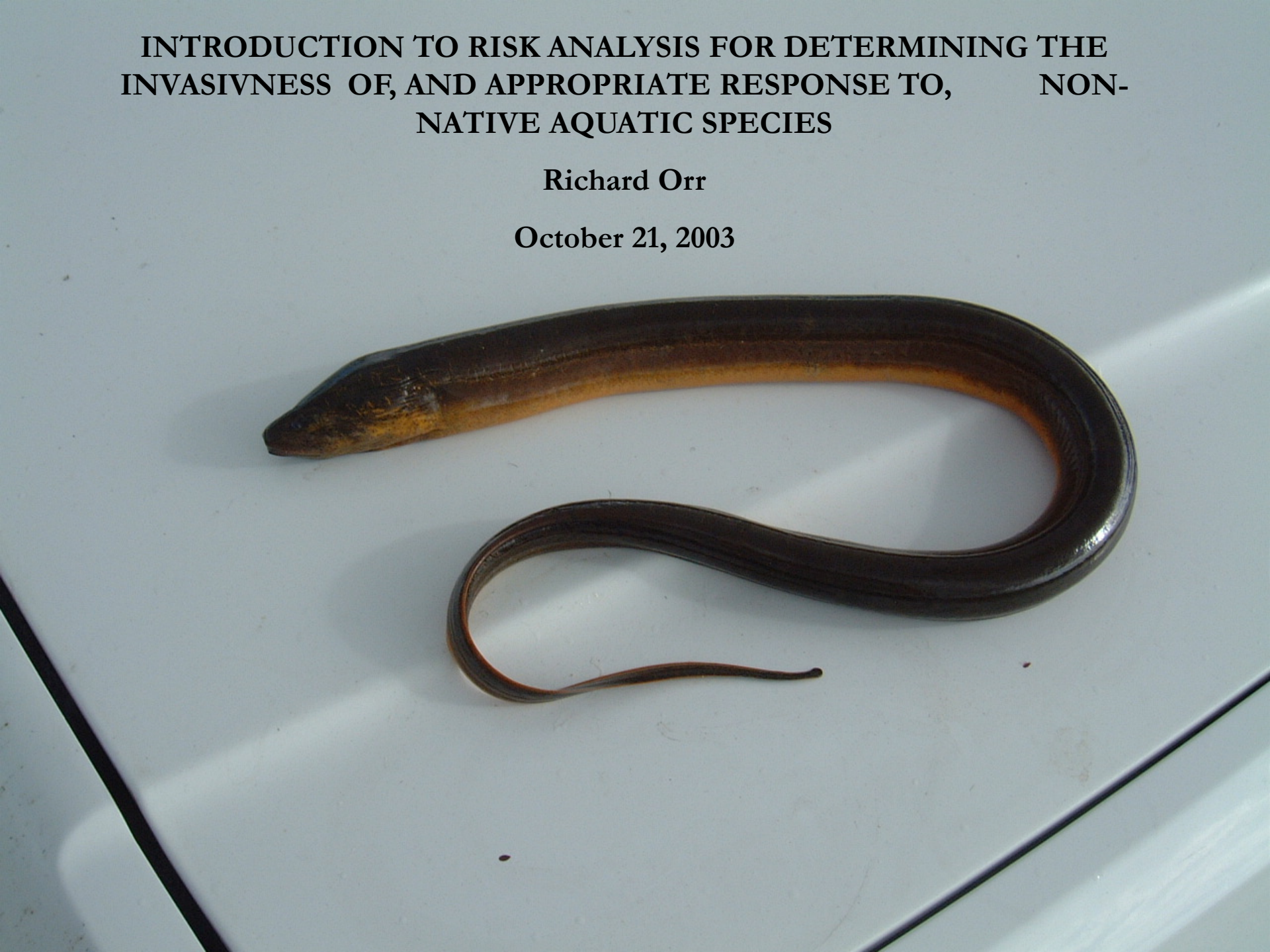
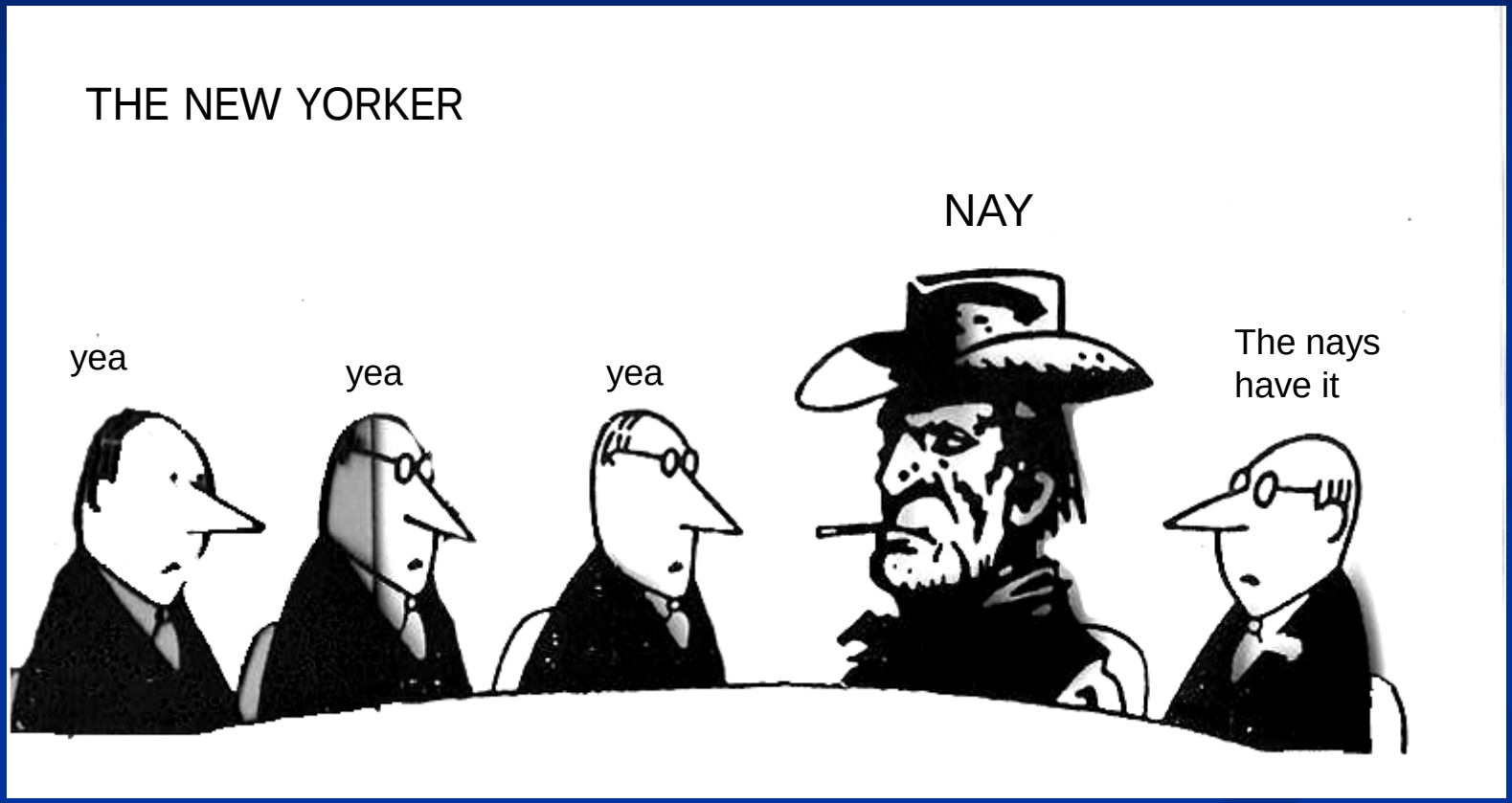
INTRODUCTION TO RISK ANALYSIS FOR DETERMINING THE INVASIVNESS OF, AND APPROPRIATE RESPONSE TO, NON-NATIVE AQUATIC SPECIES

