Challenges and Opportunities in Operationalizing Coupled Human and Natural Systems Research in the Chesapeake Bay Watershed

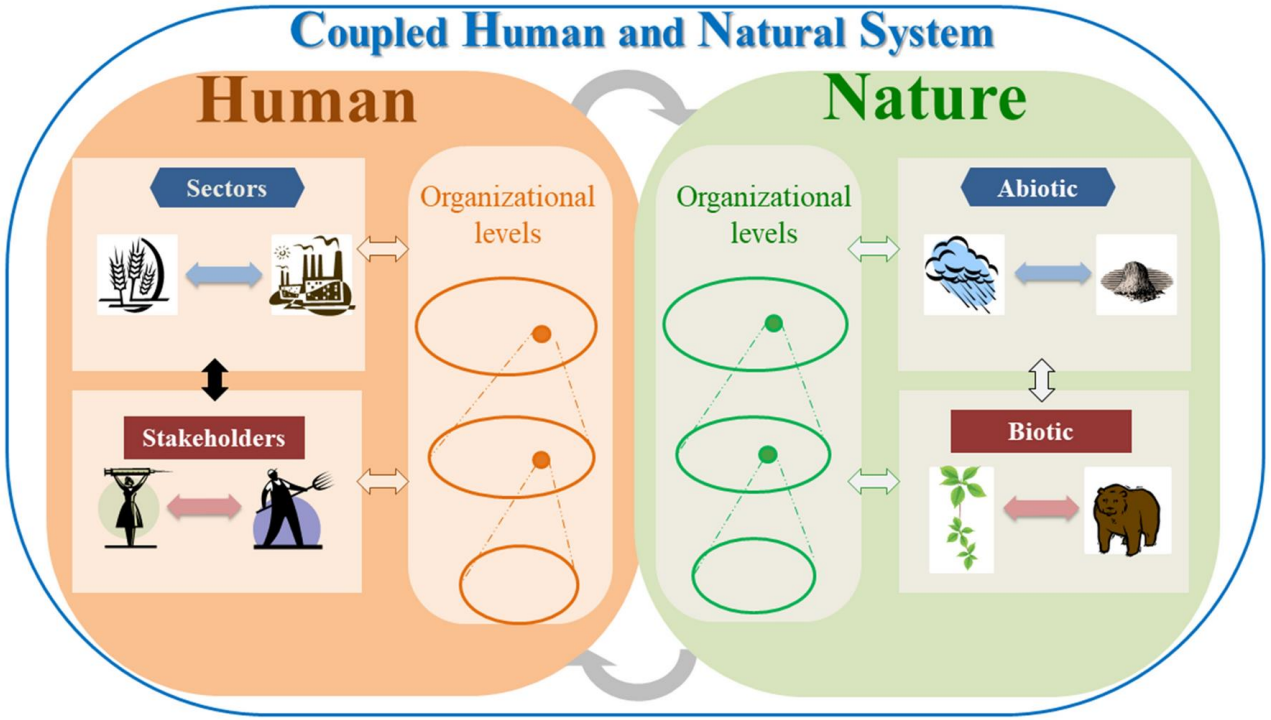
Workshop progress update

Patrick Bitterman
Assistant Professor, Department of Geography
Kent State University

