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General
Guidelines
for the
Establishment &
Evaluation of
Invasive Species
Early Detection
&
Rapid Response
Systems

Version 1. June 2003

NATIONAL INVASIVE SPECIES COUNCIL

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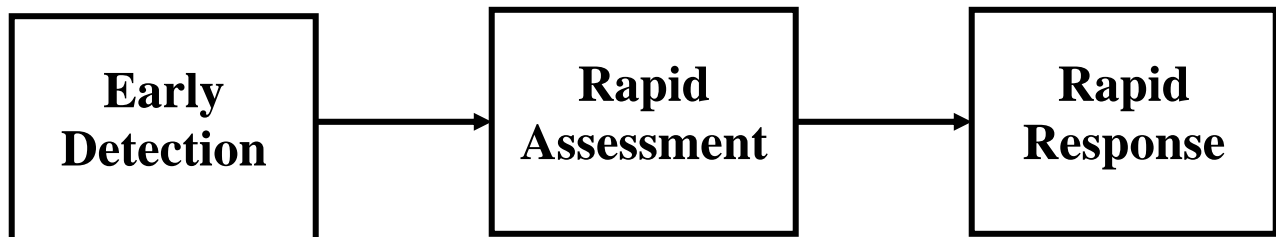
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General Guidelines for the Establishment and Evaluation of Invasive Species Early Detection & Rapid Response Systems

INTRODUCTION

Preventing the introduction of invasive species is the first line of defense against invasions. However, even the best prevention efforts will not stop all invasive species introductions. Early detection and rapid response (ED&RR) efforts increase the likelihood that invasions will be addressed successfully while populations are still localized and population levels are not beyond that which can be contained and eradicated. Once populations are widely established, all that might be possible is the partial mitigation of negative impacts. In addition, the costs associated with ED&RR efforts are typically far less than those of long-term invasive species management programs.

The charge of the National Invasive Species Council (Council) is to assist in the coordination of invasive species efforts. Because certain invasive species can spread rapidly, there is a critical need to coordinate ED&RR efforts. The 57 action items in the Council's National Invasive Species Management Plan (Plan) provide a "blue-print" for coordinated action on invasive species (*National Invasive Species Council. 2001. Meeting the Invasive Species Challenge: National Invasive Species Management Plan. 74pp. available at: www.invasivespecies.gov*). In the Plan, ED&RR is identified as a high priority. For example, Plan action items #23 and #24 deals with the development of guidelines and systems for the coordinated detection and response to incipient invasions. The Plan also calls for working with state, local, tribal, and private entities to draft proposals that will, among other things, provide permanent funding for ED&RR efforts.

The Council approved these guidelines in June 2003 to provide information to those who wish to establish or evaluate ED&RR systems for invasive species. They are based on the work of the federal and non-federal members of the ED&RR Subcommittee (see appendix 4) of the Invasive Species Advisory Committee (ISAC) of the Council. The guidelines contain information from a wide range of subject matter experts, people with direct experience in ED&RR efforts, and stakeholders that included members of the ISAC and representatives of Council member agencies. Information was drawn from documents that analyze existing or proposed systems including but not limited to: work by the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW), a report by Jim Worrall of the U.S. Forest Service, the work of the Western Regional Panel of the Aquatic Nuisance Species Task Force, the definition of "rapid response" developed by the Council, and information on ED&RR systems from New Zealand and Australia. It is anticipated that these guidelines (Version 1) will be revised as science, technology, and experience with systems and species advance.

The hallmarks of successful ED&RR efforts include: 1) potential threats are being identified in time to allow risk-mitigation measures to be taken; 2) new invasive species are being detected in time to allow efficient and environmentally sound decisions to be made; 3) responses to invasions are effective and environmentally sound and prevent the spread and

permanent establishment of invasive species; 4) adequate and timely information is being provided to decision-makers, the public, and to trading partners concerned about the status of invasive species within an area; and 5) lessons learned from past efforts are being used to guide current and future efforts.