Richard Orr

October 21, 2003




THE NEW YORKER
NAY
yea
yea
yea
The nays have it

THE REALITY OF U.S. REGULATORY ENVIRONMENT

1) Regulations restrict the personal freedom of the American People

2) Regulations without a justification will not survive the rule making process

3) A policy maker needs to show a justification for creating a regulatory action (social benefits must outweigh the loss of personal freedom)

4) Risk Analysis and Cost-Benefit Analysis are the current choice of federal policy makers for demonstration (defending) their justification for restricting the personal freedom of the American People

REPORT TO THE AQUATIC NUISANCE SPECIES TASK FORCE

Generic Nonindigenous Aquatic Organisms Risk Analysis Review Process

(For Estimating Risk
Associated with the Introduction
of Nonindigenous Aquatic Organisms
and How to Manage for that Risk)

Risk Assessment and Management Committee
Aquatic Nuisance Species Task Force

October 21, 1996

"The (Mad) Hatter spoke again on the subject at length, and although she could not catch the thought, it was certainly, Alice felt, English that he spoke."

Alice's Adventures in Wonderland

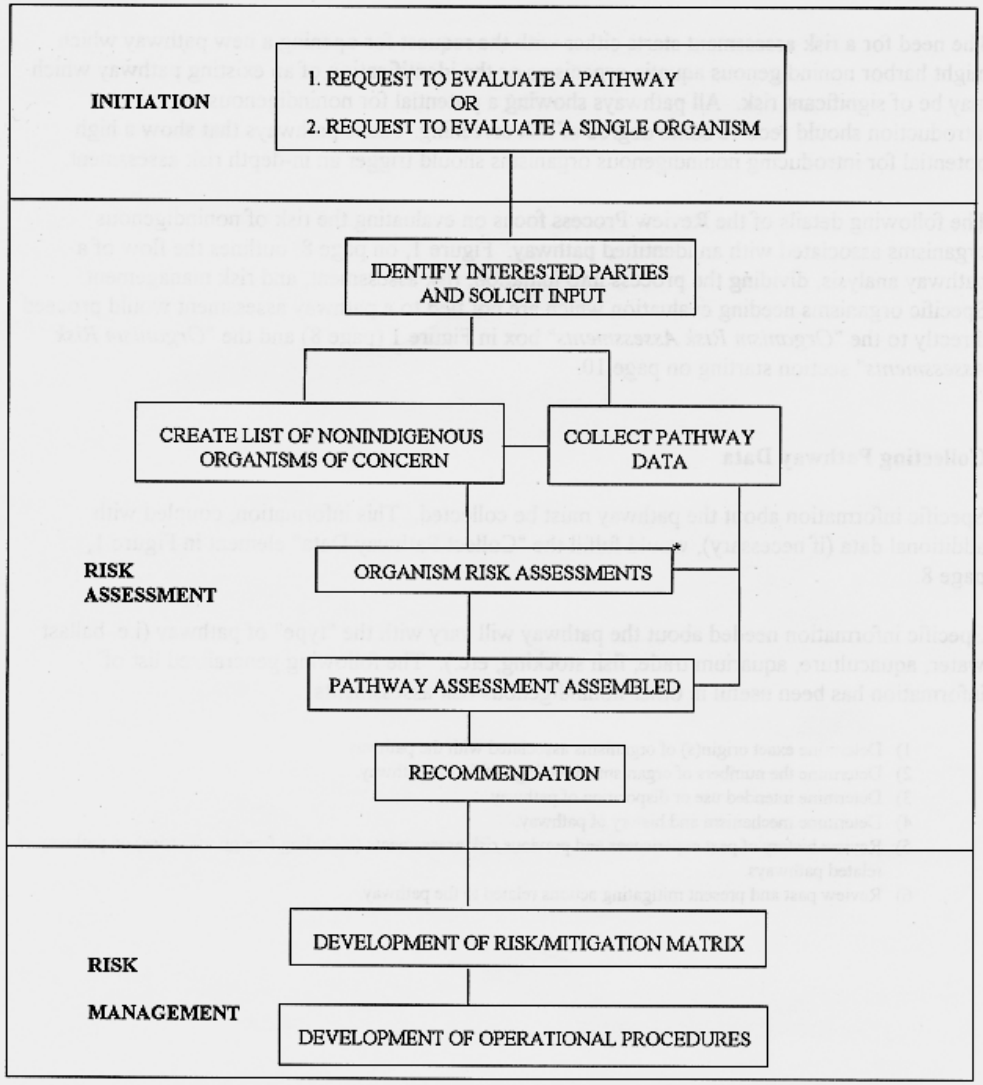
Definitions:

- **Risk** – Is the likelihood and magnitude of an adverse event
- **Risk Assessment** – the estimation of risk
- **Risk Management** – the pragmatic decision making process concerned with what to do about the risk
- **Risk Analysis** – process that includes both risk assessment and risk management
- **Risk Communication** – the act or process of exchanging risk analysis information

ASSESSMENT CRITERIA

- Relevant
- Comprehensive
- Logically & scientifically sound
- Practical
- Open to evaluation

FIGURE 1. Pathway Analysis: Flow Chart showing the Initiation, Risk Assessment and Risk Management for a pathway.



