

Final Report on Development of ECOSTAR™¹ Rating System
for Live Nonnative Species in Trade

Submitted to the Mississippi River Basin Panel on Aquatic Nuisance Species

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ABSTRACT

No scientific rating system is advising consumers/buyers, and all others in United States supply chains, of the risk of live, nonnative organisms to aquatic resources. We developed the ECOSTAR™ rating system for live, nonnative animals and plants considered for use in aquaria, water gardens, schools as instructional aides, aquaculture, live-food markets, and in various other supply chains. This rating system is based on climate matching and history of invasiveness, and was developed to provide a summary and synthesis of technical information into plain language. ECOSTAR™ products can help all of us protect the environment by minimizing the risk of nonnative species becoming established and harming ecosystems, economies, and human health. ECOSTAR™ labels could appear online and on nonnative species containers, or other means of conveyance in supply chains, thus providing nonnative species risk information to importers,

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domestic producers, sellers (wholesale and retail), and consumers/buyers. That risk information is intended to help all of us make wise decisions on plants and animals we wish to import, sell, buy, and keep.

INTRODUCTION

More than 3.2 billion live animals were imported into the United States (US) during 2000-2014 (Eskew et al. 2020), and untold numbers of live plants were also imported during that time. Nonnative plants and animals are also domestically cultured and sold live within the US. These organisms were sold for use in various trades including the aquaria, water garden, scientific supply, aquaculture, and live-food markets. No rating system has been available to advise consumers/buyers and others in US supply chains, of the risk of live, nonnative organisms to natural resources.

Advice is being provided to buyers of sustainable seafood (Monterey Bay Aquarium 2021), native plant landscapers (Ladybird Johnson Center Wildflower Center 2021), sustainable land developers (SITES 2021), and consumers/buyers of home appliances and other products (Energy Star 2021). However, no scientific advisory products have been available to guide consumers/buyers and others in the supply chains of nonnative live organisms.

The goal of our project is to protect the environment from invasive species introductions by making available science-based information, to all involved in live, nonnative species supply chains, about the risk of harm a nonnative species may have in jurisdictions and regions within the conterminous US. The objective of our project is to draft ECOSTAR™ labels for some live, nonnative species characterizing their risk in the conterminous US. These labels are intended to demonstrate products that summarize and synthesize scientific ecological risk information of nonnative species developed either by the senior author (Hoff 2010) (and then later adopted by the U.S. Fish and Wildlife Service 2018, 2021), the U.S. Department of Agriculture (2021), or others into simple, plain-language information that can be understood by the public within one minute.

METHODS

Prototype Simplified Labels

Three prototype ECOSTAR™ labels were produced using peer-reviewed scientific tools and processes (Hoff 2010; Sanders, Castiglione, and Hoff 2014; U.S. Fish and Wildlife Service 2018) and products produced using those tools and processes (U.S. Fish and Wildlife Service 2021). The foundation of the rating system is based on climate matching and history of invasiveness contained in nonnative species Ecological Risk Screening Summaries (Hoff 2010). The prototype, simplified labels included a picture of the subject species, a color-coded map of the conterminous US, a risk summary, and recommended actions. Our simplified labels are

intended for use as advice to consumers/buyers and all others in the supply chain. The content of each label was designed to include plain language that can be understood by an adult in less than one minute.

Interviews of Experts

Interviews were conducted to receive input, on ECOSTAR™ prototype labels, from selected individuals representing different aspects of supply chains, and from several graphic designers. Eight experts in graphic arts and suppliers of pets and plants were invited to complete an interview form (Appendix A).

Experts were asked to review three ECOSTAR™ prototype labels, and then answer 10 questions on the interview form. Answers to the questions were sought to help guide modifications of the format and content of ECOSTAR™ labels that were later produced as final products of our project.

Enhanced Labels

We recognize that simplified labels would be useful for many applications and outreach programs, but that additional reference information may be sought by some members of supply chains. Therefore, we developed a slightly enhanced version of the simplified labels. Those enhanced labels include at least one reference that provides additional, detailed, science-based information about the subject species.

State-Specific Labels

We recognize that individual states may wish to develop state-specific labels to guide uses of nonnative species in supply chains. Therefore, we asked two state agency experts for input in developing prototype labels for the states of Minnesota and Mississippi. The formats and contents of those labels were based on the finalized ECOSTAR™ simplified label format and input from the two agency experts.

Interpretation of the Label Maps

Quantitative scoring of climate match used to develop the maps of the conterminous U.S., Minnesota, and Mississippi was computed for whole states using the Risk Assessment Mapping Program (RAMP) developed by Sanders et al. (2014). Thus, each state is colored either red, yellow, or green which indicates high, medium, or low climate match, respectively. RAMP can also compute climate match for climate/habitat/ecological zones within each state. However, that approach was not an objective of this project.

