



Giant hogweed can become totally dominating in an area.

Photo credit: Davis Dorss «The Giant Hogweed: Field Research 2011», copied with permission from <http://bit.ly/2kHLVL2>

Invasive species - both a global and local problem

Species invasions are a global problem that often must be dealt with at local levels. Addressing this problem generally requires mixing strategies, policies, and technologies and working with multiple stakeholder groups. Invasive plant species can cause various societal problems, such as reducing biodiversity by outcompeting native plants. One example of an invasive plant species that has proven very difficult to control is the giant hogweed (Norw. Kjempebjørnekjeks; *Heracleum mantegazzianum*).

Giant hogweed

Giant hogweed is a particular nuisance, as it can cause severe burns if the plant's sap comes in contact with human skin. In addition, the plants often develop into thick, monocrop stands that reduce biodiversity, and can inhibit farming/gardening and recreation.

Giant hogweed and other invasive *Heracleum* species favor ruderal habitats and abandoned agricultural land and grasslands, and have been shown to reduce

local biodiversity through several mechanisms (Myrås and Junttila 1981, Nielsen et al. 2005, Balezentiene 2012). *Heracleum* species have been shown to be allelopathic (releasing toxins into the soil to prevent other plants from growing), and they start growing early in spring before native plants, and produce long, wide leaves that shade out other plants. When sap from the plant comes in contact with human skin, it causes the skin to become extremely sensitive to sunshine, often causing severe (2nd degree) burns,

and may cause blindness when coming in contact with eyes. Therefore, giant hogweed is a particularly troublesome species causing many injuries each year.

Aliens viz invasives

The International Union for Conservation of Nature and Natural Resources (IUCN) defines “invasive species” as species that threaten ecosystems and / or human health, and that lead to high economic costs (McNeeley et al. 2001). In comparison, “alien plants” also include any plant species that are human-introduced and non-native in an area. The definition of invasive species may also include the ability to spread quickly over wide distances in the area where they were introduced, for example, seed plants which spread more than 100 meters from the parental plant within 50 years (Richardson et al. 2000).

History and current situation

Giant hogweed (*Heracleum mantegazzianum*) is an invasive species that is on the species Black List in a number of countries including Norway. It was brought to Europe from the Caucasus region as an ornamental plant, and its cousin (*Heracleum sosnowskyi*) was brought in as a failed attempt to farm it extensively as a fodder plant for cattle. This was a failed experiment because the meat and milk of the cattle tasted of the plant, an anise-like flavor that was not considered tasty. Annual costs of existing control efforts have been estimated at £ 100 million in the UK (Oreska and

Aldridge 2012), SEK 17-73 million in Sweden (Gren et al. 2009), and € 12.31 million in Germany (Herle et al. 2003). In Norway in 2011, the Oslo Municipality alone used almost 2 million NOK to combat invasive species, and its main focus was on giant hogweed.

Mapping and eradicating giant hogweed

Multiple means to map *Heracleum* species have been undertaken in different locations where it is present. At NIBIO, manual identification of a *Heracleum* species in aerial photos has been tested, as well as finding the weed in Google Maps Street View, and verifying through ground-truth fieldwork. This method was found to be comprehensive but time-consuming. NIBIO has also created a simple Public Participation Geographic Information System (PPGIS) in which anyone can log point locations online of giant hogweed or its cousin in the North, Tromsø palm (*Heracleum persicum*) (<http://bit.ly/1YW9TeC>). This method takes very few resources and is less time-consuming, but may require expert verification for quality control. This method produced a geographically more extensive, but less comprehensive, map than the formerly mentioned method.

In Norway, there have been various efforts to control the plant on different scales. Some county offices of the Norwegian Roads Authority use funds each year to control giant hogweed or Tromsø palm along the roadsides. They use mowing and sometimes



Tromsø Palm (*Heracleum persicum*) in a typical ruderal location. Photo: Sophie Meier



Proper protection is necessary when dealing with this plant. Photo: Fraser Valley Regional District

herbicides as control methods. In addition, certain municipalities (e.g., Tromsø and Oslo) run programs to control the weed in limited areas. The mowing by the Norwegian Roads Authority is only done along larger roads, and only up to 3m on each side of the road, therefore allowing the plant to spread from untreated areas. In addition to being spread by wind, these seeds are carried by car tires along roads and by water currents, and therefore the plant spreads quickly along these corridors.

Since giant hogweed is generally found on both public and private lands, it is a challenge to control it due to the number of landowners needed to coordinate its management. Eradication programs in other countries have often failed. One reason is that programs were able to get rid of only a portion of the plants in an area, often because there were some landowners not participating. Since each plant can produce up to 100,000 seeds, the remaining plants can cause significant spread by the very next year. Another reason is that programs did not have enough follow-up plans or funds available to maintain control of the areas where the plants were located, since giant hogweed seeds can remain viable for up to 7-10 years in the soil.

An interesting example

The country of Estonia is one example of a country that started a quite successful eradication program where the government maps giant hogweed and draws up a contract with each landowner whose land contains the weed, giving the government permission to kill

the weed and maintain control of it on that parcel of land. This type of solution may be ideal since just one actor operates the eradication program, as shown by the success of the Estonian program. However, this is an expensive solution and requires significant financial and human resources from a government agency. Some programs in other countries have been grassroots-style community programs, with varying degrees of success.

Recommendations

We suggest that to coordinate a grassroots-style community program, the program leader should first create a comprehensive map of the weed in the region of interest. Further, it will be important to gain cooperation from all key stakeholders involved, in particular those that own land where the weed is found, and individuals/companies willing to control the weed where landowners cannot. A full eradication of the weed should be planned for one summer in the region of interest, with follow-up work for the 10 subsequent years. We recommend the creation of a Public Participation Geographic Information System (PPGIS) which can be used to map the weed, and to keep a log of measures completed to control the weed on each plot where it has been located. This can help stakeholders to put pressure on neighboring landowners that have not controlled the weed on their land. In case land management changes hands during the following 10-year period, a documentation of control measures on each plot will be useful. The land must be monitored and continued control measures applied in cases of resurgence of the plant.

Our experiences

NIBIO did research on how landowner characteristics and knowledge of/attitudes towards invasive species affects the landowners' probability of controlling Tromsø palm on their land (Meier et al., 2017). The results of this research can help control efforts for this and other weeds by providing government institutions information about how to focus resources on education and assistance to the populations least likely to properly control the weed. In general there is a clear need for more coordinated management of *Heracleum* species for effective eradication or control.

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