Meeting Report
Third Meeting of the Non-Native Species Task Group
August 12-13, 2003
Fort Collins, CO

The third meeting of the Non-native Species Task Group was held on August 12 and 13[1] at the Courtyard Marriott in Fort Collins, Colorado. Attendees are listed in Attachment B.

The meeting focused primarily on the structure of an indicator of invasion pattern that could be applied across taxonomic groups and across biomes. This indicator is described in detail in Attachment A.

The following are additional discussion or decision items that arose during the meeting.

1. Dave Thomas will draft a few sentences on the rationale for choosing to report on all non-native species, not just those that are invasive. Ultimately, either this text or related text in the report will acknowledge the distinction between the two types of species, the fact that species can move from one group to another, and the distinction between non-natives with self-sustaining populations (the focus of our work) and those that might be found in small numbers and not yet established self-sustaining populations (some of these species may be of extreme interest to managers). Task Group definitions should be consistent with federal definitions for the same types of species.

2. The next meeting of the Task Group will be held in October (November at the latest) and will focus solely on refining the impacts indicators. The Task Group felt that the impacts indicators for plants and pathogens[2] were reasonably well developed, but that invertebrate and vertebrate indicators needed development. Subgroups were established to work on these two tasks:

   Invertebrates: Greg Ruiz, Richard Orr
   Vertebrates: Gary Matlock, Dave Thomas, Pam Fuller

   These groups are asked to communicate during the period before the Task Group meets again and be prepared to present the outlines of a recommended indicator.

3. Individuals were asked to explore, at the August 14 briefings, whether the databases that we would be briefed on would be able to support reporting on the invasion pattern indicator discussed at the August 12-13 meeting. Questions to be explored included whether the indicator we identified is currently measured by the program (and if so, at what scale, and

[1] On August 14, most members of the Task Group attended a briefing / symposium highlighting a wide range of federal and other databases and data collection efforts, held at the federal complex at Colorado State University, and organized by Rita Beard of the US Forest Service.
[2] These indicators are, for plants: percent cover, and for pathogens: the percentages of host individuals infected, summed over all hosts and normalized by the percentage each host makes up of the total number of hosts. See the meeting report for the first meeting (April 2003).

using what sampling / collection methods), and if not, could this indicator be supported by your monitoring / reporting program. Individuals and taxa / biome assignments are listed in the table below, and individuals are asked to provide a brief note (even if it simply says there was no data base with the capability of reporting on the relevant biome/taxa combination) before the next meeting. These will be summarized and distributed before the meeting, so that we can maximize the time devoted to impact indicators.

	Forests	**Grass / Shrub**	**Fresh Water**	**Farmland**
Vertebrates	Pam Fuller	Pam Fuller	Pam Fuller	Nelroy Jackson
Invertebrates	Faith Campbell	Tom Stohlgren	Dave Thomas	Nelroy Jackson
Pathogens	Faith Campbell	Peter Rice	Chris Dionigi	Nelroy Jackson
Plants	Sarah Reichard	Dick Mack	Terri Killeffer	Nelroy Jackson

4. The Task Group initially recommended that non-native species indicators should be reported on the basis of watersheds, probably at the 6-digit level (about 350 HUCs in the conterminous US). However, this discussion occurred before the development of the pattern indicator described in Attachment A, and may be difficult to apply to some biomes. Attachment C is a proposal (from the Heinz Center) as to the appropriate presentation of the pattern indicator for various biomes, based on (but extending) the Task Group's discussions.

Appendix A – Indicator: Prevalence of Non-native Species
Appendix B – Meeting participants list
Appendix C – Reporting and geographic scale

Appendix A

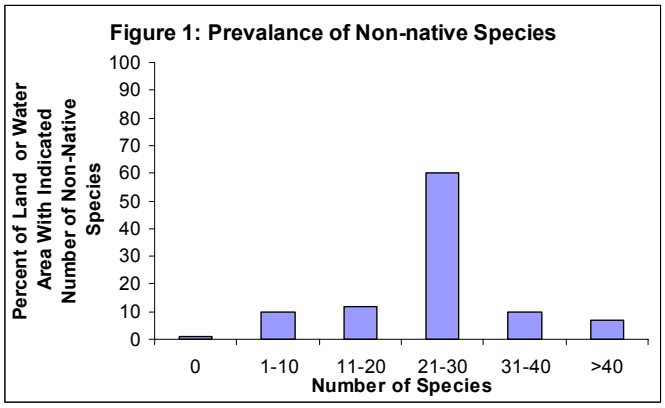
Indicator: Prevalence of Non-native[3] Species

Background: The Non-native Species Task Group of The Heinz Center's *State of the Nation's Ecosystems* project has developed an indicator that describes the overall prevalence of non-native species. This indicator is intended as a common metric that can be applied across taxonomic groups and across ecosystems or biomes. The Task Group recognizes that there are other measures that may provide additional, more-detailed information, especially on numbers of individuals or degree of invasion by any particular species, but does not believe these measures are comparable, particularly across major taxonomic groups[4]. There are also simpler metrics that could be reported based on less-structured data gathering efforts, but these do not provide as informative a view of non-native species invasions.

