Latvia – Lithuania Cross Border Cooperation Programme 2007-2013

Project LLIV-250 TEAMWORK
“Joint resistance to bioinvasions for sustainable agriculture and management of natural resources ”

“Lekcija: Metodes un veidi invazīvo sugu apkarošanā”

Martynas Kazlauskas

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Terms

• When prevention has not been successful, steps to mitigate adverse impacts include eradication, containment and control.
  – **Eradication** aims to completely remove the alien invasive species.
  – **Control** aims for the long term reduction in abundance or density of the alien invasive species.

• A special case of control is **containment**, where the aim is to limit the spread of the alien invasive species and to contain its presence within defined geographical boundaries.
• Guiding Principles (1):
  – **Preventing** the introduction of alien invasive species should be the first goal.
  – **Early detection** of new introductions of potential or known alien invasive species, together with the capacity to take **rapid action**, is often the key to successful and cost-effective eradictions.
  – Lack of scientific or economic certainty about the implications of a potential biological alien invasion should not be used as a reason for postponing eradication, containment or other control measures.
• Guiding Principles (2):
  – Eradication of new or existing alien invasive species is preferable and is more cost effective than long-term control, particularly for new cases.
  – **Eradication** should not be attempted unless it is ecologically feasible and has the necessary financial and political commitment to be completed.
  – A **strategically important focus** for eradication is to identify points of vulnerability in the major invasive pathways.
Eradication

• Where it is achievable, promote eradication as the **best management option** for dealing with alien invasive species where prevention has failed.

• Give priority to eradication **at sites where a new alien invasion has occurred** and is not yet well established.

• Ensure eradication methods are as specific as possible with the objective of having **no long-term effects on non-target native species**.

• Seek expert **advice** where appropriate. Eradication problems involving several species are often complex, such as determining the best order in which to eradicate species.
Control methods

- Control methods should be socially, culturally and ethically acceptable, efficient, non-polluting, and should not adversely affect native flora and fauna, human health and well-being, domestic animals, or crops.
  - Prioritize the alien invasive species. This should include identifying the areas of highest value for native biological diversity and those most at risk from alien invasives.
  - Regular monitoring outside the containment boundaries is essential, with quick action to eradicate any new outbreaks.
Prioritizing Control Efforts for a Single Species by Density of Infestation

Outliers – Highest priority
- Lowest density of infestation
- Goal = eliminate small, isolated infestations
- Prevent the reproduction and survival of outliers
- Monitor annually beyond the known infestation for new outliers
- Lowest level of commitment, resources and effort needed

Advancing Front
- Goal = control the advancing front and perimeter of core infestations
- Prevent the expansion of the core infestation

Core – Lower priority
- Highest density of infestation
- Goal = suppress the interior of core infestations
- Highest level of commitment, resources and effort needed

Note: Effective control may require the use of multiple control methods. Control efforts must be followed up by monitoring for new plants, regrowth, and flowering, generally within the same growing season. Monitoring should be done annually.

Adapted from work by Fred Clark, Clark Forestry, Inc. and Wisconsin DNR-Urban Forestry
List of alien (invasive) plant species

Acer negundo Ošlapu kļava
Amelanchier spicata Vārpainā korinte
Bidens frondosa Lapainais sunītis
Echinocystis lobata Adataina dzelōņgurķis
Elodea canadensis Kanādas elodeja
Gypsophila paniculata Skarainā ģipsene
Heracleum sosnowskyi Sosnovska latvānis
Impatiens glandulifera Puķu sprigane
Impatiens parviflora Sīkziedu sprigane
Lupinus polyphyllus Daudzlapu lupīna
Padus serotina Vēlā ieva
Phalacroloma septentrionale --
Robinia pseudoacacia Baltā robīnija
Rosa rugosa Krokainā roze
Rumex confertus Blīvā skābene
Sarothamnus scoparius Parastais slotzaris
Solidago altissima --
Solidago canadensis Kanādas zeltgalvīte
Solidago gigantea Mizu zeltgalvīte
Heracleum sosnowskyi
Sosnovska latvānis

Control Methods – the aim is to deplete the seed bank in the soil
Hand pull

- **Young** plants only,
- Easily hand pulled **April-May**,
- When the soil is **loose** and **moist**.

- As the stems are not woody, they will break easily so it is best to pull them gently to ensure full root removal.
- Using a trowel or other small hand tool may help to ease them out of the soil.

