Building a Better Bay Model: A Workshop for Agricultural Partners

Agricultural Forecasting Track:
Informing the Present with the Future
Session Summary

Overview:
The Chesapeake Bay Total Maximum Daily Load (TMDL) requires reductions in nutrient and sediment loads to the Bay by 2025 and these reductions must be maintained in perpetuity. Reductions will be accounted for based on the implementation of Best Management Practices (BMPs) and other factors. Major shifts in markets, technology, investments, and land use trends could radically alter pollution loads from the agricultural sector but are not being accounted for at present.

Future forecasting is a critical tool for the Chesapeake Bay Program (CBP) Partners. Short-term forecasts of agricultural land and production are needed to develop 2-year milestones and measure progress against them. Long-term forecasts, i.e., "future scenarios", are needed to account for potential practices and innovations beyond the realm of historical trends and current technologies. Long-term forecasts can inform policy goals and investment decisions that will complement and support Phase 3 Watershed Implementation Plans and Nutrient Trading and Offset Strategies. The absence of such forecasts, and the future assumptions they are based on, handicaps the CBP Partners' abilities to consider the influence of trends, drivers, and innovations on Bay restoration success.

New policies and financial incentives to encourage the development and adoption of innovative technologies and practices will likely be needed to ensure the long-term sustainability of animal agriculture in face of a shrinking agricultural land base. Simulating alternative future scenarios for this sector will provide a means to recognize the potential role and importance of such policies and incentives for restoring the Bay while sustaining agriculture.

Agricultural Forecasting Goal
In the next 8-12 months, the CBP Partners will develop 2-year, 5-year, 10-year, and 20-year forecasts of agricultural land and production based upon an understanding of historical trends, driving forces, and stakeholder visions for the future.

Programmatic Objectives
1. Improve interpolation and extrapolation of agricultural land use and production trends.
2. Spatially quantify the potential relative persistence of farms (i.e., resistance to conversion to development) based on farm demographic, economic, and environmental characteristics.
3. Develop a set of narratives (e.g., storylines) based on stakeholders' input that bound the range of potential and plausible market changes and technological innovations influencing agricultural persistence and production.
4. Spatially simulate future changes to the agricultural land base and production in accordance with stakeholder-relevant scenarios.

The goal and objectives outlined above cannot be fully achieved during the 2-day Agricultural Modeling Workshop. Rather, the forecasting sessions are designed so that key leaders in the agricultural community understand the relevance of the task, identify relevant trends, drivers, innovations, and approaches influencing the future of agriculture, and build a commitment to completing the task over the next 8-12 months.

Workshop Objectives

Participants will:

- Increase understanding and knowledge of the purpose, needs, assumptions, and methods for developing short and long-term forecasts of agriculture to inform the Bay restoration effort.
- Identify factors influencing historical and future livestock and crop trends.
- Recommend specific improvements to short-term forecasting methods.
- Identify policy and stakeholder-relevant long-term scenarios and discuss the potential role of long-term forecasts in the Bay TMDL and Phase 3 Watershed Implementation Plans.
- Identify and discuss knowledge gaps and additional work needed to improve short-term and long-term forecasts.

Invited Attendees

Federal, state, and local agricultural agencies, academics, producers, industry associations, and NGO agriculture advocates operating within or with interest in the Chesapeake Bay watershed.

EVALUATION QUESTION RESPONSES.

4. I **increased my understanding and knowledge** of the purpose, needs, assumptions, and methods for developing short and long-term forecasts of agriculture to inform the Bay restoration effort.

   1 2 3 4 5
   strongly disagree strongly agree

This question received the highest ratings in the evaluation. Perhaps because participants were less familiar with the forecasting than with Scenario Builder.

