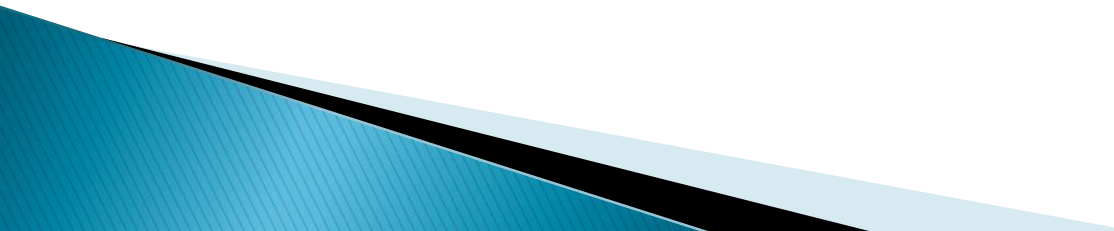# Evaluation of Nutrient Management Practices

Mark Dubin, Workgroup Coordinator

Steve Dressing, Tetra Tech

February 23, 2012

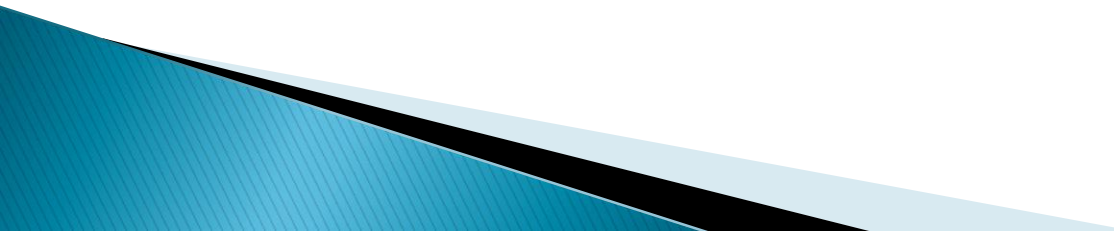# Status

- Subgroup Formation
- Literature Retrievals
- Compilation of State Program Information
- Interviews

Sub-Group Members

Land Use Subgroup			Area of Expertise Subgroup		
Cropland	Nursery	Pasture	Academic Research and Monitoring	Programmatic	Modeling
16	3	7	11	8	5

- 21 of 25 panel members in sub-groups
- Need to select leaders
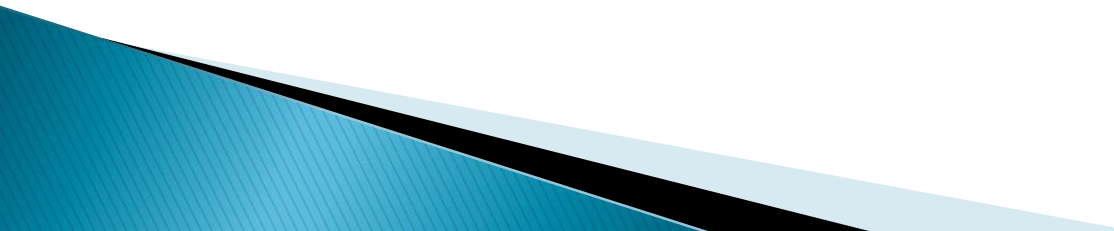- Need to set agendas
- Need to schedule sub-group calls

Tetra Tech Support–Scientific Literature Search

- To assist NM Expert Panel
  - BMP definitions
  - BMP effectiveness
- Tt searches and screens articles for applicability, usefulness, and quality
- Peer-reviewed literature back to January 1, 1985
- Tt provides citations and abstracts

Tetra Tech Support–Scientific Literature Search

- Retrievals posted on Sharepoint site
  - http://www.ttcollab.com/CB_BMP_Review/default.aspx
  - Nutrient management (1600+ references)
  - Mineralization (~200 references)
  - P Index (~100 references)
  - Excel format (title, author, source, date, abstracts)
    - Filed by search words
    - Redundancies
- Panel members can upload and download material

