

Prioritizing efforts to manage non-native species



Red-eared slider

What are the challenges for prioritization?

1. It's complicated, especially when multiple taxonomic groups are involved
2. An enormous variety of approaches have been developed, each with benefits and weaknesses
3. Scoring and weighting schemes are arbitrary
4. Existing methodologies emphasize specific taxonomic groups in pre-defined geographic areas
5. Most analyses are limited to risk assessment (i.e. evaluation of the threat posed by a non-native species), with no consideration of risk management (i.e. feasibility of different management options)
6. High levels of uncertainty regarding the status of certain taxa

A possible solution for prioritizing non-native species management

Our suggested framework:

1. Expands on an existing methodology that has been vetted in peer-reviewed scientific literature, modified and refined through use since 2005, and is now used to good effect in Great Britain (<http://www.nonnativespecies.org>).
2. Applies to any taxonomic group in any pre-defined management area
3. Incorporates risk assessment, risk management, and risk communication
4. Implements a semi-quantitative approach and relies on consensus building among taxonomic experts as a way to minimize subjectivity & bias
5. Quantifies uncertainty with regard to certain taxa
6. High-risk species that can be managed at lower cost and effort take precedence over low risk species that are more costly and/or difficult to manage
7. Builds toward a globally unified approach to analyzing risk for many of the same species that have been introduced worldwide

