

Development of model inputs for varied approaches to ecological diagnostic analyses of aquatic risks from multiple stressors in Ohio streams

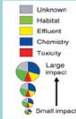


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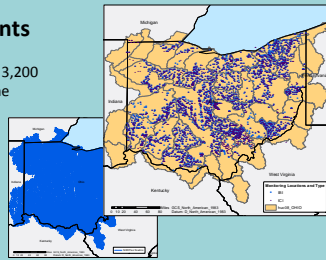
Introduction

The overall goal is to develop a diagnostic analysis of ecological degeneration in surface water which expands on two earlier diagnostic analyses, in which there was still considerable "unknown stressor data" (i.e., the "grey area"). This poster covers the process to collect refined data for eco-epidemiological analysis of stressor influences, ultimately to combine with toxicological data, acknowledging the roles of multiple toxicants, upstream land use, habitat, water chemistry, etc. See the Dyer et al., Kapo et al., Faggiano et al., and Posthuma et al. posters in the Ohio poster group to learn how the data were used.



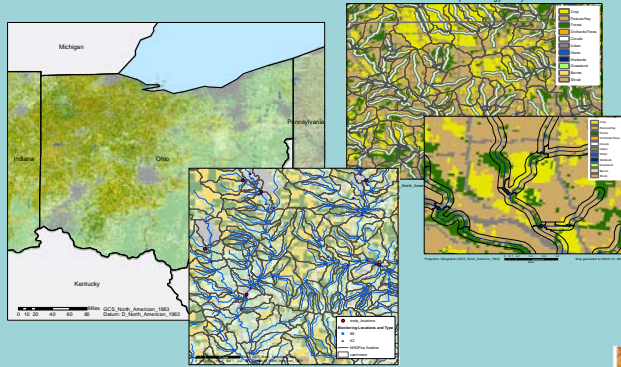
Developing Watersheds for Monitoring Points

- USGS/USEPA National Hydrography Dataset Plus (NHDPlus)
- A need for an efficient yet flexible approach to spatially process 3,200 overlapping watersheds in Ohio, comprised of over 63,000 flowline drainage areas (ie, "catchments" in NHDplus terminology)
 - Each biological monitoring location spatially assigned to a catchment, and custom code used to determine all upstream catchments for each location
 - Metrics generated at both catchment and watershed levels



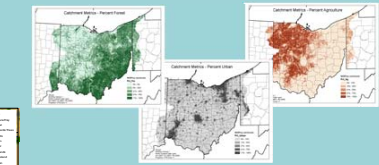
Land Cover Metrics

- USDA National Agricultural Statistics Service, Cropland Data Layer
- Metrics included % agriculture, % urban, % forest, ...
 - Also generated similar metrics for area within 100' of streams to account for the greater potential of these areas to influence water quality



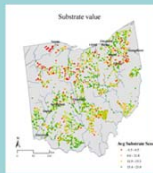
Nutrients, Pesticides and Livestock

- USDA National Agricultural Statistics Service, Census of Agriculture
- Commercial fertilizer, manure applications, livestock production
 - Pesticide class: fungicide, insecticide, herbicide, etc.
 - USGS 2002 National Pesticide Synthesis Project, 220 individual pesticides



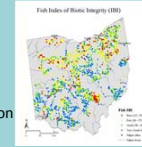
Habitat Characteristics

- Ohio Environmental Protection Agency
- Observed characteristics at each site included:
- Substrate composition, channelization, gradient
 - Riparian vegetation
 - Qualitative Habitat Evaluation Index (QHEI) values



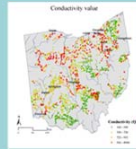
Aquatic Community Information

- Ohio Environmental Protection Agency
- Index of Biotic Integrity (IBI)
 - Invertebrate Community Index (ICI)
 - Species abundance
 - Used to define reference locations and ecological condition



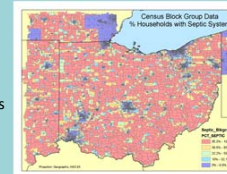
Measured Water Chemistry Data

- Ohio Environmental Protection Agency
- Conductivity, pH, BOD
 - Nitrate, phosphorus, ammonia
 - TSS, metals



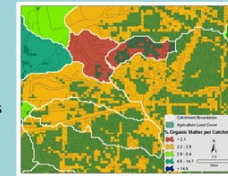
Population and Septic Use

- US Census of Population and Housing
- Percent of households using septic wastewater systems
 - Metrics area weighted to catchments based on urban land cover



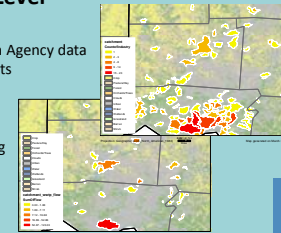
Soil Properties

- NRCS Soil Survey Geographic (SSURGO) Database
- Properties such as: %OM, erodibility, texture, erosion class
 - Area-weighted attributes for soil "under" agricultural land cover only
 - Spatial combination of 60,000 catchments and approximately 2.2 million soil polygons totaling over 3.8 million polygon combinations
 - Performed same operation for areas within 100' of streams



Discharges & Point Level Stressors

- Ohio Environmental Protection Agency data
- Waste Water Treatment Plants - Municipal, mobile home parks, subdivisions
 - Industrial discharges
 - Concentrated Animal Feeding Operations (CAFO)
 - Storm water permits
 - Flow modification (dams)



Consumer Product Chemicals

- GIS-ROUT exposure model developed by Procter & Gamble
- Estimates ingredient concentrations resulting from municipal wastewater treatment plant discharges
 - Sequential segment processing:
 - Add WWTP ingredient loads (population, flow-based)
 - Account for dilution & in-stream loss due to biodegradation, sedimentation, volatilization, etc.
 - Accumulation of ingredient between treatment plants

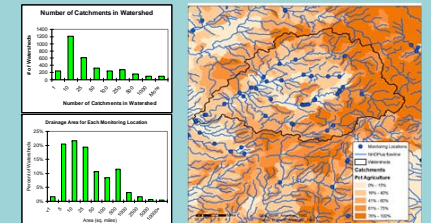


Stream Flow

- Flow statistics generated to describe the variability in flow, flashiness, etc.
- Applied same method as used by the USGS StreamStats web application to generate flow statistics for any point along a stream
- Outputs: Harmonic mean flow, Annual average flow, 19 values representing each 5th percentile flow (Q_5, Q_10, ..., Q_90, Q_95)



Merge 63,000 catchment metrics into 3,200 unique watershed combinations



Contact author for list of data set references

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