* = For details on the Organism Risk Assessment see Figure 2 "Risk Assessment Model", page 11. Pathways that show a high potential for introducing nonindigenous aquatic organisms should trigger detailed risk analyses.

Pest Risk Assessment Model

Standard Risk Formula

Risk = **Probability of Establishment** | **Consequence of Establishment**

Elements of the Model

Risk = Pest with Host (Origin) X Entry Potential X Colonization Potential X Spread Potential

$$ Economic Damage Potential + Non - $$ Environmental Damage Potential + Perceived Damage (Social & Political Influences)

Risk Management

- For model simplification the various elements are depicted as being independent of one another
- The order of the elements in the model does not necessarily reflect the order of calculation.

Life is a collection of probabilities

With more or less certain ends;

Predicted by mathematics

But determined by the winds

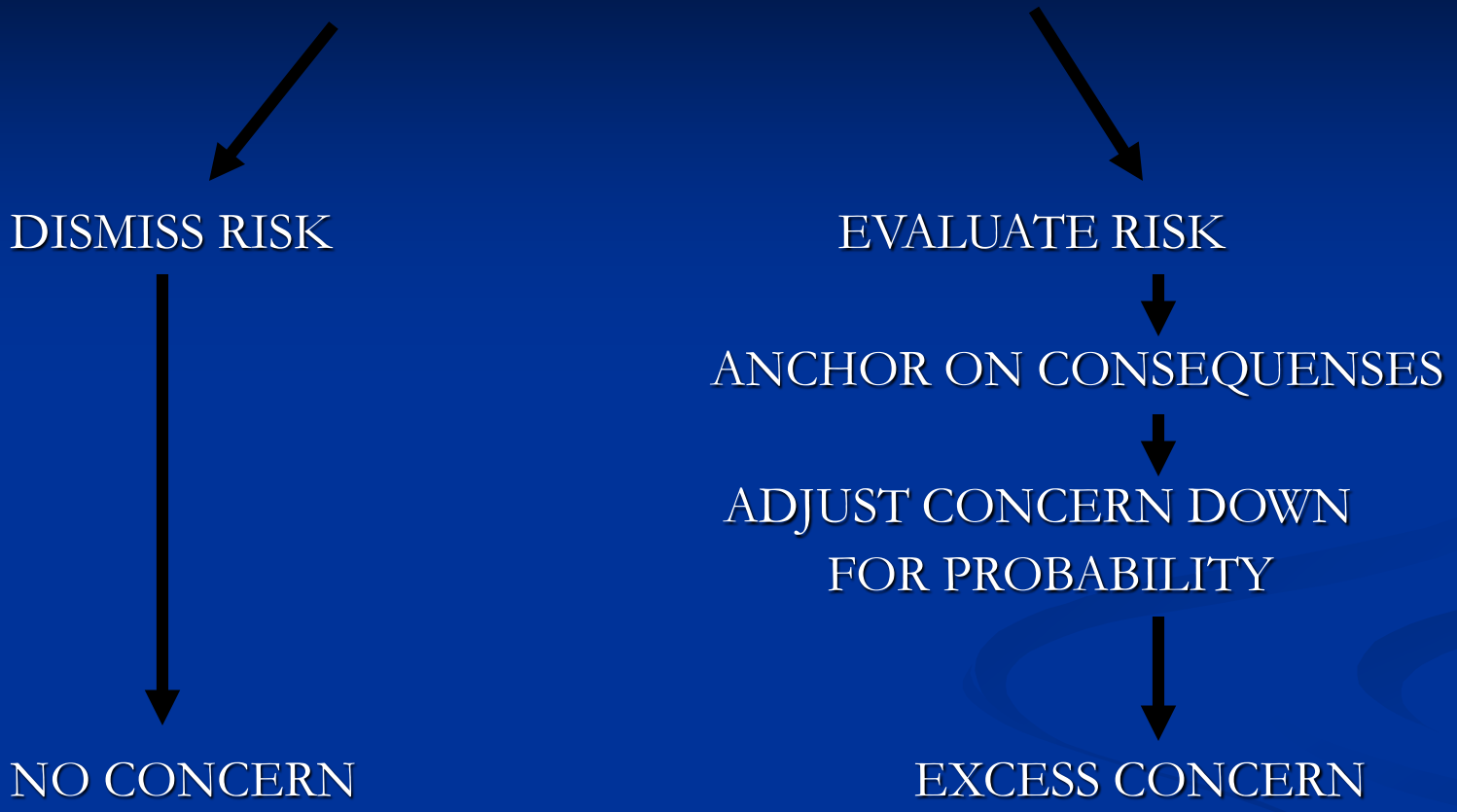
CAPTURING THE DEGREE OF UNCERTAINTY

1. UNCERTAINTY OF THE PROCESS (methodology)

2. UNCERTAINTY OF THE ASSESSOR(S) (human error)

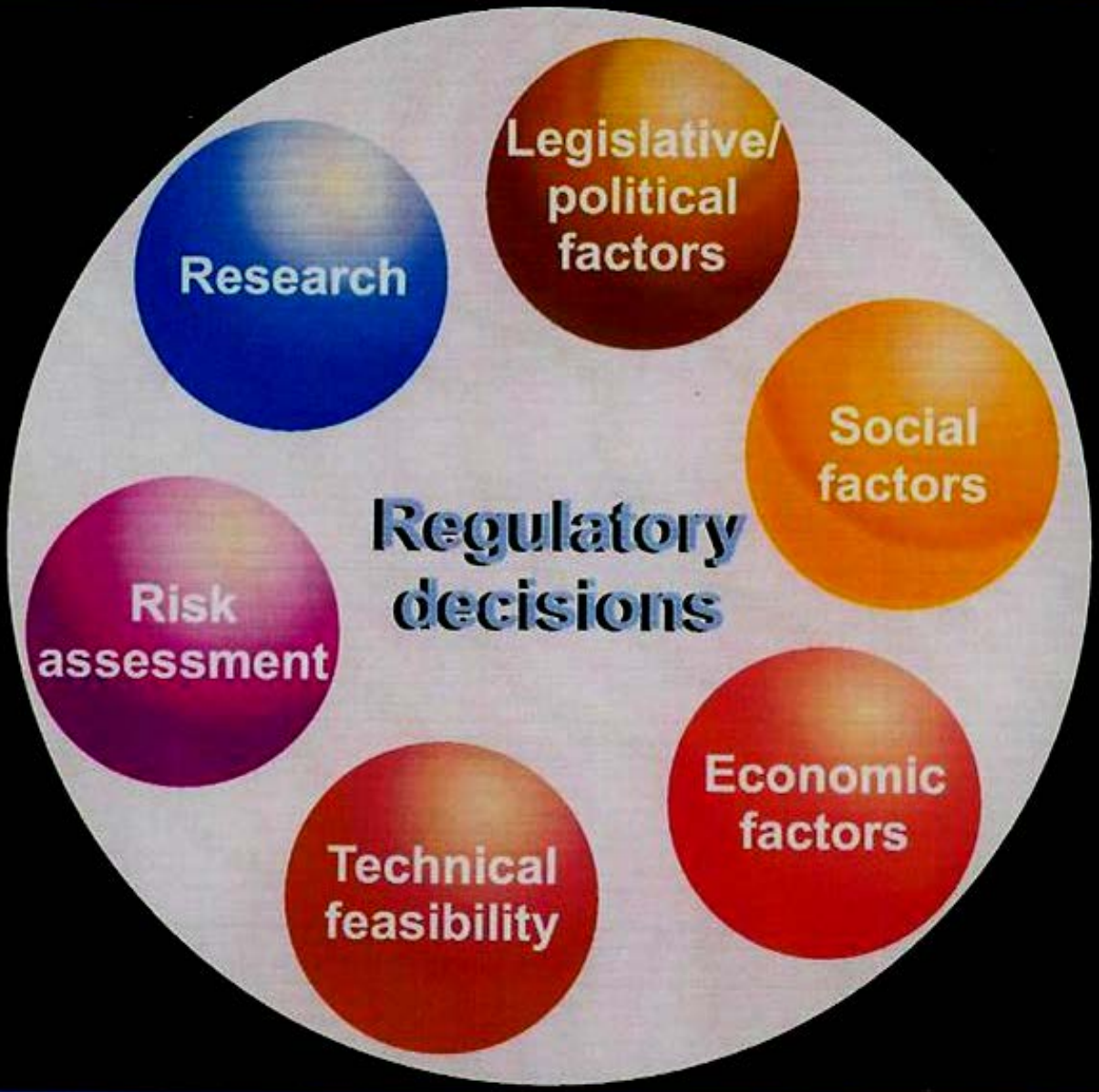
3. UNCERTAINTY ABOUT THE BIOLOGY (species and receiving ecosystem unknowns)

Is the Risk Worth Considering?



A MODEL OF RISK JUDGEMENT

Elements in Risk Management




Pink

PRARIE

DOGS

AGAINST

MONKEYPOX

Some Principles of International Trade WTO – SPS page 1

Sovereignty – each country has the right to take action preventing invasive species entry or establishment

Necessity – only those actions necessary to prevent the establishment of invasive species shall be taken

Modification – actions shall be reformed in response to new research or information

Minimal Impact – actions shall be consistent with the risk involved; and the least restrictive action on trade taken (within the bounds of cost and feasibility)

Some Principles of International Trade WTO – SPS page 2

Transparency – entry restrictions shall be published and disseminated with supporting rationale

Harmonization –national requirements shall be based on international standards unless a scientific rustication is provided for the differences

