Invasive Species, Coming to America.

Figure 1. Kudzu (*Pueraria montana*) was imported from Japan in 1876 as an ornamental porch vine, and used later for erosion control throughout the South. Kudzu now infests over 7 million acres and causes over $500 million in control costs and timber losses per year. Photo by R. Westbrooks, U.S. Geological Survey.

New Strategies for Biological Protection through Prescreening, Early Warning, and Rapid Response.

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Introduction. Over the past several thousand years, humans have intentionally and accidentally moved many organisms far beyond their historical native range around the world. The majority of these species are either beneficial to human civilization or at most benign in free living populations. However, a small percentage of introduced species pose a threat to the biodiversity of natural areas and/or diminish the production capacity of managed or agricultural ecosystems. Unlike chemical pollutants that degrade in the environment over time, invasive species, now termed biological pollutants, have the ability to reproduce and spread. By moving plants and animals far beyond their native ranges, the major biogeographical realms are being blurred, and a biological Pangaea is being recreated that will have negative impacts on biodiversity.

Currently, about 3,800 species of known introduced plants (compared to a native flora of 18,000 species) have established free-living populations in North America (J. Kartesz, Biota of North America Program, UNC-Chapel Hill). These represent established exotics that have become invasive (1,450 species are recognized as agricultural weeds) or could become invasive in the future. Researchers at Cornell University have calculated the total cost of invasive species to the American economy to be in excess of $138 billion per year. Preventing the spread and establishment of invasive species throughout the world is thus a critical strategy in protecting the sustainability of agriculture and biodiversity.

Invasive Species, Coming to America. Since the breakup of the supercontinent Pangaea about 180 million years ago, North America has been geographically isolated from the rest of the world, and thus largely protected from biological invasions. However, that changed in a short time with the beginning of modern European colonization about 500 years ago, and became a serious problem with the onset of modern transportation and travel in the 20th century.

During colonial days, when global trade and travel were minimal, foreign pests, which threatened crop and livestock production, were the primary concern. Invasive species of natural areas had few pathways and opportunities to spread beyond their native ranges in other regions of the world. In those days, before natural areas were invaded by alien invasive species, there was little concern or even notice of the thousands of plant and animals that were being imported for utilitarian purposes such as game fishing (carp), soil erosion [kudzu (*Pueraria montana*)] (Figure 1), windbreaks [Russian olive (*Eleagnus angustifolia*)], medicinal herbs (purple loosestrife (*Lythrum salicaria*)], and for ornamental use [salt cedar (*Tamarix chinensis*)]. In fact, such introductions were widely encouraged. While many of these introductions remain beneficial today, some of them have become invasive and pose a threat to many of our remaining natural and conservation areas….. Areas that have been reduced to 'islands' in a sea of disturbance.

Development of New National Strategies for Addressing Invasive Species. In 1997, the national Office of Science and Technology Policy, in response to a petition from over 500 scientists in the United States and abroad, directed the departments of Interior, Agriculture, and Commerce to establish a working group to make recommendations for improving the federal government's ability to address the invasive species issue. As a result of these ongoing deliberations, a national campaign against invasive species was initiated. Eight major goals of the campaign include:

1) development of an executive order to update the government's position on invasive species (signed by President Clinton, February 3, 1999);
2) establishment of a National Invasive Alien Species Council to provide direction and oversight to federal agencies in fulfilling their roles and responsibilities for invasive species (established in June, 2000);
3) increased interagency cooperation at the local, state, and regional levels;
4) increased federal funding to address emerging invasive species problems;
5) evaluation of present federal laws and regulations on invasive species;
6) development of a national management plan for invasive species (adopted by the National Council in January, 2001);
7) increased efforts to raise public awareness and understanding of the invasive species problem; and,
8) increased international cooperation on invasive species issues. Interagency initiatives that are recommended by the National, Regional, and State Councils will be coordinated by interagency task forces such as the Aquatic Nuisance Species Task Force and the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW).

