RETROSPECTIVE ECOTOXICOLOGICAL DATA AND INFORMATION NEEDS FOR TERRESTRIAL VERTEBRATES RESIDING IN THE GREAT LAKES AND COASTAL HABITATS OF THE UNITED STATES

Moira A. McKernan[1], Barnett A. Rattner[1], Betty K. Ackerson[1], Karen M. Eisenreich[1], Nancy H. Golden[2], Anne M. Meckstroth[3], Roger L. Hothem[3], Thomas W. Custer[4]

1USGS Patuxent Wildlife Research Center, Beltsville, MD, USA; , [2]U.S. Fish and Wildlife Service, Division of Environmental Quality, Arlington, VA, USA;

[3]USGS Western Ecological Research Center, Dixon Field Station, Dixon, CA, USA, [4]USGS Upper Midwest Environmental Sciences Center, La Crosse, WI, USA.

INTRODUCTION

The Contaminant Exposure and Effects--Terrestrial Vertebrates (CEE-TV) database was developed to conduct simple searches for ecotoxicological information, examine exposure trends, and identify significant data gaps. The CEE-TV database contains 17,150 data records on free-ranging amphibians, reptiles, birds, and mammals residing in coastal habitats of the Atlantic, Gulf, and Pacific coasts, Alaska, Hawaii and the Great Lakes. Information in the database was derived from over 1800 source documents, representing 483 unique species (about 253,000 individuals), with sample collection dates spanning from 1884 to 2003. The majority of the records contain exposure data (generally contaminant concentrations) on a limited number (n = 209) of chlorinated and brominated compounds, cholinesterase-inhibiting pesticides, economic poisons, metals, and petroleum hydrocarbons, while only 9.3% of the records contain biomarker or bioindicator effects data. To identify spatial data gaps, database records with specific sampling locations were combined with the boundaries of Great Lakes and coastal watersheds, and National Wildlife Refuge and National Park units. The Great Lakes database alone includes 3306 records. Fifty-five of these records fall within National Park Service land, with only 4 of these records being recent (1990-2003). Federal Fish and Wildlife Service refuges contained 203 records with only 41 of these considered recent. The U.S.-Canada Great Lakes Water Quality Agreement has defined 32 Areas of Concern (AOCs) in the United States. There are 2 national parks and 3 national wildlife refuges whose boundaries intersect these AOCs. Only 1 CEETV record falls within national wildlife refuges and national parks that are located in AOCs, and this data was collected prior to 1990. Delineation of data gaps in areas of concern can help prioritize monitoring efforts that will foster a more complete understanding of ecosystem health.

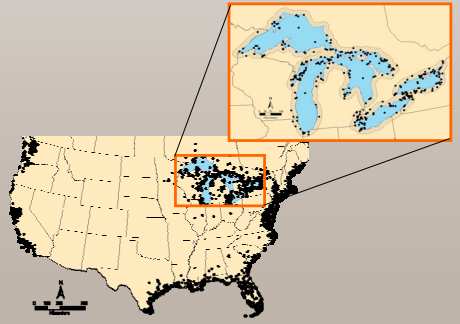

Figure 1. Geographical distribution of CEE-TV database records in the United States and within the 30 km buffer around the Great Lakes region.

METHODS

- Data for free-ranging terrestrial vertebrates residing in U.S. estuarine and coastal habitat were identified and compiled using
  - scientific literature search tools (*e.g.*, Wildlife Review, BIOSIS, TOXLINE, AGRICOLA)
  - various databases (*e.g.*, US EPA Ecological Incident Information System, US FWS Environmental Contaminant Data Management System, USGS National Wildlife Health Center Mortality Database)
  - and communication with 480 scientists in federal and state agencies, conservation organizations, and academic institutions
- Records located within a 30km buffer around the Great Lakes were mapped with ArcGIS (version 8.2). (Figure 1)

Great Lakes Areas of Concern (AOC) were defined by the U.S.-Canada Great Lakes Water Quality Agreement as severely degraded geographic areas within the Great Lakes basin.

- AOC draft boundaries and National Wildlife Refuge (NWR) and National Park Service boundaries were overlaid with CEETV records to identify data gaps on DOI lands and/or AOCs.
- Data records with coordinates assigned to county seat or state capital were excluded.
- Current data gaps were identified as areas lacking CEE-TV data collected between 1990-present.