Thus, this indicator is proposed to provide very broad coverage – multiple taxonomic groups and multiple biomes – rather than detailed information on any specific area or taxa. It is, in the Task Group's view, the best compromise between the degree of information that can be provided, and the applicability of the indicator across biomes and taxa.

Indicator Description: Non-Native Species Prevalence.
This indicator describes the fraction of an area (watershed, region, the nation) in which different numbers of non-native species may be encountered. The indicator is intended to include information on the numbers of species in four major taxonomic groups (plants, vertebrates, invertebrates, and parasites/pathogens), although the group recognizes that in many cases, incomplete monitoring will result in reporting on only a subset of these four groups.

Figure 1 shows an idealized presentation of data for this indicator[5].



[3] In this document, the term "non-native" refers to species that are non-native to a particular ecosystem, and are found in "self-sustaining populations."
[4] In other words, while more-informative indicators can be presented for, say, plants and pathogens, it is difficult to compare these or to aggregate them to make statements across a single biome. These indicators are enormously important, however, and will be recommended for reporting where applicable.
[5] This would be presented in a time-series format in the report.

Biome-Specific Considerations

For terrestrial biomes (forests, grasslands/shrublands, farmlands, urban/suburban) and coastal and ocean waters, the indicator would be expressed on the basis of area; e.g., the percent of forest area with zero non-native species; the percent of estuarine area with greater than 40 non-native species. Freshwater systems present a complication, because there are both area-based components (i.e., lake area and wetlands area) and a linear-based component (river miles). These data could be combined by assigning an assumed width to various classes of river miles, thus converting linear data to area form.

For coastal areas, the indicator would focus on estuarine area, which is presently the locus of most invasion activity and concern.

For urban and suburban areas, the indicator would be assessed on the basis of the entire urban / suburban landscape. The decision to apply the metric to the entire area, not simply to "natural lands," was based on the existence of many native and non-native species in the "developed" portion of the system (e.g., pigeons, rats, red-tailed hawks, etc.). The metric would cover all non-native species that have an ecological connection (i.e., are not simply human diseases with no ecological vector or impact). The metric would also include both free-ranging and feral cats, but not domestic cats[6].

For farmland areas, the indicator would be assessed on the entire farmland landscape. This includes both croplands and non-cropped areas such as windbreaks and woodlots as well as set-aside areas such as CRP.

The "farmland" section would include lands used for animal feeding, but aquaculture and mariculture would be included within their respective aquatic biome. (Recall that the farmed species, whether fish, cattle, or oysters, are not themselves counted as "non-natives." Rather, the indicator would count any pests / parasites – the equivalent of weeds in a cropland – and any escaped individuals.)

Integrating the Data

The Task Group presumes that data for this indicator will be gathered using sampling programs that are sufficiently robust to enable data from an individual observation (e.g., sampling plot, net tow) to be expanded to describe larger areas.

Data can be summed and expressed as cumulative frequency (i.e., numbers of species encountered) using either bins (e.g., 0, 1-10, 11-20, etc., or quartiles) or a statistical value such as the median[7].

Both terrestrial and aquatic systems could be reported on a smaller geographic basis (e.g., the percentage of estuarine area in the Southeast with no non-native species; the percentage of forest in Vermont with more than ten non-native species).

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[6] "Free-ranging" cats are pet cats that are allowed to range outdoors, while "domestic" cats remain indoors.

[7] The *State of the Nation's Ecosystems* generally presents data in distributional form – such as bins – rather than collapsing the data to single statistics. Such statistics may, however, be useful in, for example, comparing between biomes.

There was a strong sense in the group that the data will show that there are significantly more non-native plants than any other taxonomic group, and that aggregated reporting over all taxonomic groups would be overly influenced by plant data. If this is true (e.g., if the number of plant species encountered is an order of magnitude higher than the number of species encountered) it would be possible to report the data in a slightly disaggregated form (e.g., plants, all other). Clearly, it would be desirable to include access to the disaggregated data in the web version of the report.

Taxon-Specific Considerations

Plants: This would be the frequency of encounters of a single species of plant (regardless of the number of stems) found in a given area.

Parasites and Pathogens: The metric for this is analogous to plants. It would be the number of pathogen or parasite species per unit area.

Invertebrates: Because data gaps exist across many groups of invertebrates, it will likely be necessary to include only selected groups and to integrate data across biome subsets. Also, the invertebrates occupy different types of habitats in aquatic and marine systems resulting in data in different units (e.g., surface, water column, sediment – some are on an area basis and some on a volume basis), which poses challenges in integrating data.