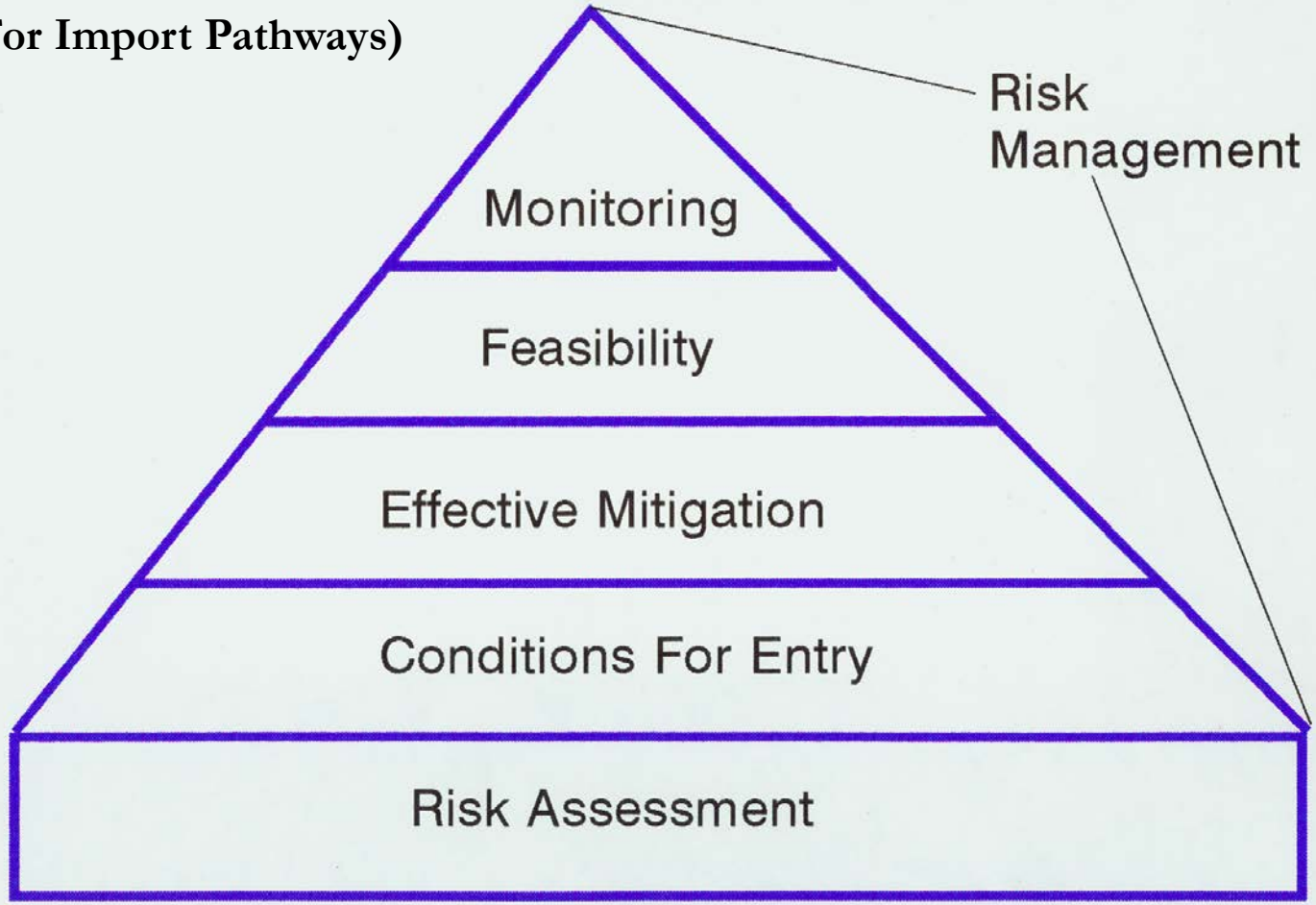
Equivalence – countries shall recognize as equal those mitigation actions that have equal effects

Risk Analysis – scientific methods shall underlie protection measures

Managed Risk – a policy of acceptable risk shall be created

Management Procedure

(For Import Pathways)



WHAT REALLY HAPPENED TO NEM0

Where there is trade

There is risk

Where there is risk

There is tolerance

- **ACCEPTABLE LEVEL OF RISK**
  The degree of risk from an invasive species, or an invasive species pathway, that society as a whole is willing to accept

- **APPROPREATE LEVEL OF PROTECTION**

  The degree of protection required to reduce, to an acceptable level, the risk of an invasive species or invasive species pathway