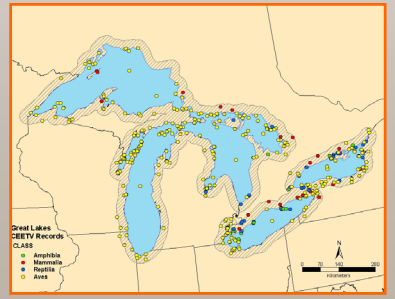

Figure 2. CEETV Records by class within 30 km of the Great Lakes located in NPS and NWR lands.

RESULTS

- **Avian species are the most represented class** (Figure 2, Table 1)

  Herring gulls account for the most records (Table 2)
- **Only 33 records include data on emerging contaminants such as polybrominated diphenyl ethers (PBDEs) and perfluorinated compounds**
- **Organochlorines in fish eating bird eggs appear to be decreasing over time (Figure 3)**
- **Mercury concentrations in Fish eating bird eggs (Figure 4)**

1960-1979	**0.03-1.59 ug/g ww**
1980-1989	**0.12-0.88 ug/g ww**
1990-1999	**0.07-0.66 ug/g ww**
2000-present	**0.39-1.86 ug/g ww**

- **55 records fall within National Park Service lands**

  4 of these records are recent (1990-2003)
- **203 records fall within National Wildlife Refuges**

  41 of these records are recent
- **373 records in AOCs (Figure 5)**

  139 of these records are recent

  1 of these records fall within NWR and NPS lands

CLASS	NUMBER OF RECORDS	% OF CEETV RECORDS
Aves	**3035**	**92%**
Reptilia	**130**	**4%**
Mammalia	**104**	**3%**
Amphibia	**37**	**1%**

Table 1. Representation of classes of terrestrial vertebrates in the Great Lakes region

SPECIES	# OF RECORDS	% OF RECORDS
Herring Gull (*Larus argentatus*)	1234	37%
Double Crested Cormorant (*Phalacrocorax auritus*)	218	7%
Bald Eagle (*Haliaeetus leucocephalus*)	154	5%
Common Loon (*Gavia immer*)	140	4%
Ring Billed Gull (*Larus delawarensis*)	131	4%
Mallard (*Anas platyrhynchos*)	104	3%
Snapping Turtle (*Chelydra serpentina*)	94	3%
Caspian Tern (*Sterna caspia*)	87	3%
Great Blue Heron (*Ardea herodias*)	76	2%
Forster's Tern (*Sterna forsteri*)	60	2%

Table 2. Top ten species listed in the CEETV records in the Great Lakes region

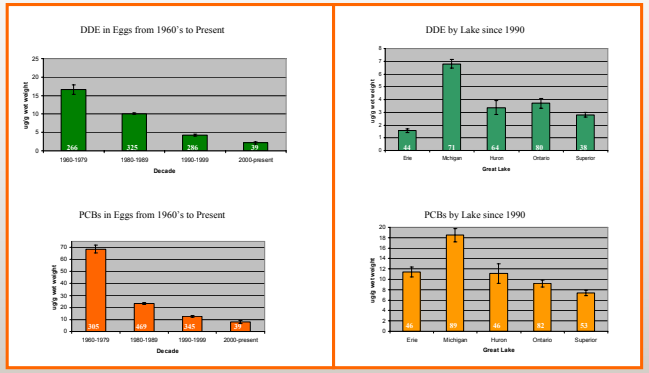

Figure 3. DDE and PCB data in eggs of fish eating birds in the Great Lakes.

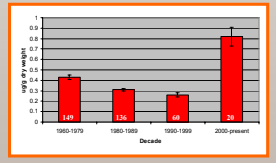

Figure 4. Mercury concentrations in eggs of fish eating birds from the Great Lakes

Figure 5. CEETV Records located within the Areas of Concern located within the United States.

DISCUSSION

- There is a moderate amount of recent (1990-2003) ecotoxicological data in terrestrial vertebrates in NWR, NPS lands, and designated AOCs. There is, however, no long term monitoring plan for National Park Service and National Wildlife Refuge lands.
- Classes other than Aves are underrepresented in CEETV records from the Great Lakes
- There is a scarcity of data about emerging contaminants of concern (PBDEs and perflourinated compounds)
- More mercury monitoring in terrestrial vertebrates may be necessary to evaluate temporal trends, however, organochlorines such as PCBs and DDE are decreasing over time

We need your help! Please send us your terrestrial vertebrate contaminant exposure and effects data for inclusion in the database!