RESULTS

Prototype Simplified Labels

Prototype, simplified ECOSTAR™ labels were developed for three species (Appendix B):

- Water Hyacinth *Eichhornia crassipes*
- Freshwater Angelfish *Pterophyllum scalare*, and
- Rio Grande Cichlid *Herichthys cyanoguttatus*.

Those three prototype labels were submitted to experts as part of the expert interview process.

Expert Interviews

Eight experts agreed to complete interviews after reviewing the three prototype, simplified labels. Five experts actually completed and returned the interview form. Interviewees were satisfied with the format and type and amount of content in the prototype, simplified labels (Table), so the finalized simplified labels used that same format and type of content. Simplified labels were completed for an additional 10 species (Appendix B):

- Parrot Feather *Myriophyllum aquaticum*
- European Frogbit *Hydrocharis morsus-ranae*
- Chinese Mystery Snail *Cipangopaludina chinensis*
- Stinging Catfish *Heteropneustes fossilis*
- Convict Cichlid *Amatitlania nigrofasciata*
- Mayan Cichlid *Mayaheros urophthalmus*
- Blue Tilapia *Oreochromis aureus*
- Mozambique Tilapia *Oreochromis mossambicus*
- Red Piranha *Pygocentrus nattereri*
- African Jewelfish *Hemichromis letourneuxi*.

Table. Summary of expert interviews that focused on format and content of ECOSTAR™ prototype simplified labels for Freshwater Angelfish, Rio Grande Cichlid, and Water Hyacinth.

Interviewee	Interviewee Affiliation	Interview Responses		
		Correctly Interpreted All 3 ECOSTAR species Risk maps?	Comments about ECOSTAR Label Content?	Preferred ECOSTAR Tagline
1	Retired agency expert; Citizen leader of invasive species activities	Yes	“Very simple and straight forward, easy to understand”	Buy ECOSTAR low-risk plants and pets
2	Owner of a large retail pet and plant store	Yes	Most like “Format, text, map...I think it does the job”	ECOSTAR: Buy low-risk plants and pets
3	Graphic artist	Yes	Most like “Map”	ECOSTAR: Buy low-risk plants and pets
4	Owner of the largest online retailer	Yes	Most like “Map”	ECOSTAR: Buy low-risk plants and pets
5	Importer, wholesaler, and distributor of fish, other pets, and plants	Yes	Most like “Simplicity”	No preference

Enhanced Labels

We developed a slightly enhanced version of the simplified labels. Those enhanced labels include at least one reference that provides additional, detailed, science-based information about the subject species (Appendix C). If any ECOSTAR™ partner wishes to use the enhanced label format and content, then we will work with them to create those labels.

State-specific Labels

Two state agency experts provided input in developing prototype labels for individual states. One prototype label was produced for Minnesota, and one was developed for Mississippi (Appendix D). The formats and contents of those labels were based on input from those experts and the final label format.

DISCUSSION

ECOSTAR™ is a rating system for live, nonnative plants and animals considered for use in aquaria, water gardens, scientific supply/schools as instructional aides, aquaculture, and live-food markets. This rating system has been developed to provide information that helps us all protect the environment, by minimizing risk of nonnative species becoming established and harming ecosystems, economies, and human health. ECOSTAR™ labels could be made available on the internet, and on nonnative species containers or means of conveyance in the supply chain. Those labels will provide information that is available to importers, producers, sellers, and buyers about labelled nonnative species. That information is intended to help us all make wise decisions on live, nonnative plants and animals we wish to sell, buy, and keep.

ECOSTAR™ labels developed and reviewed, by graphic artists and representatives from live organism supply chains, are simple products that can inform anyone in the supply chain about risks to natural resources in jurisdictions of the conterminous US. This project has demonstrated a format and content, of nonnative species eco-labels, that was favorably received by expert graphic artists and members of live organism trade supply chains. We are beginning to explore opportunities and options to fund and operationalize production of hundreds of ECOSTAR™ labels, and then distribute them.

CONCLUSIONS

The simple, plain-language ECOSTAR™ labels developed and vetted in this project show the potential to advise buyers/consumers and all others in supply chains of live organisms about ecological risk of nonnative species. Governments, non-governmental organizations, and industries can help inform all those in supply chains, while making decisions on which species to buy, sell, or keep. Our team will work with partners to develop additional ECOSTAR™

products (National or state-specific) identified as priorities. The next phase of this project is intended to acquire support to operationalize the production and distribution of hundreds of ECOSTAR™ labels that will summarize and synthesize complex species risk assessment information into products that are easily understood by all within supply chains. It is our hope that these labels will ultimately be available to all involved in live, nonnative species supply chains, including in pet stores for customers to view while they decide which species to purchase.