Figure 1

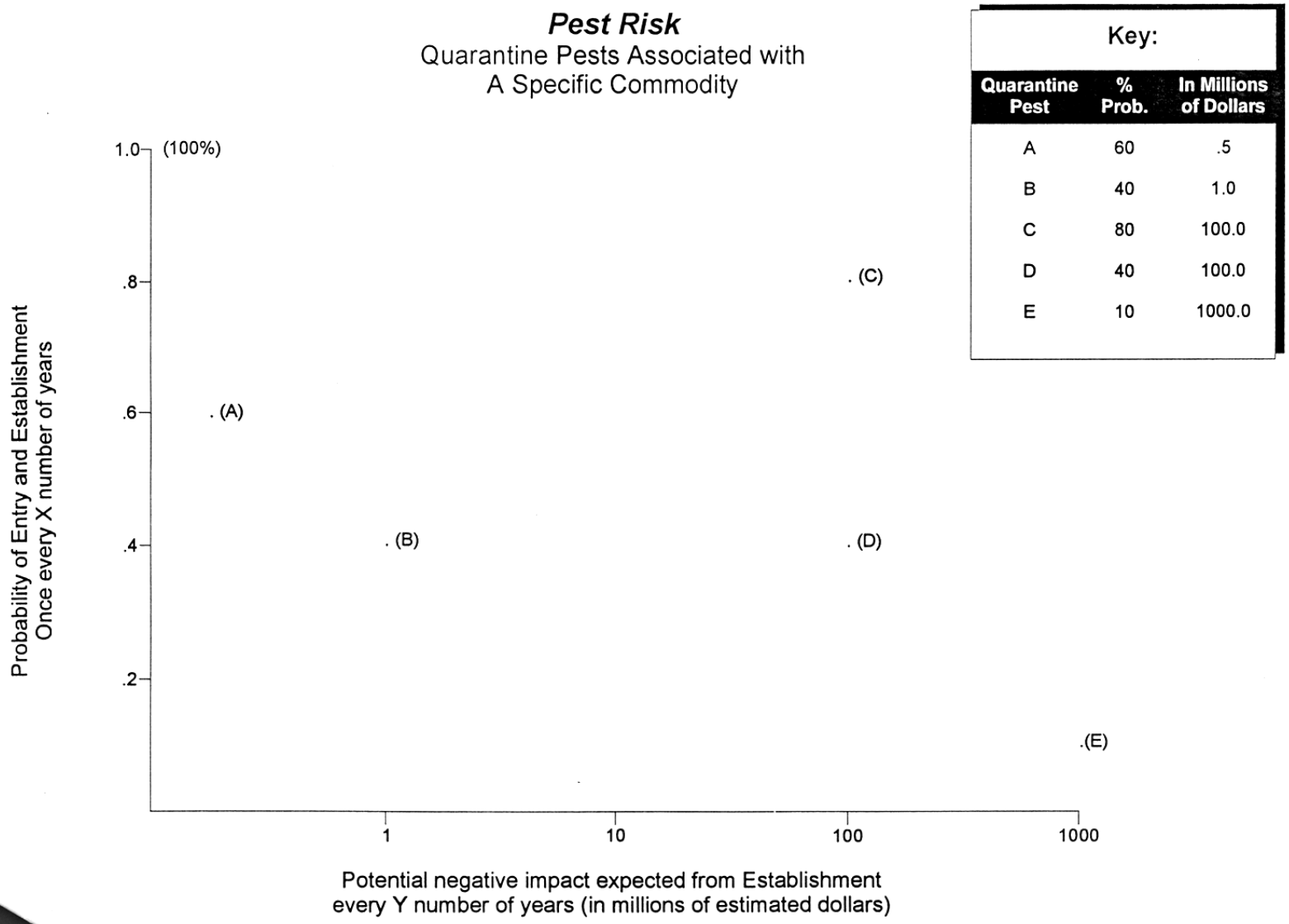

Pest Risk
Quarantine Pests Associated with
A Specific Commodity
Key:
Quarantine Pest | % Prob. | In Millions of Dollars
A | 60 | .5
B | 40 | 1.0
C | 80 | 100.0
D | 40 | 100.0
E | 10 | 1000.0
1.0 (100%)
.8
.6
.4
.2
. (A)
. (B)
. (C)
. (D)
.(E)
1
10
100
1000
