

Great Lakes Panel on Aquatic Nuisance Species Aquatic Invasive Species Risk Assessment Clearinghouse Project Report

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I. Introduction

The Great Lakes Panel on Aquatic Nuisance Species (GLP) convened its Risk Assessment Ad Hoc Committee in 2016, with a charge to improve regional species and pathway risk assessment coordination and to develop a scope of work for the development of a risk assessment clearinghouse. Between August 2016 and May 2019, the committee completed work to implement the charge, including:

- Developing a set of recommendations for development of a risk assessment clearinghouse, presented to and adopted by the GLP (November 2016)
- Developing a Request for Assistance with specific deliverables to implement the clearinghouse recommendations (April 2017)
- Identifying a primary group – National Oceanic and Atmospheric Administration’s (NOAA) Great Lakes Aquatic Nonindigenous Species Information System (GLANSIS) – to respond to the Request for Assistance and implement the recommendations with support from the committee (November 2017)
- Developing additional recommendations and input to guide implementation through NOAA GLANSIS (Ongoing 2018)
 - Specific attributes of risk assessments that should be included in the clearinghouse were defined and provided to NOAA GLANSIS as part of this outcome
- Supporting an Invasive Species Research Associate staff position to populate the risk assessment clearinghouse (February 2019)

Following committee recommendations, an initial effort to populate the clearinghouse was conducted in 2019. Species-level risk assessments from seven risk assessments recommended by the committee as priority were reviewed for inclusion in the clearinghouse: Notre Dame’s Science-Based Tools for Assessing Invasion Risk (STAIR), Aquatic Weed Risk Assessments (AqWRA), Fish and Wildlife Ecological Risk Screening Summaries (ERSS), Wisconsin Department of Natural Resources (WI DNR), Michigan Department of Agriculture and Rural Development (MDARD), New York Invasive Species Information (NYIS.INFO), and Canada Department of Fishes and Ocean Centre of Expertise for Aquatic Risk Assessment (DFO CEARA). Authors and experts familiar with the risk assessments were interviewed in the review process to inform the risk assessment summaries.

Summaries of risk assessments using six of the seven priority methods are completed. Information was not available for DFO CEARA risk assessments, and therefore was not included in the initial effort. As of October 2019, risk assessment summaries using two methods are pending expert review before they are included in the clearinghouse. Approximately 3179 species risk assessments summaries currently reside in the database. These 3179 assessment summaries contain 2357 unique species with 414 species that include more than one risk assessment entry, as noted in *Table 1*. Once experts approve the remaining two risk assessment summaries there will be a total of 3225 species summaries. In the future, this number will increase as new species assessments are conducted and included.

Table 1. Overview of risk assessment summaries included in the clearinghouse as of October 2019

Taxon	Number of comparable species (as a % of unique species)	Number of unique species	Number of total entries by taxa
Algae	3 (10.3)	29	33
Amphibians	1 (10.0)	10	11
Crustacean	38 (11.7)	326	380
Fishes	167 (10.9)	1530	1752
Bivalve	15 (41.7)	36	63
Gastropod	28 (36.8)	76	120
Plants	159 (52.8)	301	768
OTHER	3 (6.1)	49	52
ALL	414 (27.0)	2357	3179

II. Approach and Accomplishments

Population of the risk assessment clearinghouse was conducted based on the recommendations and foundational work of the GLP Risk Assessment Ad Hoc Committee¹, and working with NOAA GLANSIS team to inform the visualization, components, and component content for the clearinghouse. The methods adopted in this initial phase were refined and the results were modified through expert interviews and recommendations. The components used in the current version of the clearinghouse are defined in Appendix I, additional definitions for other clearinghouse terms are present in Appendix II.