ACKNOWLEDGMENTS

Funding was provided by the Mississippi River Basin Panel on Aquatic Nuisance Species. Experts in graphic arts and supply chains of species in trade agreed to complete the interview form. Chelsey Blanke and Dennis Riecke provided advice, and guidance on development of state-specific labels for Minnesota and Mississippi, respectively. Dennis Riecke reviewed the draft of this report.

Much of the information, for the ECOSTAR™ labels developed during this project, was based on Ecological Risk Screening Summaries (U.S. Fish and Wildlife Service 2021). We also reviewed U.S. Department of Agriculture (2021) weed risk assessments as a means to determine low risk alternatives for inclusion in ECOSTAR™ labels for plants

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APPENDIX A

ECOSTAR™ Project Interview Form

BACKGROUND INFORMATION

ECOSTAR™ is a rating system for live, nonnative plants and animals considered for use in aquaria, water gardens, schools as instructional aides, as well as for aquaculture, live-food markets, and others in various supply chains. This rating system has been developed to provide information that helps all of us protect the environment by minimizing the risk of nonnative species becoming established and harming ecosystems, economies, and human health. ECOSTAR™ labels appearing on nonnative species containers, or other means of conveyance in supply chains, will provide nonnative species risk information to importers, domestic producers, sellers (wholesale and retail), and ultimate consumers. That risk information is intended to help all of us make wise decisions on plants and animals we wish to import, sell, buy, and keep.

The goal of our project is to protect the environment by providing science-based information, not only to the supply chain, but also ultimate consumers about the risk of harm selected nonnative species may have in jurisdictions and regions within the lower 48 states of the U.S. The objective of our project is to draft ECOSTAR™ labels for some nonnative species.

We are asking you to review three ECOSTAR™ draft labels (attached to this message), and then answer the 10 questions that follow. The three attached ECOSTAR™ labels have been produced using peer-reviewed scientific tools and processes. However, we are seeking your expert input to help guide modifications of the format and content of ECOSTAR™ labels that will be produced as the final products of our project. These label products will be made available to partners and stakeholders for outreach and educational programs.

Interviews conducted under this project are intended so that our team receives input on ECOSTAR™ draft labels from selected individuals representing different aspects of supply chains, and from several graphic designers. You are being asked to complete the following interview form, by:

- Reviewing the attached PowerPoint file containing ECOSTAR™ draft labels for three species, and
- Answering questions in this interview form.

INSTRUCTIONS

Please answer the following 10 questions. Return the completed interview form to me [Michaelhoff@comcast.net] within two weeks. Please contact me, if you have any questions about completing this interview form.

INTERVIEW QUESTIONS ABOUT ECOSTAR™ LABELS (see attached PowerPoint File for the labels)

1. What does the information in the ECOSTAR labels **tell you about risk of the Freshwater Angelfish to your home state?**
 - a. Is the risk Low, Medium or High?
 - i. Answer:
2. What does the information in the ECOSTAR labels **tell you about risk of the Rio Grand Cichlid to your home state?**
 - a. Is the risk Low, Medium or High?
 - i. Answer:
3. What does the information in the ECOSTAR labels **tell you about risk of the Water Hyacinth to your home state?**
 - a. Is the risk Low, Medium or High?
 - i. Answer:
4. What does the information in the ECOSTAR draft label **tell you about risk of the Freshwater Angelfish to the lower 48 states?**
 - a. Is the risk None, Some, Much, Most, or All?
 - i. Answer:
5. What does the information in the ECOSTAR draft label **tell you about risk of the Rio Grande Cichlid to the lower 48 states?**
 - a. Is the risk None, Some, Much, Most, or All?
 - i. Answer:
6. What does the information in the ECOSTAR draft label **tell you about risk of the Water Hyacinth to the lower 48 states?**
 - a. Is the risk None, Some, Much, Most, or All?
 - i. Answer:
7. Specifically, **what do you like about the ECOSTAR labels?**
 - a. For example: Format, Text, Map
 - i. Answer:
8. Specifically, **what do you recommend changing** in the ECOSTAR labels to make it quicker and easier to understand the risk of the species to your home state or to the lower 48 states?
 - a. For example: Format, Text, Map
 - i. Answer:
9. What taglines for ECOSTAR do you prefer and why?
 - a. ECOSTAR: Buy low-risk plants and pets
 - b. Buy ECOSTARS -- low risk plants and pets