State Program Information

- Developed synopsis of each state agriculture program (nutrient management) for interviews
- Revisions made based on interview comments
- Additional information obtained from panel members interviewed
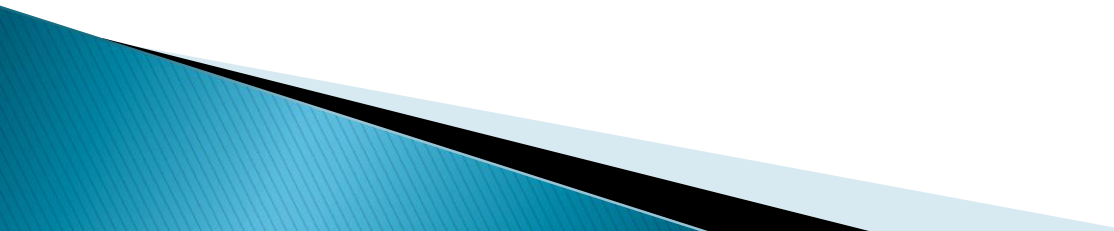
Tetra Tech Interviews

- Why?
  - To obtain research papers, project reports, fact sheets, websites, etc. that can provide information on NM BMPs
  - To obtain information on areas where BMPs are implemented and programs that have adopted the BMPs
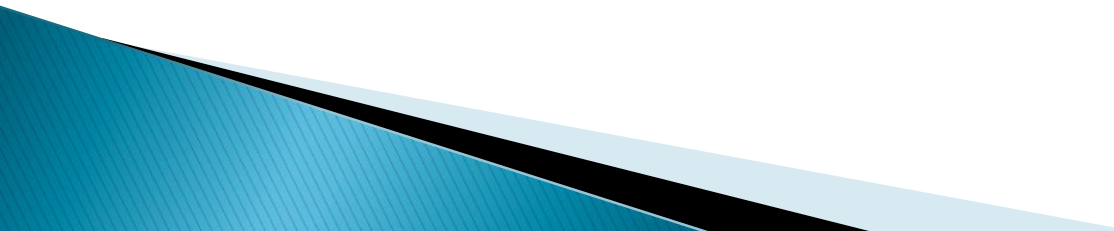- Who?
  - Expert Panel members
  - State agriculture program experts
  - Other experts identified by AgWG and Panel
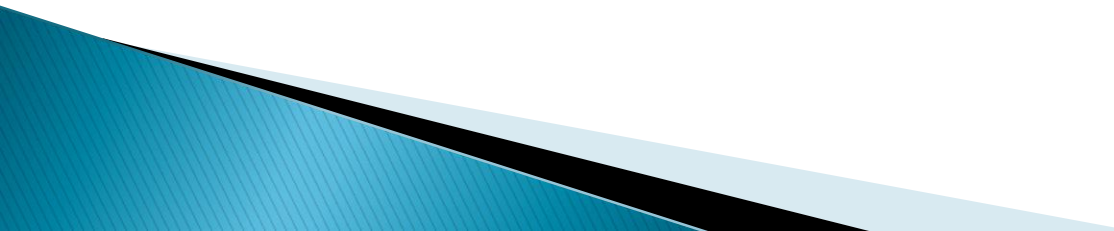
Interview Status

- 25 Expert Panel Members
- 18 Interviewed; 2 scheduled; 5 unscheduled
- Goal: Complete Interviews by end of February/Early March
- Summary of Interviews in Early March

Preliminary Observations: State Regulations

- Some states require NMP for all forms of nutrient (commercial fertilizer, manure, and other products), while others require NMP only for permitted livestock operations (e.g. CAFO).
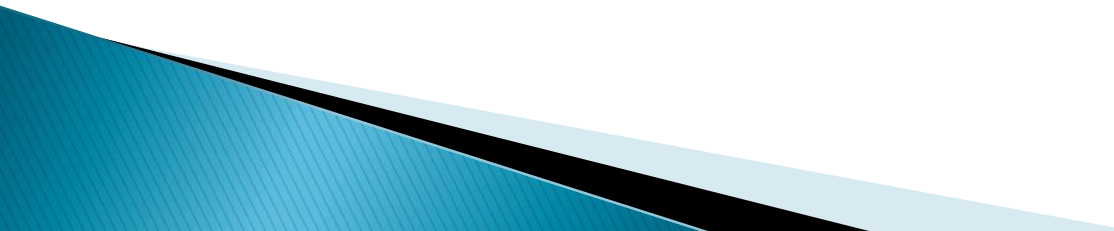- Most states treat biosolids somewhat differently than they treat animal manures.