II.1 Method Review and Setup

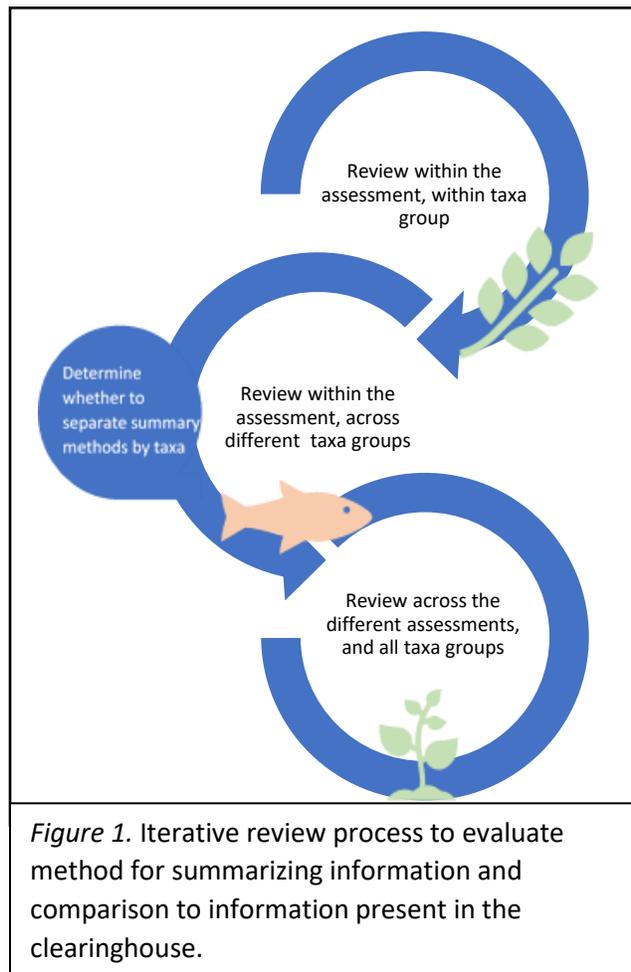
The GLP Risk Assessment Ad Hoc Committee (the committee) established guidance for component content to include in species risk assessment summaries: arrival, survival, establishment, spread, impacts (socioeconomic and ecological), geographic scope, ability to manage, type of assessment, type of results, species results, review status, and regulation. Before the summary process began, a review of the method documentation was conducted for each of the individual risk assessment approaches. This included the previous work conducted by committee members to categorize assessments and their content in the Tier-I Clearinghouse (Methodology-level summary). If the content from the species risk assessments did not easily align with these components, then experts were consulted for additional information on the risk assessment methodology, including species information, general background information, or guidance on what information would be appropriate for inclusion in the clearinghouse. An example of this is the Notre Dame STAIR-*plants* assessments that are intricately related to the Aquatic Weed Risk Assessments and required additional interviews to summarize for the clearinghouse.

II.2 Species Summary Process

An iterative process was used to extract information from the comprehensive assessments for the summaries to ensure all relevant and accessible information was included. Cycles of expert review were used to confirm that the content in the clearinghouse was accurate, relevant, and concise.

¹ Risk assessment ad hoc committee materials are available upon request.

The first step in the species summary process was to compare the information reported in the species assessments to the type of information desired to populate the components. Concisely reported quantitative and qualitative outputs from individual species assessments were used



first to populate components for each species summary. Methods for populating components were documented in a tracking sheet (“Risk Assessment Method Tracker”) for reference. The tracking spreadsheet describes in detail the source for summarized information cell-by-cell for each component across all methodologies. Components that could not be populated using concise information were further analyzed through expert interview.

Gaps in components were addressed next; the cells with blanks or insubstantial amounts of information were included in a second round of analysis. Species summaries were reviewed in detail to determine what type of additional information from the individual species assessments could be used to fill empty components and add additional context for content legibility and interpretation (typically additional information came from qualitative information not directly reported in the output from the risk assessment). Once all species or a group of species were completed, the tracking document was updated with the process for populating the components for that assessment.

Once a set of species summaries from one methodology was drafted it was cross-compared to the other methodology species summaries and among individual species summaries to ensure similar content and formatting, as described in *Figure 1*. After review, each of the different components was revised if additional information was deemed necessary or input was provided from the risk assessment expert contacted.

If the methodology was applied across multiple taxa (e.g., fish, plants), the review process also considered the practicality of using the same method of populating component content for all taxa, rather than separate methods of populating for each taxon type. In some cases, different approaches for populating components were used for a single methodology if risk assessment forms/methodology differed between taxa. If different approaches were used, then a separate entry was made in the tracking spreadsheet to show how content was summarized by taxon. Following this, the drafted set of risk assessment summaries was again cross-compared to species summaries from other methods and with itself (i.e., across taxa and different species).

II.3 Review Process

Expert review was used to validate the draft species summaries and any qualitative information that was used in the summaries. Experts were interviewed to determine whether the content of the summaries appeared true to the intent of the risk assessment methodology, whether any

information was extraneous, and if there was any additional information that should be included. If feedback was given and incorporated into the species assessments, then the results were reviewed by the expert a second time. Suggestions and alterations were discussed with experts iteratively until the final summaries resulted; any subsequent relevant updates were made to the method assessment documents. Expert interview resulted in new components being added to the summaries:

- Organization: The assessing body that evaluates species using a risk assessment methodology.
- Notes: Any additional designation or information determined to be necessary by expert interview for interpretation of the species risk assessment (e.g., whether species risk assessment were used as an output of the risk methodology, and whether the species was used in the development of the risk assessment methodology)

The organization attribute was used to help clarify situations where multiple organizations used the same methodology for their risk assessments. Experts felt that the notes column would be useful for researchers conducting meta-analyses for the data present in the clearinghouse.

