AGENTURA OCHRANY PŘÍRODY
A KRAJINY ČESKÉ REPUBLIKY

NATURE AND LANDSCAPE MANAGEMENT STANDARDS

SELECTED TERRESTRIAL HABITATS MANAGEMENT	**MANAGEMENT OF SELECTED ALIEN PLANT SPECIES**	**SPPK D02 007:2015**
SERIES D		

Management of selected alien plant species
Entfernung von ausgewählten gebietsfremden Pflanzenarten

This standard is designed to define eradication management of selected alien plant species and reducing their spreading (not only) in protected areas.

References:

Jongepierová I. & Poková H. (2006): Grassland restoration by means of regional seed mixture [Obnova travních porostů regionální směsí]. Handbook for nature conservation and agricultural practice. ZO ČSOP Bílé Karpaty, Veselí nad Moravou, 104 pp.
Mládek J., Pavlů V., Hejcman M. & Gaisler J. (eds.) (2006): Grazing as a grassland management tool in protected areas [Pastva jako prostředek údržby trvalých travních porostů v chráněných územích]. Handbook for nature conservation and agricultural practice. Crop Research Institute, Prague,104 pp.
Pergl et al. (2013): Návrh seznamů nepůvodních druhů vyžadujících zvláštní přístup (černý, šedý a varovný seznam) [Alien species in the Czech Republic; black and grey lists with recommended management actions for the state authorities]. http://invaznidruhy.nature.cz/res/archive/151/019808.pdf?seek=1391611202
Pergl et al. (2016): Black, Grey and Watch Lists of alien species in the Czech Republic based on environmental impacts and management strategy. – NeoBiota 28: 1 – 37.
Šíma J. (2008): Právní úprava problematiky nepůvodních druhů rostlin v České republice a ve světě [Legislation related to non-native species in the Czech Republic and the world]. – Zpr. Čes. Bot. Společ. 43, Mater. 23: 213–218
Act no. 114/1992 Coll. on Nature and Landscape Protection, as amended
Act no. 128/2000 Coll. on Municipalities (the Municipal Order), as amended
Act no. 326/2004 Coll. on Phytosanitary Care, as amended
Act no. 254/2001 Coll., the Water Act, as amended
Act no. 289/1995 Coll., Act on Forestry, as amended
Act no. 334/1992 Coll. on the conservation of agricultural land resources, as amended
Act no. 78/2004 Coll. on the use of genetically modified organisms and genetic products, as amended
Act no. 350/2011 Coll. on chemical substances and mixtures (The Chemical Act), as amended
Decree no. 215/2008 Coll. on measures against the introduction of organisms harmful to plants and plant products and against their spread, as amended
Decree no. 327/2012 Coll. on the Protection of Honeybees, Wildlife, Aquatic Organisms and Non-Target Organisms by Application of Plant Protection Products
Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species

Standard development:
Developed for the NCA CR by the Institute of Botany of the Czech Academy of Sciences, Průhonice, in 2014
Second reader institution:
Doc. Ing. Kateřina Berchová, Ph.D., Faculty of Environmental Sciences, Czech University of Life Sciences Prague
Authorial collective:
Ing. Jan Pergl, Ph.D. (coordinator), Ing. Irena Perglová PhD., RNDr. Michaela Vítková PhD., RNDr. Lenka Pocová, Ing. Tomáš Janata, Ing. Jan Šíma

Documentation for standard development is available in the library of NCA CR.

Standard approved by

RNDr. František Pelc
Director of NCA CR

Table of contents

1 Standard purpose and contents

The standard „Management of selected alien plant species“ describes selected invasive and non-indigenous species, situations when suitable management should be realized and control methods which lead to eradication or reduction of their impact on autochtonous species and ecosystems. It defines the purpose and content of invasive and non-indigenous species management in various biotopes. The standard follows the species classification published in the study "*Alien species in the Czech Republic; black and grey lists with recommended management actions for the state authorities*". This study was developed and updated in the Pergl et al. (2015) *Black, Grey and Watch Lists of alien species in the Czech Republic based on environmental impacts and management strategy*; NeoBiota 28 (hereinafter *Blacklist CZ*). The classification of invasive species is based on following criteria: impact on the environment (impact on ecosystems and socio-economic impact), current state of population status and dynamics of invasion type of invaded habitat and eradication and management possibilities. Species in *Blacklist CZ* are grouped into Black, Grey and Watch list. Black list is also divided into three subgroups. This grouping is based on risk of invasions connected with distribution rate and recommended management strategy. This standard is focused on species listed in Black list. Methods and procedures mentioned in this standard are possible to apply also to another non-indigenous or expansive species which are not listed in Black list. It depends on specific and current situation.

Legal framework

Regulation (EU) No 1143/2014 of the European Parliament and of the Council of 22 October 2014 on the prevention and management of the introduction and spread of invasive alien species provides for a set of measures to be taken across the EU in relation to invasive alien species included on a list of Invasive Alien Species of Union concern. For these species establishes strict restrictions (no keeping, breeding, transport to, from or within the EU, place on the market and released into the environment) and member state responsibility for their monitoring, regulation and potential eradication.

Act no. 114/1992 Coll. on Nature and Landscape Protection, as amended, deals with non-indigenous species in Section 5 (4) - an intentional dispersion of geographically non-indigenous plant or animal species into the landscape shall be possible only with a permission of a nature protection authority. Stricter mode is established for specially protected areas (national parks, protected landscape areas, (national) natural reserves). For active management and regulation of invasive species, Sections 68 and 69 could be also used.

Act no. 326/2004 Coll. on Phytosanitary Care, as amended, deals with invasive harmful species in connection with agriculture. All subjects working with plant products should monitor the occurrence of invasive harmful species. The act defines the role of the State Phytosanitary Administration (since 2015 Central Institute for Supervising and Testing in Agriculture) – this institute monitores and researches harmful and invasive harmful organisms specified in **Decree No. 215/2008 Coll.** on measures against the introduction of organisms harmful to plants and plant products and against their spread, as amended, if they represent a risk to other plant species.

Act no. 289/1995 Coll. Act on Forestry, as amended, describes that forest owners are obliged to prevent the development, spread and infestation of harmful organisms, which reduce production and non-production functions of forests.

Act no. 334/1992 Coll. on the Conservation of Agricultural Land Resources, as amended, adjusts the province of agricultural land resources conservation authorities (municipality with transfered powers, municipalities with extended powers, regional offices, national parks administrations and Ministry of the Environment).

Act no. 254/2001 Coll. Water Act**,** as amended**,** primarily doesn't solve the protection against invasive species but this act is important in case of chemical eradication of these species. It describes treatment and using of dangerous compounds in connection with groundwater and surface water contamination.

Act no. 128/2000 Coll. on Municipalities (the Municipal Order), as amended. In case of invasive species management is this act used only by defining general binding decrees and imposing fines.

Act no. 78/2004 Coll. on the Use of Genetically Modified Organisms and Genetic Products, as amended determines the release of genetically modified organisms into the environment and risk assessment of these species.

Decree no. 327/2012 Coll. on the Protection of Honeybees, Wildlife, Aquatic Organisms and Non-Target Organisms by Application of Plant Protection Products, determines the management of agents which are marked as dangerous for honeybees, terrestrial vertebrates and water organisms.