Detecting and responding to invasions requires a complex series of interlacing, coordinated, and sustained actions that can be grouped into three main categories: 1) Early Detection, 2) Rapid Assessment, and 3) Rapid Response. Actions may include: reviewing relevant legal authorities; coordinated planning; identification of high priority species and at-risk sites; routinely monitoring certain areas; prevention and containment efforts; surveillance, detection, and reporting activities including data collection and management; the collection, identification, and storage of voucher specimens; determining if newly-detected invasive populations are still localized; determining the relative and potential risk associated with an introduction; priority setting; sharing resources across jurisdictional boundaries; monitoring, treating and removing populations; restoring habitats; coordinated public communication efforts; training volunteers and professionals in detection, identification, and removal techniques; sharing information; and developing case studies. In addition, research, adequate staffing and funds, and effective public communication are essential to support ED&RR activities. The following identifies components of early detection, rapid assessment, and rapid response systems that experts consider either essential (i.e., must be present) or important to a system's success. Additional information is provided in the appendices.

A. EARLY DETECTION:

I. Active Detection Networks. Active detection networks are comprised of organizations that have specific responsibility to detect invasive species. Active detection networks often have limited resources. Therefore, it is important for active detection networks to be focused on high-priority targets, such as high-risk locations, high-value resources, important pathways, and populations and species of specific concern.

II. Passive Detection Networks. Passive detection networks are comprised of organizations or individuals who may fortuitously detect invasions as they conduct other activities. These “passive” networks are an important means of augmenting active detection networks.

III. Research. Research is needed to understand, monitor, and model parameters that may contribute to invasions, such as climatic conditions, ecosystem disturbance patterns, and land use changes. Baseline research is needed to determine if a species is “new” to an area and to detect changes in pathways. Scientifically sound information is essential to targeting detection programs.

IV. Training. It is important for professionals and volunteers engaged in early detection, collection, and reporting of suspect species to have sufficient training so that their efforts can support subsequent action, to reduce the frequency of inaccurate reports, and to reduce the excessive reporting of common species. The need to train

those engaged in detection and response networks and develop educational materials, trainers, and related resources is on-going.

V. Stakeholder approval. Support for ED&RR efforts by a wide-range of stakeholders is essential. The understanding and participation of stakeholders can be facilitated by working with professional societies and scientific organizations, agricultural organizations, conservation and outdoor recreation organizations, community groups, and others.

VI. Voucher specimens. It is essential for voucher specimens to be obtained and subsequent actions be based upon authoritative taxonomic identifications that meet international standards.

VII. Authoritative verification of reported invasive populations is especially important when the initial report is obtained from people with minimal technical training. Verification can be used to authoritatively determine the presence or absence of a species in an area, whether it is an initial introduction into the U.S. or the movement of previously reported species into a new area, and other essential information.

VIII. Data accessibility. It is important that reports and data concerning invasions be broadly accessible, easy to use, and exchanged among interested parties routinely. Also, see Rapid Assessment Attribute number III.

IX. Integration of various detection technologies. It is important that data obtained from the various technologies (e.g., on-the-ground observation and in-situ and remote sensors) be integrated across a range of temporal and geographic scales so that they provide coherent input into the decision making process.

X. Syndromic surveillance. Detecting the damage associated with invasive species may be the first indication of a new invasion. This is often the case with invasive pathogens and parasites. It is essential that “syndromic surveillance” be conducted to look for anomalies that may indicate an invasion before any causative species and/or agents are identified.

XI. Communication. Knowledge and skill obtained from past ED&RR efforts can guide and expedite subsequent efforts. As new ED&RR systems are developed, it is important to include current efforts and systems. There should be mechanisms for communicating with other networks to help identify gaps that may exist, research needs, and to cooperatively work together to correct deficiencies in programs.

XII. Biological shifts. Invasive species that occur over a wide geographic range are not typically subject to ED&RR actions. However, biotypes that are resistant to control measures may develop within a widely distributed species and changes in climatic conditions may increase the geographic range of a species. It is important for ED&RR systems to be developed so that such biological shifts are detected.

B. RAPID ASSESSMENT:

I. It is important to prepare **preliminary risk assessments for high priority species** in advance of their detection to facilitate rapid responses to invasions. Risk assessments should include stakeholder input, and consider appropriate legal authorities so that challenges do not unduly delay an effective response.

II. It is important to conduct **rapid risk assessments of newly detected species so that** decision-making (e.g., the decision to contain, treat, and monitor a population, monitor only, or ignore a population) can be done while populations are still localized. It is important for risk assessment to draw upon information from existing surveys and data sources whenever possible.

III. **Consistent data definitions and inter-operable formats** are essential so that summary statistics and analyses are readily available to support risk assessments. In some cases, it may be necessary to seek information from sources outside the U.S.