III. Discussion

Since this clearinghouse incorporates a mix of risk assessments from a wide variety of organizations from federal, state, academia, and extension and partner programs the variability in the type of risk assessment methods and results were equally as diverse. The variability in risk assessment methodologies resulted in a multitude of population methods for pulling component content from source risk assessments (which are documented in the “Risk Assessment Method Tracker” spreadsheet). What remained consistent in the population process was a focus on including all relevant information and ensuring consistency across displayed content (i.e., the aim for the clearinghouse was to stay true to the intent of each assessment type and the ability to cross-compare each species summary effectively). The discussion below describes several lessons learned throughout the process of populating the clearinghouse and how specific issues were resolved.

III.1 Method Documentation

Due to the diversity of assessments, different methods were needed to source qualitative and quantitative information included in the species summaries. Assessments were categorized as quantitative or qualitative, while some contained both types of information for the components being considered. Quantitative information was extracted into component cells first. Following this, summarization of qualitative information to fill in unpopulated component cells and give additional context to quantitative information. The supplementary context for a component cell’s content is descriptive and indicates where information can be found in the original assessment. Guidelines were adopted to streamline the collation of information due to this variability. As noted earlier, specific methods for populating components were documented in a method tracking spreadsheet. This spreadsheet includes directions on how and where information was populated in the clearinghouse for each component, split-up by individual risk assessment methodology and by taxa type for some assessments.

In addition to the method specific instructions, general guidelines for the clearinghouse were also established. One of these guidelines is to display information that is easily traced back to the literature itself, i.e., to populate with content in the component cells that was present in the risk assessment. Subsequently, there is a preference to use publicly available information in the clearinghouse to the extent possible.

III.2 Information Gaps

The risk assessment summary process occasionally resulted in information gaps (“blank cells”), or instances when a particular component was not populated for a species risk assessment summary. A blank cell for a given assessment could mean one of several things: 1) there was no information in the risk assessment methodology/species assessment for that component, 2) there was relevant information, but it was not available in a form that could be included in the summary, or 3) it was an error and the cell was accidentally left blank.

Different methods were used to resolve the information gaps depending on the reason for the blank cell. If no relevant information was available in the assessment, “N/A” was used in the drafting process to mark the blank cell. If author or expert review further determined there was no relevant information to include, the cell remained blank in the final summary. This field is then removed entirely from the search results for that summary when a user searches the risk assessment clearinghouse, though blank cells will still appear for that field in the exportable dataset. For information that could not be included due to formatting (e.g., multiple quotes from different peer-reviewed literature with different experts that related to the components), the cell was populated using standard phrased sentences. These standard phrases were composed of a description of the relevant component information that is available in the assessment and its location within the source materials (if available) and are phrased for consistency under each risk assessment method for ease of access to types of information represented in the literature and for quick comparison between notes. Quotes from the literature were generally excluded because of their length, their effect on legibility of search results and assessment comparisons returned by the clearinghouse, and to avoid the potential for perceptions of bias within the clearinghouse: if the summaries include specific experts’ literature over others.

III.3 Regulatory Status

Regulatory status was a component for species-level risk assessment summaries originally identified by the committee as a priority to be included in the clearinghouse. However, this component was not included in the initial development phase for two reasons. The first is the potential implications of its interpreted use, in that it must be constantly up to date in order to effectively guide the user through the legal status of AIS. The second is the desire to avoid duplication of other related efforts. For example, TakeAIM.org reports regulatory status for many non-native aquatic species of concern to the Great Lakes region. Additional work may be explored in the future to partner with this project and link to their regulatory information or include regulatory information in another arrangement.

III.4 Taxonomic Nomenclature

In these assessments, scientific names were provided and were used to assist component collation, though adjustments were made in the summaries to ensure credible taxonomic nomenclature. In cases where taxonomic names differed due to phylogenetic updates, common names were beneficial for helping resolve taxonomic mismatches in the species risk assessment summaries. Since common names are accessible for users not familiar with scientific names provided in the clearinghouse, an effort was made to include as many common names as possible from source materials. Unfortunately, additional information about common names was not always provided for assessments, therefore the use of the online database ITIS.gov – Integrated Taxonomic Information System was integral since it was a federal source of credible taxonomic information. If species were not represented in ITIS, secondary sources were used: IUCN – International Union for Conservation of Nature and GBIF – Global Biodiversity Information Facility. In this process, if additional taxonomic/common-name

synonyms were found, then the replaced names were added in an alternate name column for future clearinghouse search development.