- **DANGER !** You must be very careful to wear waterproof gloves and clothing and not get the sap on yourself if you use this method.
Taproot Cutting

Method:

• Using loppers, cut back the upper portions of larger plants to allow easier access to cut the stem and taproot.
• Using a sharp, long-handled narrow spade, sever the root about 10 to 15 cm below the soil surface.
• Treat all plants, not just the large ones. Smaller plants can be pulled.
• Leave above-ground plant parts on-site to decompose, (unless there is risk that people will touch them).
• Undertake:
  – first taproot cutting in early spring (April 1–May 15)
  – second round in early-summer (June 15–July 15) to treat any plants that were missed or have re-sprouted.
• Monitor the site annually around June 15 for 3–5 years.
Umbel Removal

- Removal of the flower head can be as effective as cutting the whole mature plant.
- Very important to keep it from spreading the seed.
- **Timing** of the cutting is crucial;
  - if cut too early the plant can regenerate and produce new flowers with more numerous viable seeds.
  - cut off the flower heads after the seeds have formed but before they mature to prevent the plant from shedding the seeds and from forming new flowers on lower branches (if cut while flowering new umbels may form).
• A cut and hold long reach pruner is the ideal tool for flower head removal, but any sharp cutting tool which is long enough so that you won’t touch the plant can be used.

• Second person can gently hold the stem and direct the umbel into a large, heavy-duty garbage bag, ensuring that all seeds go into the bag with the umbel.

• Seal the bag and place in a location where they will be exposed to direct sunlight to give flowers and seeds solarization for at least two weeks.
Plowing

• One of the single best methods of mechanical control.
• Will have to be done for multiple years as large roots are capable of regrowth.
• Recommended in fall, frost will help degrade the roots.
• Large roots should be hand removed from the plow zone to ensure no regrowth occurs.
• Deep plowing of the soil will significantly reduce the germination of hogweed seeds due to the upper soil layer being buried.
• Clean the plowing equipment before using in another area to avoid spreading seeds to new locations.
Bury plants and seeds using a skid loader

• This is a very effective method.

• Majority of the seeds (95%) are found within the top 5 cm of the soil layer, the emergence of new plants is prevented by burying the topsoil to a minimum depth of 50 cm and covering it with clean soil.

• Clean the equipment used on site before using in another area.
Cut and cover

• Cut the plants down to ground level and cover the soil with black plastic or landscape fabric with mulch on top.
• Check the following year to make sure seedlings do not poke through.
• After a few years, remove the plastic and re-vegetate the area.
Repeated Mowing

• Used for flat sites:
  – Repeatedly cut all above-ground plant parts during the growing season using a tractor-based mower (not a brush-cutter) to reduce the possibility of contact with plant sap.
  – Start April 1st each year and continue every three weeks throughout the summer and fall, until the first frost.
  – Multiple years of mowing may be required depending on how well developed the seed bank is and other factors.
Diluted Herbicide Application

• Diluted glyphosate (e.g. Roundup) can be applied directly
  – 1) onto leaf surfaces using a simple paint brush,
  – 2) inserted into a single stem of a Giant hogweed plant using a stem injection tool,
  – 3) inserted into a cut stem.

In more detail (about chemical methods):
Paintbrush application

Painting Leaf Surfaces:
• Dilute a glyphosate formulation;
• Carefully paint formulation onto all leaf surfaces,
• Avoid dripping onto the ground or adjacent non-target plants.
Stem injection

- Inject only one stem per plant, 30 cm above ground
- Use 5 ml of a 5% glyphosate solution
Cut Stem

- Dilute glyphosate with water down to 5% active ingredient
- Cut one stem per plant
- Using a large plastic syringe inject the hollow stem with 5 ml of a 5% solution
• Herbicide is most effective March 15–May 15 when plants have reached a height of 20–50 cm.

• Glyphosate is a “non-selective” herbicide, meaning it kills both target and non target plants, therefore foliar spraying is not recommended, unless by a trained, certified applicator.
Nielsen et. al. (2005) suggests means of hogweed depends on colony size

- 5–100 individuals
- 100–1000 individuals
- > 1000 individuals
### Few plants, 5-100 individuals

<table>
<thead>
<tr>
<th>Control options</th>
<th>Estimated time effort</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Root cutting</td>
<td>100 plants / h (plants in their second growth season)</td>
<td>Labor expensive, effective</td>
</tr>
<tr>
<td>Mechanical cutting</td>
<td>100-200 plants / h when using scythe</td>
<td>Less labor expensive than root cutting, but less effective</td>
</tr>
<tr>
<td>Chemical control, spot treatments</td>
<td>100-200 plants / h</td>
<td>Needs to comply with national rules and guidelines for herbicide use</td>
</tr>
</tbody>
</table>
## Small colony 100-1000 plants