Probability of Entry and Establishment
Once every X number of years
Potential negative impact expected from Establishment
every Y number of years (in millions of estimated dollars)

Figure 2

Acceptable Level of Risk Graph

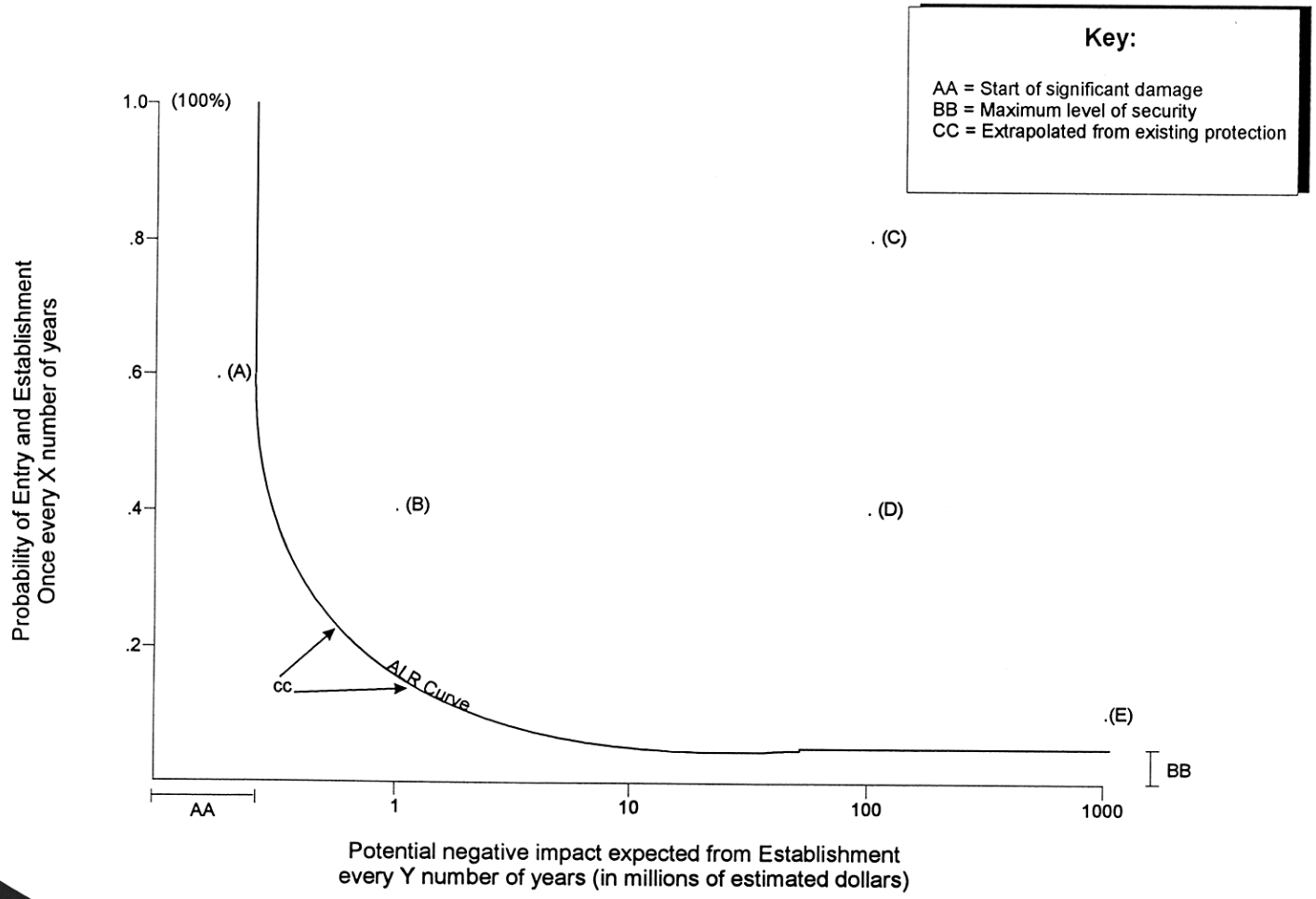
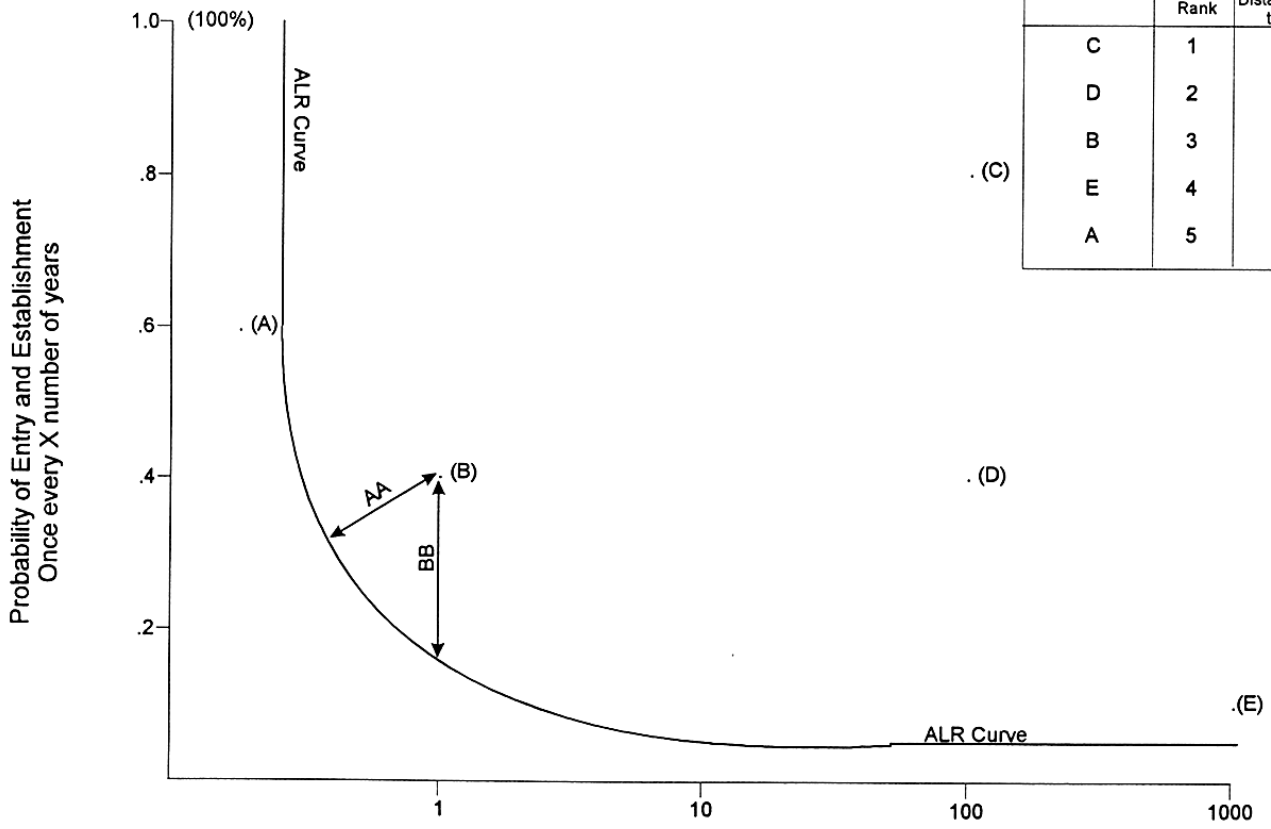


