Progress Report:
Mosquito Control Task Force Study

Lauren Brown
Eastern Research Group
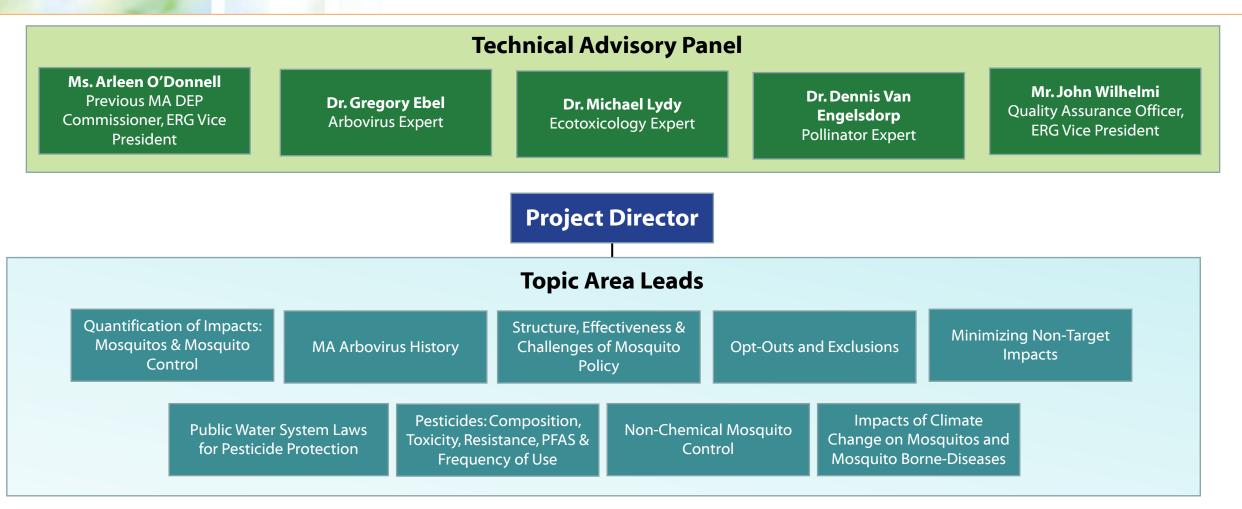June 2, 2021

Agenda

- Organization of the Research Team
- Overarching Project Activities to Date
- Project Activities to Date by Topic Area
  - Scope
  - Progress
  - Work to Be Done
  - Questions, Obstacles, Data Gaps
- Next Steps
- Questions

Organization of the Research Team

Technical Advisory Panel

| **Ms. Arleen O'Donnell** Previous MA DEP Commissioner, ERG Vice President | **Dr. Gregory Ebel** Arbovirus Expert | **Dr. Michael Lydy** Ecotoxicology Expert | **Dr. Dennis Van Engelsdorp** Pollinator Expert | **Mr. John Wilhelmi** Quality Assurance Officer, ERG Vice President |

Project Director

Topic Area Leads

| Quantification of Impacts: Mosquitos & Mosquito Control | MA Arbovirus History | Structure, Effectiveness & Challenges of Mosquito Policy | Opt-Outs and Exclusions | Minimizing Non-Target Impacts |

| Public Water System Laws for Pesticide Protection | Pesticides: Composition, Toxicity, Resistance, PFAS & Frequency of Use | Non-Chemical Mosquito Control | Impacts of Climate Change on Mosquitos and Mosquito Borne-Diseases |

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Overarching Project Activities To Date

- Onboarded additional experts in response to Task Force Feedback

- Weekly Check-In Calls with EEA

- Attendance at all Task Force calls since award

- Scoping calls with technical advisory panel

- Extracted data from more than 100 annual MCD and SRB reports
  - All data extracted 2016-present.
  - Select data extracted 2009-present.
  - Includes information such as pesticides products and amounts applied to IT resources used, revenues and expenditures, service and exclusion request, and more.

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Topic Area Updates

1. History of West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE) in MA
2. Mosquito Policy: Structure, Effectiveness and Challenges on Public and Private Lands
3. Mosquito Control Opt-Outs and Exclusions
4. Pesticides: Composition, Toxicity, Resistance, PFAS, and Frequency of Use
5. Non-Chemical Mosquito Controls
6. Minimizing Non-Target Impacts of Mosquito Pesticide Use
7. Public Water System Laws and Regulations for Pesticide Use Protections
8. Impact of Mosquitos, Mosquito-borne Diseases, and Mosquito Control
9. Impacts of Climate Change on Mosquito Populations and Mosquito-Borne Diseases

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1. History of West Nile Virus (WNV) and Eastern Equine Encephalitis (EEE) in Massachusetts

- **Overview of Scope:** Data-driven history of WNV and EEE in Massachusetts (MA).

- **Progress to Date:**
  - Requested complete data from DPH (human cases, mosquito/animal data, and trap location data), obtained on May 24th.
  - Discussed data nuances and limitations with DPH (e.g., location of cases represent residence not exposure, changes in data collection methods over time).
  - Pulled additional publicly available data from annual reports.
  - Began summarizing data.

