ECOLOGY, PRACTICE AND POLICY OF BLACK CHERRY (*PRUNUS SEROTINA* Ehrh.) MANAGEMENT IN BELGIUM*

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ABSTRACT

Black cherry (*Prunus serotina* Ehrh.), a tree native of North America, was introduced in Europe in the 17th century and applied as a forest tree from the end of the 19th century onwards. It was expected to produce valuable timber, even on poor sandy soils, but it seldom did. Until the fifties, it was massively underplanted in Scots pine (*Pinus silvestris* L.) stands where it was believed to ameliorate the soil. Nowadays, as a consequence of its offensive reproduction strategy and important atmospheric ammonia immissions, black cherry has completely overgrown the substorey of thousands of hectares of Scots pine forest in Belgium, Germany and the Netherlands, preventing regeneration of any species but itself. Some ecological, silvicultural and forest political aspects of this issue are presented and discussed.

This paper shows that the soil ameliorating properties of black cherry are doubtful and suggests that it might be an important competitor of the timber crop for nutrients and water.
Furthermore, it illustrates that the abundance of black cherry forces silviculture to maintain an everlasting age class system with clearcutting and very costful black cherry combat operations (mechanical or/and chemical) during each regeneration period.
It finally states that the present forest policy in Belgium, that made the option to reconvert the first generation pine stands into mixed and more uneven aged stands, only can be realized with an efficient control of black cherry. In that respect, an integrated black cherry management plan issuing a total prohibition of planting and trade, an obligatory control of seed trees in public forests and a subsidized combat in private forests, is proposed in this paper.

1. INTRODUCTION

Black cherry is a tree native of a vast area in North America, ranging from Guatemala to Nova Scotia (Fowells 1965). An optimal growth is reached on fertile soils on the Allegheny Plateau of northwestern Pennysylvania and southwestern New York where it can produce a decorative timber of high commercial value (Hough 1953, Husch 1954, Baillieux & al. 1977). In drier, sandier regions, growth and maximal dimensions are much more modest (L.W. 1907, Anonymus 1895, Hough 1953, Auclair & Cottam 1971). Different varieties have been distinguished (Fowells 1965), the one imported in Europe probably being the variety *serotina*, but not of the Allegheny provenance (Wallis de Vries 1987). Black cherry was imported in Europe between 1620 and 1630 (Booth 1894, Borrmann 1988, Starfinger 1990) via France (Eijsackers & Oldenkamp 1976). Nowadays, a tree with a worse reputation can probably not be found in Western Europe (Maddelein 1990) : this woody weed has completely overgrown the substorey of thousands of hectares of pine forest on poor sandy soils (Starfinger 1990). Its vigorous canopy almost prevents regeneration of any species but itself. A satisfactory approach of this problem has not been worked out uptil now. Therefore, this paper first aims to get a better understanding of the origin of the nowadays situation by a review of the history of introduction and the ecology of this species. After a synopsis of the possible methods of control, a black cherry management plan, integrating all this knowledge, is proposed.

2. HISTORY OF INTRODUCTION

2.1. history of extension

After its first introduction in Europe during the 17th century, black cherry was used as an ornamental tree for many years (Duhamel du Monceau 1755, De Poederlé 1772). For forestry purposes, it was recommended for the first time by Michaux in 1810 in Belgium and northern France and about in the same period by Wangenheim and Burgsdorff because of its good growth on poor sandy soils in Brandenburg, Germany (Anonymus 1896). Besides some isolated plantations in Netherlands' coastal dunes in 1873 (Martens 1991), it still lasted until 1883 (Germany) and 1892 (Belgium) that the first experimental plantations of black cherry had been established (L.B. 1894, Anonymus 1896, Borrmann 1988). In this early period, the production of first quality timber was the main motivation to promote the use of this tree : 'this recommendation (of Michaux to plant black cherry) was justified because, together with the walnut (*Juglans nigra*), black cherry is of all trees that can be cultivated in Belgium the one of which the wood yields the highest prices'(Berger 1895) and 'if our grandfathers had followed the advice of Michaux in 1810 to cultivate this tree in our country, we would now see the inhabitants of the Campine region, paying with their cherry sawlogs, the wheat-cargos imported from America.'(Berger 1894). This writings had a considerable impact on the application of black cherry as a forest tree in Belgium (Booth 1894, Anonymus 1896). Their optimism, identical in Germany (P.N. 1901) and the Netherlands (Anonymus 1897), was partly based on the good growth and commercial results in its region of origin (Anonymus 1895, Rouffignon 1899) and partly on the nice forms of some isolated trees in parks and along roads in Europe (Berger 1895, De Neunheuser 1922, Quéritet 1922).