Figure 4

Acceptable Level of Risk Graph
for Ranking Quarantine Pests and Determining
Appropriate Level of Protection



Key:

AA Degree of RIsk = Closest distance to ALR curve

BB Level of Protection = vertical distance to ALR curve

Quarantine Pest	Ranking by Degree of Risk		Appropriate Level of protection	
	Rank	Distance (mm) to ALR	Rank	Actual pest reduction needed
C	1	82	1	75%
D	2	44	2	35%
B	3	11	3	15%
E	4	10	4	5%
A	5	(-)10	5	0%


SCREENING

PRE-ENTY APPROACH (DRAFT)

"If there is a non-native species which has not been evaluated for invasiveness within the area of concern, and it is uncertain as to what its risks are; then movement into the area must wait until it has been evaluated (screened). The screening would require that before restricting the movement of an organism there must demonstrate a reasonable and rational justification indicating that the organism can become invasive and that the threat of its invasiveness outweighs the benefits of restricting its movement or use"

invasiveness = ability to establish, spread, and cause damage

reasonable and rational justification = cause and effect relationships can be demonstrated or can be implied based on extrapolation from relevant existing information.

benefits = benefits to the society as a whole

Figure 1:

Non-Native Organisms Ready for Screening

= Low Risk

= Moderate Risk/High Benefits

= Moderate Risk/Moderate Benefits
or
High Risk/High Benefits

= Moderate Risk/Low Benefits

= High Risk/Low Benefits

Figure 2:

Hypothetical Screening System for Propagative Plant Introductions for Commercial Use

