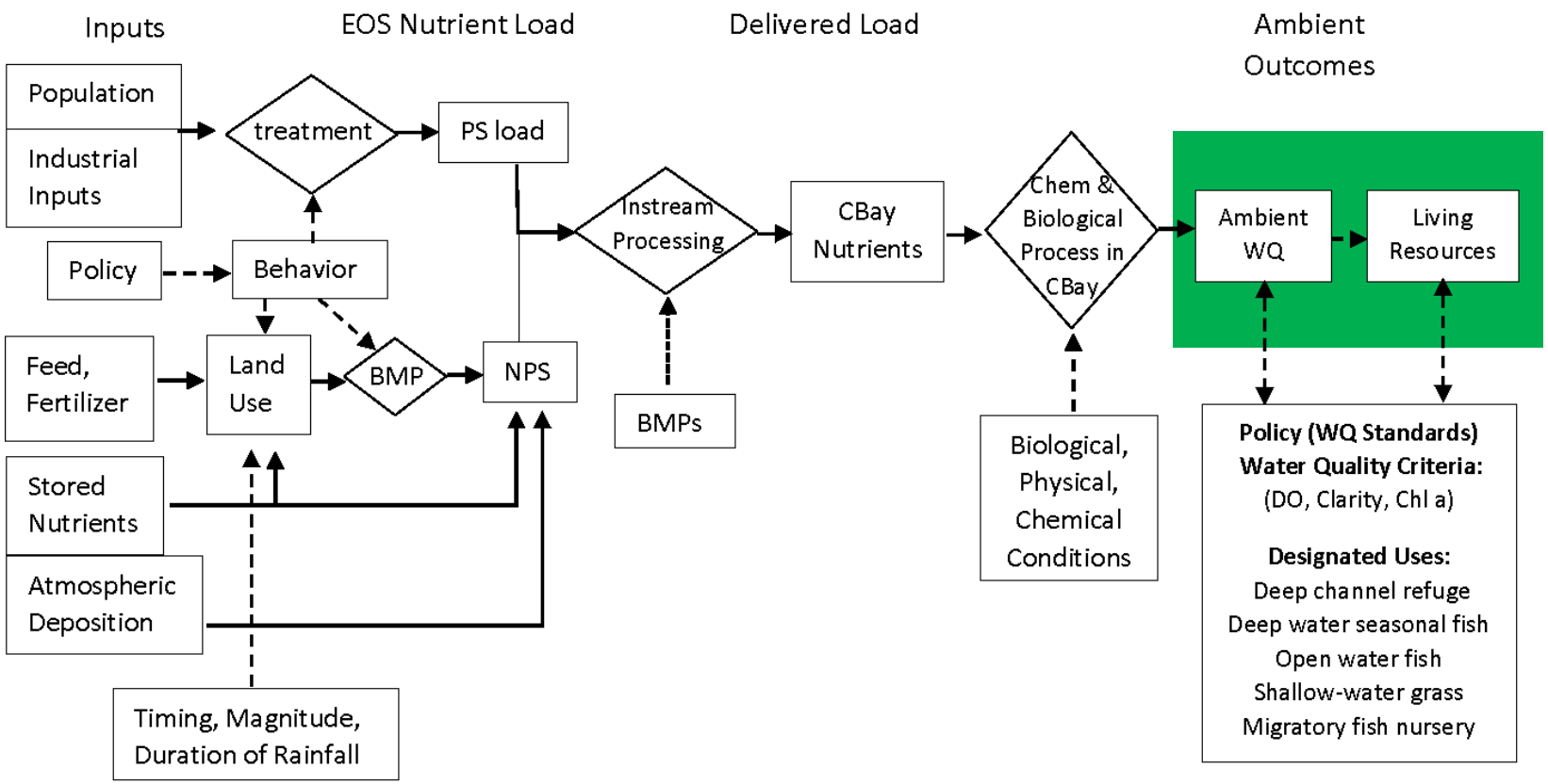
Goal of this Morning

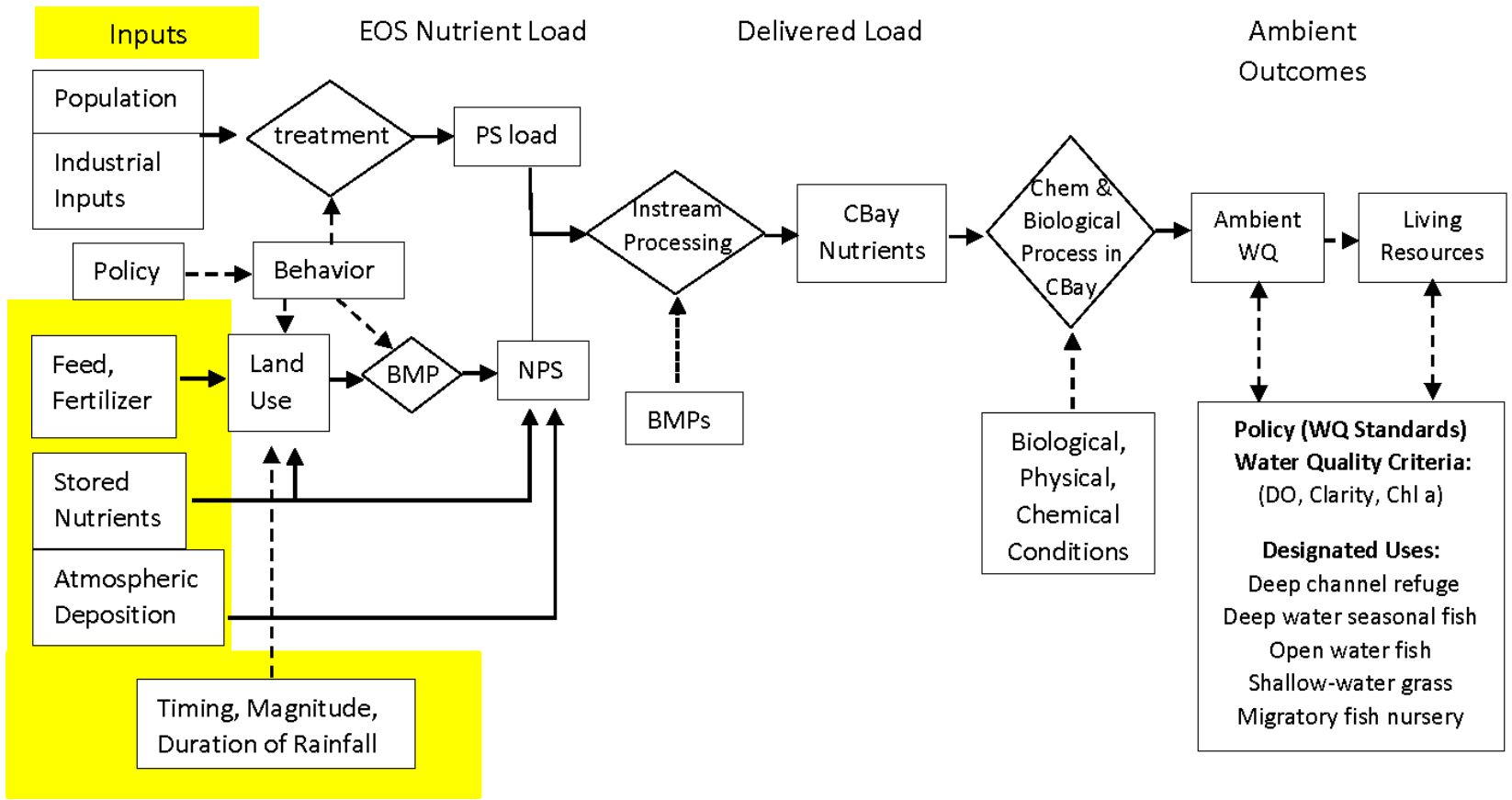
Begin process to identify focal areas for our efforts to assess long term system responses to efforts to achieve WQ standards in the Bay