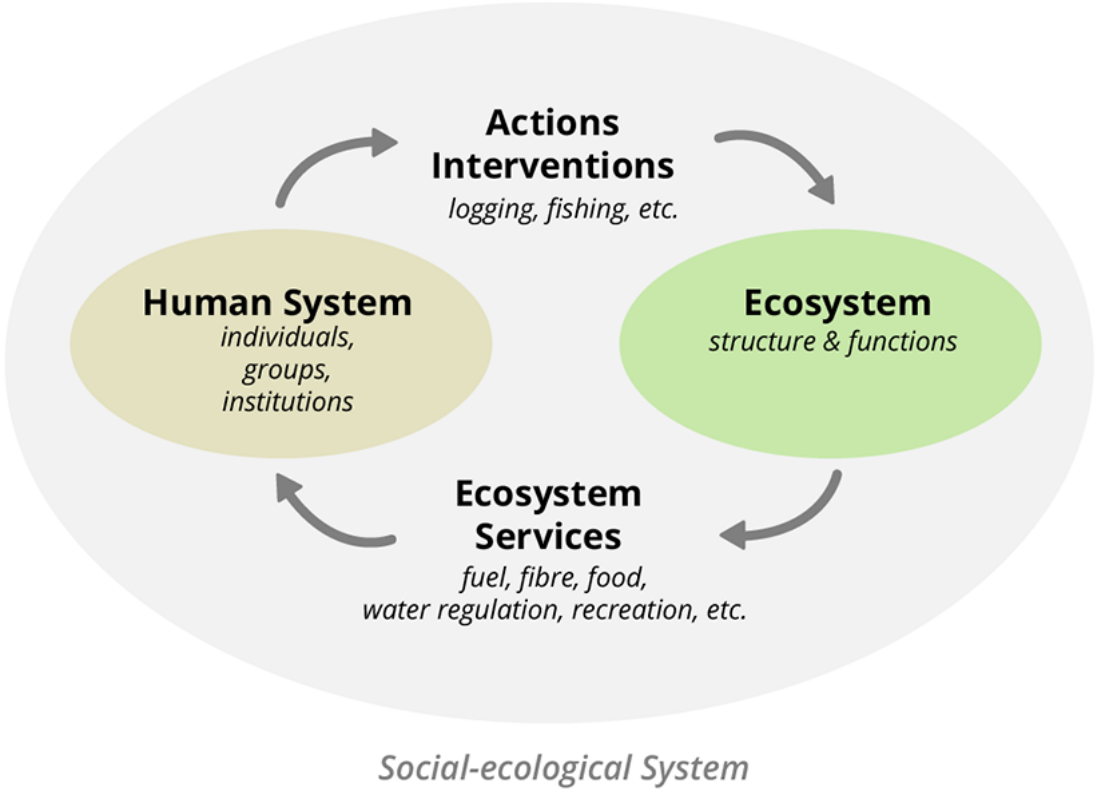
September 16, 2025 // CBP STAC Meeting

www.patrickbitterman.com
pbitterm@kent.edu

Human-environment feedbacks in complex adaptive systems



Liu, Jianguo, Thomas Dietz, Stephen R. Carpenter, Carl Folke, Marina Alberti, Charles L. Redman, Stephen H. Schneider et al. "Coupled human and natural systems." *AMBIO: a journal of the human environment* 36, no. 8 (2007): 639-649.