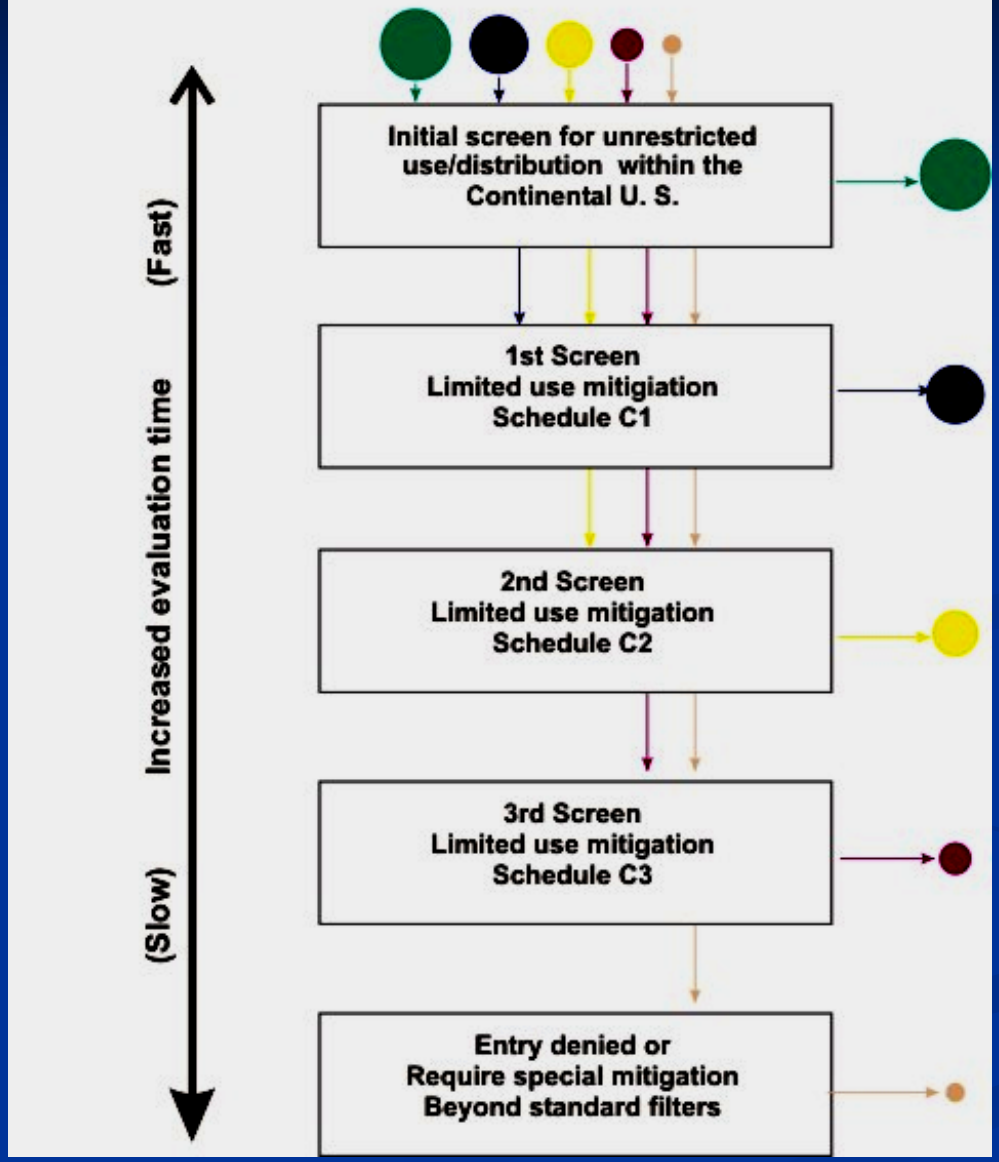
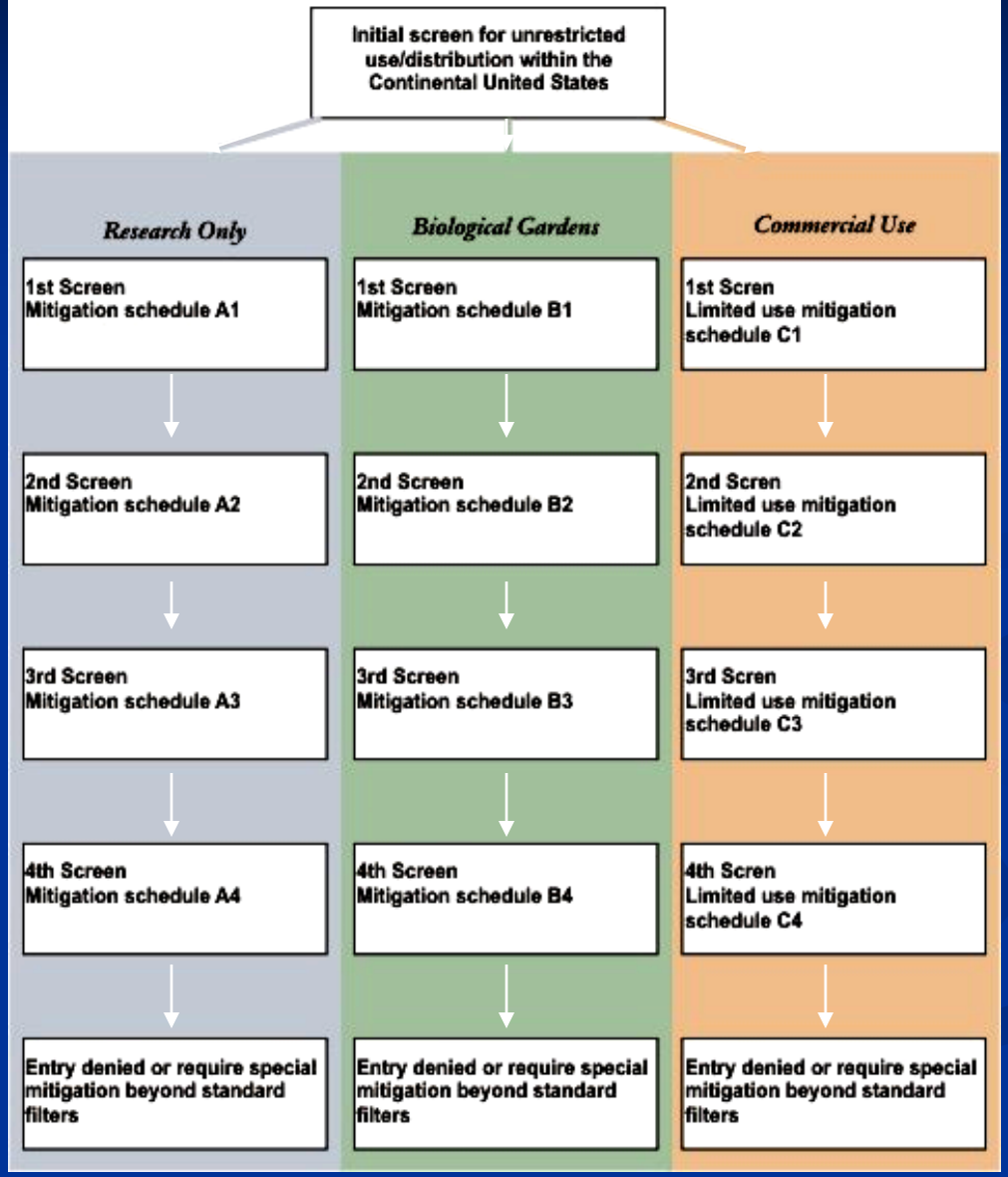


Figure 3:

Hypothetical Screening System for Propagative Plant Introductions Into the Contintental United States



Clean Lists vs. Dirty Lists vs. Gray Lists

CLEAN (WHITE) LIST – presumes that all species should be prohibited unless they have been officially listed as allowed.

DIRTY (BLACK) LIST – presumes that all species may be allowed unless they have been listed as prohibited

GRAY LIST – uses a combination of clean and dirty lists

Handling of Uncertainty

(the crux of the international Precautionary Principle issue)

Policy Option 1: Do not use uncertainty for making a judgment on the invasiveness of an organism

Policy Option 2: The higher the uncertainty the higher the ranking for that species potential for invasiveness

Policy Option 3: If the organism is a borderline case between approved or unapproved, then a high uncertainty would result in that species being treated as a higher risk (hybrid of 1 & 2)

NISC / ANSTF JOINT PREVENTION STRUCTURE