C. RAPID RESPONSE:

I. **Support for planning** is important because the development of ED&RR plans can be time-consuming and require a significant commitment of resources.

II. **Standing teams** with compositions that can be adjusted to meet the specific needs and circumstances of an invasion in a timely manner are essential. It is essential that Federal and State agency responsibilities and the roles and responsibilities of the officials involved be delineated clearly and understood by all.

III. **Previous training** in eradication/control methods is essential since there often is not sufficient time to train a response team following the detection of an invasion. This training may include mock exercises and emergency response training in addition to programs that provide a core competency.

IV. **Rapid response manuals** should be developed to support training programs. It is not possible for even the best-trained teams to retain all the specific knowledge needed. It is essential that they have adequate manuals and other materials. Materials should be oriented towards particular functional areas involved in the response (i.e., population containment, species removal, compensation, relevant laws and policies, public outreach planning, safety, regulatory responses, and etc.), be up-to-date, and have specific control information.

V. **Rapid response teams should set appropriate schedules for action.** Depending on the likelihood of establishment, the rate of spread, and other factors, different species and invasion scenarios will require differing schedules of response. It is important that plans contain schedules that are appropriate for the specific conditions of the invasion.

VI. It is important for certain rapidly advancing or particularly serious infestations that an **incident command system** be maintained.

VII. Dynamic rapid response plans are essential so that they can be scaled-up if needed to address cross-jurisdictional and/or rapidly advancing invasions. Some invasions may be first found along borders and/or expand rapidly and by that cross jurisdictions rapidly. Often the responsibility for rapid response will fall upon or involve Local, State, and/or Tribal governments in the affected area. At each scale of operation, it is essential that there is an adequate mobilization of resources and that individual and agency roles and responsibilities are clearly defined and that public communication efforts are coordinated.

VIII. Stakeholder input in the development of rapid response plans is essential. Responses actions will often be led by Local, State, or Tribal governments and may involve the private sector personnel, working with the support of Federal officials when requested. Effective working relationships can be fostered among groups and individuals by collaborating with them in the development of response plans.

IX. Adequate flexible and available funding is essential to mount an effective, timely and sustained response to new invasions. Invasions are often unpredictable. They can span jurisdictional boundaries, expand rapidly, and may require several years to complete. Funds may be needed for several fiscal years and may need to be shared across jurisdictional boundaries to avoid disrupted or incomplete response efforts.

X. Response efforts may impact and/or involve areas outside the current distribution of a species. **Cooperation with “non-affected areas”** is important to the success of response efforts, to lessen the chance of subsequent infestations.

XI. It is essential that those engaged in ED&RR efforts **understand and follow all relevant laws**, regulations, policies, and guidelines that may affect EDRR efforts. To prevent these legal considerations from obstructing rapid response, appropriate *de minimis* exceptions and categorical exclusions should be considered, identified or developed beforehand when planning and implementing rapid response systems.

XII. It is important that ED&RR systems work on **the concepts of "closest available forces" and "total mobility"** and be sufficiently standard so that personnel from a variety of agencies and diverse geographic locations can rapidly meld into a common management structure. This is important because experience and training obtained by individuals involved in ED&RR efforts can benefit others during subsequent events and often the availability of trained personnel may be limited.

XIII. Public Outreach. It is important to facilitate public understanding of response efforts. A coordinated public outreach effort should be a component of rapid response efforts. Authoritative balanced information should be provided early in the rapid response timeline. Response efforts may have impacts beyond the targeted species. Public understanding of the anticipated economic and ecological impacts of response actions as well as the expected benefits associated with response efforts is important to success.

Appendix 1. Examples of Elements of ED&RR Systems.

1. State agricultural agencies often engage in **priority setting** efforts to direct their active detection networks. Examples of active detection networks already in place include the: **a.** National, Regional, and State Cooperative Agricultural Pest Survey (CAPS) committees that receive funding and technical support from the Animal and Plant Health Inspection Service (APHIS) Office of Plant Protection and Quarantine (PPQ). The CAPS program surveys for targeted plant pests and weeds across the U.S. and involves State regulatory officials, the National Plant Board, and universities. **b.** The National Executive Team under the Forest Service Forest Health Protection program (FHP) provides national policy direction concerning the detection of forest pests. The FHP includes State forest health specialists, National Plant Board members, National Association of State Foresters representatives, APHIS officials, and research and management experts from the Forest Service. Pilot studies under the FHP suggested that active surveillance surveys for targeted pests using specialized methods may be necessary to detect some types of invasive species. **c.** The APHIS Animal Disease Detection Network engages in priority setting for very high risk invasive species, such as certain animal pathogens that may require specific active detection programs such as those conducted by APHIS's Veterinary Services. In addition, National Invasive Species Management Plan (Plan) action item #17 refers to the identification of high priority pathways, and Plan action item #21c concerns the systematic monitoring of locations where introductions are likely to occur (National Invasive Species Council. 2001. Meeting the Invasive Species Challenge: National Invasive Species Management Plan. 74pp. available at: www.invasivespecies.gov).