Prohibited Lists – The Heart of the Current U.S. Crop Protection System. The current U.S. federal/state agricultural protection system was developed in the late 1800s and early 1900s in response to outbreaks of plants and animal pests such as foot and mouth disease, Mediterranean fruitfly (*Ceratitis capitata*), and gypsy moth (*Lymantria dispar*). The current system includes programs that form two lines of defense against invasion through:

1. **Exclusion of Foreign Agricultural Pests**
   A. Production of pest free commodities in exporting countries (e.g., disease free beef)
   B. Pre-clearance at ports of export
   C. Inspection and clearance at ports of entry
2. **Early Warning and Rapid Response to Domestic Outbreaks.**
   A. Early Detection
   B. Rapid Assessment
   C. Rapid Response

On the surface, it would seem that this system could provide protection against invasion by all types of invasive species. However, in reality, the system was set up to facilitate trade by protecting American agriculture from invasion by high profile, devastating plant and animals pests and diseases. For decades, alien pests of concern have been assessed for invasiveness and prohibited introduction into the U.S. under a menagerie of federal laws. In 2000, most of these laws were superseded by the omnibus Federal Plant Protection Act. While the new Plant Protection Act provides equal authority for regulation of all types of invasive species, including invasive plants, the decision to assess a candidate species to determine whether it should be regulated is still optional in most cases. As a result, most species that are imported into the United States are still not being assessed for invasiveness – in general, the system does not require it. (The exception to this is new fruits and vegetables, which must be assessed under Quarantine 56 for invasiveness prior to importation).

The current system generally works fine to protect monocultural agricultural production systems from *known* foreign pests. However, in order for the nation to effectively meet the challenge it faces with invasive species in all types of environments, scientific evidence is persuasive that new approaches for preventing introduction, establishment, and spread of invasive species are needed.

Prescreening – A Regulatory Yield Sign Needed to Slow the Global Movement and Spread of Invasive Species. Based on past experience in Hawaii and New Zealand, it is has been concluded that a very low percentage of all introduced plants will become invasive in a new area over time. Since intentionally introduced species represent a very high percentage of all species that become invasive, mandatory prescreening of all proposed plants and animals is the only sure way to potential invaders before they are imported into the United States.

In theory and practice, there is nothing inherently wrong with the assessment tools being used in the current federal prohibited list system. However, in order to identify all potential new invaders that are being imported, <u>all</u> proposed species should be assessed for invasiveness and to determine whether they should be regulated. The very successful Australian Weed Risk Assessment System has demonstrated the viability of this approach, and could serve as a model in developing a similar system in the United States.

For continuity with the current U.S. plant regulatory system, the proposed prescreening system could continue to focus on 'prohibited' species. However, unlike the present federal system, which only assesses a small percentage of proposed species for invasiveness, the new system would assess all proposed species to determine whether they should be prohibited entry[1], regulated entry[2], permitted entry[3], or placed on a National Invasive Plant Watch List[4].

Under this proposed system, as in the past, species found to be invasive that are absent from, or occur in a limited percentage of, their potential ecological range within the U.S., would be formally listed under the Plant Protection Act of 2000 and prohibited entry except under permit from USDA APHIS. Following current international rules under the International Plant Protection Convention, proposed species found to be invasive that

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1 **Prohibited species** would be officially listed, highly destructive species (absent from or occupying a small percentage of their potential ecological range in the U.S.) with no commercial or recreational use that would cause great harm to native ecosystems or agriculture if released into the wild.

2 **Regulated species** would be officially listed species (absent from or occupying a small percentage of their potential ecological range in the U.S.) that have some beneficial commercial or recreational use, but would become invasive unless regulated.

3 **Permitted (approved) species** would be placed on an informal list for future reference.

4 **Species of ecological concern** that are not prohibited or regulated could be placed on a National Invasive Plant Watch List.

already occur in a large percentage of their potential ecological range in the U.S. (either in trade or in free living populations) would not be formally listed. However, if appropriate, such species could be placed on a National Invasive Plant Watch List (non-regulatory), to *discourage* further artificial spread (see Diagram 1). Kudzu, which is obviously a serious invader in the southern U.S., would not be officially prohibited entry under this approach because it does not meet the traditional definition of a 'quarantine significant pest' – it is simply too widespread to regulate. However, it could definitely be placed on a National Watch List to discourage further importations. New introductions of kudzu from different parts of its native range could hybridize with populations here and create more invasive biotypes, such as cold tolerant biotypes in the Northeast. Development of a new land conservation ethic that is based on the need to conserve and preserve biodiversity would be a philosophical cornerstone of this regulatory/non-regulatory based biological protection System.

