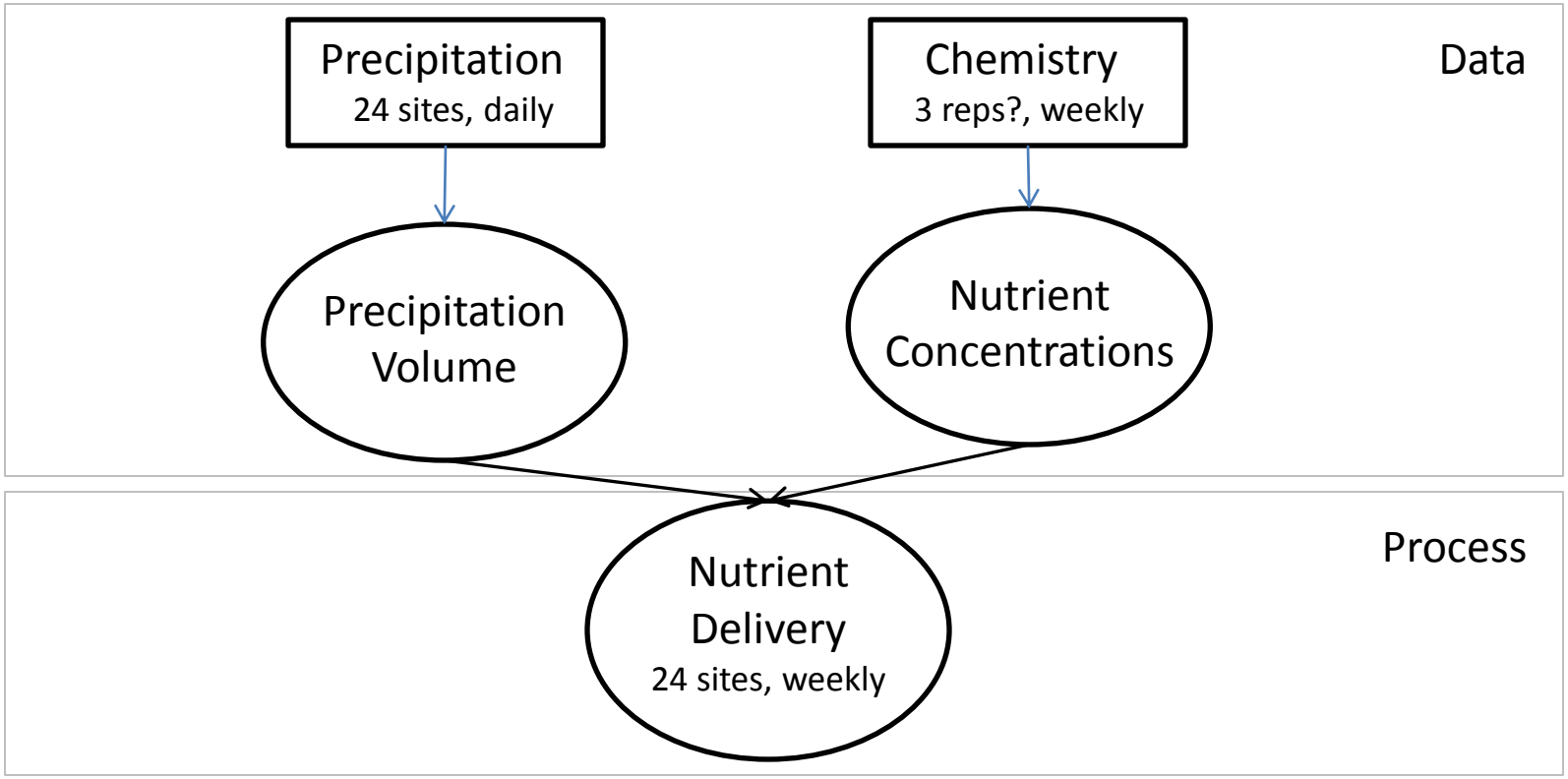
Cary Institute

Known unknowns and uncertainties

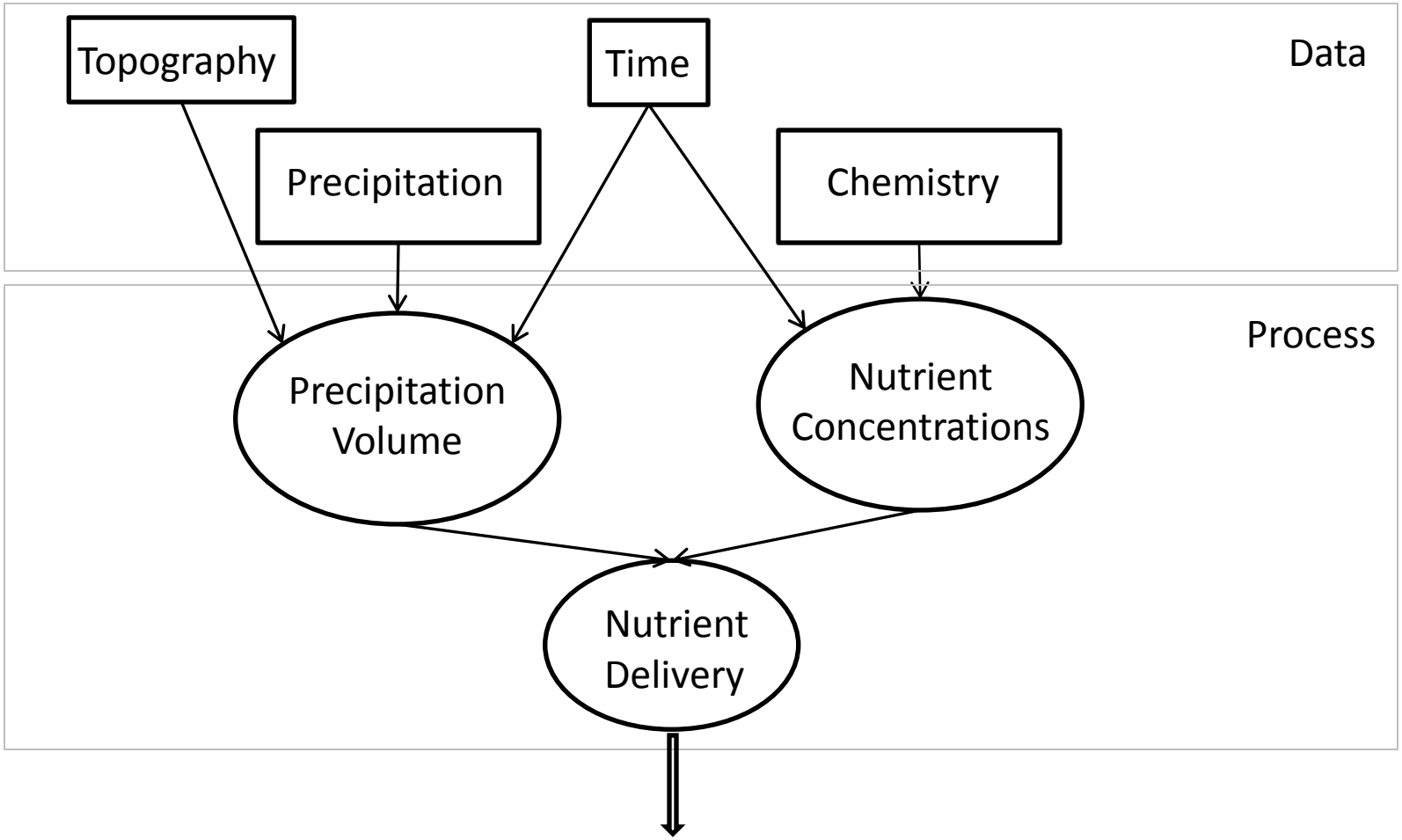
Precipitation **Volume** recorded(daily) at 24 gages across 5 watersheds.
Elevation, Aspect, etc differ among gages and watersheds.

