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# The ECOTOXicology Knowledgebase: Updating Literature Search and Review Processes for Identifying and Curating Toxicity Data for Risk Assessments

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Safe and Healthy Communities



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## What is the ECOTOX Knowledgebase?

**The ECOTOXicology Knowledgebase is a comprehensive, publicly available, curated database that provides environmental toxicity data from single chemical exposure studies on aquatic life, terrestrial plants and wildlife.**

Through its 30+ year history, ECOTOX has developed systematic and transparent procedures to conduct comprehensive literature searches, title/abstract screenings, application of acceptance criteria, and data extraction of all pertinent study and effects information.

Here we present efforts to refine and implement tools to improve current procedures, integrate ecological data with human health evidence mapping, and incorporate information of study quality into the ECOTOX Knowledgebase.

## Consistency Across Ecological and Human Health Reviews

We conduct a comprehensive search and review of toxicity data in open and grey literature (e.g., government documents), with transparent standard operating procedures that meet requirements for systematic review protocols. This streamlines the cost for literature searches and data curation within the Agency. This also provides all test data information in a format that can be readily used for study evaluation by government or public entities.

### Criteria for inclusion in ECOTOX

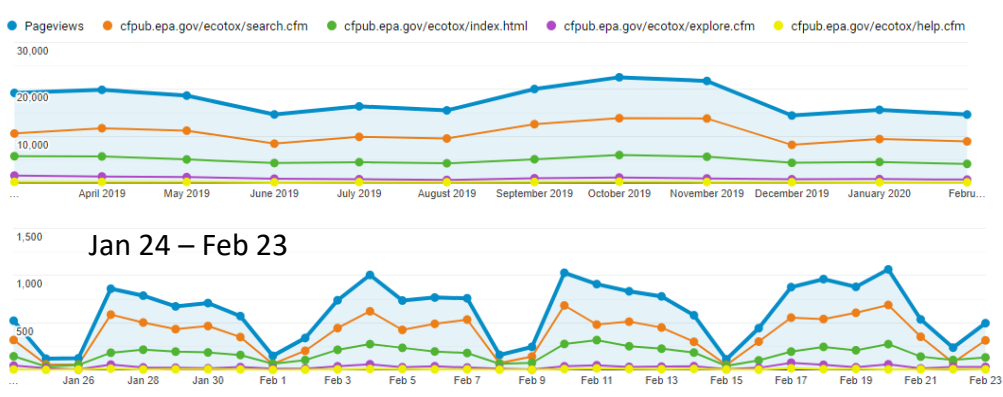
Table 1. Criteria for inclusion in ECOTOX, with recently-developed PECO statement and requirements in well-established ECOTOX Standard Operating Procedures.

Recently developed PECO statement for ECOTOX		Requirements/Inclusionary Criteria from ECOTOX SOP
<b>P (Population)</b>	Animal: Aquatic and terrestrial species (live, whole organism) of any life stage (including preconception, in utero, lactation, periparturient, and adult stages). Include wild mammals (e.g., <i>Peromyscus</i> sp.), insects, spiders, amphibians, birds, crustaceans, fish, molluscs, reptiles, worms and invertebrates. Bacteria and viruses are not included. Plants: Aquatic and terrestrial species (live), all plants including algal, moss, lichen and fungi species	<ul style="list-style-type: none"><li>Ecologically-relevant species</li><li>Live, whole organisms</li><li>Organism taxonomic information verifiable against standard taxonomic sources</li><li>Priority species are wild (test results for terrestrial domestic and laboratory species are used to fill data gaps when needed)</li><li>In vitro studies (with viable cells or tissue) flagged for possible inclusion as requested by Programs</li><li>NOT: humans, monkeys, bacteria, viruses, yeast species</li></ul>
<b>E (Exposure)</b>	Relevant forms: Chemical of Concern, name and CASRN (plus synonyms, tradenames), when requested: Metabolites, degradants, parent compound and related chemicals Animal: Any exposure to relevant forms of the chemical of concern including via water, injection, diet, and dermal, with reported concentration and duration. Inhalation studies are excluded unless this is the primary route of environmental exposure (e.g., for volatile compounds). Plants: Exposure to relevant forms of the chemical of concern via water or soil, with reported concentration and duration. * Studies involving exposures to mixtures will be included only if they include exposure to a relevant form for the chemical alone. * Chemical exposures for aquatic organisms where only sediment concentrations are reported from field studies are excluded (unless porewater concentration measured); laboratory-based sediment studies are retained.	<ul style="list-style-type: none"><li>Verifiable Chemical Abstract Services (CAS) number</li><li>Single chemical exposure</li><li>Relevant to environmental exposure</li><li>Report exposure concentration, dose or application rate</li><li>Report duration of exposure</li><li>Sediment studies must have a water concentration reported to be included</li><li>NOT: Air pollution studies related to CO2 and ozone</li></ul>
<b>C (Comparison/Control)</b>	A concurrent control group exposed to vehicle-only treatment and/or untreated control (control could be a baseline measurement).	<ul style="list-style-type: none"><li>Must have a control treatment</li></ul>
<b>O (Outcome)</b>	All biological effects (including bioaccumulation from laboratory studies with concurrently measured water and tissue concentrations).	<ul style="list-style-type: none"><li>Biological effect measured</li><li>Effect concurrent with associated chemical exposure</li><li>Adverse effects are priority (beneficial, nutritional effects are lower priority)</li></ul>
<b>Publication/Data Format</b>		<ul style="list-style-type: none"><li>Primary source of the data</li><li>Study must be a full article in English</li><li>NOT: Reviews or abstract only</li></ul>

