



# EcoToxCHIP: A TOXICOGENOMICS TOOL FOR CHEMICAL PRIORITIZATION AND ENVIRONMENTAL MANAGEMENT

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## CHALLENGE

- Chemical contamination threatens the health of humans and animals globally
- Regulatory agencies and businesses are tasked to manage chemicals but are challenged:
  - many chemicals (e.g., 4.3K in Canada, 84K in USA, 10K in EU) need to be tested within short timeframes;
  - mandate to monitor many complex environmental samples (e.g., sediment, water, effluents);
  - testing is costly, time-consuming, and uses many animals; and
  - tests on limited model species poorly predict risk in native species of concern.

**Urgent worldwide demand for improved testing tools that are more efficient, affordable, flexible, predictive, and less dependent on live animal studies**

## OPPORTUNITY

**Global paradigm shift in toxicity testing from historical whole-organism testing to mechanistic studies**

### *Human Health:*

- U.S. NRC's "Toxicity Testing in the 21<sup>st</sup> Century-Vision and Strategy"; and
- New toxicogenomic tools and stakeholder acceptance helping to transform the field

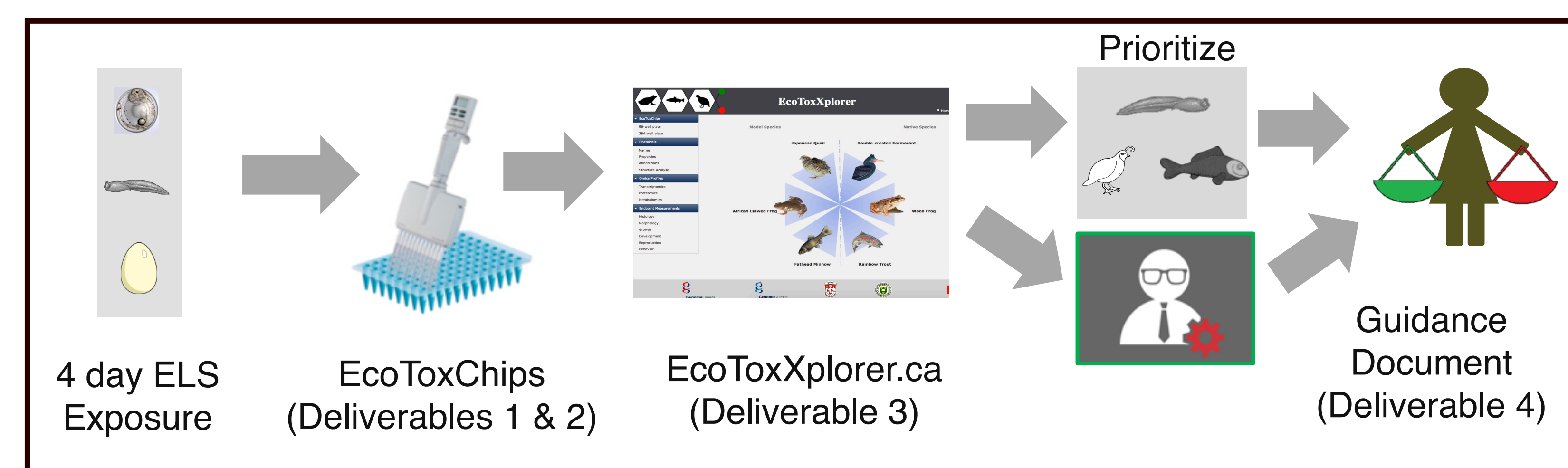
### *Ecological Risk Assessment:*

- Acceptance of Adverse Outcome Pathway (AOP) framework;
- Avian ToxChip qPCR array developed by Environment and Climate Change Canada researchers via commercial partnership → embraced by Canadian regulators, environmental monitoring programs, and the scientific community

## OBJECTIVES & DELIVERABLES

To develop, test, validate, and commercialize qPCR arrays (**EcoToxChips**) which consist of 384 genes covering key toxicity pathways of regulatory concern, and a data evaluation tool (**EcoToxXplorer.ca**) for the characterization, prioritization and management of environmental chemicals and complex mixtures of regulatory concern. Four project deliverables include:

- EcoToxChips for three key vertebrate model species used globally in ecological risk assessment (fathead minnow, Japanese quail, *Xenopus laevis*; fish, bird, frog);
- EcoToxChips for three native species of commercial, recreational, and Aboriginal concern (rainbow trout, double crested cormorant, wood frog);
- EcoToxXplorer.ca is an online data evaluation tool that provides functions to allow users to upload EcoToxChip data and interpret results; and
- Technical Guidance Document is informed by our GE<sup>3</sup>LS (social sciences) research and will be government-vetted resource to advise end-users on how to adopt EcoToxChips.