2 General instructions for management of all unwanted plant species

2.1 Monitoring and mapping of target species and endangered habitats has to be taken before eradication, including locality owner's identification and protective conditions of these areas.

2.2 Management priorities have to be set with regard to invaded area character, particular invasive species and available financial sources. It is impossible to eradicate all invasive alien species in the Czech Republic - and also this is not the purpose of nature protection strategy. Management priorities are: naturally valuable areas (specially protected areas, terrestrial systems of ecological stability and localities with the occurrence of specially protected and endangered species) and selected risk species (e. g. with impact on human health). It it essential to cooperate with area owners and administrators during management activities.

2.3 Depending on invaded area character (cities, suburbs and nature ecosystems) some invasive species could be partially accepted and their impact is limited by changes in area management. Some plantings of these species in city parks are acceptable because historical or cultural aspects can prevail. Therefore black locust or other exotic species are planted in cities. Risk of spreading along roads, rivers and with contamined soil has to be taken into consideration.

2.4 It is important to pay attention to species used in forestry, agriculture (incl. energy crops) and biological recultivations. The attention should be given to the ending of these plantations.

2.5 In forestry, forest management plans (FMP) should be modified in order to gradual replacement of non-indigenous woody species by autochtonous ones.

2.6 Management activities have to allow for local limitations of selected control methods. Invasive plant management has to be set with respect to area character and particular invasive species in order to prevent environment damaging. Mechanical methods are used especially in the following cases: protection of water sources, natural medicinal sources, protective conditions of protected areas and in ecological farming. In addition, agricultural areas come under subsidy rules GAEC No. 7 (related to giant hogweed and Himalayan balsam). In other cases, selective herbicides are recommended and preferred. Non-selective herbicides are suitable for small areas, for individual plant treatment and in cases where using of selective herbicides is ineffective. Non-selective herbicides could be also used if some nature conservation authorities submit an application for use.

2.7 Changing of field crops is relatively undemanding manner of limiting some invasive plants (mostly weeds) in agricultural areas. Sometimes, this procedure is the only way of limitation - e. g. common ragweed and sunflower are taxonomically related and application of herbicides is impossible.

2.8 Local bans and limitations have to be respected, e. g. no biocides application in National Parks, 1. and 2. zones of Protected Landscape Areas, in (National) Nature Reserves, protective zones of water resources and along watercourses.

2.9 Species which reproduce by seeds or other easily portable particules have to be eradicated systematically. Firstly, species from upper parts of river basin should be removed and then movement along watercourse will follow. Remote areas should be

preferred. Species which reproduce vegetatively (knotweeds, goldenrods) have to be monitored, the same as localities influenced by soil transfer.

2.10 The whole vegetation cover has to be eliminated to prevent regeneration from remaining individuals (typically area borders).

2.11 It is necessary to provide management of area borders and areas with unclear boundaries.

2.12 Areas with disturbed ground cover should be treated e. g. by seeding of suitable grass species (see the standard SPPK D02 001 RESTORATION OF GRASSLANDS USING REGIONAL SEED MIXTURES) and thus prevent colonization of other unwanted species.

2.13 Monitoring of performed eradication (efficiency, financial costs) has to include checking of 1) management activities progress, 2) methodology observing and 3) time schedule. The eradication efficiency has to be monitored for several years after elimination and if it's necessary, eradication has to be repeated.

2.14 All field workers have to follow occupational health and safety principles (recommended protective clothes and tools) during management activities. They also have to respect laws and directives connected with eradication areas and activities.

2.15 Requirements of all area owners and administrators have to be respected during control activities.

3 Principles of management technology

3.1 Mechanical control

3.1.1 Mechanical control – except hand-pulling or digging – doesn't frequently result in plants eradication even if applied within several years. Only annual species could be eradicated by these methods (e. g. Himalayan balsam).

3.1.2 In case of large areas of invasive plants vegetation where herbicides application is financially inacceptable, mechanical control could be suitable solution of seedbank reduction.

3.1.3 Plants which reproduce by seeds have to be eliminated no later than in flowering period. This eradication should be carried out before fruit production. During manipulation with removed biomass, the spreading of these particules could occur. Grazing and girdling have to be performed earlier.

3.1.4 Vegetatively reproduced species and species with good regeneration skills could spread with removed biomass or contaminated soil during mechanical control. Thus, it is necessary to be careful and to minimize biomass waste transfer.

3.1.5 Species with good sprouting capacity (e. g. black locust) is necessary to eliminate by combination of mechanical and chemical control – depending on site conditions.

3.1.6 Mechanical control is the only one possibility how to eliminate invasive plants in ecological farming areas, in protective zones of water resources and in the first and second zones of Protected Landscape Areas (see 2.8). It is possible to apply for herbicide ban dispensation in serious cases.

3.1.7 *Grazing*

3.1.7.1 Grazing is most frequently used in extensive areas. By itself, grazing will rarely, if ever, completely eradicate invasive plants. It decreases their spreading and severe infestations can be reduced.

3.1.7.2 Grazing could be carried out after herbicide application, not until than protective period of herbicide effect expires.

3.1.7.3 Grazing characteristics of animals and their weight have to be taken into account during management planning. Grazing intensity should be set according to area carrying capacity as a prevention of pasture degradation and vegetation cover damage.

3.1.7.4 Grazing management has to begin no later than plants and sprouts start to lignify or produce seeds.

3.1.7.5 It is important to focus on non-grazed sites and area edges. If necessary, additional management activities should by carried out.

3.1.7.6 Some invasive plants could be toxic for animals (e. g. common milkweed (*Asclepias syriaca)*, black cherry (*Prunus serotina)* for ruminants, black locust (*Robinia pseudoacacia*) for horses). Animals could have problems with photosensitive plants like giant hogweed (*Heracleum mantegazzianum*).

3.1.7.7 Grazing management focused on particular invasive plants has to be precisely planned (grazing period, herd size, animal species). Grazing management has to be applied repeatedly for several years. One-time grazing activity is not recommended due to its minimal effect on invasive plants growth.

3.1.7.8 Regular grazing management in grasslands also limits the expansion of some autochtonous grasses, especially tall oatgrass (*Arrhenatherum elatius*), couch grass (*Elytrigia repens*) and wood small-reed (*Calamagrostis epigejos*) and thus facilitates the recurrence of other autochtonous associations.

3.1.8 *Mowing*

3.1.8.1 Timing of management activities is crucial. Early eradication leads to species regeneration and seeds production. As soon as seeds are produced, it is too late to carry out this type of management.

3.1.8.2 Perrenial herbaceous plants should be mowed several times per year. This mowing should be carried out as low (close to the ground) as possible.

3.1.8.3 Particular species (e. g. common ragweed (*Ambrosia artemisiifolia*), should be monitored after mowing. They are able to create rosettes near the soil. These structures enable to survive also after repetitive mowing.

3.1.8.4 Hardly accessible areas could be mowed by scythes, machetes or brush cutters – it depends on cover characteristics.