- **Work Remaining:**
  - Summarizing data (tables, maps, and narrative).

- **Questions, Obstacles, Data Gaps:**
  - Obstacle: Precision of data.

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- **Overview of Scope:** Describe existing policy structure (including entities involved and major legislation), evaluate the effectiveness of the program, and discuss challenges to mosquito control on state, federal, and privately owned land.

- **Progress to Date:**
  - Reviewed **36 documents** related to existing policy, lessons learned, challenges, and best practices.
    - Documents reviewed include legislation, press releases, academic articles and white papers, agency reports, position papers, plans, and public letters.
  - Conducted **18 interviews with 21 respondents.**
    - Respondents include MA state agency staff, MCD superintendents, local board of health representatives, MCTF members, environmental non-profit representatives, and mosquito control experts from other states.
  - Developed a **detailed organizational chart and logic model** for the mosquito control program that illustrates roles and responsibilities, program inputs, activities, outputs and outcomes. Received initial feedback from EEA.
  - Began qualitative analysis of document review and interview data and quantitative analysis of MCD report data.

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- **Work to Be Done:**

  - Finalize analysis of extracted MCD annual report data to focus on key report aspects relevant to evaluation questions (e.g., IPM, education and outreach, revenues and expenditures, Children and Families Protection Act impacts).

  - Finalize qualitative analysis of document review and interview data to determine key themes related to program effectiveness, challenges, lessons learned, and best practices.

  - Assessment of program effectiveness against evaluation criteria and development of report.

- **Questions, Obstacles, Data Gaps:**

  - Obstacle/Data Gap: Transferrable best practices and mechanisms used in other states, given contextual differences between mosquito control in various Northeastern (and beyond) states.

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3. Mosquito Control Opt-Outs and Exclusions

- **Overview of Scope:** Review of current opt-out policies including municipal opt-out and individual exclusion requests in MA and other states.

- **Progress to Date:**
  - Reviewed current opt-out process and procedures in MA, all five other New England states, NY, NJ, and MI.
  - Gathered data on exclusions in each MCD and outside MCDs.
  - Gathered data on use of GIS/GPS systems across MCDs.
  - Interviewed one MCD superintendent.
  - Reviewed input from task force members and the public shared at task force meetings.

- **Work to Be Done:**
  - Analyze data on municipal opt-out (submission deadline May 28).
- **Questions, Obstacles, Data Gaps:**
  - Data Gap/Obstacle: Lack of other state opt-out programs for comparison.

4. Pesticides: Composition, Toxicity, Resistance, PFAS, and Frequency of Use

- **Overview of Scope:** Describe the Composition, Toxicity, Resistance, PFAS and Frequency of Use of Pesticides used in MA since 2009.

- **Progress to Date:**
  - Extracted data on pesticide products used in MA since 2009 from more than 100 MCD annual reports; mapped products to chemical components.
  - Extracted data on amount of each product applied since 2016 from MCD annual reports.
  - Gathered hazard data (human health and ecological toxicity) and physical chemical properties for each active ingredient. Also obtained seminal literature on synergistic effects from ecotoxicity expert.
  - Collected data on PFAS in pesticides (conducted interviews with PEER, state employees and desk research).
  - Conducted literature reviews and interviewed experts on pesticide resistance.

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- **Work to Be Done:**
  - Synthesize data collected and discuss in context of efficacy of pesticides.

- **Questions, Obstacles, Data Gaps:**
  - Obstacle: Regarding pesticide resistance, data is only available for select A.I. and mosquitos of concern.
  - Data gap: Unlisted ingredients (on pesticide labels) are not identified; their toxicity and potential synergistic effects cannot be completely understood.

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5. Non-Chemical Mosquito Controls

- **Overview of Scope:** For six types of non-chemical controls: IPM; Stormwater Management; Education and Public Engagement; Dam Removal and Culvert Management; River and Wetlands Restoration; and Mosquito Predator Habitat, we will summarize:
  - Best available science/information:
    - Effectiveness in controlling target mosquitos at various life stages.
    - Applicability and limitations for use in MA.
    - Considerations for "protected areas" and buffer zone, per Wetlands Protection Act.
  - Current practices in MA.
  - Current practices in other states.
  - Costs.
- **Progress to Date:**
  - Literature reviews completed for each type of mosquito control. Digest of MCD Annual Reports and summary of activities in other states completed.
  - Initial drafts for five of the six topics are complete.

- **Work to Be Done:**
  - Specialized reviews from ERG's technical advisory panel and potentially experts from the state (e.g., Division of Ecological Restoration review of dam removal section).

- **Questions, Obstacles, Data Gaps:**
  - Obstacles/Data Gap: Quality and comprehensiveness of data not consistently available for all topics.