Achieving Water Quality Standards in the Chesapeake Bay



Illustrations: Knowledge Gaps/Uncertainties & System Responsiveness

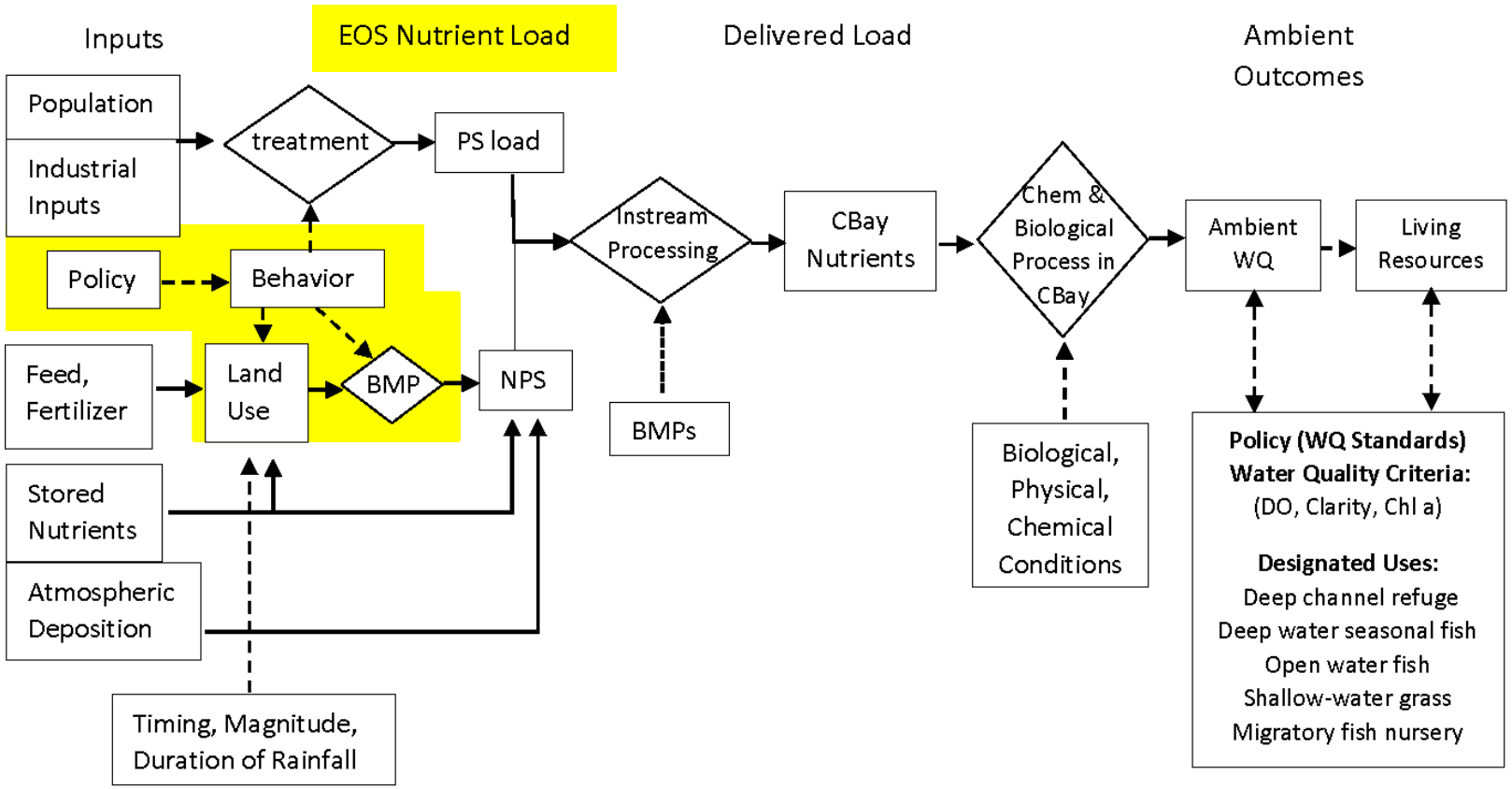
- Examples of uncertainties and limits in system response
- Examples pulled from previous STAC workshop reports and reviews and conversations
- Purpose: Illustration purposes only: generate discussion for an initial effort to identify areas from which we might focus our collective attention in an SoS effort.



Nutrient Sources/Boundary Conditions

Is the magnitude of current and future nutrient imports adequately accounted for (STAC 12-005)?