- c. Buy ECOSTARS, which are low risk plants and pets
 - i. Answer:
10. Do you have any further suggestions for how to create labels to encourage any and all in the supply chain to purchase low risk plants and animals?
- i. Answer:

Appendix B
Simplified ECOSTAR™ Labels



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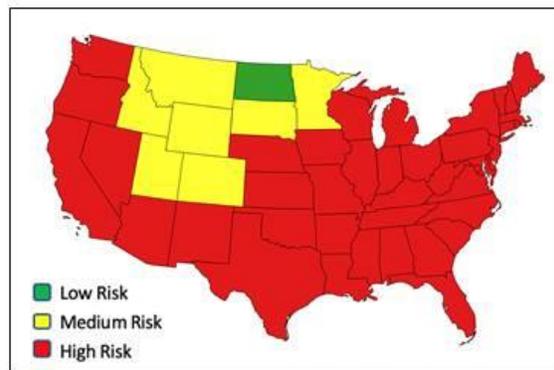
Water Hyacinth (*Eichhornia crassipes*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Water Hyacinth is not native to the United States, and is a high risk of causing harm to waters in most of the U.S. (red states on the map).



Photo: Andrew Davies. Licensed under Creative Commons BY-NC 4.0.
Available: <https://www.inaturalist.org/photos/2692015>. (October 6, 2020).



Map created from information at <https://www.fws.gov/fisherie/ANS/erss/highrisk/ERSS-Eichhornia-crassipes-FINAL.pdf>.

Take Action By:

- Choosing a low-risk alternative to Water Hyacinth, such as Pickerelweed (*Pontederia cordata*).
- Consulting local and state regulations prior to buying and keeping specimens of Water Hyacinth and Pickerelweed.



TM

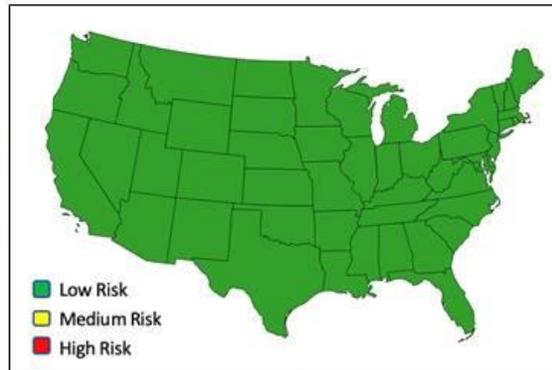
Freshwater Angelfish (*Pterophyllum scalare*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Freshwater Angelfish is not native to the United States, and is a low risk of causing harm to U.S. waters.



Photo: Daniel Mennenich. Licensed under Creative Commons BY-NC-ND 2.0.
Available: <https://www.flickr.com/photos/29858421@N04/12797047273/>.
(October 6, 2020).



Map created from information at <https://www.fws.gov/fisheries/ANS/erss/lowrisk/ERSS-Pterophyllum-scalare-Final-Jan2020.pdf>.

Take Action By:

- Consulting local and state regulations prior to buying and keeping specimens of Freshwater Angelfish.



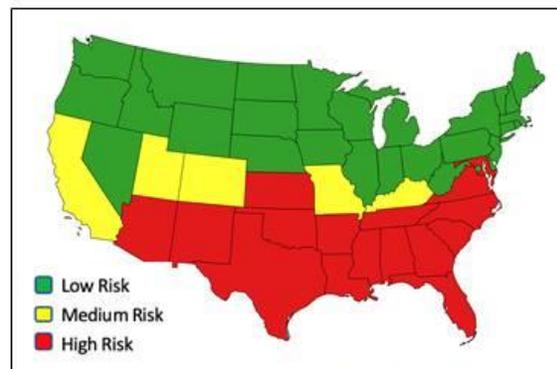
Rio Grande Cichlid (*Herichthys cyanoguttatus*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Rio Grande Cichlid is not native to the United States, and is a high risk of causing harm to waters in some of the U.S. (red states on the map).



Photo: Charles & Clint. Licensed under Creative Commons CC BY-SA 2.0. Available: <https://www.flickr.com/photos/20087733@N00/20396340>. (October 6, 2020).



Map created from information at <https://www.fws.gov/fisheries/ANS/erss/highrisk/ERSS-Herichthys-cyanoguttatus-final-October2019.pdf>

Take Action By:

- Either buying Rio Grande Cichlids in green states or choosing a low-risk alternative to the Rio Grande Cichlid, such as the Cockatoo Cichlid (*Apistogramma cacatuoides*).
- Consulting local and state regulations prior to buying and keeping specimens of Rio Grande and Cockatoo Cichlids.