At the state level, where enforcement is typically conducted at the point of sale, it makes sense to combine the traditional prohibited listing system with a formal permitted listing approach. Under this approach, all species proposed for importation into a state would fall into one of the following regulatory categories:

1) *Prohibited non-native species* (highly destructive species which may not be possessed, imported, purchased, sold, propagated, transported, or introduced except under permit issued by an appropriate agency);
2) *Regulated non-native species* (species that have some beneficial commercial or recreational use, and would become invasive unless regulated);
3) *Unregulated (permitted) non-native species* (species which have been reviewed by an appropriate agency and have been determined to present a low risk of becoming invasive, or is an invasive species that is currently present and beyond control).
4) *Unlisted non-native species* (species that have not been reviewed and classified by and appropriate agency and thus may not be possessed, imported, purchases, sold, propagated, transported or introduced into the state).

New Approaches for Early Warning and Rapid Response to New Invasive Plants.

Under the current crop protection system, federal and state plant regulatory agencies work to protect the nation from economically important plant and animal pests and diseases. However, due to a lack of resources and organized constituencies, new invasive plants (both agricultural weeds and invasive plants of natural areas) are seldom addressed on public or private land until populations become widespread and prevention/eradication becomes impractical. The recent appearance of the Brazilian floating fern giant salvinia (*Salvinia molesta*) in 30+ water bodies in nine states, is a notable example of the problem, and has highlighted the serious need for a new and systematic approach for addressing new invasive species, and, in particular, invasive

plants (Figure 2). With this in mind, the Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW) hosted a workshop in Ft. Collins, Colorado, in June, 2000, on creating a National Early Warning and Rapid Response System for Invasive Plants. Subsequently, the proceedings of the workshop were posted on the FICMNEW Home Page. During 2001, an Early Warning/Rapid Response Action Plan was developed that closely follows major recommendations that were developed at the workshop, as well as relevant recommendations under the National Invasive Species Management Plan, which was approved by the National Invasive Species Council in January 2001. Refer to **Diagram 1, Diagram 2A, Diagram 2B, and Diagram 2C,** for an outline of system elements and how information is expected to flow in the system.

The overall purpose of the National Early Warning and Rapid Response System will be to provide a coordinated framework of public and private partners at the local, state, regional, and national levels to more effectively address new invasive plants through:

- Early detection and reporting of suspected new plants to appropriate officials
- Identification and vouchering of submitted specimens by designated botanists
- Verification of suspected new state, regional, and national plant records
- Archival of new records in designated regional and plant databases
- Rapid assessment of confirmed new records
- Rapid response to new records that are determined to be invasive.

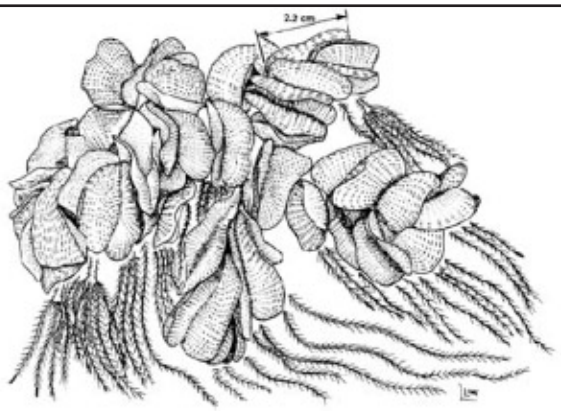

Figure 2. Giant Salvinia (*Salvinia molesta*), a floating fern from Brazil that is widely regarded as one of the worst aquatic weeds in the world, now occurs in at least 30 water bodies in nine states in the U.S.A. (Illustration courtesy of the Center for Aquatic and Invasive Plants, University of Florida).