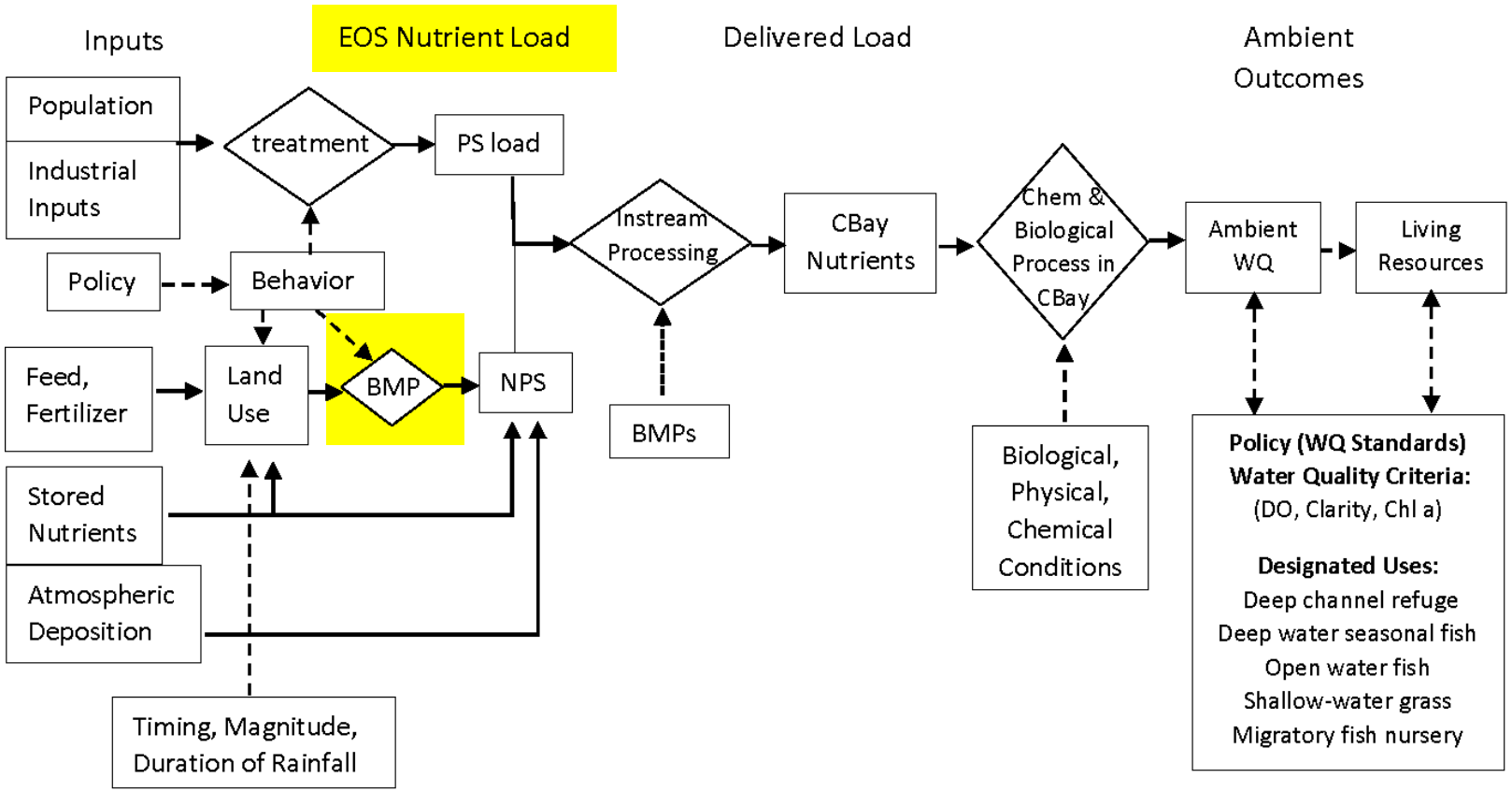
- Legacy nutrients and sediment in the landscape
- Manure loads may not be adequately counted (STAC 16-005)
- Atmospheric deposition may be underestimated (STAC 09-001)
- Are urban nutrient inputs adequately counted (STAC 15-001)
- Rainfall patterns, temperature (climate change)



NPS Management and Behavioral Response

The single biggest challenge to meeting nutrient reduction targets is nonpoint loads and the single biggest component of NPS loads is agriculture.