Parrot Feather (*Myriophyllum aquaticum*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: Parrot Feather is not native to the United States, and is a high risk of causing harm to waters in the entire U.S. (red states on the map).



Photo: Dennis Wong. Licensed under Creative Commons BY 2.0.
Available: <https://www.flickr.com/photos/97247234@N00/8336711995>.
(January 7, 2021).



Map created from information at https://www.fws.gov/fisheries/ans/erss/highrisk/ERSS-Myriophyllum-aquaticum_Final.pdf.

Take Action By:

- Choosing a low-risk alternative to Parrot Feather, such as Pickerelweed (*Pontederia cordata*).
- Consulting local and state regulations prior to buying and keeping specimens of Parrot Feather and Pickerelweed.



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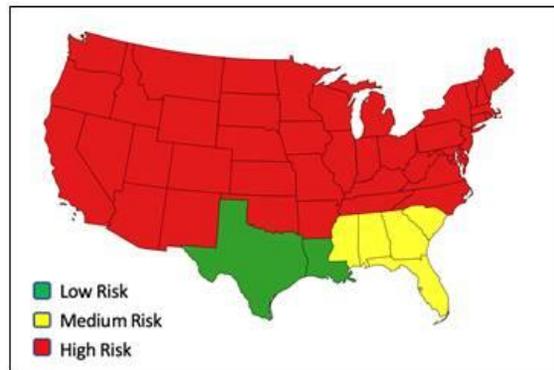
European Frogbit (*Hydrocharis morsus-ranae*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: European Frogbit is not native to the United States, and is a high risk of causing harm to waters in most of the U.S. (red states on the map).



Photo: Petroglyph. Licensed under Creative Commons BY-NC 2.0.
Available: <https://www.flickr.com/photos/28113115@N00/2809337443>.
(January 7, 2021).



Map created from information at https://www.fws.gov/fisheries/ANS/erss/highrisk/ERSS-Hydrocharis-morsus-ranae_Final.pdf.

Take Action By:

- Choosing a low-risk alternative to European Frogbit, such as Pickerelweed (*Pontederia cordata*).
- Consulting local and state regulations prior to buying and keeping specimens of European Frogbit or Pickerelweed.



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Chinese Mystery Snail (*Cipangopaludina chinensis*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Chinese Mystery Snail is not native to the United States, and is a high risk of causing harm to waters in the entire U.S. (red states on the map).



Photo: Brent Mitchell. Licensed under Creative Commons BY-NC 2.0.
Available: <https://www.flickr.com/photos/68400387@N03/40579116002>.
(January 7, 2021).



Map created from information at https://www.fws.gov/fisheries/ans/erss/high_risk/ERSS-Cipangopaludina-chinensis-FINAL-March2018.pdf.

Take Action By:

- Consulting local and state regulations prior to buying and keeping specimens of Chinese Mystery Snail.



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Stinging Catfish (*Heteropneustes fossilis*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Stinging Catfish is not native to the United States, and is a low risk of causing harm to waters in most of the U.S.



Photo: Maxim Gavriljuk. Licensed under Creative Commons BY-SA 3.0.
Available: <https://commons.wikimedia.org/w/index.php?curid=25619602>.
(January 6, 2021).



Map created from information at https://www.fws.gov/fisheries/ANS/erss/high_risk/ERSS_Heteropneustes_fossilis_final_January_2018.pdf.

Take Action By:

- Choosing a low-risk alternative to Stinging Catfish, such as the Redtail Sharkminnow (*Epalzeorhynchus bicolor*)
- Consulting local and state regulations prior to buying and keeping specimens of Stinging Catfish and Redtail Sharkminnow.



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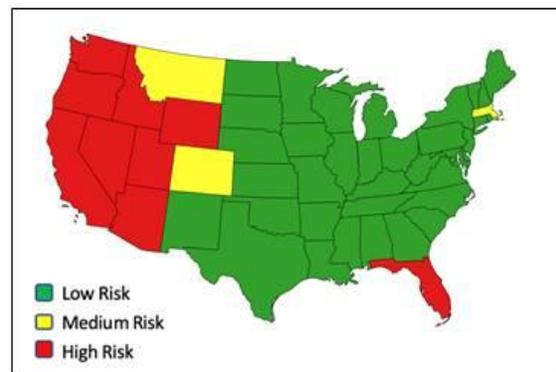
Convict Cichlid (*Amatitlania nigrofasciata*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Convict Cichlid is not native to the United States, and is a high risk of causing harm to waters in some of the U.S. (red states on the map).



Photo: Marcel Sigg. Licensed under Creative Commons BY-ND 2.0.
Available: <https://www.flickr.com/photos/68400387@N03/40579116002>.
(January 7, 2021).