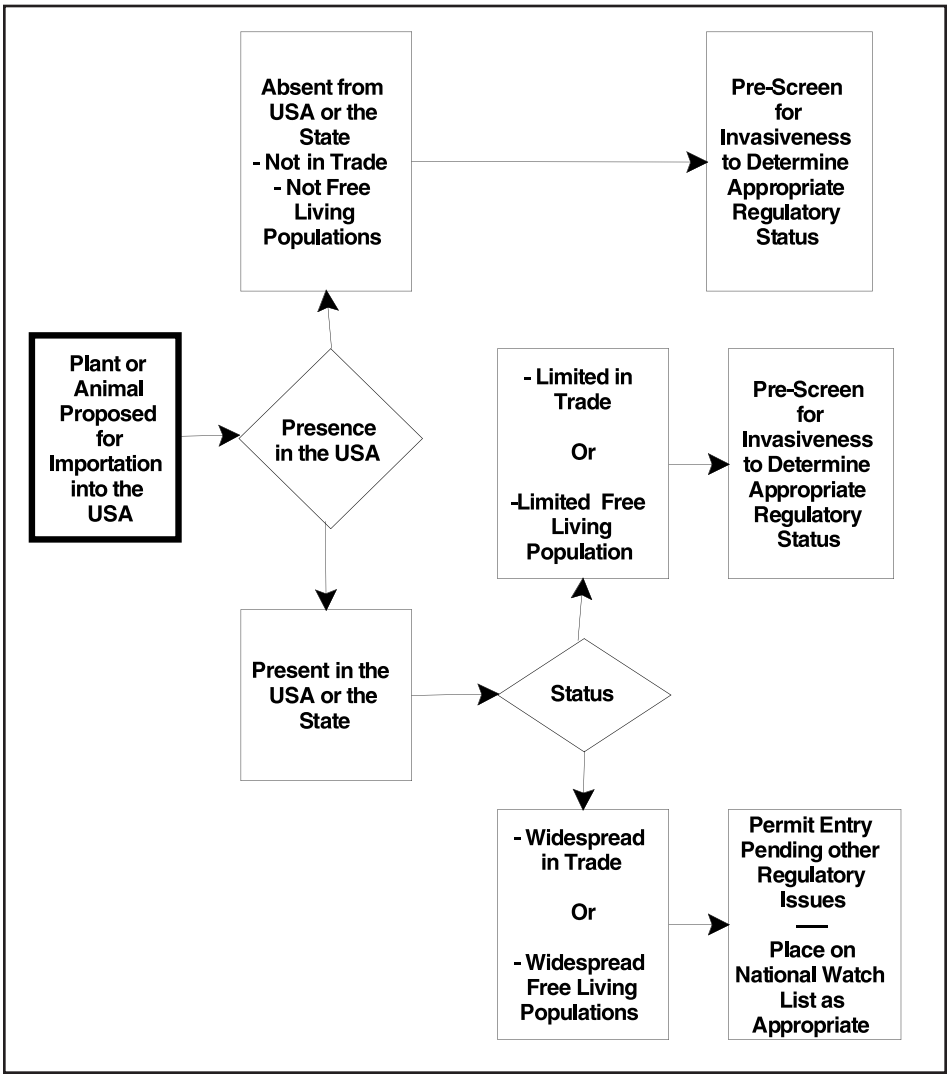

Diagram 1. Proposed system for prescreening of imported plants and animals.

Once fully implemented across the United States, the proposed early warning and rapid response system would provide an important second line of defense against invasive plants, that would work in concert with federal efforts to prevent unwanted introductions at the ports of entry (the first line of defense). With both systems in place, the nation would be better able to defend against future economic and environmental losses due to "plants out of place."

Conclusions. Based on existing scientific knowledge, we should have serious concerns about allowing importation of certain species that are well established and invasive in one part of the U.S. for which assessments show that they could become established in other regions of the country. The notion that once a species becomes a problem in a particular part of the country, it may be freely imported and used ANYWHERE in the U.S. because it is too widespread to regulate makes no sense ecologically. Also, importation of a species from throughout its native

Diagram 2A. National Early Warning and Rapid Response System for Invasive Plants. Early Detection, Reporting, Identification, Vouchering, and Verification.

range (as well as other areas where it has become invasive) risks genetic "enrichment" of the species in the U.S., thus increasing the risk to native biota. While many exotic invasive species in the U.S. are widespread and technically beyond the scope of our current federal/state plant regulatory system, *their use should be strongly and officially discouraged* (based on scientific criteria).