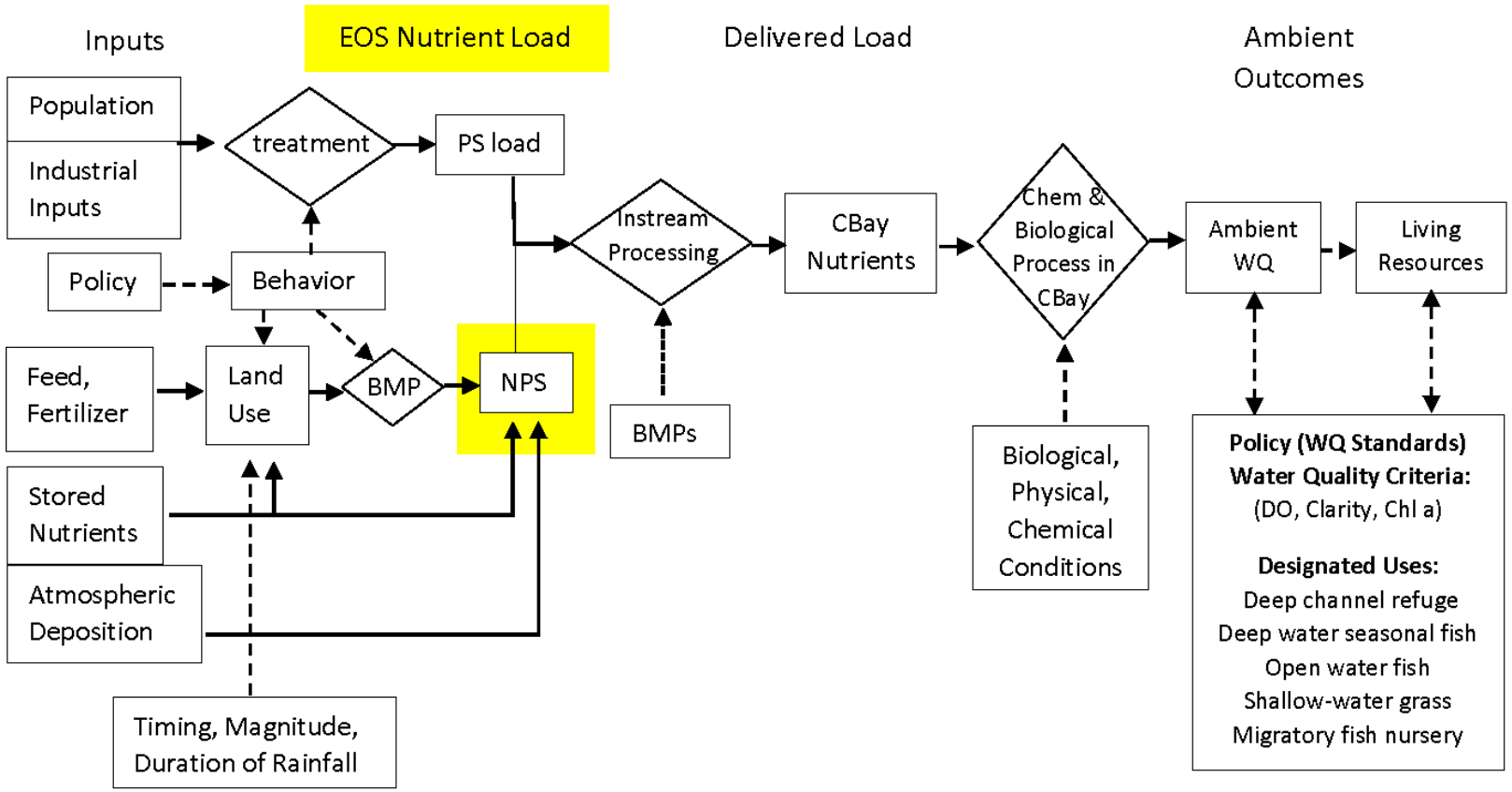
- Are voluntary cost share programs capable of generating the level and type of participation needed to achieve reduction goals?
- Alternative incentive program designs may improve behavioral responses (STAC 14-002)



Nutrient Removal Effectiveness of BMPs

Uncertainty surrounding effectiveness of BMPs investments to produce expected load reductions:

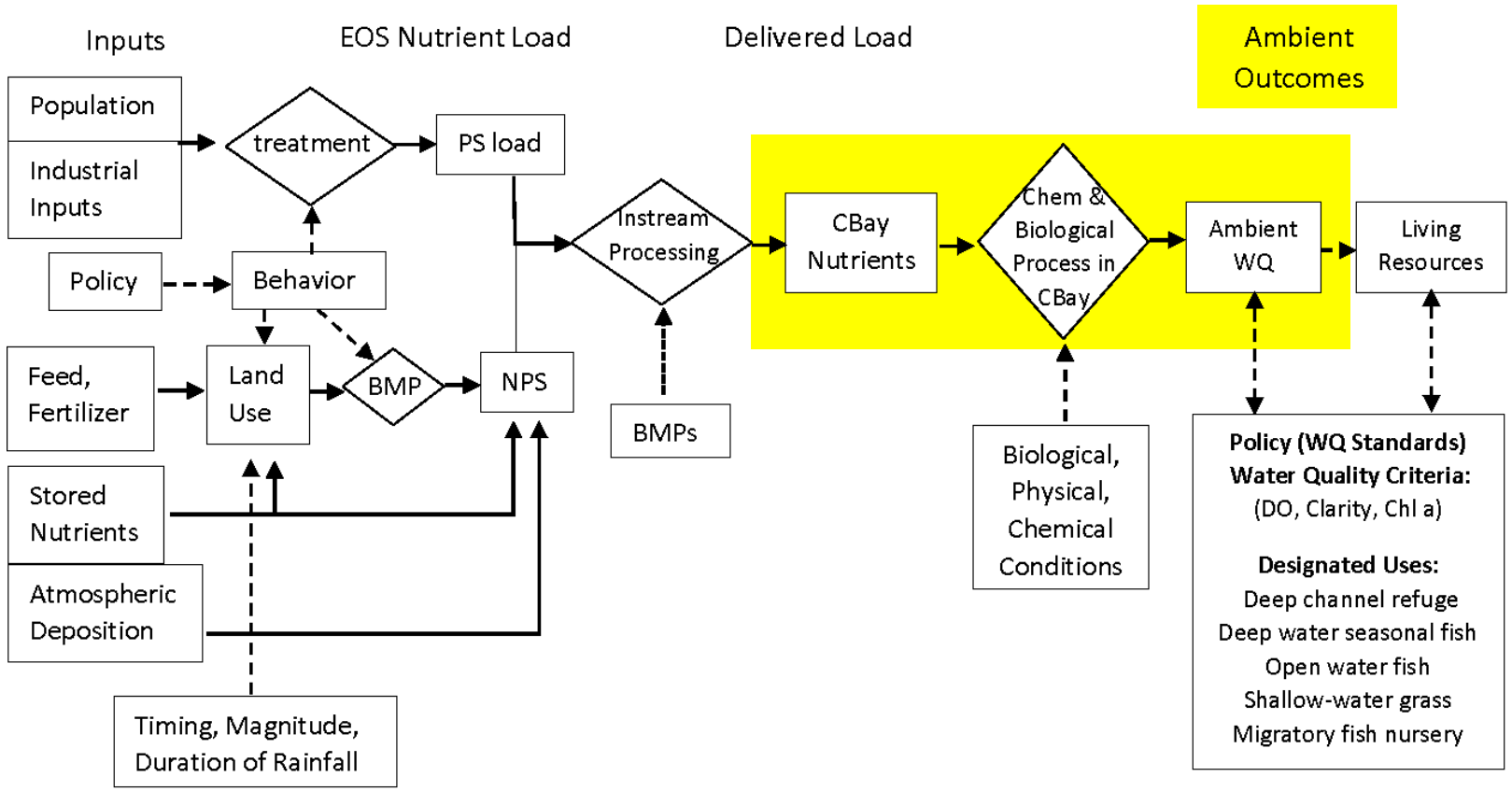
- Localized high loss source areas not targeted (STAC 17-007)
- Uncertainties about BMP removal efficiency estimates (STAC 18-003)
- Lag times in removal effectiveness (STAC 13-004)
- BMP resilience in face of climate change (STAC 18-004)
- BMP maturity & performance (STAC 13-004)



Delivery of Nonpoint Source Loads to Streams

Limited evidence that management actions are lowering instream nutrient levels:

"Current research suggests that the estimated effects of conservation practices have not been linked to water quality improvements" (STAC 18-005)