### ECOTOX by the numbers

Curated ecological data from ~50,000 papers, with >11,000 chemicals and >13,000 species.

March 2019 – February 2020:  
17,800 page views per month  
8,400 unique page views per month



### Data extraction fields in ECOTOX

Table 2. Types of data extracted from each reference (if applicable and reported), with category, example data fields, and examples of how ECOTOX fields can inform study evaluation questions.

Category	Data Fields (not all inclusive)	Select study evaluation questions with relevant ECOTOX fields)
<b>Chemical</b>	Chemical Name, CASRN, Grade, Purity, Formulation, Carrier Test Specific: Analysis, Application Type and Rate/Frequency, Number of Doses, Doses, Concentration Type (e.g., active ingredient or formulation), Concentration/Dose associated with each effect and/or endpoint	<ul style="list-style-type: none"><li>Is test substance identified? <b>Required for inclusion in ECOTOX inclusion</b></li><li>Is the purity of test substance reported? <b>Chemical Purity</b></li><li>Were chemical concentrations verified? <b>Chemical Analysis</b> (e.g., nominal versus measured concentrations)</li></ul>
<b>Species</b>	Scientific and Common Name, Taxonomy, Lifestage, Age, Initial and Final Weight, Gender, Source	<ul style="list-style-type: none"><li>Is the species given? <b>Verifiable species (Scientific Name, etc.) required for inclusion in ECOTOX</b></li><li>Are the organisms well described? <b>Organism Source, Lifestage, Age, Gender, Initial and Final Weight</b></li></ul>
<b>Test Conditions</b>	Test Method, Media Type, Test Location, Exposure and Study Duration, Control, Experimental Design, Physical and Chemical Soil and Water Parameters	<ul style="list-style-type: none"><li>Are appropriate controls performed? <b>A control is required for inclusion in ECOTOX</b>, type described in <b>Control</b></li><li>Is a guideline method (e.g., OECD) used? <b>Test Method</b></li><li>Are the experimental conditions appropriate and acceptable for the test substance and organism? <b>Test Method, Media Type, Test Location, Experimental Design, Physical and Chemical Soil and Water Parameters</b> (e.g., pH, Temperature, Dissolved Oxygen)</li></ul>
<b>Test Results</b>	Effect (observation of a response): general effect groups and specific effect measurements, Endpoint (quantification of an observed effect, e.g., LC50), Trend, Response Site, Effect %; Statistical Significance and Level, Observed Duration (exposure Duration when result observed), Bioconcentration (BCF or BAF) with units	<ul style="list-style-type: none"><li>Are the reported effects and endpoints appropriate for the purpose, test substance and organism? <b>Effect Measurement, Endpoint</b></li><li>Is the response/effect statistically significant? <b>Statistical Significance, Significance Level</b></li></ul>

For further information on the ECOTOX Knowledgebase, contact ECOTOX Support: [ecotox.support@epa.gov](mailto:ecotox.support@epa.gov)