3.1.9 *Pulling / digging*

3.1.9.1 This method is suitable both for annual species (*Impatiens* spp.) and for perrenial ones (*Solidago* spp.). Annual species have shallow and rather small root system so that pulling and digging could be highly effective. Perrenial species could be pulled or dug only if they occur in limited quantities.

3.1.9.2 Pulling and digging are not recommended for species with high regeneration and sprouting capacity (e.g. *Reynoutria* spp., see 4.2.4.7). Risk of subsequent spreading is too high.

3.1.9.3 Be carefull during elimination and manipulation with removed biomass. New infestation might return also from dead or nearly dead plants.

3.1.9.4 Disposed biomass of some species (e. g. Himalayan balsam) could be leaved on site. This is possible only in cases when seeds of these removed plants are not able to germinate (eradication before flowering). Resprouting from roots has to be prevented as well.

3.1.9.5 Pulling and digging belong to methods which disturb vegetation cover. It is necessary to prevent further invasive species colonisation. Some type of recultivation should be carried out.

3.1.10 ***Girdling (ring-barking)***

3.1.10.1 Girdling is an appropriate method for wood plants which substantially regenerate after injuries both from roots and from stool shoots (e. g. black locust (*Robinia pseudoacacia*), boxelder (*Acer negundo*). Trees partially regenerate after girdling.

3.1.10.2 It involves cutting away a strip of bark several centimeters wide all the way around the trunk (1-1,5 m above the ground). The removed strip must be cut deep enough into the trunk (ca 2 cm) to remove the vascular cambium, or inner bark, which is the thin layer of living tissue that moves carbohydrates between areas of production (leaves), storage (roots), and growing points. This inner cambium layer also produces all new wood and bark.

3.1.10.3 Since this method does not prevent sprout formation below the girdle on the stem, incomplete (partial) girdling is recommended. In the first year a strip of bark about 5 cm wide is removed from about 80 – 85% of the trunk circumference. Transportation of nutrients is thus limited and trees are gradually weakened and sprouting capacity decreases.

3.1.10.4 In the second year of partial girdling the strip is completed and in the third year trees could be felled.

3.1.10.5 Girdling is one form of cutting, so that it is necessary to respect forest management laws and rules (Act no. 289/1995 Coll. Act on Forestry) and conditions of felling of woody plants growing ouside forest (Act no. 114/1992 Coll. on Nature and Landscape Protection).

3.1.10.6 Girdling can be carried out only in areas where dry branches and dead trees don’t endanger human activities. The best period for girdling is August and September.

3.1.10.7 If possible, girdling should be combined with herbicide application. Immediately after cutting, stems are painted with concentrated herbicide using a spray bottle or wicking applicator. The best period for application of herbicides is the end of vegetation season (second half of August and September), when assimilates are translocated to the roots.

3.1.11 ***Pruning/cutting of woody plants***

3.1.11.1 Cutting management is connected with forest management rules (Act no. 289/2005 Coll., Act on Forestry) and conditions of felling of woody plants growing ouside forest (Act no. 114/1992 Coll., on Nature and Landscape Protection). Cutting of

woody plants growing ouside forest is a part of the standard SPPK A 02 005 Tree felling.

3.1.11.2 High stump cutting can be used for minimize sprouts creating and also for safety reasons - in areas where it is impossible to use ring-barking methods.

3.1.11.3 If is possible and suitable to use herbicides on cut wounds, the application has to be performed immediately after cutting.

3.1.11.4 As a prevention of regeneration of black cherry (*Prunus serotina*) application of decay fungi on cut wounds is also used (see 4.2.6.4.1).

3.2 Chemical control

3.2.1 Chemical control and its combination with mechanical methods are preferred for their high effectiveness. (see 3.1.1). It is necessary to consider their application with regard to eradication extent and limitations in use. Mechanical methods are more environment-friendly but sometimes they are not so effective. Herbicide application is limited along watercourses, in protected areas (see 2.8) or due to general public aversion. In case of public disapproval is essential to properly justify the use of these chemical compounds.

3.2.2 Herbicides can be selective or non-selective. Non-selective herbicides kill or damage all treated plants. Selective herbicides kill certain plants but not others (e. g. herbicides used in lawns kill broadleaf weeds but will not kill grasses). Herbicides differ in chemical characteristics of the compound, doses and protective limits. Some of them could be used in protective zones of water resources and along watercourses. This is mentioned in registration decision which defines application possibilities of each agent (see List of permitted agents for current year, published by Central Institute for Supervising and Testing in Agriculture (ÚKZÚZ).

3.2.3 Application of selective herbicides to target plants reduces the potential for erosion by maintaining vegetative cover and minimizes damaging of desirable non-target plants. After non-selective herbicides application it is necessary to restore the area (e. g. seeding of regional seed mixture) and its subsequent monitoring.

3.2.4 Blanket spraying management is used in large areas of invasive plants (knotweeds (*Reynoutria* spp.), monk's-rhubarb (*Rumex alpinus*) or giant hogweed (*Heracleum mantegazzianum*). If it’s treated by non-selective herbicides, restoration of vegetation cover and subsequent monitoring has to be ensured. In case of spot spraying with non-selective herbicides is possible to leave vegetation restoration out and rely on seed bank and seed transport from the surroundings.

3.2.5 An aerial spot spraying which enables exact focusing on unwanted species is used in naturally valuable areas, areas with diverse vegetation, in the vicinity of watercourses and in protected areas.

3.2.6 Wipe-on application of herbicide eliminates the possibility of spray drift or droplets falling on non-target plants. This time-consuming method could be used only on low-occurred invasive species. Herbicides have to be wiped on at least one fourth of foliage.

3.2.7 Cut-stump is often used on woody species that normally re-sprout and on perennial species with massive root or rhizome system (e.g. knotweeds, giant hogweed).

Herbicides must be applied to the entire inner bark (cambium) within minutes after the trunk is cut (woody species within two hours). Together with wipe-on application, this method also minimizes impacts on adjacent vegetation, if performed properly.

3.2.8 Stem injection and herbicide capsules application are very effetive methods for especially woody species eradication. Stem injection is recommended in hardly-accesible areas where falling of dead trees doesn't endanger human activities. This control method is also suitable for herbs (e. g. knotweeds, giant hogweed). It could be carried out in naturally valuable areas or in the vicinity of water sources. On the other hand, this method is time-consuming and quite costly.

3.2.9 Depending on type of treated invasive species, timing of application will vary. Details are described by individual invasive species management. Generally, herbicides have to be used in vegetation growth season.

3.2.10 In areas with increased risk of herbicide impact in summer and autumn (e. g. herb cover in forests), herbicide application could be carried out in early vegetation season (before foliage).

3.2.11 Avoid using herbicides on foggy days, windy days or if there is a threat of rain within six hours after application. In case of sudden rain, herbicide application has to be repeated in suitable conditions.

3.2.12 Herbicides could be couloured due to the transparent indication of treated individuals.

3.2.13 Stem injection and herbicide capsules application could be used in worse weather conditions (wind, soft rain). Due to the slow death of injected trees, the area is not suddenly exposed to the sun and soil erosion is also minimized.

3.2.14 The result of herbicide application is visible during few days. Areas with indequated damage of invasive species have to be treated repeatedly.