III.5 Academic Risk Assessments and Proprietary Data

In expert interviews, concern was expressed over proprietary data used in risk assessments. Risk assessments that originated from academic literature and were included in the clearinghouse used biological information that was relevant to the components but not publicly available. Through interviews with experts it was determined that this information would provide important context for some of the accessible information in the species assessment, and consequently, should be included. The inclusion of this information resulted in increased expert review time since permission to use the species data (or aspects of) had to be approved by multiple parties. Overall, proprietary information was not a disincentive for populating components using risk assessments sourced from academic literature, though increased time for interviews and coordination is needed for obtaining data from these sources, and result in an increased effort for users access the source literature.

III.6 Future Work

Since research to assess the risks of new and potential invaders is ongoing, for the clearinghouse to remain up to date, species risk assessment summaries should be updated cyclically as additional species are assessed and updated. The committee identified NOAA GLANSIS as the host for the clearinghouse and thus it is likely NOAA will be responsible for operation and management of the risk assessment clearinghouse, in consultation with the Great Lakes Panel. The Great Lakes Panel also serves as an informal advisory body for GLANSIS.

For the current risk assessment methodologies contained in the clearinghouse, future updates are anticipated for the FWS ERSS, WI DNR, NYIS.INFO methodologies and potentially AqWRA. In addition to updates, assessments may not always be accessible due to organization review processes and departmental change (e.g., the assessments may all be taken down from public accessible site so that they can be updated). For this reason, one risk assessment methodology not currently summarized or included in this clearinghouse is Canada DFO CEARA assessments. Currently, these assessments are not publicly available online but were previously available when this project started. CEARA was contacted to determine the status of CEARA risk assessment documents, currently the status of these documents remain unresolved and are not included in the database however, future follow-up will be conducted to include these assessments and other Canadian risk assessment information in the future.

An approach for updating the species summaries already included in the clearinghouse was developed with information provided by the risk assessment expert about the source assessment updating timelines. Specifically, all FWS ERSS risk assessment summaries must be summarized from assessments conducted in 2015 or later since the updated assessments use a newer version of the climate-match map – Risk Assessment Mapping Program (RAMP), which explicitly denotes which states are likely for the survival-establishment of the species. Additionally, the number of assessments that are waiting to be updated or added can grow rapidly. For example, from mid-August to mid-September at least 35 species were updated or added to FWS ERSS. Regular updates may be necessary for some assessments that have ongoing species assessment programs.

IV. Conclusion

Methods used during this effort should inform maintenance and future development of this clearinghouse. In addition, these methods and lessons learned could be applied to similar

efforts conducted by other groups. There may be a need to adapt these methods to respond to novel circumstances or specific needs of other groups. Based on the development of this clearinghouse, future clearinghouse initiatives should establish clear boundaries/limits, define the components and methods for summarizing data, and incorporate assessment author and expert input in the summary process. Method tracking documents should be kept explaining how information was included and may be important for tracking down additional information for stakeholders in the source risk assessment materials. Future work should also consider consultation with the members of the Great Lakes Panel to provide additional insights and ensure continuity of efforts.

This project is important for coordination and improved access to risk assessments for the Great Lakes region. The clearinghouse provides collated information which can be used by managers in implementing programs and strategies for addressing high-risk vectors and species. The clearinghouse also supports collaboration to avoid duplication of risk assessment resources, identify needs for new risk assessments, and to inform the adoption/development of risk assessment methodologies for organizations initializing risk assessment programs.

The clearinghouse is currently in a beta version that will continue to be refined and updated under NOAA GLANSIS. Overall, there has been the successful integration of four of the seven identified risk assessment methodologies, with the addition of risk assessment summaries provided by NOAA this allows users the ability to compare 414 species between different risk assessments (out of the total 2357 species) for the benefit of stakeholders across the Great Lakes region.