2. **Passive or fortuitous detection networks** range from relatively formal networks, such as the Federally accredited veterinarians that are required by law to report certain diseases that they might encounter in their practices, to informal volunteer reporting efforts, such as those conducted by certain native plant societies. A large number of groups and individuals could be and are involved in the passive detection of invasive species and outreach efforts to these groups can contribute to network development. Examples include: weed scientists, field botanists, The Nature Conservancy managers, native plant and wildflower society members, local, tribal, state, and federal land managers and field workers, National Wildlife Refuge System volunteers, National Resource Conservation Service RCS specialists, Cooperative Extension Service agents, county weed supervisors, land grant university plant pest/diagnostic clinics, herbarium curators, master gardeners, zoo and aquarium officials, exotic plant pest councils, civic organizations, professional crop consultants, outdoor recreation associations, conservation groups, public land friends groups, physicians, and private individuals. Often the primary "point of entry" for a member of the public that may or may not be connected with a passive detection network that has information about an invasive species will be their county Cooperative Extension Service agent or Seagrant Extension agent. The Invasive Plant Atlas of New England project, which is being led by researchers at the University of Connecticut with funding primarily from the Cooperative State Research, Education and Extension Service (CSREES), was initiated with input from FICMNEW with the goal of developing an early detection, rapid assessment, and rapid response capability in the seven northeastern states (ME, NH, VT, MA, CT, RI, and NY). In the first four years of the project, principal investigators are planning to train a team of 450 volunteers of early detectors for new invasive plants.

3. The National Interagency Fire Center uses several data sources and models to **target active surveillance** for fires. A similar approach could be used to target invasive species active detection programs. For example, the work of the National Institute for Invasive Species Science that is facilitated by USGS could, with input from FICMNEW and other groups, help detection networks know where to look for high priority invasive species. The system uses models to help guide survey and monitoring efforts for the appearance of high priority invasive species, particularly on high value conservation sites. The U.S. Geological Survey (USGS) Eros Data Center in Sioux Falls, SD, has created a system which recognizes 969 land cover types and has mapped the entire U.S. with 30 m² pixels. This system could also be used to help identify habitats where a species might pose a significant risk. The New Zealand Department of Conservation Weed Surveillance System includes a model to determine appropriate surveillance intervals at a particular site. Factors included in the model are the species arrival rate at the site, the habitat type (forest, shrubland, short vegetation, wetland, and open habitat), the species growth form, and its inherent biological capacity for reproduction and spread.

4. Numerous **training** programs and materials are available for individuals interested in invasive species. They are provided by state and federal governments, universities, exotic plant pest councils, private companies, and others. For example, the U.S. Fish and Wildlife Service (FWS) and the USGS are working to develop ED&RR training for Fish and Wildlife Refuge friends groups. Ultimately, the training will be used to train volunteers throughout the country, to detect, collect, and report suspected new invasive plants. Training materials developed for the FWS-USGS project will also be used to train 450 early detection volunteers under the Invasive Plant Atlas of New England project which is being led by researchers at the University of Connecticut.

5. An example of professional awareness raising effort is the Center for Disease Control (CDC) publication of the “Emerging Infectious Disease Journal” and “CDC Recommends.” Professional society newsletters such as the Weed Science Society of America Newsletter could alert members to new and emerging invasive species and provide a forum for providing information on invasive species issues. The Cooperative Extension Service and State departments of agriculture can also be highly effective at offering training to the general public on invasive species and assisting in professional and **stakeholder communication**.