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<td>Mechanical mowing or cutting</td>
<td>Mechanical mowing by flail mower: 0.25-1 ha/h</td>
<td>Machinery is required</td>
</tr>
<tr>
<td></td>
<td>Mechanical cutting by scythe:</td>
<td></td>
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<tr>
<td></td>
<td>High density: 1500 plants/h</td>
<td></td>
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<tr>
<td></td>
<td>Medium density: 1000 plants/h</td>
<td></td>
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<tr>
<td></td>
<td>Low density: 500 plants/h</td>
<td></td>
</tr>
<tr>
<td>Chemical control</td>
<td>300 m²/hour</td>
<td>Hand-held equipment</td>
</tr>
</tbody>
</table>
## Large colony >1000 plants

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</thead>
<tbody>
<tr>
<td>Ploughing or mechanical mowing</td>
<td>Mechanical mowing by flail mower: 0.25-1 ha/h</td>
<td>Machinery is required. Not all stands are accessible for heavy machinery</td>
</tr>
<tr>
<td>Chemical control</td>
<td>0.5-1 ha/h</td>
<td>Machinery required</td>
</tr>
<tr>
<td>Grazing</td>
<td>1 000 hours per year for daily inspection and moving of 170 sheep distributed on 10 different areas</td>
<td>Total cost depends on the price of fencing, maintenance and inspection of the animals</td>
</tr>
</tbody>
</table>
Hogweed in dangerous for health, hence we should care about safety

- waterproof clothes
- gloves
- goggles or face mask
• If controlling plants with multiple people, keep a good distance from one another as the sap can splash 1-2 m while doing control.
• Do not touch your exposed skin with the sap covered gloves!

If some juice get on your skin, immediately:
  • go to the shade;
  • wash with water and soap;
  • Cover and keep area out of sunlight for 48 hours.
  • consult with a doctor if skin will start to change a color

If some juice get on your eyes:
  • flush eyes immediately for 1 minute;
  • put on sunglasses and consult with a doctor immediately
Revegetation

• After successful eradication - revegetation is crucial!

• This will help to:
  - reduce soil erosion
  - provide competition for invasive plant species.
Eradication means special for (invasive) trees
Plugs for trees

Is granulate Glyphosate product.

Ecological benefits of usage plugs:
• 100% selective method.
• No spillage of chemicals.
• No damage to the surrounding nature.
• No risk for those who do the work to come in contact with the active substance.
Tools needed
On standing trees and on stumps from the side or on the stump also from above.
• Plugs should be inserted around the stump/tree evenly at intervals of about 6-8 cm.

Usage:
• Drill a hole 13 mm diameter and 30-35 deep close to the bark
• Use a hammer to drive the plug into the hole, thus sealing the opening so that no substance can escape.

N.B.
• On fresh wood or stumps not older 2 weeks
Useful for all invasive trees that are sensitive to glyphosate:

✓ Vēlā ieva (*Padus serotina*)
✓ Ošlapu kļava (*Acer negundo*)
✓ Baltā robīnija (*Robinia pseudoacacia*)
Ošlapu kļava (Acer negundo)

- Mainly **mechanical** eradication of seedlings and juvenile individuals.
- **Chemical** treatment also effective - *A. negundo* is sensitive to many herbicides, e.g. to glyphosate.
- Recommended time for injections is May – June.
Vārpainā korinte (*Amielanchier spicata*)

- Method to restrict the distribution is **cutting** of the plants.
- Has to be done regularly by cutting and removing the plants while they are still in the **offshoot stage**.
- **Repeated** cutting must be done several times to avoid regrowth.

- Experimental cutting of A. spicata shoots were done in Lithuania (Dobravolskaitė 2010) proving that the regrowth of shoots is fast – in the next year after cutting 52% of shoots regenerated from sleeping buds and produced new shoots.
Baltā robīnija  
*(Robinia pseudoacacia)*

**Mechanical:**
- Cutting and burning works only temporarily because the species spreads vegetatively. Bulldozing may be used on disturbed lands.

**Chemical:**
- This tree in many controlled using the following herbicides (e.g. glyphosate).
- The management of this suckering species is very difficult and follow-up treatments are required.
Vēlā ieva (*Padus serotina*)

- Mechanical control is labour- and cost-intensive.
  - cutting of trees and larger saplings with subsequent uprooting (horses, bulldozers, smaller - pulled by hand).

- **Combination of mechanical and chemical control** can be successfully applied: glyphosate used for injections or as plugs and after 1-2 weeks dead trees are cut.

- Monitoring of the area and checking for newly emerged seedlings or root sprouts for five years is essential.
The techniques used for control of plant have been digging, cutting, grazing, or the use of herbicides.