Chemistry is monitored at 3-4 gages on a weekly basis.

Design


Precipitation
24 sites, daily
Chemistry
3 reps?, weekly
Data
Precipitation Volume
Nutrient Concentrations
Process
Nutrient Delivery
24 sites, weekly

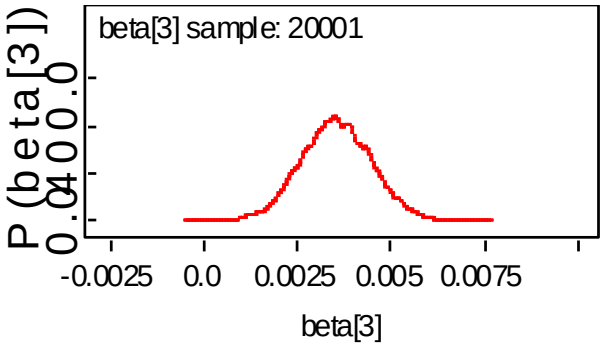
Design



Scale up to watershed, annual budget

Results

Parameters	mean	Low CI	High CI
Intercept	26.82	20.81	31.87
Slope	-0.03	-0.05	0.002
Elevation	**0.004**	**0.002**	**0.005**
Aspect	0.0000	-0.001	0.001
sd.Chem	0.18	0.04	0.42
sd.Precip	3.57	3.47	3.67
sd.time	19.33	16.75	22.15



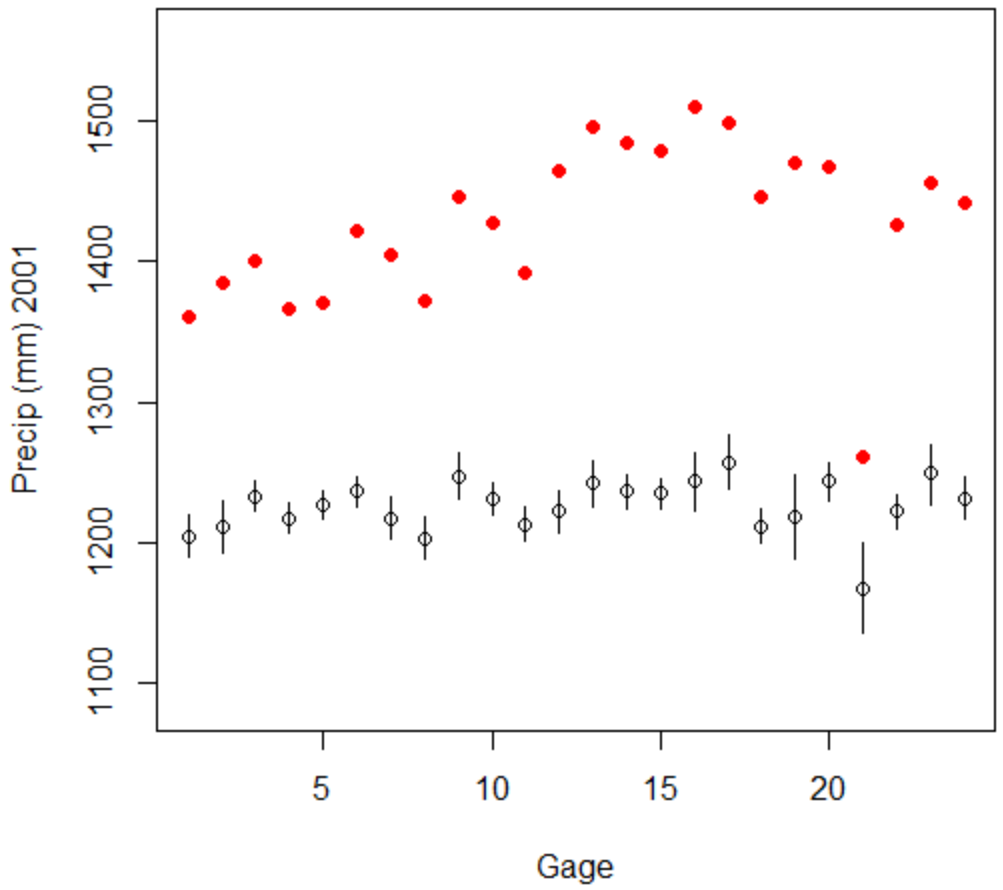
Model Structure (Precip Component):