Mentions of bad stem-forms and even of a pronounced disorderly habitus arrived very early (L.B. 1894, Berger 1895, Anonymus 1910, C.J.Q. 1920, C.N.L. 1921, Quéritet 1922. Already before its massive plantation, the reason of the almost impossibility to obtain valuable timber was understood : 'However, it must be remarked that even in America, it prospers only in very favorable conditions of soil and climate'(Anonymus 1895).
However, the fact that the first results of quality wood production with black cherry were frankly negative couldn't stop planting it, on the contrary. The effective application of the species in the forest brought new experiences along, which showed characteristics offering alltogether wonderful perspectives as an aid to the big-scale afforestations of heathlands and continental dunes that took place at that time :

- easily coppicing (Rouffignon 1899, Halleux 1902, C.J.Q. 1919, Quéritet 1922);
- appreciated fuelwood (Rouffignon 1899, C.N.L. 1921);
- not sensitive to summer drought and late frosts (Anonymus 1896, Anonymus 1913, Masson 1920, C.J.Q. 1921; Goblet d'Alviella 1922, Quéritet 1922);
- no game and insect damage, because the leafs contain cyanhydric acid (Anonymus 1896, Anonymus 1907, Masson 1920);
- 'exuberant' youth growth (L.B. 1894, P.N. 1901, Halleux 1902, Schwappach 1912, De Neunheuser 1922);
- tolerant of a slight shelter of e.g. pine trees (P.N. 1901, C.J.Q. 1919);
- abundant annual seed production from the age of 5 (Halleux 1902, C.J.Q. 1919, Quéritet 1922);
- seeds easily dispersed by birds (C.J.Q. 1919, Masson 1920);
- fluent natural regeneration, also under pine canopy (Rouffignon 1899, Halleux 1902, C.J.Q. 1919, Masson 1920, Quéritet 1922);
- fruits providing non-woody forest products (game, jam, brandy)(C.J.Q. 1921);
- good soil protection cover (Halleux 1902, C.J.Q. 1919, Masson 1920, De Neunheuser 1922, Quéritet 1922);
- fast leaf litter decomposition leading to a good humus with high nutrient-content (Rouffignon 1899, Halleux 1902, Goblet d'Alviella 1922, Queritet 1922).

Between 1900 and 1930, black cherry appeared on many places in the sandy planes of North-western Europe. In Belgium, it was used as a coppice (Rouffignon 1899, C.J.Q. 1921, De Neunheuser 1922, Goblet d'Alviella 1922), for the fixation of continental dunes (Masson 1920, C.J.Q. 1921), for underplanting in pine forest (De Neunheuser 1922, Goblet d'Alviella 1922), or, and that is important for the later dispersal by seed, mixed with other broadleaved species in the network of shelterbelts built around the new pine stands (4 ha) to protect them against wind and fire (C.J.Q. 1921, Ab. B. 1937). In the Netherlands, it was used in shelterbelts around pine plantations too but also as a filler between conifer species and for the control of grass and heather in fallowland afforestations (Bakker 1963). In Germany, it was rather used for beating up beech plantations (Anonymus 1896, P.N. 1901, Schwappach 1912), for understory management of pine forests (P.N. 1901). and for hunting purposes (Borrmann 1988).