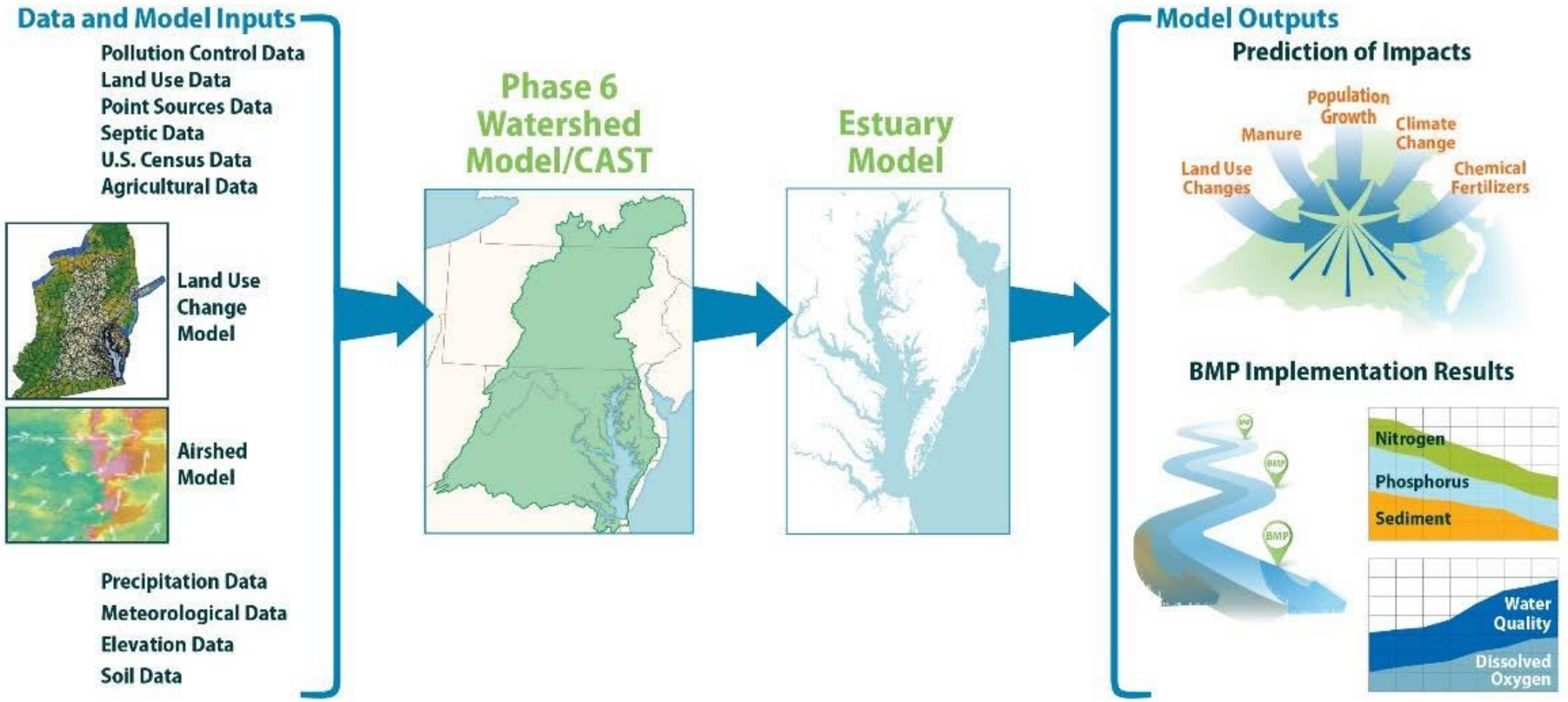


https://saras-institute.org/social-ecological-systems/

The (consensus-based) CBP modeling system

focuses on “feed forward” linkages (monitoring is similarly structured)

Chesapeake Bay Program
Science. Restoration. Partnership.