Map created from information at: <https://www.fws.gov/fisheries/ans/erss/highrisk/ERSS-Amatitlania-nigrofasciata-final-june2018-revised.pdf>.

Take Action By:

- Either buying Convict Cichlids in green states or choosing a low-risk alternative to the Convict Cichlid, such as the Cockatoo Cichlid (*Apistogramma cacatuoides*).
- Consulting local and state regulations prior to buying and keeping specimens of Convict and Cockatoo Cichlids.



TM

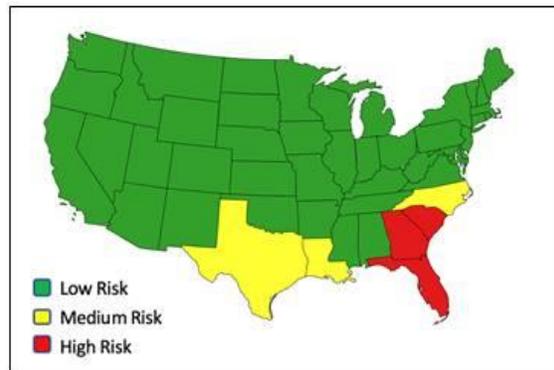
Mayan Cichlid (*Mayaheros urophthalmus*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Mayan Cichlid is not native to the United States, and is a high risk of causing harm to waters in some of the U.S. (red states on the map).



Photo: Bernard DuPont. Licensed under Creative Commons BY-SA 2.0.
Available: <https://www.flickr.com/photos/65695019@N07/49572416047>.
(January 7, 2021).



Map created from information at <https://www.fws.gov/fisheries/ANS/erss/highrisk/ERSS-Mayaheros-urophthalmus-FINAL-Jan2020.pdf>.

Take Action By:

- Either buying Mayan Cichlids in green states or choosing a low-risk alternative to the Mayan Cichlid, such as the Cockatoo Cichlid (*Apistogramma cacatuoides*).
- Consulting local and state regulations prior to buying and keeping specimens of Mayan and Cockatoo Cichlids.



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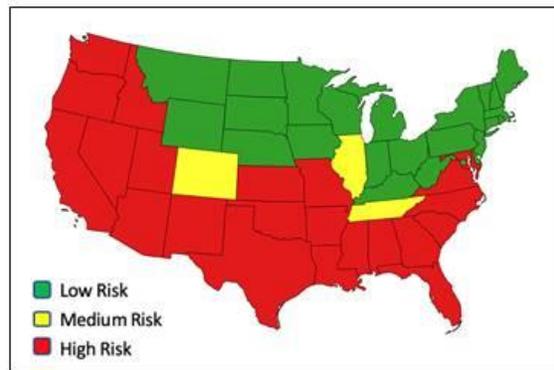
Blue Tilapia (*Oreochromis aureus*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Blue Tilapia is not native to the United States, and is a high risk of causing harm to waters in much of the U.S. (red states on the map).



Photo: Neil DeMaster. Licensed under Creative Commons BY-NC-ND 2.0.
Available: <https://www.flickr.com/photos/84169650@N07/49656929041>.
(January 6, 2021).



Map created from information at <https://www.fws.gov/fisheries/ans/erss/highrisk/ERSS-Oreochromis-aureus-final-April2018.pdf>.

Take Action By:

- Either buying Blue Tilapia in green states or choosing a low-risk alternative to the Blue Tilapia, such as the Tinfoil Barb (*Barbonymus schwanefeldii*).
- Consulting local and state regulations prior to buying and keeping specimens of Blue Tilapia and Tinfoil Barb.



TM

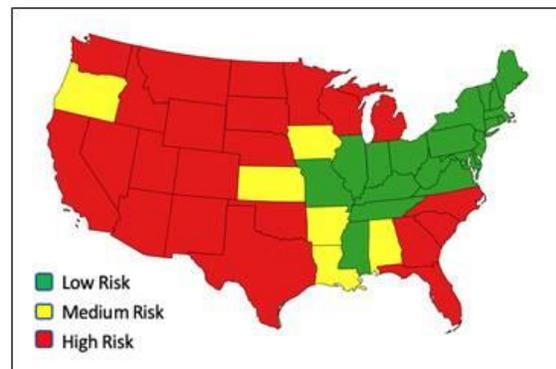
Mozambique Tilapia (*Oreochromis mossambicus*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Mozambique Tilapia is not native to the United States, and is a high risk of causing harm to waters in much of the U.S. (red states on the map).



Photo: Moses Liukali. Licensed under Creative Commons BY-NC-ND 2.0.
Available: <https://www.flickr.com/photos/61545321@N06/18725663933>.
(January 6, 2021).