6. Several documents indicate the importance of action being based upon **authoritative identifications** and records, including vouchering. The Integrated Taxonomic Information System (ITIS) provides a checklist and coding system for taxonomic names that facilitates identification. This need for vouchering is mentioned in the FICMNEW draft Early Warning and Rapid Response Proposal. Also, this is a central mission area for the USGS-National Nonindigenous Aquatic Species Information Center, the Smithsonian Institution and Agricultural Research Services taxonomic resources, and the National Identification Services within APHIS/PPQ Plant Health Programs. Plan action item #21a calls for compilation of lists of taxonomic expertise, which is being addressed substantially in the U.S. through the Taxonomic Resources Expertise Database.

7. An example of a **verification** effort is that which is conducted by Foreign Animal Disease Diagnosticians. They may be dispatched through the State Veterinarian’s Office or APHIS Area Veterinarian in Charge (AVIC) to investigate a report of the occurrence of certain diseases. Verification of suspected new state and national plant records is an important

element of the FICMNEW draft Early Warning and Rapid Response Proposal. APHIS/PPQ also has a system in place for exotic plant pests which are then reported into National Agricultural Pest Information System (NAPIS). Land Grant Universities can currently assist in species verification and work closely with state governments. Verification data must be linked to national databases to determine if the specimen is new to the country or just new to that state.

8. **Data**, including negative data concerning the absence of invasive species, can be used to substantiate animal/crop health claims, document ecosystem health, illuminate emerging issues, quantify successes, identify problem areas, and direct rapid response efforts. An example of routine reporting is the CDC's National Electronic Telecommunication System for Surveillance NETSS. Data from the NETSS are published weekly and are used by state or local epidemiologists to detect outbreaks. In addition, the CAPS of APHIS, the National Agricultural Pest Information System (NAPIS), the federal and state Cooperative Invasive Plant Pest Survey (CIPPS) program, the USGS's National Nonindigenous Aquatic Species Database, and the Exotic Forest Pest Information System for North America which works with Canada and Mexico under the FAO are examples of ED&RR data collection and dissemination systems. The USGS recently established the Invasive Species Information Node of the National Biological Information Infrastructure to facilitate coordination, synthesis, and reporting capabilities among the many agencies and institutions that manage data on invasive species.

9. An example of **syndromic surveillance** is the CDC Epidemic Intelligence Service that was deployed to investigate occurrences that could be linked to anthrax exposure. In addition, detection of harmful algal blooms may involve investigating reports of fish kills or seafood-related toxicity before the actual causative agent is identified. The symptoms of Sudden Oak Death Syndrome were recognized before the causative pathogen was identified.

10. Action item #49 under the Plan concerns the posting of **case studies** concerning the efforts to respond rapidly to invasive species, and the Plan indicates the importance of testing ED&RR methods (see action item #23b). For example, information about early detection, reporting, and assessment with relevance to many categories of invasive species has been developed through the Federal/State Witchweed Eradication Program (1958-current) in the eastern South Carolina and North Carolina. Early detection, rapid assessment, and rapid response to new infestations of this serious root parasite of grass crops have been important factors in reducing the total infestation of this parasitic plant from 432,000 acres in 39 counties of eastern North Carolina and South Carolina, to less than 5,000 acres, over the past 44 years.

11. Systems used to detect harmful algal blooms, oil spills, and forest fires use **several types of sensors**, observation techniques, and analysis tools. The USGS Eros Data Center in Sioux Falls, SD, has created a system which recognizes 969 land cover types and has mapped the entire United States with 30 m² pixels. This system could possibly be used to map infestations of certain invasive plants.

12. An example of a "**biological shift**" is evidence of adaptive crossbreeding or hybridization in desert salt cedar. Many U.S. salt cedars appear somewhat different from the two main species initially imported, *Tamarix chinensis* and *Tamarix ramosissima*. The U.S. plants also seem to repel many pests that effect one or the other salt cedar species in their native ranges in Asia. Evidence from DNA "fingerprinting" indicates that the most invasive U.S. specimens are hybrids (John F. Gaskin and Barbara A. Schaal, Hybrid *Tamarix* widespread in U.S.

invasion and undetected in native Asian range. Proceedings of the National Academy of Sciences. 2002. 99: 11256-11259).

13. Examples of **invasive species fact sheets** include those prepared by APHIS/PPQ and the NY Sea Grant National Aquatic Nuisance Species Clearinghouse. The APHIS/PPQ August 2002 Factsheet concerning Giant Hogweed provides a specific example. The USGS has also developed fact sheets on a number of invasive plants, animals, and wildlife diseases. Exotic pest plant councils, native plant societies, and other organizations develop “fact sheets” and other information.