Respondents	# Responding	Ave. Rating	% Agree (4+5)
All	49	4.1/	87.7
Ag Enterprise	10	3.7	70
Agency	20	4.0	90
Academic	19	4.3	95

5. Our group succeeded in identifying and discussing knowledge gaps and additional work needed to improve short-term and long-term forecasts

   1 2 3 4 5
   strongly disagree strongly agree

Respondents	# Responding	Ave. Rating	% Agree (4+5)
All	52	4.1/79	79
Ag Enterprise	12	3.5	40
Agency	20	4.1	85
Academic	20	4.3	95

Agricultural Forecasting Track: Summary of Session Feedback

1. Vulnerability of farmland to conversion
   - Weight vulnerability by state using relative regulatory/outreach indicators (e.g., preferential taxation and agriculture extension services)
   - Consider: Farmer age (by county), BMP implementation, proximity to markets, ports, and processing plants, regional agriculture infrastructure, proximity to population and job centers, proximity to public utilities, zoning and other relevant land use policies

2. Short-term forecasting of crops
   - Use NASS annual data to better represent and interpret trends

3. Future crop scenarios
   - Irrigation (higher production)
   - Commodity projection based on market share. Include specialty/direct market crops
   - Crop genetics (more productive, more efficient at using nitrogen) -/+ 2 bushel/year
   - Widespread adoption of precision agriculture including fertigation, foliar feeding, and crop protection (controlling for pests/weeds) advancements
   - Climate change (increase growing season)
   - Renewable fuel standard (corn market demand and impacts on animal ag)

4. Short-term forecasting of livestock
   - Use NASS annual data to better represent and interpret trends de-couple production from acreage

5. Future livestock scenarios
   - Preserving the local grain base
   - Enhanced genetics and nutrition leading to higher feed conversion ratios
   - Automation and other production efficiencies
   - Changing size and clustering of farm operations Increase in broiler due to export market (demand for dark meat)
   - Vary scenarios by state given the different markets served by each state (smaller birds and larger flocks in MD to serve fast food industry, compared to VA)
   - Downscale USDA national commodity projections to Bay states based on relative market share. Translate commodities (e.g., milk production) into # of animals and lbs of nutrients in manure

6. New data sources
   - Annual NASS production statistics
   - Industry and state Dept of Ag statistics
   - National Pork Board trend data (birth rates, production numbers)
   - AgriStats Packers/processers output numbers

7. Participants interested in further involvement
   - Mark Davis (Delaware Department of Agriculture) mark.davis@state.de.us
   - Paul Bredwell (U.S. Poultry and Egg) pbredwell@uspoultry.org
   - Dale Hawks (USDA-NASS) dale.hawks@nass.usda.gov
   - Rick Kohn (University of Maryland) rkohn@umd.edu
   - Allan Stokes (National Pork Board) astokes@pork.org
   - Jamie Burr (Tyson Foods Inc.) jamie.burr@tyson.com

- Mark Conner (Dupont Chesapeake Farms) Mark.C.Conner@dupont.com
- Scott Malcom (ARS) smalcolm@ers.usda.gov

8. Other related mapping & data efforts
    - New England Plant, Soil and Water Laboratory - Sherri DeFauw, Sherri.DeFauw@ars.usda.gov
    - Penn State – Stephan Goetz sgoetz@psu.edu
    - Kate Clancy klclancy@comcast.net
    - Tufts, Tim Griffin Timothy.Griffin@tufts.edu
    - JHU /Center for a livable Future Amanda Behrens abehrens@jhsph.edu
    - Susana Crespo ESRI, screspo@esri.com
    - CBP LGAC, Pennsylvania, Mary Gattis

Proposed Next Steps

Phase 1

a. Form a small steering committee of academics and industry representatives
b. Develop agricultural future "Trend" and "Market" scenarios for 2025.
    - "Trend" scenario = extrapolation historic agricultural and urban trends + WIP implementation + climate change
    - "Market" scenario = extrapolation of historic urban trends + WIP implementation + climate change + downscaled ERS projections + ↑ irrigation + ↑ feed conversion ratios + ↑ adoption of precision agriculture + Δ crop genetics + ↑ specialty crops for local markets + renewable fuel standard impacts

Phase 2

a. Develop scenario evaluation metrics: total nutrient and sediment loads, loads per unit of production, and offset capacity, and cost (?)
b. Evaluate the scenarios. If challenged to meet and maintain TMDL, draft a more "Sustainable" scenario.

    "Sustainable" scenario: same as market scenario but replace historic urban trends with ↑ infill/redevelopment + protection of prime soils + protection of agricultural production centers + manure export + other means of maintaining the agricultural land base, profitability, and production levels while reducing nutrients and sediment.

Phase 3

- Host workshop to critique (and reformulate) "Sustainable" scenario to meet and maintain TMDL. Involve a broad representation of interests including land use planning, habitat and open space preservation, and forestry.