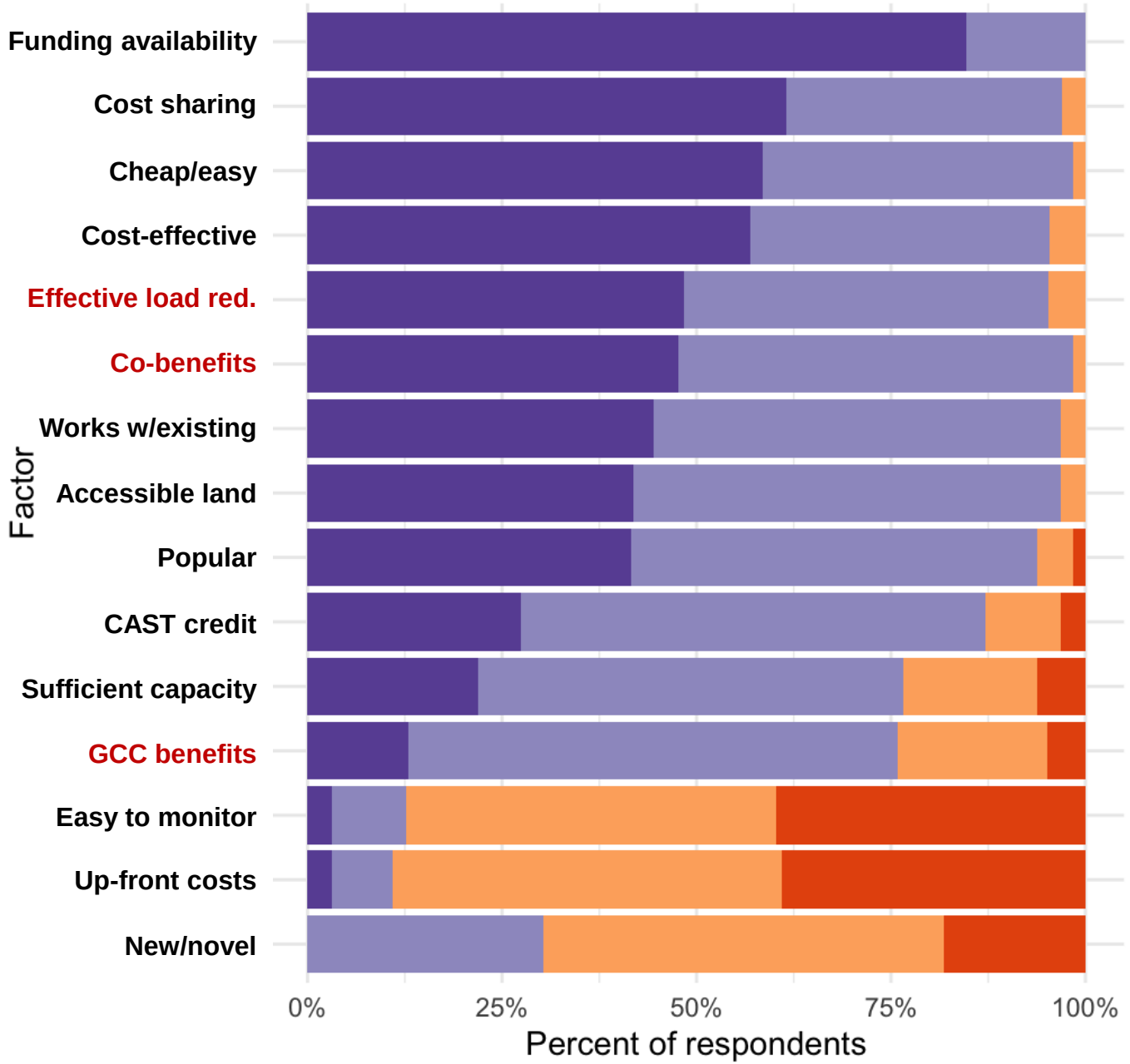


NSF award #2009248: CNH2-L: Modeling the dynamics of human and estuarine systems with regulatory feedbacks

Hood, R. R., G. W. Shenk, R. L. Dixon, S. M. C. Smith, W. P. Ball, J. O. Bash, R. Batiuk, K. Boomer, D. C. Brady, C. Cerco, P. Claggett, K. de Mutsert, Z. M. Easton, A. J. Elmore, M. A. M. Friedrichs, L. A. Harris, T. F. Ihde, L. Lacher, L. Li, L. C. Linker, A. Miller, J. Moriarty, G. B. Noe, G. E. Onyullo, K. Rose, K. Skalak, R. Tian, T. L. Veith, L. Wainger, D. Weller, and Y. J. Zhang. 2021. The Chesapeake Bay program modeling system: Overview and recommendations for future development. *Ecological Modelling* 456:109635.

Lim, T. C., P. D. Glynn, G. W. Shenk, P. Bitterman, J. H. A. Guillaume, J. C. Little, and D. G. Webster. 2023. Recognizing political influences in participatory social-ecological systems modeling. *Socio-Environmental Systems Modelling* 5:18509.