Preliminary Observations: Nutrient Management Practices

- General agreement with model definitions of N-based and P-based NM; very similar across states.
- Some seek environmental impact as an objective of NMPs.
- P-site Index is typically used to determine how much manure can be spread on soils that are at or above the optimum soil test P.
- Except for MD and DE, each state has a different P Index construct.

Preliminary Observations: Nutrient Management Practices

- Yield goals are a major driver of NM plans and the parameter often with the most uncertainty and flexibility.
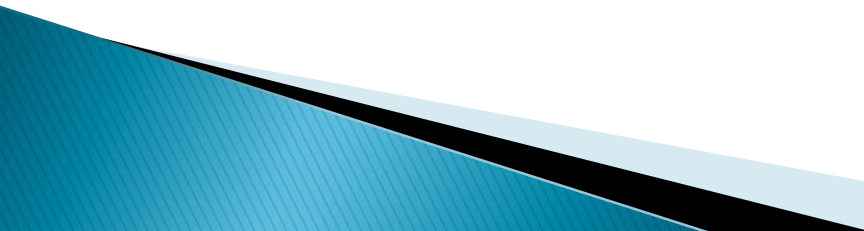- Some experts seek increasing crop yields with little or no increase in fertilizer nutrient.

Preliminary Observations: Nutrient Management Practices

- P-based plans are not as problematic as N-based with respect to yields and risks.
  - P soil test is effective and reliable.
  - Most fields near or above optimum P level – deficiency unlikely
- Questions raised about eliminating winter application of manure.
- Questions raised about recommendations to apply additional N to compensate for volatility and leaching losses.

Preliminary Observations: Nutrient Management Practices

- Several questioned whether enhanced nutrient management (as used in CB) was a viable definition.
- Multiple definitions to enhanced nutrient management
  ◦ 4 R's
  ◦ Increased yields at the same N rates (over time)
  ◦ PSNT, CSNT, and/or chlorophyll meters
- Little/no interest among farmers or regulators in cutting fertilizer application rates below that recommended by land grant universities.
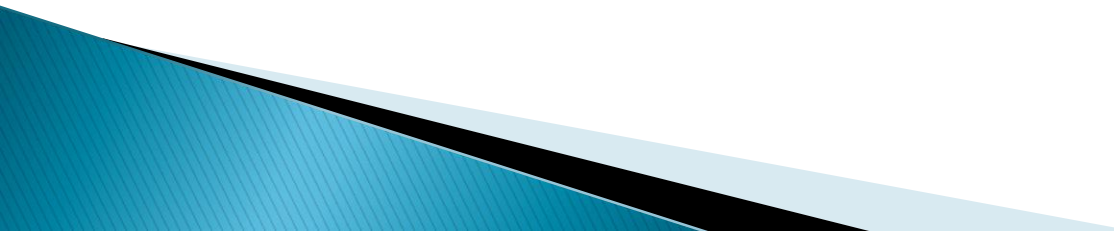
Preliminary Observations: Practice Effectiveness