3.2.15 Repeated using of one type of herbicide could lead to the resistance of some invasive species to this coumpound (e. g. common ragweed).

3.2.16 Herbicide labels indicate minimum protective principles required. Water must not be contamined by herbicide or its container. All equipment for application of herbicide must not be cleaned in watercourses and other water sources and their vicinity. It is also important to prevent herbicide runoff from paved areas, etc.

3.2.17 Field workers are recommended to wear all protective gear (glasses, gloves, protective shield) required on the label of the herbicide they are using. Safety instruction stated on herbicide labels have to be kept.

3.2.18 It is recommended to use only clear water for dilution in order to prevent reduction of herbicide effectiveness.

3.3 Removed biomass management

3.3.1 Many species could regenerate from small pieces of stems, rhizomes or seeds remained in soil for several years. To prevent from creating new propagation of invasive plant species, careful treatment with plant waste and contaminated soil is needed.

3.3.2 During ground works, it is necessary to deposit contaminated soil separately in case of perrenial species with rhizome system or in soil with many seeds. It prevents from spreading invasing species in the area.

3.3.3 Removed biomass has to be removed from the locality in naturally valuable areas. Decomposed plant material enriches soil with nitrogen which slows down the restoration of natural vegetation. This is mostly important in case of *Fabaceae* species. These are able to fix aerial nitrogen.

3.3.4 In other areas it is possible to leave biomass on site and localities could be mulched with this material. Species with high regeneration from above-ground parts have to be crushed. Biomass must not contain seeds and pollinated flowers.

3.3.5 Cut and removed invasive plants could be collect on plastic canvas. This eliminates the transport of seeds and rhizome fragments to the surroundings. Collected biomass could be removed subsequently or regenerated plants could be sprayed by herbicide. Plastic canvas has to be cleared away before the beginning of winter season.

3.3.6 Biomass which couldn't be leaved on site has to be eliminated. It is possible to use it in biogas plants or composting plants. If seeds or regenerating rhizomes or roots are present, stable and high temperature during decay process has to be ensured (see common ragweed composting in 4.1.1.8). Home composting is not recommended due to the instable temperature during the process so that some seeds or other plant parts could survive and germinate.

3.4 Restoration

3.4.1 Appropriate restoration of degraded areas after invasive species removal is an important part of invasive species management in the area.

3.4.2 Restoration sites are highly suitable place for invasive plant migration and proliferation. Severe soil disturbances, including those caused by using non-selected herbicides and by mechanical methods, may provide an ideal colonization site for new invasive species. Mitigating their impact must be a high management priority during the planning and implementation of restoration treatments.

3.4.3 For revegetation of non-forest areas, local seeds should be applied. This could be carried out by means of mulching material from local hay (see the standard SPPK D02 001 RESTORATION OF GRASSLANDS USING REGIONAL SEED MIXTURES).

3.4.4 If vegetation with *Fabaceae* plants dominance is removed, increased soil nitrogen concentration remains for several years. It limits native species recurrence. Due to this, biomass removal from these sites is an appropriate method.

3.4.5 Forest area restoration should be in accordance with Forest Management Plans and nature protection requirements.

3.4.6 After felling of invasive woody species, new target species should be planted during new sprouts occurrence (e. g. after black locust control), or immediately after removal (e. g. after tree-of-heaven control). Weakly competitive species are not appropriate.

3.4.7 Natural succession could be practiced on sites, if possible. During sequential dying (e. g. after girdling) there are only slight changes in light conditions and soil erosion is also eliminated.

4 Recommended management

Species are divided into groups according to the study Pergl et al. (2016) *Black, Grey and Watch Lists of alien species in the Czech Republic based on environmental impacts and management strategy, NeoBiota 28.*

4.1 Species group BL1

This group comprises invasive species with the greatest impact on natural habitats and human health:

- **common ragweed** (*Ambrosia artemisiifolia)* - aggresive pollen alergen and also a noxious weed.
- **giant hogweed** (*Heracleum mantegazzianum)* (alternatively the other species of genus *Heracleum* – Persian hogweed (*H. persicum*) and Sosnowskyi's hogweed (*H. sosnowskyi*) – these are not present in the Czech Republic). The species colonizes a wide variety of habitats and it can also cause a significant reaction when people come in direct contact with the plant.

Recommended management tools include direct eradication and sequential reducing of invasive plants occurrence. Crucial activity is to prevent from new planting of these species. Apart from direct eradication in naturally valuable areas, possible source populations of invasive plants have to be eliminated, especially along roads, railways and watercourses.

4.1.1 **Common ragweed** – *Ambrosia artemisiifolia* L.

4.1.1.1 Common ragweed is an annual herbaceous plant. The species only reproduces by seeds. This noxious weed is hardly treated. Incompletely damaged plants are able to regenerate and produce vital seeds. Seed spreading by wind is difficult but these are able to endure in soil more than 20 years.

4.1.1.2 Prevention is the most important management activity. Transport of soil, remained biomass and seed mixture with vital *Ambrosia* seeds have to be eliminated.

4.1.1.3 Common ragweed management has to be focused on preventing from seeds production. All management activities (mechanical and chemical) must be carried out before flowering.

4.1.1.4 Common ragweed is sensitive to a broad range of herbicides, including glyphosate or triazine. These are commonly used against other weeds in agricultural areas, so that application of herbicides is usually sufficient. Within regular application of these compounds, plant resistance to herbicides could occur.

4.1.1.5 The occurrence of *Ambrosia* species could be reduced from the area by crop rotation. If herbicides couldn't be used (e. g. in case of crop similarity to *Ambrosia* – typically sunflower), crop rotation is the only choice of eradication.

4.1.1.6 Common ragweed creates basal cluster (rosette) at ground level. Mowing should be as close to the ground as possible, but without disturbance of the soil surface to minimize re-growth.

4.1.1.7 Uprooting of plants before seed ripening is efficient for small to medium sized populations, especially suitable for naturally valuable areas. Uprooted plants

should be put in plastic bags with soil around the roots and rendered by waste collection.

4.1.1.8 Removed plants shall be composted in industrial composting plants. To effective seed destruction, composting temperature should reach at least 55°C within 3 weeks or 65°C within one week. Home composting is not recommended due to the instable temperature so that some seeds or other plant parts could survive and germinate. Biomass could be used in biogas plants – it has to be placed in anaerobic digester at least 10 days.

4.1.1.9 As an alternative way of mechanical control, hot steam application could be used. This treatment was tested along roads and it seems very effective but also expensive.

4.1.1.10 After eradication, restoration treatment should be carried out, especially seeding of regional seed mixture (not in fields) because common ragweed is sensitive to competition.

4.1.2 **Giant hogweed** – *Heracleum mantegazzianum* Sommier et Levier

4.1.2.1 This plant reproduces only by seeds. Management activities have to be focused on limitation of seed production and their spreading. In case of vast invaded areas, long-term repeated mechanical control (mowing, grazing) could reduce the amount of produced seeds but doesn't eliminate all plants. Complete cover of invasive plants has to be eradicated to prevent regeneration from remnant individuals (typically edges of areas).

4.1.2.2 Using suitable herbicides and cutting roots (at least 15 cm under the ground) are the only reliable methods for immediate eradication of giant hogweed.