Env → human feedbacks are dispersed, punctuated, & rarely measured



Influences on prioritization of BMP <u>implementation</u> decisions

(in-progress analysis of survey data)

Level

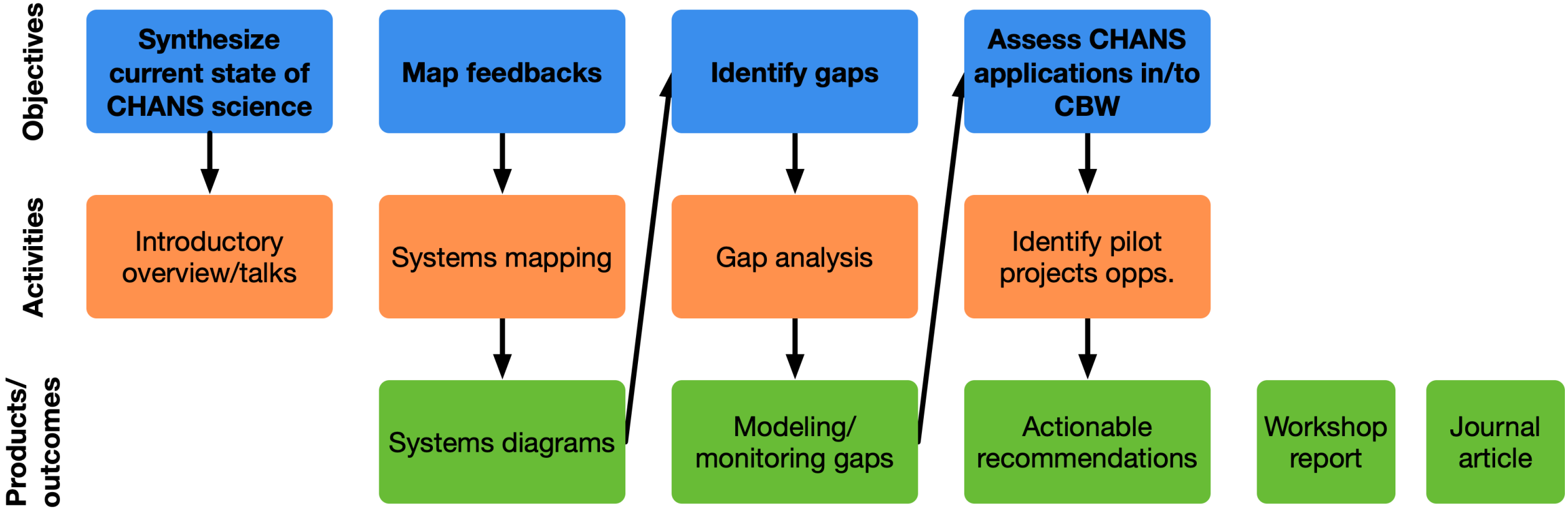
- Substantially decreases priority
- Slightly descreases priority
- Slightly increases priority
- Substantially increases priority

Motivations and objectives

- Pressing need for **integrating social science** into a systems-based approach (Beyond 2025)
- Need for creating and improving **approaches to adaptive management** (CESR Report)
- "… [the CPB has] limited knowledge on **how the environment impacts human** quality of life, behavior, and decision-making." (letter of support)

1. **Synthesize** the current state of applied CHANS science and its relevance to addressing challenges in the CBW ecosystem
2. **Map** feedbacks and identify gaps
3. **Assess** CHANS applications
4. **Develop** recommendations

General workshop structure



Current thinking

- Panel and/or lightning talks from case study experts in similar-ish systems (e.g., Puget Sound, Lake Erie)

- Breakout groups
  - Systems mapping
  - Gap analysis
  - Opportunities/recommendations

- CBW stakeholder roundtable

- Poster session

Progress to date

1. Steering Committee - two organizing meetings
2. Refining activities and structure
3. Sub-group to manage scientific output (journal article)
4. Have begun discussion re: participant recruitment

Recent (outstanding?) questions

- CRC funding
- Online participants and breakout groups
- Venue