- Efficiency in nutrient use depends on related practices to such a degree that it is difficult to ascribe changes in efficiency to a single practice. For example, conservation tillage (e.g. no-till) reduces sediment-bound P but increases dissolved P losses.
- Except for auto-steer, there are little/no data suggesting that precision/decision agriculture protects water quality.
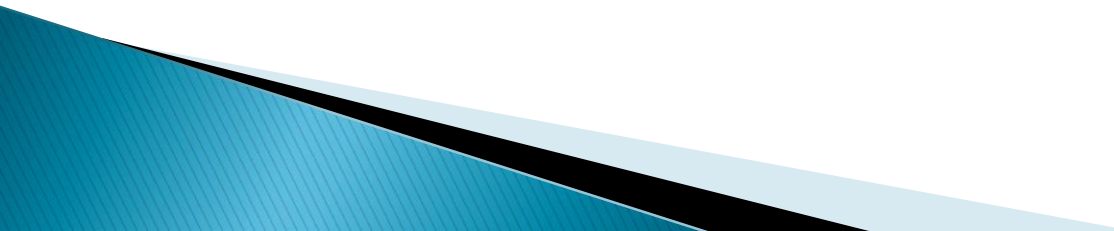
Preliminary Observations: Practice Effectiveness

- NM with inorganic fertilizer is more precise and widely practiced well than NM with organic sources
  - Better control over applications for inorganic
    - Uncertainties in nutrient content of organic sources
  - High cost of inorganic fertilizer
  - Volume of organic versus land base for application
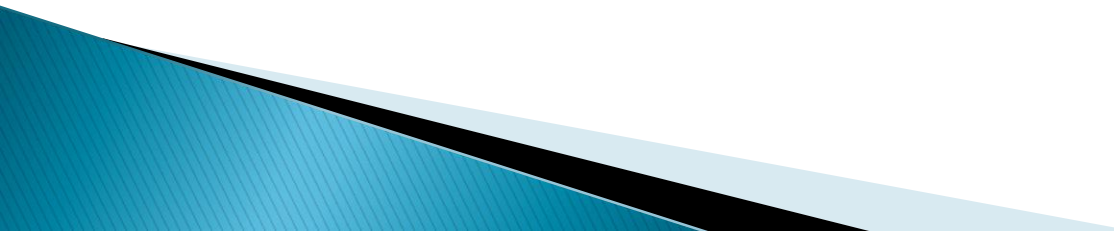- But impact of NM for organic sources is likely to be greater on per-acre basis

Preliminary Observations: Reporting/Tracking/Modeling

- Because regulatory structures and data collection differ among states, data used in the Bay model will unevenly characterize on-the-ground practices.

- Many NM plans are not assessed or tracked by state program managers, even where they are required – certified consultants prepare plans.

- The protection of NM data due to privacy issues often prevents the best use of collected data on useful spatial scales by managers, researchers and modelers interested in tracking progress and understanding environmental impacts.

Preliminary Observations: Reporting/Tracking/Modeling

- Need to look beyond counting plans with assumptions of effectiveness
  - Need to know what has been implemented (e.g., by practice component), what has changed since 1985 baseline
- Tracking of NM as change in rate only is insufficient
  - Animal waste application rates are a guess, despite analysis due to the nature of the organic materials used.
  - Need to account for timing, placement, method, but even the best state reporting systems still do not capture timing and placement
  - Evaluate/track results of NM using environmental as well as agronomic measures, e.g. soil test P

Preliminary Observations: Reporting/Tracking/Modeling

- Even the best state-reporting system does not transfer the data into the county-level reporting system (scale issue)

- The need to track import and export of manure seems prominent.

- A soils layer would be helpful in simulating yield goals, appropriate N rates, and "hydrologically contributing areas"

- Monitoring soil P levels through time is recommended.

Schedule

- **December:** Tt starts literature search. Panel selection.
- **Early February:** Panel conference call. Interviews and collection of program info.
- **Mid-Late February:** Summary of interviews.
- **Late February:** Citations/abstracts for retrieved literature-first draft. Summary of program information.
- **Mid February:** Consult with modelers on BMP incorporation.

- **Early March:** Panel initial findings to AgWG.
- **Early March:** Preliminary information for use in Phase 2 WIPs.
- **March-June:** Panel continues research on BMPs. Prepares for reviews and approvals.
- **June:** Final recommendations from Panel.
- **June/July:** Source Sector Review.
- **July:** Technical Review.
- **July/August:** Approval meeting for WQGIT.
- **August/September:** Final report