4.1.2.3 Root cutting and digging is possible to use only only for single plants, smaller stands and small areas. It is recommended that the root is cut at least 10 cm below soil level. Cut parts of the plants are pulled out of the soil and either destroyed or left to dry out (it has to be removed from wetlands). Cutting should take place in the beginning of vegetation season until flowering. This method is effective within whole year but it is not suitable for the time when plants start with seed production.

4.1.2.4 Similar technique is so called „spring digging", made by hoe in the early spring when plants are very small (the end of March and April). Plants are very small, roots are only 5-10 cm deep in soil and health risks are negligible.

4.1.2.5 Giang hogweed is susceptible to a broad scale of herbicides. Selective herbicides are recommended, they enable revegetation of areas by grass. Consistent grass cover subdues giant hogweed juveniles and prevents other invasive species from growing there. If herbicides are applied, it is strongly recommended that the plants are treated early in spring (May) when they have reached a height of 20-50 cm and access to the centre of the colony is still possible for operators. Leaves are sprayed from the top and the aerosol is not dispersed broadly. Herbicides application is more effective in period before flowering. Later, plants are more resistant to usual doses of herbicides and higher concentration of these substances is not suitable in relation to the adjacent vegetation. Some herbicides could be used in the period of umbel production. After that, flowering plants are not able to produce seeds.

4.1.2.6 Mowing or grazing does not cause the immediate death of target plants. These methods only prolong the age of flowering but they could significantly reduce the amount of seeds, if carried out properly.

4.1.2.7 Mowing or grazing is used in vast invaded areas where herbicide application is limited (ecological farming). Experience with livestock grazing has been gained mainly from the use of sheep, but this plant is also very palatable to cattle. Sheep and cattle prefer young and fresh individuals, and the most efficient control is obtained by beginning the grazing early in the season when plants are small. Small, but flowering plants have to be monitored and removed. Umbels have to be removed at the beginning of the flowering (before seed setting).

4.1.2.8 Mowing and grazing must be carried out repeatedly within vegetation season because plants could regenerate and produce seeds. After the first cutting, giant hogweed produces small basal cluster and short (approx. 0,5 m) stalk with tiny inflorescence. The second cutting has to follow four weeks after the first one to minimize the amount of flowering individuals. It is possilble to perform the third cutting and combine it with mulching. Remaining plants have to be dug or their roots cut.

4.1.2.9 Every treatment carried out in late phase of flowering has to be accompanied by cutting umbels. These have to be collected into plastic bags and destroyed. Cut umbels or whole plants must not be leaved on site. These parts could produce viable seeds within suitable conditions. Remaining parts of plants are not necessary to cut/remove.

4.1.2.10 If plants with mature seeds are liquidated, plastic canvas has to be placed on the ground before eradication and fallen seeds must be collected. This control is possible to choose exceptionally when plants are found too late. The method is not effective and only decreases the amount of seeds on site. This area has to be carefully monitored in the following years.

4.1.2.11 Protective clothing and goggles must be worn by the staff when conducting recommended cutting techniques due to the risk of skin contact with splashes of the toxic sap.

4.2 Species groups BL2 and BL3

For purposes of *Blacklist CZ,* species were divided into groups according to the character of their current spreading - species (i) which spread by humans or spontaneously and species (ii) which spread predominantly without human contribution. This division is important with respect to the prevention and spreading control. Control methods are in both groups the same. It could be divided into several groups – approaches suitable for (i) trees, (ii) shrubs and lianas, (iii) annual herbs reproduced by seeds, (iv) perennial herbs reproduced mostly by seeds and (v) perennial species which reproduce both by seeds and by rhizomes/roots.

In suburban areas is possible to tolerate these species in limited rate, especially in cases of vast metapopulations where eradication could be too exacting. This tolerance doesn't relate to invaded areas along watercourses roads and routes. There is an increased risk of soil erosion, infrastructure damage and especially possibility of followed spreading of invasive sopecies in these areas. *Reynoutria* species could be tolerated in gardens if spreading into adjacent areas isn't a threat.

Invasive species from gardens and plantations have also positive socio-economic impact - this fact influences control activities. Minimizing of new planting and limitation of current plantations in naturally valuable areas should be a management priority. Populations which could be sources of new spreading have to be limited.

Most experiences with invasive woody species are available for black locust and tree-of-heaven in Central Europe. Management strategies against these species are usable for other woody species with similar character (big sprouting capacity – boxelder, matrimony vine). As for herbs, most information with control is available for knotweeds, Himalayan balsam, monk's-rhubarb and goldenrods. These species are eradicated most frequently. These management strategies could be also used for eradication of species with similar character. It is important to allow for regeneration skills of invasive species. Management activities in forests have to be in accordance with forest growing rules (maximal size of clear cutting areas, ensuring of vegetation restoration).

Species in groups BL2 and BL3 are especially the following ones:

- **Himalayan balsam** (*Impatiens glandulifera)*: representative of annual species which reproduce entirely by seeds
- **perennial herbaceous species which reproduce mostly by seeds**: e. g. monk's-rhubarb (*Rumex alpinus*), garden lupin (*Lupinus polyphyllus*) and yellow oxeye (*Telekia speciosa*)
- **perennial species which reproduce both by seeds and by rhizomes/roots**; e. g. goldenrods (*Solidago* spp.), asters (*Symphyotrichum* spp.) and Jerusalem artichoke (*Helianthus tuberosus*)
- **perennial herbaceous species which reproduce mostly vegetatively**; knotweeds (*Reynoutria* spp.)
- **woody plants and shrubs with good regeneration**; e. g. black locust (*Robinia pseudoacacia)*, boxelder/ashleaf maple (*Acer negundo*) or tree-of-heaven (*Ailanthus altissima)*
- **woody plants used in forestry**; eastern white pine (*Pinus strobus*) and northern red oak (*Quercus rubra*)

4.2.1 **Himalayan balsam** – *Impatiens glandulifera*

4.2.1.1 Himalayan balsam is an annual herb that spreads entirely through seeds. This species is also able to regenerate from plants which were pulled out. It grows especially on disturbed areas which are well saturated by water and nutrients. Most of populations are located along watercourses and roads, recently, this species also spread apart from rivers and into forest areas. Seeds are encased in distinctive green droplet shaped seed capsules. When ripe they "explode" when touched, firing seeds at high speed out of cases. Most of these seeds (95 %) germinate in the following season.

4.2.1.2 This annual species produces big amount of seeds. Management activities have to be focused on spreading prevention (e. g. transport of soil contaminated by seeds) and early eradication of source populations. It is necessary to reduce using this plant in horticulture, especially in humid areas.

4.2.1.3 This species spreads very effectively by running water and along traffic infrastructure. This fact has to be reflected in management planning with respect to possibility of further recolonisation of treated areas. Localities with invasive plants have to be treated as a whole. In case of watercourses, eradication activities must begin on upper parts of river basin.

4.2.1.4 Himalayan balsam has shallow and rather small root system so that pulling and digging is recommended and highly effective technique (see 3.1.8.5). Roots should be separated from stalk. Pulled plants should be broken one or two times in order to prevent regeneration and creation of adventive roots. Pulled plant could be placed on adjacent higher vegetation. Sunny places and localities far from watercourses are more suitable for pulled plants placement (see 4.3.1.10).