Vertebrates: As with other taxonomic groups, vertebrate counts would be based on the frequency of encounters of a single species, summed over the plot or area. As with all of the taxonomic groups, it is important to define the rules. In the case of vertebrates, this will be especially important for migratory species, anadromous and catadromous fish, etc.

Closely Related Indicators

The Task Group identified two closely related indicators, each of which has benefits and drawbacks, when compared to the proposed prevalence indicator.

Simply reporting the number of non-native species found – say in a watershed, or county, or state – can be accomplished using less-structured data collection programs, such as those that rely upon reports from observers. However, the proposed indicator is preferable because it provides a more quantitative gauge of the degree of invasion.

Reporting the *percentage* of species that are non-native can provide an even better sense of the degree to which non-native species are (or may be inferred to be) affecting an area. However, there are many taxa and regions for which the total number of native species is not known with any certainty, making it difficult to use this metric in all circumstances.

In addition, the Task Group clearly believes that indicators that go beyond species counts are enormously important, because they provide information on the intensity of invasion by non-native individuals. Thus, these indicators begin to provide information on the *impact* of non-

native species (although clearly stilly relying upon inference of impact, based on intensity of invasion).

Ann Bartuska, Chair
Executive Director
The Nature Conservancy

Faith Campbell
American Lands Alliance

Gabriella Chavarria
National Wildlife Federation

Chris Dionigi (Agency Liaison)
Liaison to the National Invasive Species Council and the Invasive Species Advisory Council

Pam Fuller
USGS / BRD
Nonindigenous Aquatic Species Program
Center for Aquatic Resources Studies

Nelroy Jackson
Monsanto

Terri Killeffer
Botanical Research Associate
NatureServe

Richard Orr
USDA APHIS
Risk Analysis Systems

Sarah Reichard
Assistant Professor, College of Forest Resources, Center for Urban Horticulture
University of Washington

Peter M. Rice
University of Montana
Division of Biological Sciences

Greg Ruiz
Smithsonian Environmental Research Institute

David Thomas
Director
Illinois Natural History Survey

Tom Stohlgren (Absent Day 1)
Biological Resources Division, USGS
Natural Resource Ecology Lab

Staff:

Robin O'Malley, Senior Fellow and Program Director

Laura Meyerson, Research Associate

Meeting Absentees

Ted Batkin
President
Citrus Research Board

Richard Mack
University of Washington
Global Invasive Species Program

Gary Matlock
Director, National Centers for Coastal Ocean Science (NCCOS)
NOAA NOS

Jerry Beatty
Deputy Director, Forest Health Protection
USDA Forest Service

Reporting and Geographic Scale for the Pattern Indicator

The following is a suggested approach to reporting on the pattern indicator developed at the August 12-13 meeting of the Task Group. It is based upon the group's discussions, but goes beyond them in several areas.

The basic Task Group recommendation (made before extended discussion of the indicator) was to report on the basis of watersheds (actually, 6-digit HUCs). However, reporting on a 6-digit HUC level means that only one value (probably something like the median) can be reported, and the HUC-based approach is not necessarily applicable to urban / suburban or coastal reporting.

A suggested approach to the basic presentation of the indicator might include two components

a) A graph showing the percent of [lands, waters] with various numbers of non-native species. This would essentially be the graph on the first page of Attachment A,
b) A map showing the median value of the indicator for relevant geographic units.

For farmlands, forests, grass/shrub, and freshwater, the geographic unit could be 6-digit HUCs, in which the HUCs would be shaded to show the median value of the indicator for the relevant lands (e.g., forest) within that HUC. This would mean the presentation would look much like the presentation of the freshwater non-native species indicator on page 145 of the report, or at http://www.heinzctr.org/ecosystems/fr_water/non_nat_ani.shtml.

For coastal waters the relevant geographic area would be estuaries, which could be indicated with color-coded dots or similar graphic devices.

For urban / suburban areas, the geographic are would be "metropolitan areas" or similar designation, which could also be coded by dot color or some similar approach. (See page 40 or http://www.heinzctr.org/ecosystems/national/eco_ext.shtml for an indication of the extent of urban / suburban lands by the Report's definition.)

In the event that a core national indicator is included addressing non-native species, the presentation would have to be some combination of these. Presumably, forest, farmland, grass/shrub, freshwater, and urban / suburban data could be aggregated to provide an indicator value for the percent of all lands / waters in that HUC, and this might be expanded to include the area of estuaries associated with coastal HUCs.

NOTE: The approach of using 6-digit HUCs is dependent upon the ability of monitoring programs to report the indicator at the 6-digt HUC level, which may be more than major sampling programs such as FIA can support. In this case, the choice of geographic region would be determined by the sampling density and reporting grain size of the programs involved. Presumably the Task Group would recommend that sampling be at least able to report the indicator on a scale comparable to the ten or so federal regions, Forest Service, regions, etc.