Map created from information at <https://www.fws.gov/fisheries/ans/erss/highrisk/ERSS-Oreochromis-mossambicus-final-April2018.pdf>.

Take Action By:

- Either buying Mozambique Tilapia in green states or choosing a low-risk alternative to the Mozambique Tilapia, such as the Tinfoil Barb (*Barbonymus schwanefeldii*).
- Consulting local and state regulations prior to buying and keeping specimens of Mozambique Tilapia and Tinfoil Barb.



TM

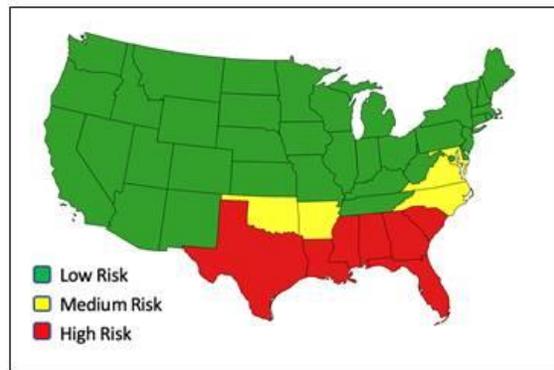
Red Piranha (*Pygocentrus nattereri*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Red Piranha is not native to the United States, and is a high risk of causing harm to waters in some of the U.S. (red states on the map).



Photo: Wendell Reed. Licensed under Creative Commons BY-NC-SA 2.0.
Available: <https://www.flickr.com/photos/48178221@N06/6534800755>.
(January 6, 2021).



Map created from information at https://www.fws.gov/fisheries/ans/erss/high_risk/ERSS-Pygocentrus-nattereri-final-May2018.pdf.

Take Action By:

- Either buying Red Piranha in green states or choosing a low-risk alternative to the Red Piranha, such as the Tinfoil Barb (*Barbonymus schwanefeldii*).
- Consulting local and state regulations prior to buying and keeping specimens of Red Piranha and Tinfoil Barb.

Appendix C
Enhanced Labels



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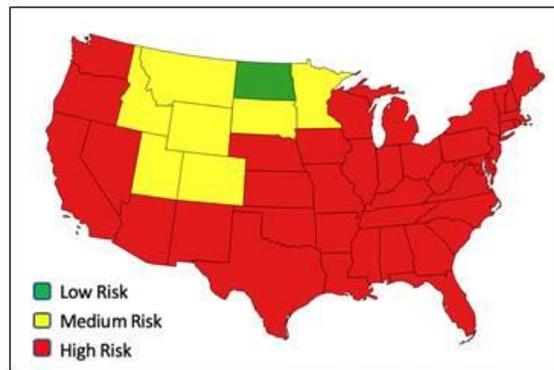
Water Hyacinth (*Eichhornia crassipes*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Water Hyacinth is not native to the United States, and is a high risk of causing harm to waters in most of the U.S. (red states on the map).



Photo: Andrew Davies. Licensed under Creative Commons BY-NC 4.0.
Available: <https://www.inaturalist.org/photos/2692015>. (October 6, 2020).



Map created from information at <https://www.fws.gov/fisherie/ANS/erss/highrisk/ERSS-Eichhornia-crassipes-FINAL.pdf>.

Take Action By:

- Choosing a low-risk alternative to Water Hyacinth, such as Pickerelweed (*Pontederia cordata*).
- Consulting local and state regulations prior to buying and keeping specimens of Water Hyacinth and Pickerelweed

For More Information:

- <https://www.fws.gov/fisherie/ANS/erss/highrisk/ERSS-Eichhornia-crassipes-FINAL.pdf>
- <https://www.cabi.org/isc/datasheet/20544>



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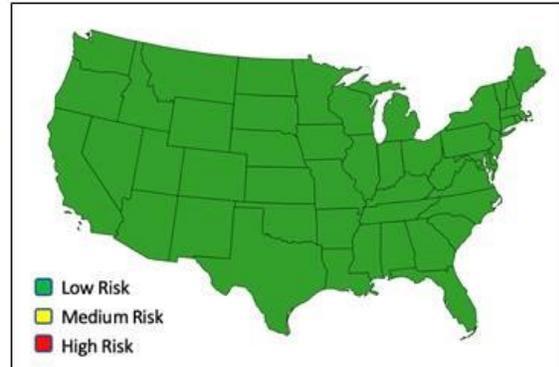
Freshwater Angelfish (*Pterophyllum scalare*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Freshwater Angelfish is not native to the United States, and is a low risk of causing harm to U.S. waters.