14. An example of **proactive risk assessment** was the work of the Aquatic Nuisance Species Task Force (ANSTF), FWS, USGS, and APHIS in preparing a risk assessment for snakehead fish that was available before their detection in Maryland. Proactive risk assessment may include the development of general risk assessment processes, such as was done by the Risk Assessment and Management Committee of ANSTF, which can be quickly adapted to new species and pathways. It is noted in the FICMNEW draft Early Warning and Rapid Response proposal that certain species do not warrant the same response times as others and a standardized system for identifying species that should receive actions first can help prioritize programs. The New Zealand Department of Conservation uses net present value control costs (per unit area) and estimated rates of increase in biomass cover over time for assessing the impact of an incipient infestation.

15. The Safeguarding review of APHIS/PPQ and the FICMNEW Early Warning and Rapid Response Plan for Invasive Plants indicate the need for **scheduling** decisive rapid action at critical stages of an invasion. This is supported by the Council’s definition of “rapid response” which identifies the critical stage of an invasion as while the infestation is “still localized.”

16. Examples of work to make **data systems** more interoperable include the recommendations of the Safeguarding Review of APHIS concerning: VS, CAPS, -NAPIS, and CIPPS. In addition, Exotic Forest Pest Information System for North America which works with Canada and Mexico under the FAO; the CDC National Electronic Disease Surveillance System (NEDSS) that integrates the approximately 100 species-specific databases; ANSTF’s, USGS’s National Nonindigenous Aquatic Species Database in Florida; and the Information Center for the Environment Center for Spatial Technologies and Remote Sensing at UC Davis’s work to develop an invasive species cataloger and translation are examples of efforts to create and enhance interoperable systems. Also, the USGS, in cooperation with U. CA-Davis and other partners, are also leading an effort through North American Biodiversity Information Network (NABIN), and the Inter-American Biodiversity Information Network (IABIN), to develop standards to facilitate development of a network of interoperable databases on invasive species in the Western Hemisphere.

17. An example of a **fluid team structure** is the APHIS/PPQ New Pest Advisory Group (NPAG) that gathers information on new invasive species and recommends responses. The composition of a NPAG team is altered so that it is appropriate for the pest invasion being considered. In addition, the National Parks Service has several regional response teams that have a fluid make-up that can respond quickly to an invasion. The draft FICMNEW Early Warning and Rapid Response System also calls for creation of standing regional teams of weed management specialists to provide on the ground technical support for addressing new invasive plants, upon request.

18. An example of a **training program** that includes mock exercises is the APHIS/VS Regional Emergency Animal Disease Eradication Organization (READEO). Training is also a key element of the Incidence Command System approach. The CSREES is supporting early detection training in the Northeastern U.S. Similar training exercises are called for under the draft FICMNEW Early Warning and Rapid Response Plan for Invasive Plants.

19. Examples of “**functional area organization**” are the approaches taken by the APHIS/VS READEO and the “all risk” focus of the National Interagency Fire Center. Also, see the APHIS/PPQ Emergency Programs Manual that was updated in 2002. Plan action item #23d indicates the importance of preparing guides to assist rapid response teams.

20. An example of **appropriate scheduling** is the APHIS goal to respond within 48 hours of receiving information concerning a new plant pest occurrence.

21. An example of a regulatory “situation room” or **incident command system** is the Emergency Operations Center maintained by APHIS at their headquarters in Riverdale, MD.

22. An example of a “**scaleable**” **regional response system** is the National Interagency Fire Center response to a wildfire. This system can expand from a local to national effort as needed.

23. An example of a **collaborative planning** process is described by the Western Regional Panel on Aquatic Nuisance Species, 2003 Model Rapid Response Plan for Aquatic Nuisance Species, Denver, CO 82pp. This plan by the Western Regional Panel indicates that the South Carolina system provides one model of a coherent system to manage aquatic nuisance plants. The South Carolina Legislature established three interlocking entities: The Aquatic Plant Management Council; The Aquatic Plant Management Program; and the Aquatic Plant Management Trust Fund. The draft FICMNEW Early Warning and Rapid Response Plan calls for creation of state interagency weed teams and local weed management areas to plan and execute such rapid response actions. The National Contingency Plan for Response to Unusual Marine Mammal Mortality Events provides an example of regional contingency planning. Approaches in this plan could be adapted to invasive species work (see: www.nmfs.noaa.gov/prot_res/eadingrm/MMHealth/contingency.pdf).