6. Minimizing Non-Target Impacts of Mosquito Pesticide Use

- **Overview of Scope:**
  - Profile current practices in MA based on MCD Annual Reports and SRB Reports.
  - Potential changes/adjustments to current pesticide use to protect non-target receptors: vulnerable individuals (i.e., those with respiratory or immune illnesses); drinking water supplies; pollinators; and aquatic life.

- **Progress to Date:**
  - Current practices based on MCD Annual Reports and SRB Reports is drafted.
  - Interviews with pollinator expert, ecotoxicologist, and the Commonwealth's Chief Apiarist completed.

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6. Minimizing Non-Target Impacts of Mosquito Pesticide Use *(Cont'd)*

- **Work to Be Done:**

  - Conduct literature review on best practices that could lead to changes/adjustments to current pesticide use to protect non-target receptors.

  - Synthesize information for report.

- **Questions, Obstacles, Data Gaps:**

  - None currently.

7. Public Water System Laws and Regulations for Pesticide Use Protections

- **Overview of Scope:** Summarize public water system laws and regulations related to pesticide use, consider effectiveness of protections for water systems, and best practices from other states.

- **Progress to Date:**
  - Reviewed and documented requirements of key regulations related to drinking water and pesticides:
    - MA Pesticide Control Act, 333 CMR 12.00 (Groundwater Protection), MA Drinking Water Act.
  - Reviewed and documented drinking water monitoring requirements:
    - Post aerial spraying events.
    - Guidelines set by Office of Research and Standards (ORS).
    - Cross-walked all pesticide products used in MA since 2009 (from more than 100 MCD annual reports) with those on lists of regulated and monitored chemicals.
  - Five interviews with drinking water and/or pesticide experts.

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7. Public Water System Laws and Regulations for Pesticide Use Protections *(Cont'd)*

- **Work to Be Done:**
  - Develop logic model for drinking water protections that illustrates roles and responsibilities, activities for the state agencies, outputs and outcomes.
  - Further research in best practices from other states.
  - Development of text for the report.

- **Questions, Obstacles, Data Gaps:**
  - Question: What kind of monitoring of surface and ground water for pesticides happens (or has happened) in conjunction with non-aerial pesticide applications (e.g., truck-based spraying)?

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8. Impact of Mosquitos, Mosquito-borne Diseases, and Mosquito Control

- **Public Health**
  - **Overview of Scope:** Human infections (number, cost, deaths) by level of control.
    - Level of control was separated into: No control; source reduction and larval control only; larval and adult ground control; all control including aerial; and business-as-usual scenario, which has various levels of control by MCD/county.
    - Categorize by disease outcome.
  - **Progress to Date:** Data collection is complete; both models are built.
  - **Work to Be Completed:** QC models; draft report.
  - **Questions, Obstacles, Data Gaps:** None currently.

- **Agriculture/Pollinators**
  - **Overview of Scope:** Value of pollinators to agriculture; impact of pesticides on bees; WNV and EEE animal infections.
  - **Progress to Date:** Data collection complete; begun drafting report.
  - **Work to Be Completed:** Finish drafting report.
  - **Questions, Obstacles, Data Gaps:** None currently.

- **Commerce**
  - **Overview of Scope:** How is commerce, including tourism and recreation, impacted by mosquitos, disease, and control.
  - **Progress to Date:** Data collection is complete.
  - **Work to Be Completed:** Draft report.
  - **Questions, Obstacles, Data Gaps:** This section has limited available data so it will need to be described qualitatively.

- **Environment**
  - **Overview of Scope:** Impact of mosquitos and control on aquatic ecosystems; impact of mosquito population levels on predators.
  - **Progress to Date:** Data collection complete.
  - **Work to Be Completed:** Begin drafting report.
  - **Questions, Obstacles, Data Gaps:** This section will also need to be described qualitatively due to quantitative literature limitations.

9. Impact of Climate Change on Mosquito Populations and Mosquito-borne Disease

- **Overview of Scope:** Describe major climate factors that may contribute to changes in mosquito species distribution and population and arborvirus prevalence in the Commonwealth in the future.

- **Progress to Date:**
  - Reviewed 20+ peer-reviewed articles and government reports on mosquito response to changing climate conditions.
    - Focus on understanding strengths and weaknesses of current arborvirus and climate models.
  - Interviewed expert on health impacts of the climate crisis and vector-borne disease.

- **Work to Be Done:**
  - Develop report. Report sections will:
    - Establish trends in mosquito and arborvirus range. Discuss challenges of current arborvirus and climate models.
    - Describe literature on emerging viruses in MA in the context of changing climate.
    - Implications of climate change for arborvirus surveillance and management techniques.
- **Questions, Obstacles, Data Gaps:**
  - Question: Are there any key people in state government that you recommend we speak to on this topic? We have spoken with Dr. Katie Brown and experts outside of MA agencies to date.

Next Steps

- Synthesize all the research conducted to date
- Finalize topic area reports and develop an executive summary for review by technical advisory panel and EEA
- Respond to comments from review
- Submit to the Task Force

Thank you!

Questions or Comments?