At gage g, for period p;

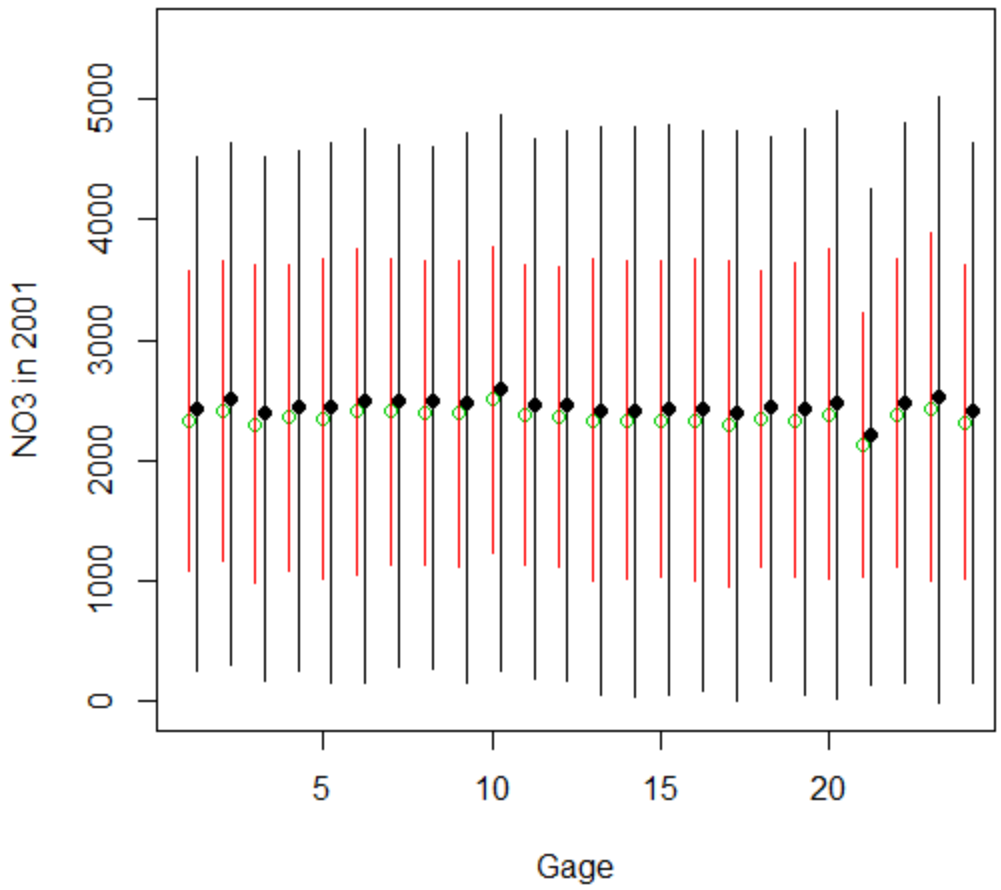
Observed Precip $_{g,p}$~ Normal (mu $_{g,p}$, sd.Precip)

mu $_{g,p}$ = fxn(covariates $_{g}$, time$_{p}$)

Uncertainty: Precipitation



Uncertainty: Annual Fluxes



There is considerable uncertainty in the measured data and this is likely amplified by multiplication .

Other avenues-

What are implications of scaling up (space or time) with uncertainty estimates?
[How much difference among period-based, monthly-based, or a simple total precip * mean(chemistry)?]

Does inclusion of uncertainty actually improve inference or forecasting accuracy?