24. An example of **funding** is the APHIS/PPQ 2003 budget proposal for a \$120 million Emerging Pest and Pathogen Line item Fund, and funding of the PPQ line item "Pest Detection" of \$27 million. Also, Plan action item #24 concerns the need for permanent funding for rapid response efforts. The U.S. Fish and Wildlife Service allocated \$2 million in its FY2003 budget proposal for ED&RR Training of Friends Groups at FWS refuges, nationwide.

25. Examples of “**non-affected area**” coordination are supportive road and trail closures in areas near wildfires that are coordinated by the National Interagency Fire Center. Similar approaches can be and are used to support of invasive species quarantine efforts. An example of engaging “at risk stakeholders” is the work of the Southeastern North Carolina Giant Salvinia Task Force. The main infestation of giant salvinia in North Carolina is a 25-acre wetland adjacent to the Northeast Cape Fear River in Pender County. The task force has enlisted support from two ‘at risk’ land owners (the Nature Conservancy and the N.C. Wildlife Resources Commission) that manage area downstream from the primary infestation which helped prevent further spread of this very serious aquatic weed from the current 25 acre infestation.

26. An example of the consideration of **legal requirements** in the ED&RR planning process is the development of NEPA guidance called for in the Plan.
27. An example of a “**common management structure**” is the responses to wildfires coordinated by the National Interagency Fire Center.

Appendix 2. Identifying ED&RR Scenarios:

It is recommended that ED&RR plans consider the potential scenarios that teams might encounter, because what should be done and by whom may depend upon the “context of the invasion.” For example, while an authoritative identification of a species is always needed (see above), the individuals and institutions involved with an aquatic species may differ from those for a terrestrial species. Therefore, habitat type (i.e., aquatic v. terrestrial) is an example of a “context category” that could be considered in anticipating scenarios ED&RR teams might encounter. One way to identify potential scenarios is to make a matrix of the “context categories” that invasions might occur in and list all possible combinations of context categories (see example below).

Examples of Context Categories:

1. **Habitat type** - aquatic or terrestrial.
2. **Accessibility** - accessible (i.e, ED&RR teams can use existing transportation systems to gain close ready access to invasive populations) or relatively remote populations.
3. **Economic Interest** - direct (i.e., is the area used directly to produce a commercial crop and by that possibly requiring compensation for lost production) or indirect, such as ecosystem function.

Arranged in all possible combinations, these three context categories yield the following list of eight scenarios. However, this is provided as an example only.

<u>Habitat</u>	<u>Accessibility</u>	<u>Economic Interest</u>	<u>Scenario Example</u>
1.Aquatic,	Remote,	Direct	open-water commercial fishing grounds
2.Aquatic,	Accessible,	Direct	aquaculture ponds, irrigation canals, potable water,
3.Terrestrial,	Remote,	Direct	open grazing land, timber sale areas
4.Terrestrial,	Accessible,	Direct	farms, animal confinement areas, orchards, homes
5.Aquatic,	Remote,	Indirect	back country lakes & streams, some recreational fishing areas, upper river reaches, marshes & swamps
6.Aquatic,	Accessible,	Indirect	urban/suburban ponds & streams, lake & near-shore marine areas
7.Terrestrial,	Remote,	Indirect	some wildland recreational areas
8. Terrestrial,	Accessible,	Indirect	backyards, urban/suburban parks, roadsides, undeveloped corporate lands, reclaimed mines.

Appendix 3. Additional Considerations:

There are several factors that would affect ED&RR actions and need to be considered by those planning and conducting ED&RR efforts.

Examples include:

- Invasive species that directly effect human health;
- Invasive species that have quarantine/trade significance;
- Invasive species that are in areas that contain threatened and endangered species;
- Invasive species which are difficult to detect or differentiate from other species;
- Invasive species that are vertebrates;
- Invasive species that are on private lands;
- Invasive species that cross Local, State, Tribal, or National borders;
- Invasive species that are very near human populations;
- Invasive species that have commercial, recreational, religious, or cultural value;
- Invasive species that have no known or legally available control technologies;
- Species that are poorly known and their invasive potential is unclear.

Appendix 4. Contributors to the General Guidelines for the Establishment and Evaluation of Invasive Species Early Detection & Rapid Response Systems, Version 1:

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