APPENDIX

I. List of Acronyms

AIS – Aquatic Invasive Species

DFO CEARA – Department of Fisheries and Ocean Canada Centre for Expertise for Aquatic Risk Assessment

FWS ERSS – Fish and Wildlife Service Ecological Risk Screening Summaries

GLP ANS – Great Lakes Panel on Aquatic Nuisance Species

GLC – Great Lakes Commission

MDARD – Michigan Department of Agriculture and Rural Development

NYIS.INFO – New York Invasive Species Information

Notre Dame STAIR – University of Notre Dame Science-Based Tools for Assessing Invasive Risk

NOAA GLANSIS – National Oceanic Atmospheric Administration Great Lakes Aquatic Nonindigenous Species Information System

RA – Risk Assessment

USDA APHIS – United States Department of Agriculture Animal and Plant Health Inspection Service

WI DNR – Wisconsin Department of Natural Resources

II. Risk Assessment Clearinghouse Component Guidelines:

Organization: The assessing body that evaluates species using a risk assessment methodology.

Geographic scope: Region which the risk assessment methodology covers in its analysis and output of the risk determinations

Introduction: Refers to the arrival of a species within the geographic scope of the species assessment, and the ability to arrive in new environment

Survival: Ability of the species to survive in a new environment, and to what extent (geographic, and population size)

Establishment: Ability to establish self-sustaining populations in a new environment, and potential for establishment in the Great Lakes region

Spread: Ability of the species to spread beyond the initial introduction

Impacts: The potential socio-economic and ecological impacts of the species. Is this species invasive (causes measurable harm?) and include where species management information can be found in the assessment, if available

Overall: Does the assessment give an overall scoring or result based on its determination of risk?

Certainty/Confidence: How much credible information was available to the risk assessment method to assess the species? Is the certainty/confidence of the risk assessment or methodology directly reported?

Notes: Any additional designation or information determined to be necessary by expert interview for interpretation of the species risk assessment

***Appear in the column order present in the database for the clearinghouse

II. Definitions for Clearinghouse Terms:

Method explorer: The online interface (titled: “Great Lakes Risk Assessment Explorer”) hosted by National Oceanic Atmospheric Administration Great Lakes Aquatic Nuisance Information System for accessing species risk assessment methodology information. The method explorer is one of two facets that comprise the risk assessment clearinghouse, included with the species explorer.

Component: The defined categories that were used to guide the extraction of information from species risk assessments. Components were expanded to include the invasion status/information relating to it. (e.g., geographic status, taxonomic information, introduction, survival, establishment, spread, impact, overall, uncertainty, notes). A component cell is an individual spreadsheet cell that contains extracted information on an individual component for a specific species entry.

Populating (Cells and/or Content): Refers to the process of finding information present in the original risk assessment literature and copying the qualitative or quantitative information present along with contextual information into a spreadsheet cell under a specific component that corresponds to that content (information extracted from the species risk assessment) for an individual species risk assessment.

Risk Assessment Clearinghouse: Comprehensive product that contains information from summarized methodology and species assessment information presented in the NOAA GLANSIS (Appendix-Figure 1, below).

Risk assessment method(ology): The supporting documentation for an organization's species risk assessments that contains the information about the process for conducting risk assessments.

Risk assessment method tracker: A reference document that contains information about how risk assessment content was extracted for the species risk assessments for the risk assessment clearinghouse and separates methods by taxa (if there are differences in the risk assessment methods between taxa). It includes references where information is located within species risk assessments for individual components.

Species database: Contains all species risk assessment summaries, including all components pulled from individual species risk assessments. The database is a component of the risk assessment clearinghouse and is accessed through the species-level risk explorer hosted by NOAA GLANSIS.

Species risk assessment summary: (alt. Species summaries, Species risk assessment summaries) The end-product resulting from extracting information from one risk assessment method for a single species or multiple species (plural) (can be from multiple RA methodologies).

Species risk assessment: The source information/document that assesses the risk of an individual species from a risk assessment methodology.

Species explorer: (alt. species risk assessment summaries) The online portal hosted by National Oceanic Atmospheric Administration Great Lakes Aquatic Nuisance Information System to access the species database. The explorer is a component of the risk assessment clearinghouse along with the method explorer.

Clearinghouse Interface: Hosted by NOAA GLANSIS

Risk Assessment Methodology Explorer

Species Risk Assessment Summaries Explorer

Database for Risk Assessment Clearinghouse

Species Risk Assessment Summaries
Components based on invasion curve

Methodology Information
From Each Risk Assessment Method

Risk Assessments
Provided by Great Lakes regional Organizations

Appendix Figure 1: Information generated from summarizing the priority risk assessments was separated into "species risk assessment summaries" and "methodology information." These two aspects were integrated into the database as two interfaces, allowing access to the information shown in the topmost image using the given selections for search-able method and species data.