Photo: Daniel Mannerich. Licensed under Creative Commons BY-NC-ND 2.0.
Available: <https://www.flickr.com/photos/29858421@N04/12797047273/>.
(October 6, 2020).



Map created from information at <https://www.fws.gov/fisheries/ANS/erss/lowrisk/ERSS-Pterophyllum-scalare-Final-Jan2020.pdf>

Take Action By:

- Consulting local and state regulations prior to buying and keeping specimens of Freshwater Angelfish.

For More Information:

- <https://www.aqueon.com/information/care-sheets/angelfish>



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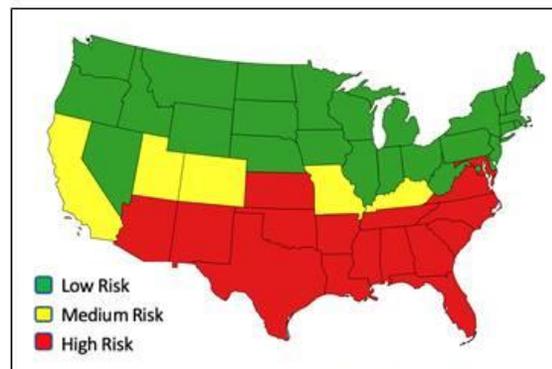
Rio Grande Cichlid (*Herichthys cyanoguttatus*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: The Rio Grande Cichlid is not native to the United States, and is a high risk of causing harm to waters in some of the U.S. (red states on the map).



Photo: Charles & Clint. Licensed under Creative Commons CC BY-SA 2.0. Available: <https://www.flickr.com/photos/20087733@N00/20396340/>. (October 6, 2020).



Map created from information at <https://www.fws.gov/fisheries/ANS/erss/highrisk/ERSS-Herichthys-cyanoguttatus-final-October2019.pdf>

Take Action By:

- Either buying Rio Grande Cichlids in green states or choosing a low-risk alternative to the Rio Grande Cichlid, such as the Cockatoo Cichlid (*Apistogramma cacatuoides*).
- Consulting local and state regulations prior to buying and keeping specimens of Rio Grande and Cockatoo Cichlids.

For More Information:

- <https://www.fws.gov/fisheries/ANS/erss/highrisk/ERSS-Herichthys-cyanoguttatus-final-October2019.pdf>
- <https://www.cabi.org/isc/datasheet/120933>

Appendix D
State-specific Labels



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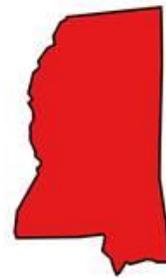
Nile Tilapia (*Oreochromis niloticus*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: Nile Tilapia is not native to Mississippi, and is a restricted species there. The species presents a high risk of causing harm to waters in Mississippi.



Photo: Sahat Raitmuangkhwang. Licensed under Creative Commons BY 3.0.
Available: <https://search.creativecommons.org/photos/0bbcd67-b9d3-4234-ae1c-8a3ee09ee1d3>. (February 12, 2021).



High Risk

Map created from information at <https://www.fws.gov/fisheries/ANS/erss/highrisk/ERSS-Oreochromis-niloticus-final-April2018.pdf>

Take Action By:

- Complying with Mississippi regulations prohibiting the release of Nile tilapia into public waters.

For more information:

- <https://www.fws.gov/fisheries/ANS/erss/highrisk/ERSS-Oreochromis-niloticus-final-April2018.pdf>
- <https://nas.er.usgs.gov/queries/factsheet.aspx?SpeciesID=468>
- <https://www.cabi.org/isc/datasheet/72086>



TM

Carolina Fanwort (*Cabomba caroliniana*)

ECOSTAR™: Buy low-risk plants and pets

Risk Summary: Carolina Fanwort is not native to Minnesota, and is a regulated species here. The species presents a high risk of causing harm to waters in Minnesota.



High Risk

Photo: Leslie J. Mehrhoff. Licensed under Creative Commons BY 3.0.
Available: <https://www.creativecommons.org/photos/b139a684-08be-42eb-9a55-301499eb28df>, (February 11, 2021).

Map created from information
at https://www.fws.gov/fisheries/ANS/erss/highrisk/ERSS-Cabomba-caroliniana_Final.pdf

Take Action:

- Choose a low risk alternative to Carolina Fanwort such as Pickerelweed (*Pontederia cordata*) or Anubias (*Anubias barteri*)
- Comply with Minnesota regulations prohibiting release and planting of Carolina Fanwort in public waters

For more information:

- https://www.fws.gov/fisheries/ANS/erss/highrisk/ERSS-Cabomba-caroliniana_Final.pdf
- <https://www.dnr.state.mn.us/invasives/trade-pathways.html>