4.2.1.5 In case of mowing and subsequent mulching, plants have to be cut close to the ground in order to minimizing of regeneration.

4.2.1.6 Grazing and mowing with heavy machinery is not recommended because these activities contribute to coil compaction. Trampling by cattle also supports regeneration of injured plants.

4.2.1.7 Application of herbicides is not necessary because Himalayan balsam is an annual species with limited regeneration.

4.2.1.8 Control methods have to be carried out no longer than the first flowers appear. In that time, plants are ca 1m high and don’t produce seeds yet. Earlier eradication lead to plants regeneration nad eradication after flowering doesn’t prevent from seed production.

4.2.1.9 Treated areas have to be regularly monitored and potential survivors have to be damaged. Monitoring activities should be carried out several times in three-week intervals.

4.2.1.10 Pulled/mown plants could be collected on plastic canvas. Approximately after one month, signs of regeneration are removed or sprayed by herbicides. This technique should be carried out outside protected areas and not in the tight vicinity of watercourses. Plastic canvas has to be removed after vegetation season because plastic material can be disintegrated by frost in winter.

4.2.2 **Perennial herbaceous species which reproduce mostly by seeds**: e. g. monk's-rhubarb (*Rumex alpinus*), garden lupin (*Lupinus polyphyllus*) and yellow oxeye (*Telekia speciosa*)

4.2.2.1 These species produce seeds which survive in soil for a long time. Species also regenerate very well and are relatively resistant to mechanical control. Cutting could reduce the amount of seeds and spreading of plants but it doesn’t liquidate plants as such themselves.

4.2.2.2 The most effective control is combination of mechanical methods with herbicide application.

4.2.2.3 Herbicide application has to be carried out before seed production. Glyphosate herbicide in concentration 3–5% is recommended for monk's-rhubarb and 10% for garden lupin.

4.2.2.4 In areas with no specific protective conditions (outside protected areas far from

water resources) is possible to tolerate blanket spraying management for *Rumex alpinus* in the first year. In fact, large rhizome system of this plant could prevent from soil erosion. Spot spraying on survived plants has to be carried out in the following years. Plants growing from soil seed banks could be eradicated by grazing or cutting.

4.2.2.5 Flowering plants have to be eliminated in order to prevent seed production. Inflorescences in early phase of flowering could be cut and leaved on site. Nearly overblown inflorescences have to be transported from locality. Composting under the plastic film is also possible (in area borders).

4.2.2.6 Germinated plants don't thrive in consistent grass cover. Thus, recovering of grass cover is required after eradication activities. Regional seeding mixtures should be used, as well as covering treated area by mown grass from adjacent meadows.

4.2.2.7 Restored areas have to be treated and monitored regularly. Complementary eradication activities have to be carried out.

4.2.3 **Perennial species which reproduce both by seeds and by rhizomes/roots**; e. g. goldenrods (*Solidago* spp.), asters (*Symphyotrichum* spp.) and Jerusalem artichoke (*Helianthus tuberosus*)

4.2.3.1 These species could spread both by seeds (in case of long distances) and rhizomes (locally). Soil transport (e. g. during floods) could be also an important means of spreading. Hunters and their using of Jerusalem artichoke in small fields for animals could also contribute to spread.

4.2.3.2 Character of the area has to be taken into account during management planning. Species are tolerated in urban areas where risk of environmental impact is very low.

4.2.3.3 Species in this group could be very well controlled by mechanical methods. These could be combined with herbicide application.

4.2.3.4 Invasive plants could be pulled out in case of relatively small and scattered populations.

4.2.3.5 Species in this group are dispersed especially by seeds, so that prevention from seeds production must be as a main management priority. All control methods have to be carried out before flowering phase. These species are able to produce viable seeds even when were cut in the time of flowering.

4.2.3.6 Recommended management is based on regular activities (grazing, mowing) in target areas.

4.2.4 **Knotweeds** (*Reynoutria* × *bohemica*, *Reynoutria japonica*, *Reynoutria sachalinensis*; (synonym *Fallopia*, *Polygonum*)

4.2.4.1 These taxons reproduce almost only vegetatively and they create massive root system. Any type of control of this species is difficult and lengthy. Regeneration of this species is possible from small parts of sprouts or rhizomes. Removed parts have to be carefully transported; attention has to be also focused on contaminated soil. This soil has to be stored separately in order to prevent the following spread of knotweeds. Nevertheless, spreading by seeds is probably possible and its character is not clear. Recommended management methods have to notice seed

germination in order to minimize of knotweed regeneration.

4.2.4.2 The best eradication method for knotweeds is foliar spraying of herbicides. Maximal leaf surface has to be treated. In case of large knotweed cover, passageways have to be cut in order to use herbicide on bottom leaves. Passageways have to be treated after their regeneration or in the following year. The best time to perform chemical control on knotweeds is late summer. In case of higher risk of using herbicide in this time (e. g. in forest undergrowth), herbicide spraying could be carried out in May followed by another ones – these may be required for re-sprouts.

4.2.4.3 Stem injection is a suitable control method in naturally valuable areas and in the vicinity of watercourses where foliar praying could damage adjacent vegetation or pollute water. Stem injection is possible to carry out also in bad weather. This method is effective already in the first year of application. If any survivors appear in the following year, stem injection could not be used due to the weak stems of plants, so foliar herbicide application could be carried out. Glyphosate is the most commonly used herbicide, application dose is ca 5 – 7 ml per stem. At least 50% of stems must be injected for this treatment to be effective. Plants have to be at least 1,5 m high and stem diameter minimally 1,5 cm.

4.2.4.4 Mechanical control doesn't lead to complete eradication of knotweeds. Nevertheless, these are used to reduce the negative impact of knotweeds in the areas where herbicides cannot be applied.

4.2.4.5 If knotweeds grow in localities accessible for agricultural mechanization, mowers, drum chippers and mulching machines could be used. Mechanization has to be cleaned after using in order to prevent the following spread of plants. Hardly accessible localities are treated by brush cutters, machetes and scythes. Cutting methods have to be carried out several times per year and as near the ground as possible due to fast growth of knotweeds and their stem lignifying. By optimal plant height 40 cm is possible to cut up to eight times per year. Cutting methods effectively prevent from spreading knotweeds but it has to be carried out regularly and over a long period.

4.2.4.6 Knotweeds could be partially eliminated by grazing and subsequent cutting. Grazing has to be launched early due to digestibility of plants by livestock.

4.2.4.7 Removing knotweeds from the soil (pulling, digging) is nearly impossible due to their extensive root system. These methods are effective only in early phase of knotweeds occurrence or in very small populations. Whole plants have to be pulled out – including rhizomes which can grow up to 2 m deep in soil. Recommended minimal depth of digging is 30 cm. Pulled and digged plants have to be dryied and burned. This treatment has to be carried out regularly during vegetation season. It is necessary to minimize transfer of removed plants and contamined soil. Suitable grass mixture has to be seeded on treated surface.

4.2.5 **Black locust** *Robinia pseudoacacia* L.