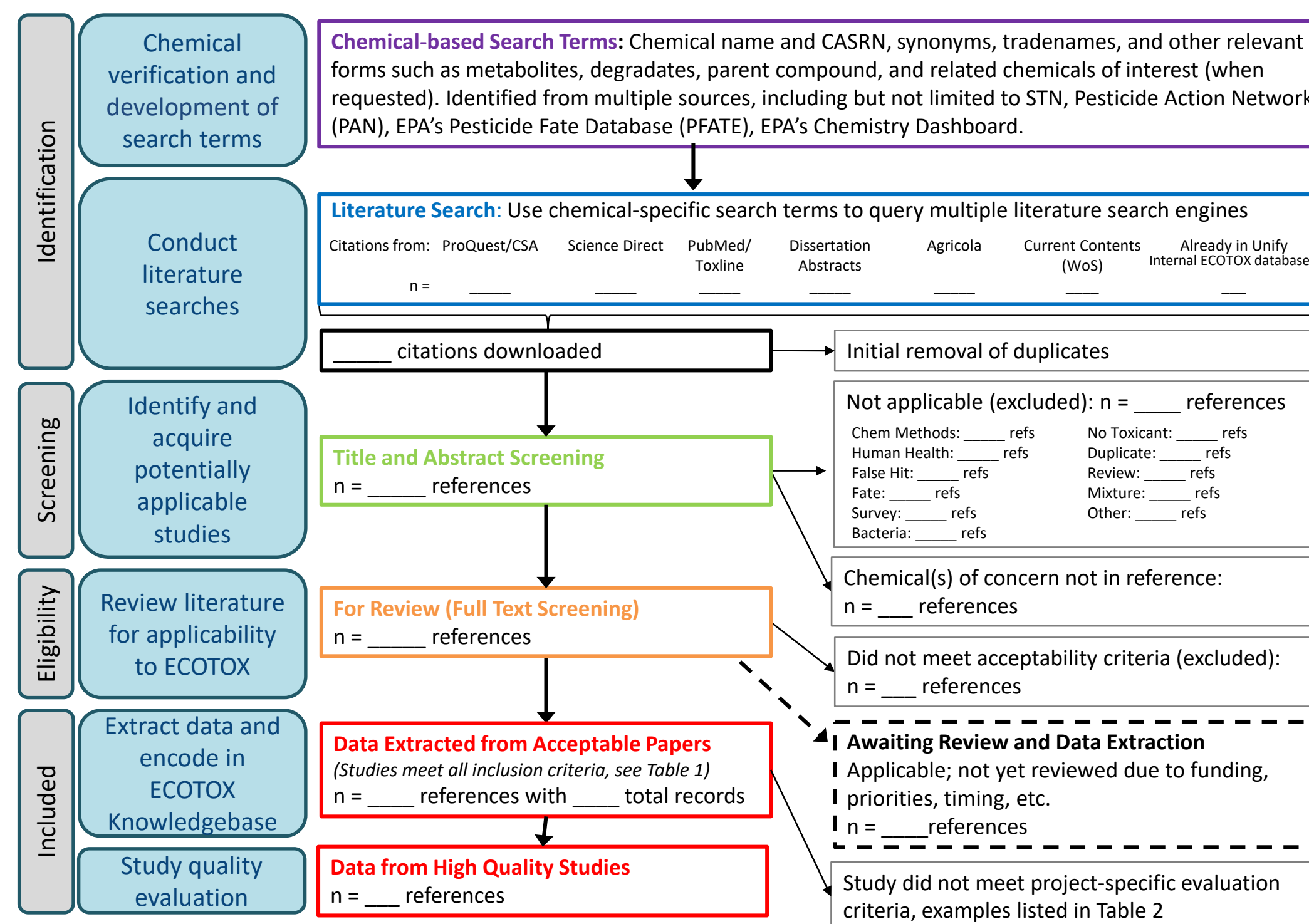
ECOTOX originated in the early 1980s and is maintained by U.S. EPA ORD, available at: [www.epa.gov/ecotox](http://www.epa.gov/ecotox)