In order to effectively address new environmental invaders that have no obvious political constituency, we need to develop a science based Biological Protection System for more effectively preventing the introduction, establishment and spread of invasive species in natural and managed areas of the United States. To accomplish this, we need to:

A. Prescreen all new plants and animals proposed for importation into the United States, to determine if they should be prohibited, regulated, or permitted entry at the federal and/or state level, or placed on a National Watch List.
B. Develop a National Early Warning and Rapid Response System for Invasive Species.
C. Create new local, state, and regional interagency partnerships to rapidly assess and respond to new invaders.

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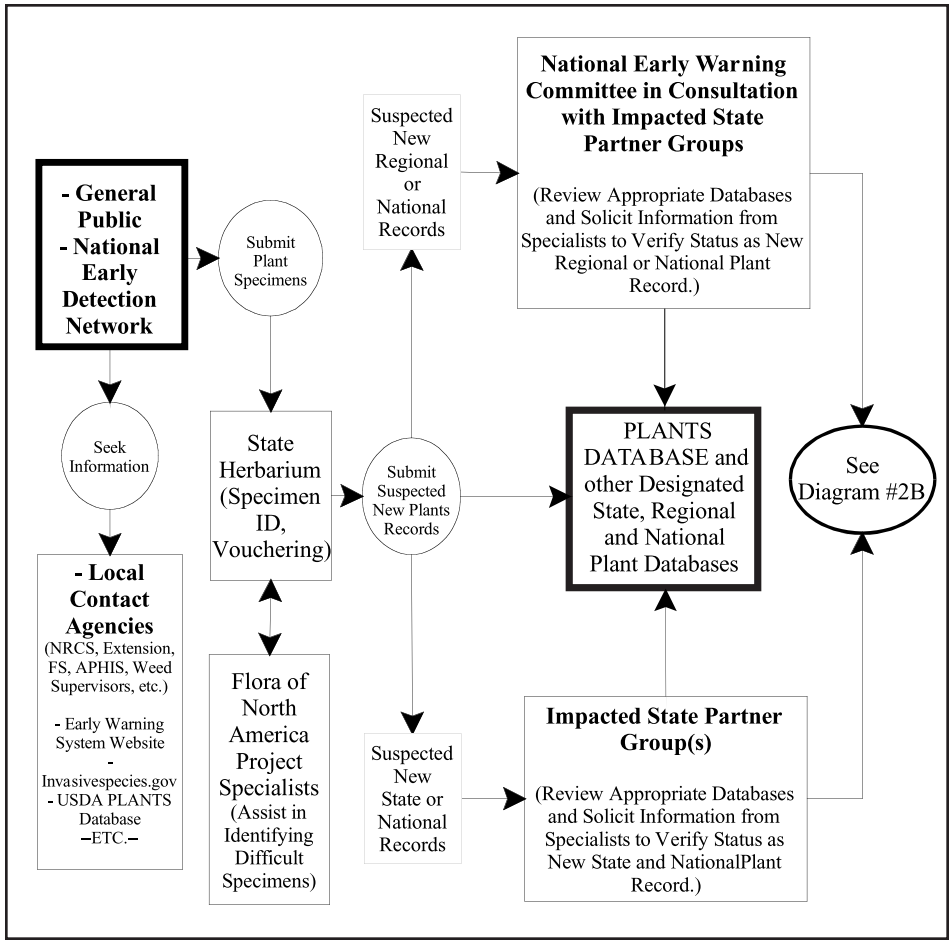