## PROJECT ACTIVITIES

### PHASE I: Model Species

- Exposure Studies
- Omics → EcoToxChips
- Develop EcoToxChips
- End-Users Validate

DELIVERABLE 1 – YR3

### PHASE II: Native Species

- Exposure Studies
- Omics → EcoToxChips
- Develop EcoToxChips

DELIVERABLE 2 – YR4

- Data Evaluation Pipeline (EcoToxXplorer.ca)

DELIVERABLE 3 – YR4

- GE<sup>3</sup>LS Institutional Entrepreneurship

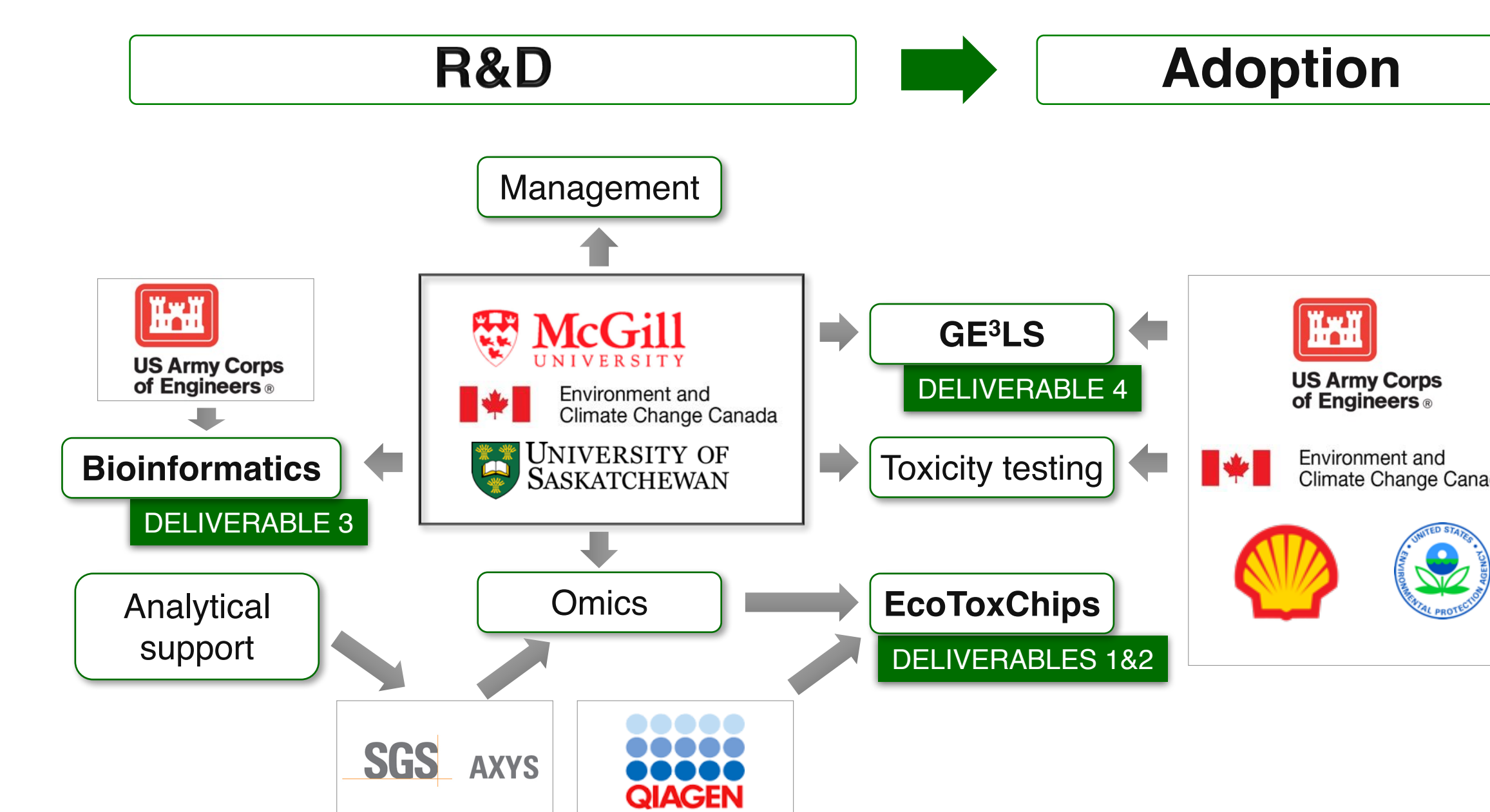
DELIVERABLE 4 – YR4

## SOCIO-ECONOMIC BENEFITS

- Deliverables are end-user driven, standardized, validated, and commercialized = trusted tools to reliably screen and prioritize chemicals and complex mixtures
- Helps end-users meet their regulatory obligations and to develop improved policies and regulatory frameworks:
  - accelerate decisions and compliance monitoring;
  - significantly reduce number of animals needed for testing; and
  - increase efficiency of resource utilization

**Help fulfil unmet and essential needs in chemical and ecological risk assessment in Canada and globally**

## COLLABORATIVE TEAM



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**Research Oversight Committee:** Drs. Nancy Denslow (chair), Kevin Crofton, Daniel Schlenk, Roy Suddaby, and Carole Yauk

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