U.S. Environmental Protection Agency  
Office of Research and Development

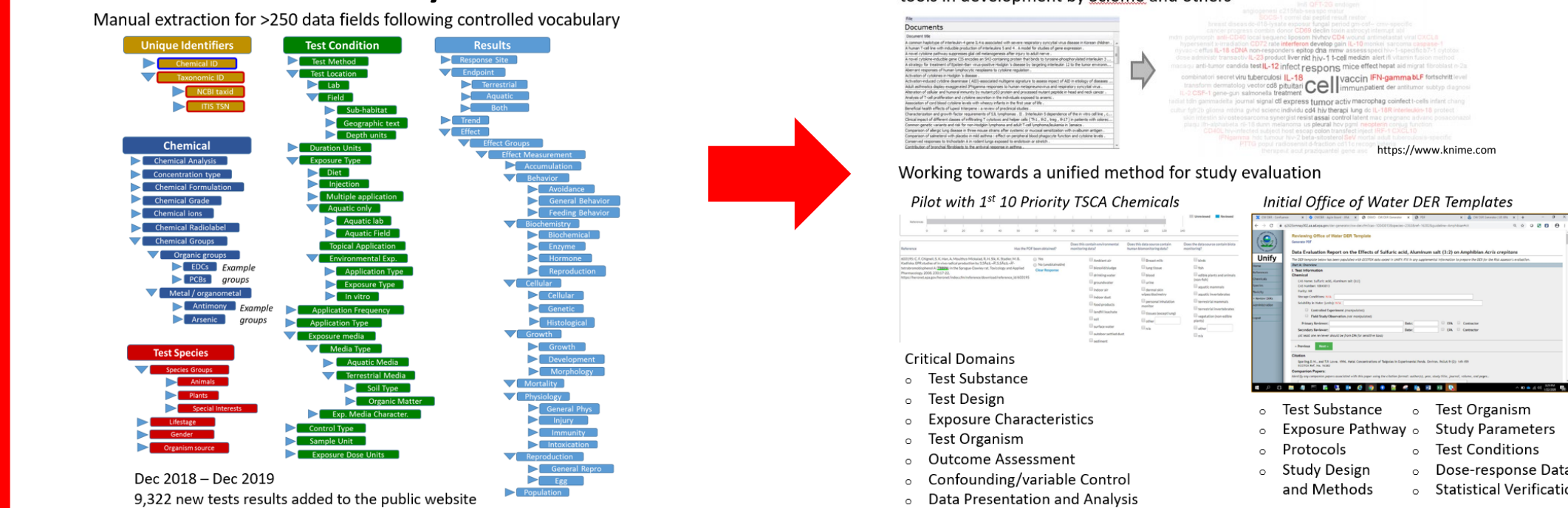
The views expressed in this poster are those of the authors and do not necessarily reflect the views or policies of the U.S. EPA.

## ECOTOX: Systematic Review and Data Curation

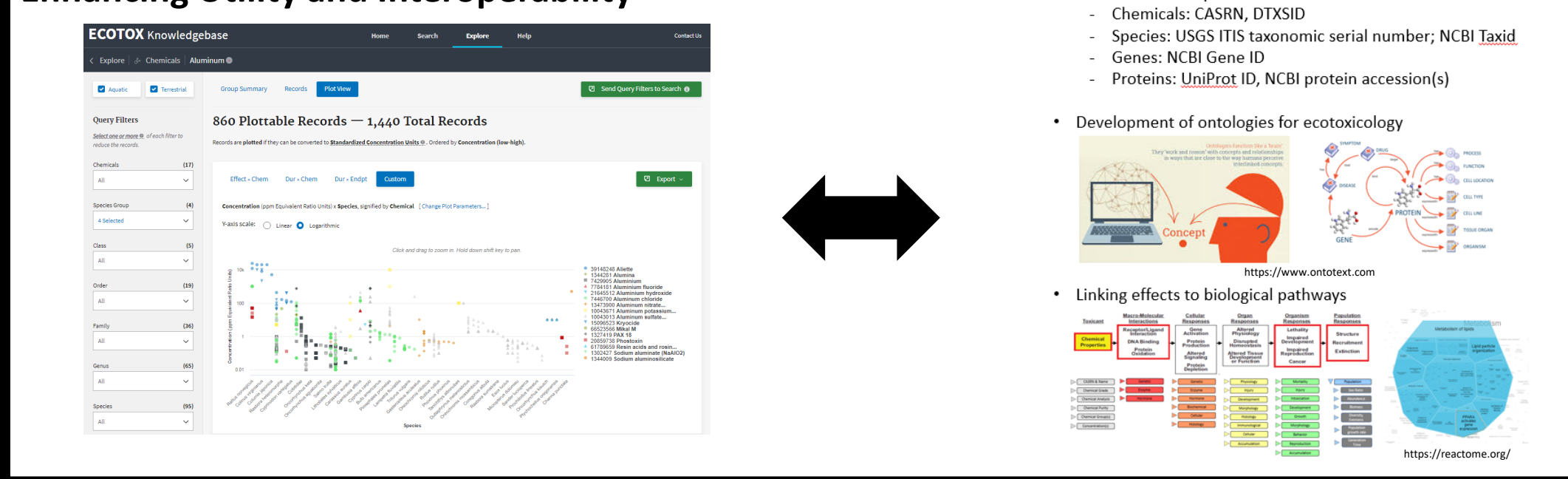
### Literature search and study selection flow diagram with ECOTOX pipeline



