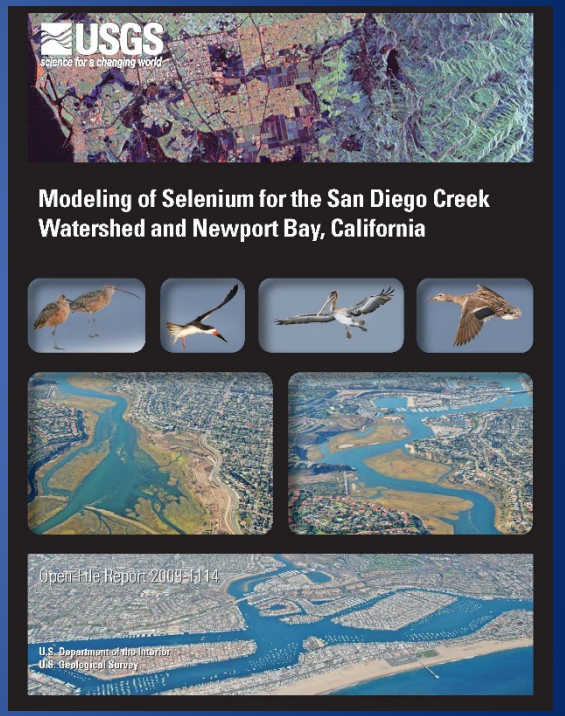
Linkage Analysis: Key Issues

- Use the Newport Bay watershed biodynamic model or an alternative approach?
- Updates/additional data needed to further refine the Newport Bay watershed biodynamic model



Alternatives to the Biodynamic Model Considered

1. Use bioconcentration factors:

$$BCF = \frac{\text{concentration in organism}}{\text{concentration in water}}$$

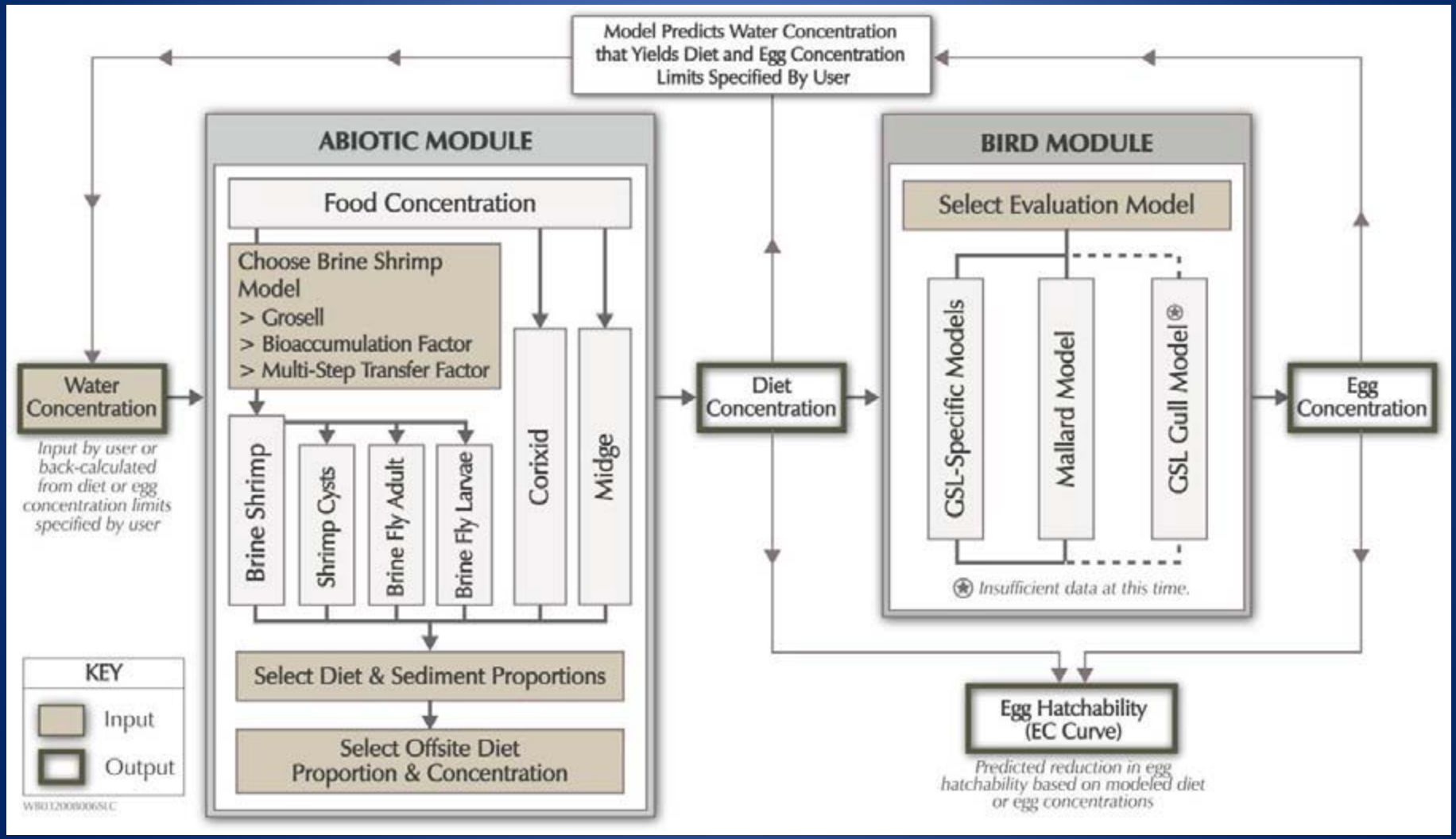
2. Use biota-sediment accumulation factors:

$$BSAF = \frac{\text{concentration in organism}}{\text{concentration in sediment}}$$

3. Use USEPA's (Peterson and Nebeker, 1992) simplified approach to bioaccumulation:

$$BAF = \frac{\text{concentration in organism}}{\text{concentration in environment}}$$

4. Use Model Similar to Great Salt Lake Bioaccumulation Model



Alternatives to the Biodynamic Model Considered

- Selenium is primarily accumulated via diet, not water or sediment (BCF or BSAF)
- The first 3 of the alternatives (BCF, BSAF, BAF) do not provide a mechanism to consider selenium speciation and transformation
  - Se species can dramatically affect the rate of bioaccumulation in an ecosystem

Alternatives to the Biodynamic Model Considered

- The Great Salt Lake Bioaccumulation Model
  - Developed specifically for the foodwebs characteristic of the Great Salt Lake (brine shrimp and brine flies, birds, but no fish)
  - Only two bioaccumulative processes considered
    - Water/sediment to diet and diet to birds (no fish)
- Not applicable to the complex foodwebs in the Newport Bay watershed

Reasons for Using the Biodynamic Model for the Newport Bay Watershed

- Biodynamic model addresses Se speciation and bioavailability through the partitioning coefficient (K_d)
- Model reflects the complexity of the foodwebs (and Se transformations) in the watershed for different waterbodies (e.g., San Diego Creek vs. Big Canyon Wash)
- Model validation showed a good correlation between observed Se concentrations in different media and predicted concentrations

Reasons for Using the Biodynamic Model for the Newport Bay Watershed

- Presser-Luoma model is being used (or is proposed to be used) as a water column translator for:
  - Tissue-based site-specific objectives for Se in the San Francisco Bay and Delta
  - USEPA's proposed tissue-based national 304(a) aquatic life criteria
  - Predicting a dissolved Se concentration that would be necessary to attain a site-specific Se fish body burden in ecosystems of southern West Virginia affected by drainage from mountaintop coal mines and valley fills

Data Requirements for Refinement/Future Use of the Newport Biodynamic Model

New data needs to be incorporated into the model runs:

- Much more robust data on Se concentrations in sediment, fish tissue, and bird eggs
  - Se concentrations in particulate material and bird eggs now available for portions of Big Canyon
- Better information on hydrology and selenium sources

❖ However, still need to collect and analyze suspended particulate material for total Se in several areas in the watershed