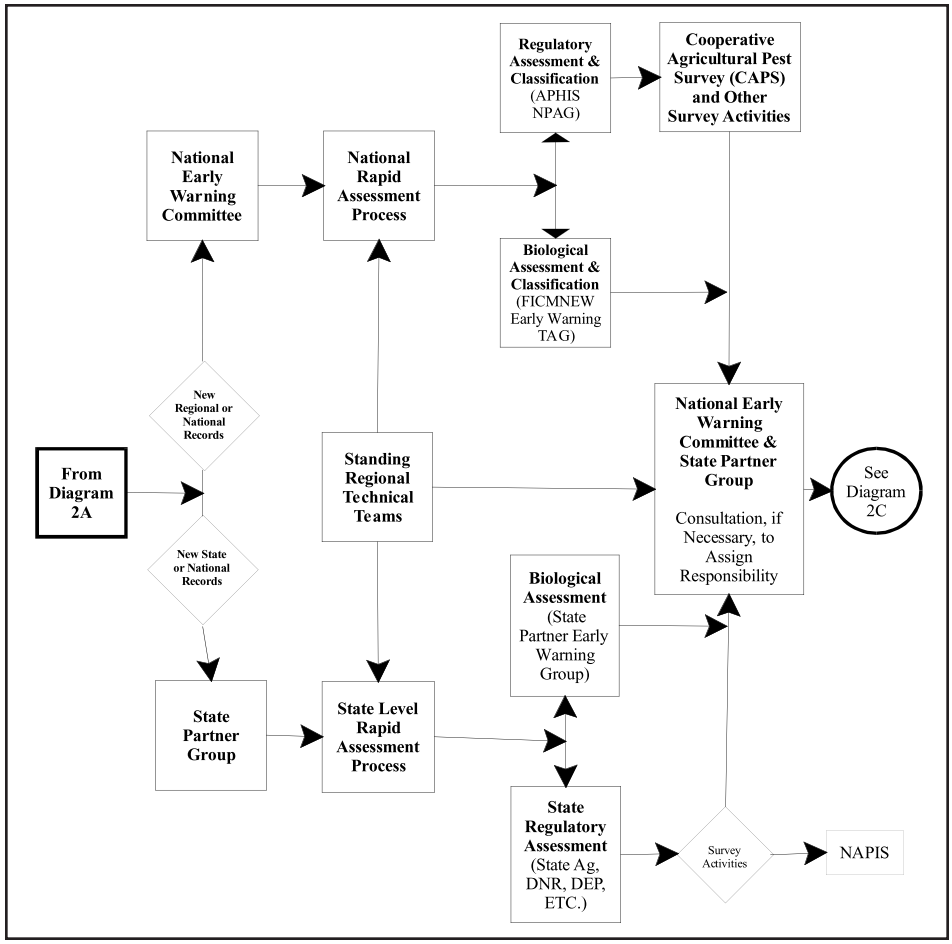
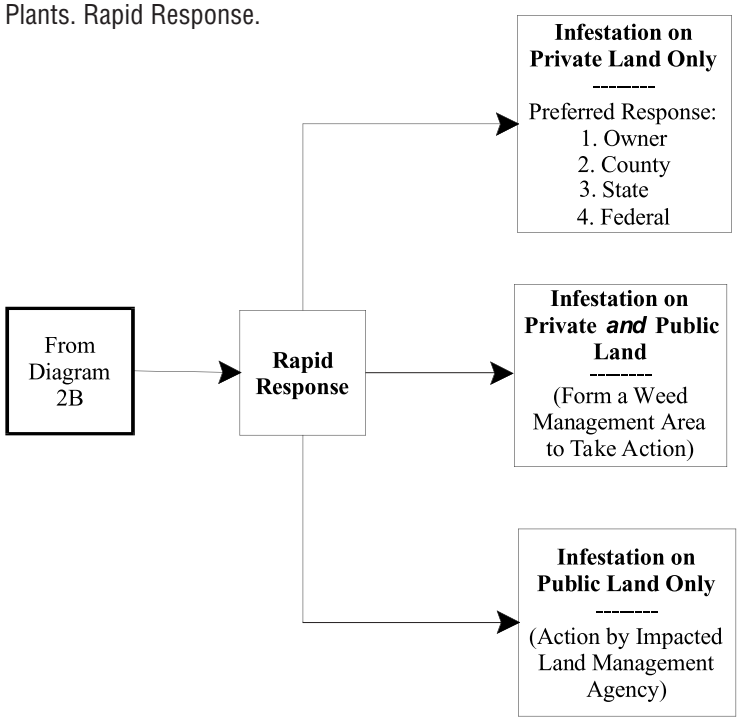


Diagram 2B. National Early Warning and Rapid Response System for Invasive Plants. Rapid Assessment.

Diagram 2C. National Early Warning and Rapid Response System for Invasive Plants. Rapid Response.



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