### Data Extraction and Study Evaluation

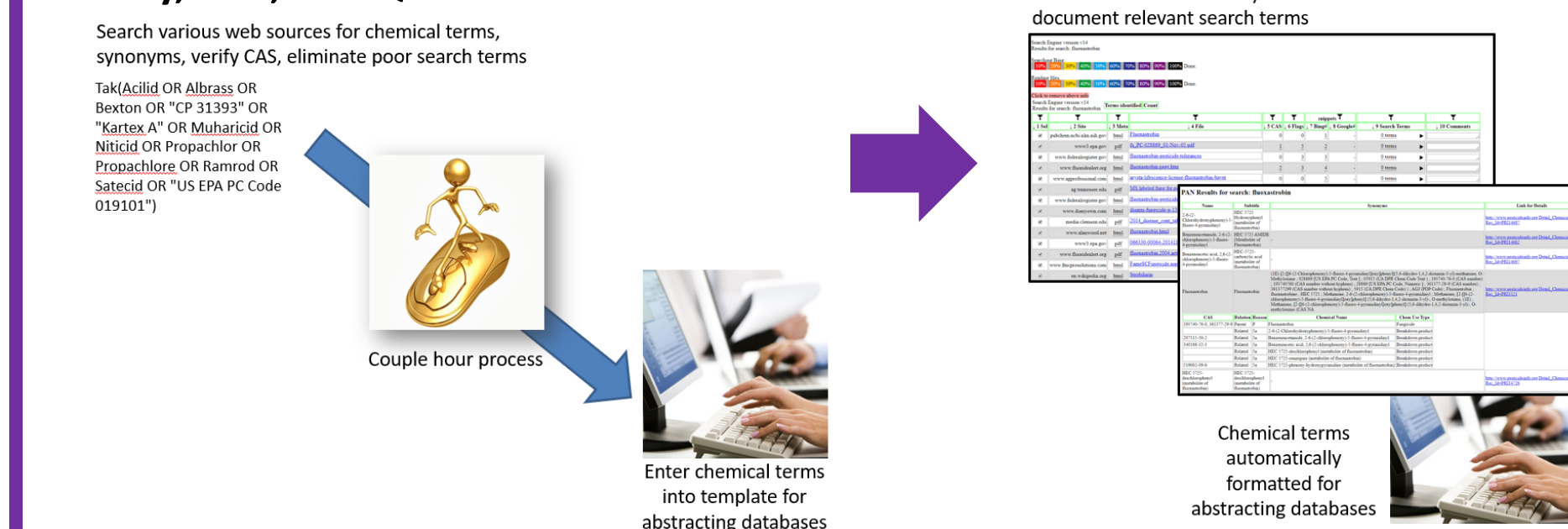


### Enhancing Utility and Interoperability

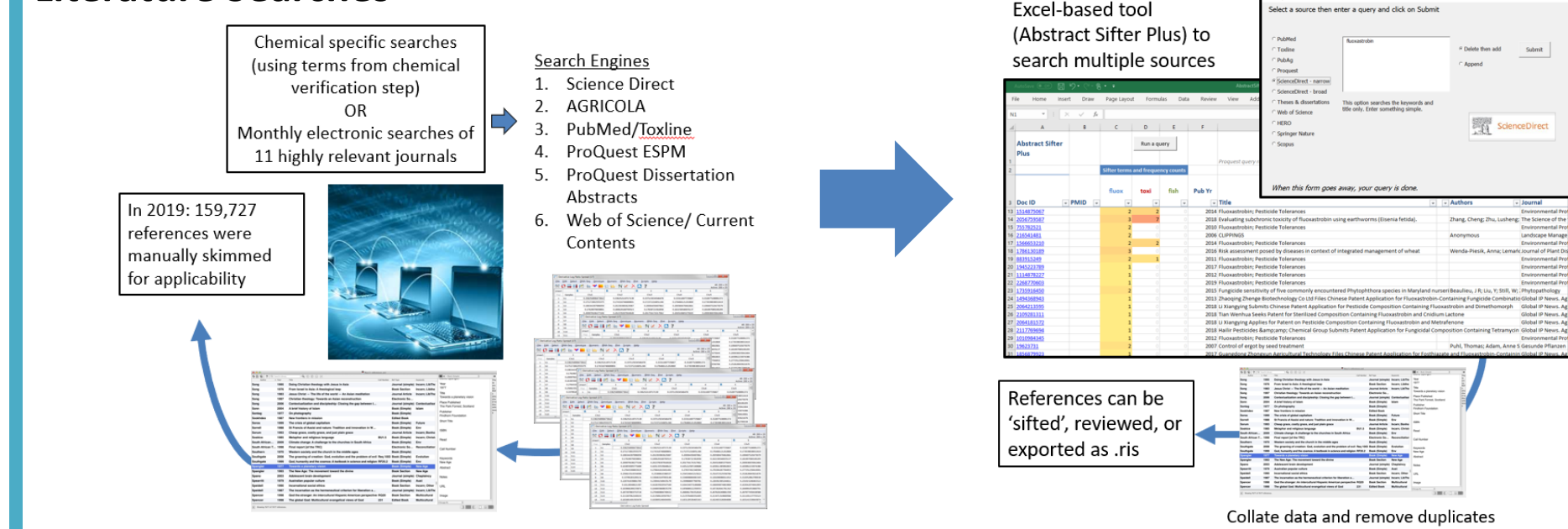


## Consistent Search Term Application

### Identify, Test, and