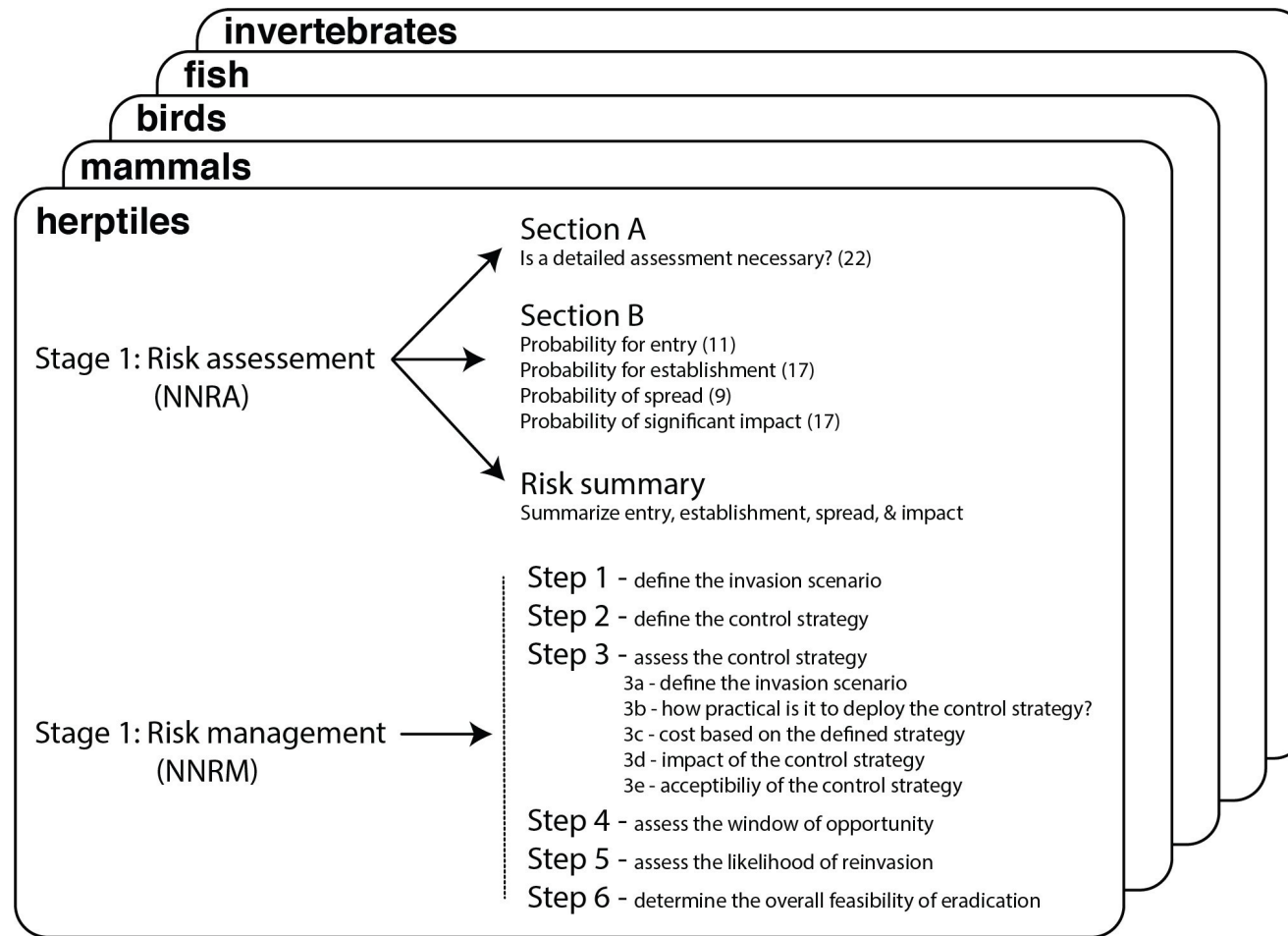
The framework

Stages for performing the risk analysis:

1. Assemble groups of assessors according to taxonomic expertise, with each group comprised of two leaders and up to five additional participants chosen by the leaders
2. Leaders supplied with guidance documents and electronic templates (i.e. questionnaires) to carry out each of three stages of the analysis
3. Stage 1: risk assessment scheme for listed species (developed by USGS, subject to revision by experts)
4. Stage 2: risk management scheme
5. Stage 3: consensus-building workshop based on Stages 1&2, involving all groups, after which all participants are expected to agree on a rank order for prioritizing the risk posed by non-native animal species



Argentine ants attack!



Red swamp crayfish



Golden spotted oak borer



New Zealand mud snail

Summary data for non-native species of concern

- Orange cells denote the major taxonomic groups
- Each category is specifically defined in the project summary



Fox squirrel *Sciurus niger*

Taxa	N	Established	Limited	Reported	Extirpated	Horizon	Threat
Herptiles	25	3	7	0	0	5	0
lizards	8	1	3	1	0	1	0
snakes	6	1	1	0	0	4	0
turtles	4	1	3	0	0	0	0
frogs	5	1	1	0	0	2	0
toads	1	0	0	0	0	1	0
salamander	1	0	1	0	0	0	0
Fish	55	19	9	6	3	7	11
Birds	19	8	0	0	1	2	9
Mammals	16	8	2	0	2	2	2
Invertebrates	58	12	1	3	0	6	25
mollusks	8	4	0	0	0	2	2
annelids	2	0	0	0	0	0	2
arachnids	2	2	0	0	0	0	0
insects	39	5	1	1	0	2	20
crustaceans	7	1	0	2	0	2	1

Table 2. Examples of assessment criteria for response scores

Criteria	Response Score				
	1	2	3	4	5
Effectiveness	Very ineffective	Ineffective	Moderate effectiveness	Effective	Very effective
Practicality	Very impractical	Impractical	Moderate practicality	Practical	Very practical
Cost	>\$10M	\$1.2-10M	\$250K-1.2M	\$65-250K	<\$65K
Negative impact	Massive	Major	Moderate	Minor	Minimal
Acceptability	Very unacceptable	Unacceptable	Moderate acceptability	Acceptable	Very acceptable
Window of opportunity	< 2 months	2 months - 1 year	1 – 3 years	4-10 years	>10 years
Likelihood of reinvasion	Very likely	Likely	Moderate likelihood	Unlikely	Very unlikely
Conclusion (overall feasibility of eradication)	Very low	Low	Medium	High	Very high

Some caveats on the suggested framework:

1. Risk assessment and management questionnaires have been modified from the templates used in Europe to meet local conditions/criteria, but further changes will likely be necessary to increase their utility for the MSP
2. This framework is focused on eradication, which may not be realistic for some taxa in San Diego County (but for which some level of control is beneficial and feasible)
3. Animal groups as defined in the scope of work are not taxonomically or evolutionarily equivalent units
 - Further subdivisions may be necessary to standardize the workload across groups and better reflect the different taxonomic areas of expertise for likely participants (especially for invertebrates)
4. Consensus-building aspect of the study will presumably rely on researchers to volunteer their time in completing the questionnaires and attending the workshop

Exploiting social media to promote community awareness and activism:

1. 'San Diego Invasive Species Watch' web-portal on iNaturalist.org
 - 2086 observations
 - 210 non-native species recorded
 - 400+ people currently participating
2. Volunteers have the potential to be major contributors to surveillance of non-native species
3. Opportunities to engage local schools to participate in this endeavor to increase awareness in the younger generation