In natural (e.g. forestry) and human-created (e.g. agriculture) ecosystems the rapid spread of any damaging organism can result in pest control, forest health, nature protection, public health and even economic issues, especially when an alien invasive species enters the system. The following definitions are widely accepted to describe biological invasions: 

Non-native (alien) species: a species appearing in an area where previously it was not present. Introduced species: a non-native species: which is introduced (either intentionally or accidentally) to the area by humans. Invasive species: any species, including its seeds, eggs, spores, or other biological material capable of propagating that species, that is not native to that ecosystem, the introduction of which does or is likely to cause economic or environmental harm or harm to human health. We consider as invasive any living organism, which spreads rapidly, is able to establish a population in foreign areas and has an impact on the local ecosystem. Most invasive species have been introduced by humans, but species which spread independently can also become invasive. It is also important to emphasize that not every newcomer species becomes invasive. The ecological, economic, and public health damage caused by species which have become invasive after introduction is growing every year. Protection against alien invasive species pest is now the biggest problem in pest control. Nowadays, policies of globalization, especially increasing intercontinental trade, widening of travel possibilities and climate change are the major factors accelerating the introduction and establishment of alien species. Our aim should be to at least slow the increases in numbers of introduced species and their establishment by the adoption of strict control measures.

Example 1. The emerald ash borer (EAB, Agrilus planipennis) is an invasive buprestid beetle native to Asia (Northeast China, Korea, and Far-East Russia). Symptoms of attack include frass-filled, S-shaped larval galleries in the cambium (A, B). D-shaped adult exit holes, yellowing and thinning of foliage, death of branches, dieback and tree mortality. Specific characteristics for discriminating EAB (C) from other native Agrilus species include: 1. No patches of subcercuscence. 2. Pronotum coppper/green. 3. Elytra and abdominal sternites emerald green; note that indistinction is not easy even for specialists. (Photos: S. Katovich – A; Pennsylvania Dep. of Conservation and Natural Resources - B; D. Cappaert - C).

Example 2. The fungus causing ash dieback was first described in 2006 as Chalara fraxinea. Four years later it was shown that Chalara fraxinea was the asexaul (anamorphic) stage of a fungus that was subsequently named Hymenoscyphus pseudobasidiatus. Initially, necrotic spots appear on the foliage but enlarge rapidly, leading to withering of the leaves (B). The fungus grows from infected leaves into twigs and branches, where extending, perennial cankers are formed (A). Girdling of branches leads to dieback of the crown (below the bark, necrotic lesions frequently extend into the xylem (C)). (Photos: A. Kirtica – A,B,C).

Example 3. The chestnut gall wasp, Dryocosmus kuriphilus (A) attacks Castanea crenata (Japanese chestnut), Castanea dentata (American chestnut), Castanea mollissima (Chinese chestnut) and Castanea satsiva (European chestnut) and their hybrids. Castanea species are native to Asia, but have been introduced to several countries in Europe and to North-America. Galls are unilocular or multilocular (B,C), 5–20 mm in diameter, green or rose-coloured, often including portions of developing leaves, stems and pedicles. They develop on young twigs, on leaf pedicles or on the middle of the leaves. After adult emergence, the gall dries, becomes wood-like, and remains attached to the tree for up to two years. (Photos: G. Czoka – A; B; F. Stergulc - C).

Example 4. Many species in the genus Phytophthora are plant pathogens of considerable economic importance. Research beginning in the 1990s has placed some of the responsibility for European forest die-back on the activity of introduced Phytophthora, many of which are of Asian origin. Some of the most important Phytophthora diseases for forests are: 
- Phytophthora ramorum (A) – infects over 60 plant genera and over 100 host species; causes Sudden Oak Death and Sudden Larch Death.
- Phytophthora palmivora (B) – highly aggressive to roots and stems of beech; 
- Phytophthora spp. (C) – causes bleeding canker in hardwood trees. 

Example 5. The Pine Wood Nematode (PWN, Bursaphelenchus xylophilus) infects various pine trees. The species is native to North America where it inhabits dead pine trees. It has been introduced to Asia and Europe, where it causes pine wilt disease, a sudden decline of pines and other conifers. The most evident symptoms are a general decline of the whole crown, yellowing of needles, and finally the death of the tree (A). B. xylophilus is transmitted by long-horned beetle vectors in the genus Monochamus. Beetles are 15 to 30 mm long, brownish colored with typical yellow patterns on the elytra (B). Larvae have soft, elongated bodies (C). Insect development starts in dying or freshly cut trees affected by PWN, where the nematodes can intrude under the elytra of developing adults and emerge afterwards on a healthy tree, where the young beetles are making regeneration feeding. (Photos: USDA Forest Service – A; F. Lakatos – B; A. Herbert - C).

Example 6. The fungus Mycosphaerella dearnessii appears to be of North American origin and has spread to other continents, the first report in Europe was in 1978 but some forest pathologists have claimed that it was already present in a number of countries, for example Austria, France, Germany and Switzerland. On Pinus sylvestris symptoms initially appear in August-September on older needles (A,B) as yellow, resin-soaked spots, approximately 3 mm in diameter, which later become dark-brown in the centre with a prominent yellowish-orange border (C). These lesions coalesce and infected needles typically dieback; eventually the whole needle turns brown and falls prematurely in late autumn to early winter. Over several years, this may result in branch and tree death. (Photos: Minnesota Dept. of Natural Resources Archive - A, D. Skilling - B; H. Evans - C).