QA Search Terms

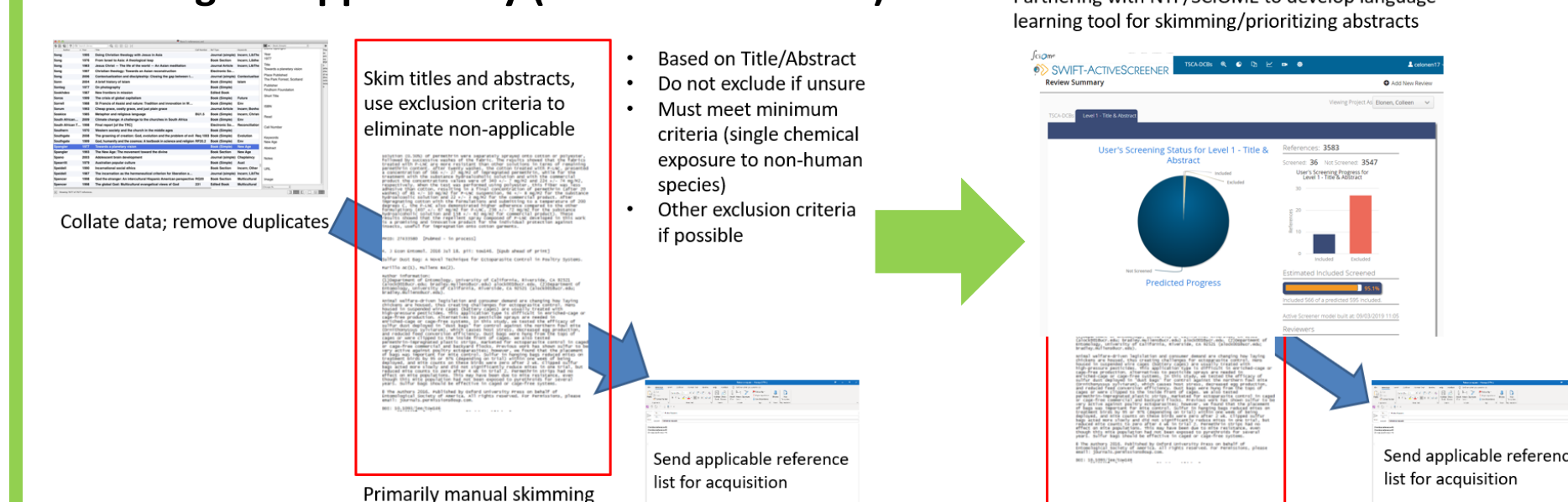


### Literature Searches



## Streamlining Literature Screening

### Skimming for Applicability (Title and Abstract)



### Full-text Review for Data Extraction