4.2.5.1 This tree is widely used in horticulture, forestry (primarily erosion control) and also as a part of windbreaks and urban greenery. One of the advantages of black locust is its high tolerance of pollution, drought and frost. Wood of black locust is decay resistant (ca 200–250 years) and causes problems in old plantations where enormous accumulation of old wood is located. Seedlings successfully grow only

on disturbed bare soils or fire sites. Black locust regenerates mainly through re-sprouting from root and stem sprouts, even the individuals older than 70 years. Black locust seedlings are sensitive to shading, the spreading into forests with closed canopies is limited. Mechanical damage to the stem or to the root system leads to an increase in the number of sprouts and creation of a compact clonal colony which may reach 15 metres from felled tree. This is very important for management strategy. Simple clear-cutting or strip-cutting is the worst eradicative option because it only stimulates regenerative skills of black locust. As the most effective, the combination of mechanical and chemical methods is recommended.

4.2.5.2 With respect to landscape context and nature protection requirements management techniques for black locust could be divided into these alternatives:

4.2.5.2.1 Leaving old black locust growths to natural succession, i. e. gradual replacement by autochtonous shade-tolerant woody species. This alternative is possible only in localities where black locust is not dangerous for adjacent natural habitats, residences or traffic infrastructure. Precondition for this alternative is also the occurrence of competitive autochtonous woody species in the surrounding of black locustc stands. These trees are potential to replace old growths of black locust (age between 50 and 70 years). Suitable woody plants could be for example common ash (*Fraxinus excelsior*), maples (*Acer pseudoplatanus*, *A. platanoides*) and on drier localities e. g. field maple (*Acer campestre*), European spindle (*Euonymus europaeus*), common buckthorn (*Rhamnus cathartica*) or blackthorn (*Prunus spinosa*). Black locust retreats in case of light deficiency conditions and its sprouting capacity is minimal. Keystone of this management is to prevent regeneration by means of the absence of all management activities incl. tree removal or harvest.

4.2.5.2.2 Allowing black locust growths to grow, to cut sprouts regularly from surroundings. This alternative is suitable in the intensive agricultural landscape where black locust stands occur in gorges, ravines, balks or groves (alternatively usable as biocentres or biocorridors). Sprouts of black locust cannot spread through regularly ploughed fields. Sprouting capacity of black locust needs to be controlled on grasslands, meadows, pastures and fallows. Potential sprouts and seedlings have to be removed.

4.2.5.2.3 Removing the black locust growths. This alternative is used in the following cases: 1) occurrence in naturally valuable areas and their protective zones (e. g. steppes, sands grasslands, thermophilous oak or boreo-continental pine forests); 2) bad condition of unkempt black locust stands in decay phase. These covers could threaten infrastructure or settlements. Recommended process is based on combination of mechanical and chemical methods.

General comments on management practice:

4.2.5.3 Universal effective method of eradication for all conditions does not exist at all. Recommended eradicative techniques with respect to time demands, black locust phenology phase and practicability are: high-stump cutting, low-stump cutting and partial girdling followed by immediate application of herbicide. In the second year of partial girdling the strip is completed and in the third year trees are felled. During management activies it is necessary to focus on root sprouts elimination. Stool shoots are easily eliminated and they also don’t threaten surrounded

biotopes so much. The best way how to reduce regeneration is application of herbicides.

4.2.5.4 Girdling is not suitable to use close to settlements and infrastructure. Gradual tree dieback could cause injuries or damages.

4.2.5.5 Herbicide application has to immidiately followed cutting or girdling due to the maximal absorbance of chemical compound. The best period for application of herbicides is the end of vegetation season (second half of August until October) when assimilates are translocated to the roots. Spring and summer applications are not so suitable because herbicides don't flow into reserve organs and management activity is not so effective.

4.2.5.6 Foliar spraying with herbicides is recommended only for lower individuals (under 4 metres above ground) and with leaf covers approximately 60–70 %. In areas with naturally valuable vegetation, wipe-on application of herbicide is more suitable and considerate technique.

4.2.5.7 Stem injection and herbicide capsules application are very effetive methods for especially woody species eradication. Stem injection is recommended in hardly-accesible areas where falling of dead trees doesn't endanger human activities. The best period for using this method is July and August.

4.2.5.8 Injection and stump covering with plastic (approximately 1 m high stump is covered with heavy black plastic and tied up to prevent light from getting through), are not recommended for large black locust stands due to high financial and time difficulty. Burning the areas is not also suitable management tool. Complete girdling (around the whole trunk circumference) leads to the intensive sprouting capacity.

4.2.5.9 Unmanaged old *Robinia* forests on steep slopes pose a big problem in terms of their stability. There is an increased risk of soil erosion and human activities threat. Due to this, the maintenance of black locust trees in contour belts is recommended. In gaps between belts, *Robinia* is replaced by shade-tolerant competitive trees such as *Fraxinus excelsior*, *Acer* species or *Tilia* species. Very slow decay of felled *Robinia* trunks may be utilized to stabilize slopes. Trunks could be fixed by existing stumps. There is very low probability of their decay. These activities should be carried out in winter season when soil is frozen and without heavy machinery. As a preceding activity, late summer girdling with herbicide application is recommended – using herbicides is not effective in winter season.

4.2.5.10 To prevent recovery of *Robinia*, it is important to avoid all interventions that induce sprouting, even leaving dead wood at a site after disturbance (e.g. wind break). Removing felled trees also prevent from nitrogen enrichment of soil during decay process. Ploughing of treated localities is not suitable because soil disturbance may trigger soil erosion and regeneration of black locust.

4.2.5.11 Black locust management also includes control of tree regeneration for 3–5 years. Grazing activities (sheep, goats) are suitable control methods on steppes. Goats are mostly preferred as an ideal means of long-term treatment because they actively search for black locust sprouts and leaves. Regular grazing (once or twice per year) also limits the expansion of high grasses, especially false oat-grass (*Arrhenatherum elatius*) and couch grass (*Elytrigia repens*) and accelerates return

of autochtonous vegetation.

4.2.5.12 The most suitable method of cover restoration is a way of natural rejuvenation. Planting of seedlings and transplants of target species could be carried out after reducing of *Robinia* sprouting capacity, i. e. not earlier than 3 years after treatment. All eradicated biomass should be removed and all weeds (herbs, shrubs) should be under the control. Using shade-intolerant species (Scots pine, birch) is not suitable because black locust doesn't disappear from these localities and has to be removed by some type of management. Appropriate areas could be complementary seeded with durmast oak (*Quercus petraea*).

4.2.5.13 If black locust grows in mixed stands, it is necessary to focus on natural processes by releasing of autochtonous species (e. g. oak, lime, maple, ash) for creating tree crowns and starting fructification. Younger individuals and groups of indigenous species are preferred. If there is a danger that target species could be injured, black locust has to be felled on high stump (ca 1,3 m) and growing sprouts are mechanically removed.