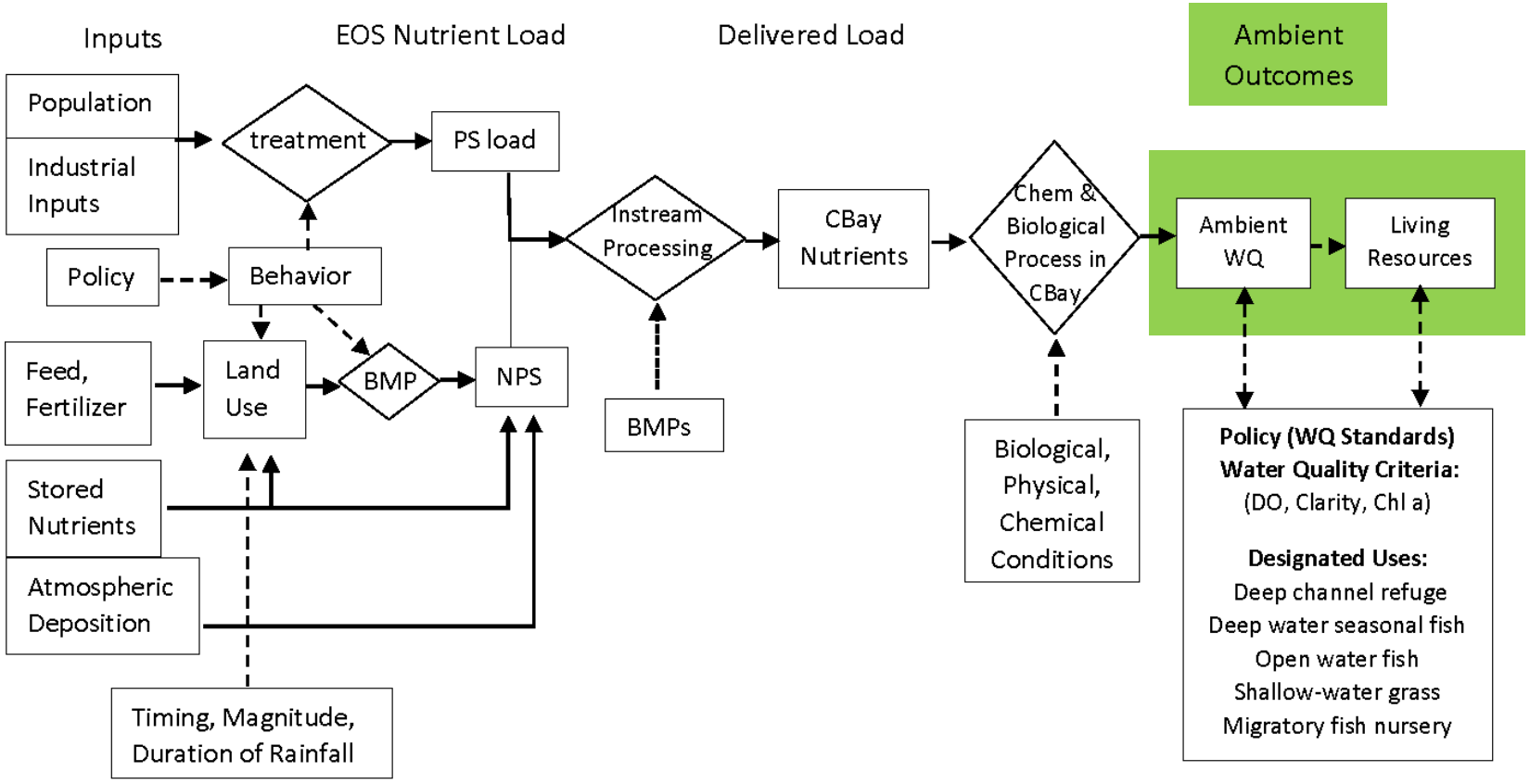


C-Bay WQ Response Nutrient Inflows

Ex. Challenge to predicting DO response, particularly in deep channel, from changing nutrient levels (STAC 15-002; 18-005) and climate conditions (STAC 18-002)

Stability of nutrient-DO response stable over time; Uncertainties over spatial, temporal and magnitudes of response (Tango and Batuik 2016; Boynton et al 2005; Keisman et al 2018).

Nonlinear effects and thresholds may impede attainment of WQS (STAC 08-002)



Relationship between Living Resource and WQ Conditions

Food web dynamics may play significant role in recovery (STAC 08-002)

Fishery response to nutrient enrichment, hypoxia (Breitburg March 2009 STAC presentation)

Groups:

- Nutrient inputs/Boundary Conditions
- Watershed (Nutrient Loads, BMPs)
- Estuary
- Living resources

- Identify key scientific uncertainties/knowledge gaps in understanding system response.
- Identify limitations in system responses that pose risk to achievement of desired changes/expected outcomes
- Prioritize uncertainties/knowledge gaps/limitations that have the most potential risks to achieving expected system response.