- **Digging** - the most efficient method.
  - all rhizomes and roots should be removed.
  - procedure needs to be repeated until one is certain that all rhizome pieces have been found and removed.
  - small areas this method is preferable, for larger – very labour intensive.
  - In dune areas complete removal of the plant from large areas may lead to sand drift, since no other vegetation will be left to cover the sand.
• **Mechanical removal by a machines** with a loading shovel.
  - The machines take a whole layer of sand away from the depth were the rhizomes were found.
  - Above-ground shrubs and most of the rhizomes are removed.
  - Pieces of rhizomes treated **manually** afterwards.
• Cutting the roses down:
  – repeated cutting is needed.
  – cutting only once will have an adverse effect - will rejuvenate the bush!
• **Grazing** as a control method is only relevant where *Rosa rugosa* enters an area that has previously been grazed.

• Grazing provokes vigorous regrowth by rhizomes, and very heavy grazing is necessary, often altering the plant community in an adverse direction.

• Goats are the only animals that seem to be able to graze *Rosa rugosa* enough to control it efficiently.
Parastais slotzaris
(Sarothamnus scoparius)

• Mechanical
  – Brush cutting tools or tractor mounted mowers (should be cutted before seed pod maturation)
  – For better effect should be combined with herbicide (glyphosate) use (after resprouting)

• For control of large infestations herbicides may be necessary.
Lapainais sunītis (*Bidens frondosa*)

- Mow regularly or pull out until seed formation.
- Grass prepared in such way is suitable for compost.
Phalacroloma septentrionale

- Frequent mowing (every 2 weeks)
Adatainais dzeloņgurķis (*Echinocystis lobata*)

**Mechanical**
- Seedlings can be removed easily by hands.

**Chemical**
- Effective, but herbicide use is impossible in floodplain areas.
Skarainā ģipsene (*Gypsophila paniculata*)

Suppressing the root system and preventing seed production is the management goal for established plants.

**Mechanical:**
- Hand pulling after root system severed below the thickened crown and rhizome. May require digging to a depth of 15 – 30 cm.
- Frequent deep tillage

**Chemical:**
- Sensitive to glyphosates and many other herbicides.
Blīvā skābene (*Rumex confertus*)

- Digging
Daudzlapu lupīna
(\textit{Lupinus polyphyllus})

- Mechanical:
  - Easily removed by weeding (cutting or removal of the whole plant).

- Chemical:
  - Glyphosate works.
  - Used when occurs in masses.
  - Could not be used if rare species grows nearby.
Zeltgalvītes
Invasive *Solidago* species

- **Mechanical:**
  - digging up
  - mowing twice per year (May and August) for several years
  - tilling
  - covering after mowing with light impenetrable plastic sheet reduces growth (but destroys all vegetation!)

- **Chemical:**
  - Young plants at heights of 10-15 cm are sensitive to glyphosate and several contact herbicides.
Puķu sprigane
*(Impatiens glandulifera)*

- The removal has to be continued until no more growth occurs for at least 2 to 3 years.

- Mechanical (when the first flowers occur, mostly at the end of July):
  - pulling,
  - cutting
  - grazing

- Chemical:
  - Sensitive to herbicides, but place for application isn’t suitable.
Sīkziedu sprigane (*Impatiens parviflora*)

- **Mechanical:**
  - cutting (flowering phase before seed-set)
  - mowing (flowering phase before seed-set)

- **Chemical:**
  - Possible, but only few experience yet
Kanādas elodeja (*Elodea canadensis*)

- **Biological control:**
  - herbivorous fish (eg. grass carp)

- **Mechanical control:**
  - cutting or harvesting, most effective if done in July – early August. Cut *Elodea* should be removed from the water and left to decompose well away from the water to avoid cut fragments from rooting.
  - freeze *Elodea*
Elodea harvesters
Some conclusions

• The choice of methods will depend on resource availability as well as the legal frameworks for herbicide application.

• A mechanical control program may be successful in many situations.

• Control measures should never be undertaken without making sure in advance that an appropriate method is available and that funding is sufficient to continue the work for at least five years and to preclude reinvasion. In all other cases it will result in a sheer waste of money and effort.
Thank you!
Useful links

• Delivering Alien Invasive Species Inventories for Europe:  
  <http://www.europe-aliens.org/>

• European network on Invasive Alien Species:  
  <http://www.nobanis.org/>

• The Giant Hogweed Best Practice Manual: <http://www.giant- 
  alien.dk/pdf/Giant_alien_uk.pdf>

• Giant Hogweed Control Methods:  
  <http://www.dec.ny.gov/docs/lands_forests_pdf/ghcontrol.pdf>

• Understanding control methods:  
  <http://dnr.wi.gov/topic/invasives/control.html>

• Introduction to Invasive Species:  
  orial1_Static.html>