4.2.6 **Boxelder** *(Acer negundo),* **tree-of-heaven** *(Ailanthus altissima),* **green ash** *(Fraxinus pennsylvanica),* **hybrid black poplar** *(Populus ×canadensis),* **myrobalan plum** *(Prunus cerasifera),* **black cherry** *(Prunus serotina)*

4.2.6.1 These species have similar biological properties to black locust, thus identical management techniques are recommended. The main difference is in their higher biomass decay rate – for tree-of-heaven only two years are stated. So there are no problems with biomass accumulation. But wood couldn't be used for anti-erosion techniques.

4.2.6.2 **Boxelder** is a fast-growing and early-fruiting tree. It reproduces mainly by seeds. These are very easily dispersed by wind and in riparian zones also by running water. This species is quite intolerant of competition. It has very good ability to send up many vigorous resprouts when cut.

4.2.6.2.1 It invades especially fresh alluvial deposits in floodplains and flood areas. There could be large stands of this tree in these areas. This species also grows in disturbed localities in warmer areas. It could spread on abandoned fields or grasslands. It is used as an ornamental and melliferous tree. It is also planted in forests, windbreaks and recultivated areas.

4.2.6.2.2 It is necessary to focus on prevention and limitation of other planting of this tree as accompanying greenery or in recultivation plantations. Its occurrence in great river floodplains, especially in flood areas is also undesirable.

4.2.6.2.3 The best way of boxelder control is a combination of cutting and immediate treatment of the cut stump with an appropriate herbicide.

4.2.6.3 **Tree-of-heaven** is short-lived, vital and undemanding thermophylic tree. It runs away easily in urban areas. *Ailanthus* is among the most pollution-tolerant tree species and it is also salt tolerant. It can colonise any kind of abandoned areas. Tree-of-heaven produces an allelopathic chemical, which inhibits the growth of other plants. This species spreads outside the urban and disturbed areas only sporadically in warmest regions of the Czech Republic. Young trees suffer from strong frost. It is also considered a shade-intolerant tree and cannot compete in low-light situations. It spreads aggressively both by seeds and vegetatively by root

sprouts, re-sprouting rapidly after being cut.

4.2.6.3.1 For management priorities is crucial to prevent new planting of this tree and also to limit its occurrence in areas with high conservation value. Similarly to black locust, *Ailanthus* could be tolerated in urban areas. One of the most effective control techniques is partial girdling or drill and fill/injection followed with leaving standing trees to die on site. Immediate reforestation after eradication is recommended.

4.2.6.4 **Black cherry** is a shrub or tree with a high sprouting capacity.

4.2.6.4.1 Classical control methods for species with high regeneration skills are used. Biocontrol could be also used. Spores of European autochtonous fungal species *Chondrostereum purpureum* are applied on stumps as a suspension. The efectiveness of restraint on regeneration is high. There is a risk that this fungus could attack some autochtonous woody species. For this reason the application of this species minimally 500 metres from orchards is recommended. Fungus *C. purpureum* is very common in the environment and it is unable to attack woody species through undamaged bark so that its using seems to be safe.

4.2.7 **Shrubs – matrimonyvine, false Virginia-creeper, snowberry**

4.2.7.1 Species with a high regeneration ability. Sprouts grow intensively after mechanical control (e. g. cutting). Application of herbicides on cut wounds and biomass removal is recommended.

4.2.7.2 The occurrence of matrimonyvine is the most problematic. This species spreads easily by root sprouts and also by branch layering. It could produce huge amount of biomass during short period as well.

4.2.7.3 One of the management priorities is prevention of new plantings (especially along line constructions like traffic infrastructure) and limitation of the occurrence in protected areas.

4.2.8 **Eastern white pine** – *Pinus strobus* L.

4.2.8.1 It is a large coniferous tree which belongs to the most rapidly growing northern conifers. Therefore this species has been extensively used in forestry. This pine regenerates very easily and restricts especially the occurrence of Scots pine.

4.2.8.2 It spreads only by seeds and doesn't produce stool shoots or root sprouts. This is very important for its management.

4.2.8.3 Crucial for eastern white pine management is removing of fertile trees. In the adventive area, individual trees can be fertile at the age of twenty years.

4.2.8.4 Winged seeds of this species are dispersed by wind. If sequential removal in several years is applied movement from source areas in upper parts of slopes, ridges and plateaus has to be carried out. Subsequently, eradication of populations in valleys takes place.

4.2.8.5 Among recommended management actions belongs felling of fertile trees by classical forestry techniques (select or clear cutting, interventions including thinning). Individual felling trees could be leaved on site. Ring-barking and withering of trees is also possible but it depends on site conditions.

4.2.8.6 3 – 5 years after cutting, all natural seedlings are removed. Seedlings and young trees could be eliminated in later phases (until the fertile age in about twenty

years) but this removal is more expensive.

4.2.8.7 Seedlings could be pulled out manually. Due to the absence of vegetative reproducing, removal of seedling and young trees by chainsaw or brush cutter is also possible. All vital branches (or whole whorl) have to be removed from the stump during cutting activities. In fact, these branches could change from lateral to apical ones and management action becomes less effective.

4.2.8.8 Management areas have to be monitored in the following years and individual seedlings have to be removed.

4.2.9 **Northern red oak** – *Quercus rubra* L.

4.2.9.1 This partial-shade deciduous tree is ofted used in horticulture, for planting in parks and in urban landscape and also in forestry during last decades. This tree spreads by means of seeds out of original plantations into the adjacent vegetation. It also reduces the occurrence and rejuvenation of autochtonous woody species and also negatively influences soil conditions.

4.2.9.2 Northern red oak has good regeneration ability after injuries and also well rejuvenates by means of stool shoots. Therefore, it is necessary to combine mechanical methods with chemical control. Natural seedlings of this tree should be pulled out in stands with high conservation value.

4.2.9.3 It is possible to limit stool shoots by means of partial girdling and herbicides application (see 3.1.9).

4.2.9.4 If felling on low stump, cutting of sprouts close to stump is carried out in the same year. Many stool shoots appear in the following year and foliar spraying with herbicide is applied before the end of vegetation period (August, September). Herbicide application is not absolutely effective so that it is necessary to repeat it during following three years. The effectiveness of herbicide treatment is much lower if it's applied on sprouts more than 2 metres high.

4.3 Species from Grey list and Watch list

These groups contain species with limited environmental impact at present and with limited spreading, distributed locally or not present in the Czech Republic yet. In case of increase of spread or negative interaction with autochtonous species, change in management strategy may be actively taken into account.

4.3.1 Active management focused on individual species is not required for most of these species.

4.3.2 Regular maintenance of agricultural landscape (grazing, cutting) is an adequate management which should limit the spreading and impact of these species.

4.3.3 Potential management of species listed in Grey list could be carried out according to schemes for specified life forms (annual species, species with rhizomes, trees, shrubs,…) mentioned in section 3 and 4.1 – 4.4.

4.3.4 For grassland management, it is recommended to use suitable published methods (Jongepierová & Poková 2006, Mládek et al. 2006) and standards (SPPK D02 001 RESTORATION OF GRASSLANDS USING REGIONAL SEED MIXTURES; D02 003 GRAZING, 02 004 MOWING OF GRASSLANDS).

Zámek 1
252 43 Průhonice

Kaplanova 1931/1
148 00 Praha 11

SPPKD02 007

www.standardy.nature.cz

2014