From 1930 onwards, the soil protecting and ameliorating function became the main object of planting black cherry. They just had to serve as a soil protective cover in the understory of pine forests. The humid microclimate created by a broadleaved understory was believed to avoid litter accumulation observed in pure pine stands (Houtzagers 1930). Its presence was even believed to stimulate the growth of the tree crop (De Neunheuser 1922). Underplanting of black cherry in 20 to 30 year old stands was the cheapest way to realize a complete cover (Misson 1930, Ab.B. 1951). It was expected to fulfill its task optimally after 10 years. From that age, induced by a thinning of the pines, it would be able to fructify and spread out by natural regeneration 'which will garantee the perpetuation of the species and the infinite protection of the soil' (Misson 1930). Massive underplanting and filling of conifer stands occurred, until the late fifties. Eversince, it spreaded out naturally. Oosterbaan & Van Tol (1977) reported a dissemination of 6 and 12 % in two Dutch forest areas between 1957 en 1977, being not very alarming. In eastern Germany however, in an area studied by Borrmann (1988), the area of black cherry increased with a factor eight in a 40 years period.
Nowadays, black cherry is still used for forestry purposes in eastern-European countries, e.g. in Poland (Eijsackers & Oldenkamp 1976). In western-Europa, it is still planted along highways (Starfinger 1990, Martens 1991) and recreational infrastructures (Stichting Kritisch Bosbeheer 1983).

Very remarkable is the fact that uptil now, the dream of producing ever high quality timber of black cherry never completely disappeared. Baillieux & al. (1976) promoted the use on good soils and with an intensive stand treatment, giving growth results comparable to that of the indigenous *Prunus avium*. In certain regions of Germany, e.g. in FA Karlsruhe-Hardt, a certain satisfactory timber production is realized. Even the setup of a black cherry selection program, issuing from controlled crossings of better provenance has recently been taken into consideration in Flanders (Belgium). In our opinion, this doesn't make sense for three reasons :

- The chances to produce valuable timber of black cherry on poor soils in Europe aren't better than on poor soils in America.

- On rich soils, same or better results can be reached with the indigenous *Prunus avium*.

- The introduction of new selected material doesn't solve the problem of the proliferation of the present bad material.

2.2. history of control

Directly after his coming into use in European silviculture, it was observed that black cherry was very intrusive (Rouffignon 1899, Halleux 1902). While Rouffignon observed in this matter : 'it is convenient to be careful', Halleux wrote : 'that is far from being a disadvantage in the (dry and sandy) Campine region'.
Real criticism on its use appeared rather early but however very scarcely : 'it seems to us that, after a long period of want of appreciation of the true value of this species, its merits have been exaggerated' (L.W. 1907); 'Black cherry should be only assigned a very secundary role, even for protective purposes.'(Delevoy 1946); 'Its protective role is contestable. That's why we place it in the category of pronounced secondary species and propagation is useless.' (Goblet d'Alviella 1946).
Altough it was still promoted until 1955 (Ab. B. 1951, Von Wendorff 1954, Bodeux 1956), the first problems of black cherry control appeared from 1950 onwards since the first pine afforestations of the turn of the century had to be clearcut and regenerated. The damage by an often unlimited spreading appeared much greater than the expected advantages (Bakker 1963). After 1955, black cherry became a weed, called 'bospest' (dutch for forest pest)(Leclercq 1960). Plantation stopped almost completely and control operations started.

The control of black cherry has economic, ecological and nature conservational reasons. The presence of a closed black cherry understory causes a 40 % surplus cost for thinning, felling and timber extraction operations. The costs for the care of young growth can be ten times higher than normal (Borrmann 1988). Its dense understories impoverish or eliminate the indigenous forest vegetation (Starfinger 1990). This can completely disturb the equilibrium between forest and game (Borrmann 1988).

One of the main conclusions is that it are not always fungal diseases or attacks by insects that makes the cultivation of exotic species illusive. With black cherry, it is the complete absence of commercial interest (Goblet d'Alviella 1946). Striking is also that non-committal judgments of some individuals can have such an impact in the field. Between these judgments and their results in the field, there's always a lag of at least 20 years, which explains the uncontrolled spreading.

3. ECOLOGY

From the second world war, the ecology of black cherry has been scientifically studied. The earlier insights, derived from forestry practice were sometimes refuted, sometimes affirmed. Anyway, a thorough knowledge of the ecology of the species is an absolute necessity for an integrated control.

3.1. Strategies

Black cherry can be found in a very wide range of sites and cannot be attributed one or another strategy (Starfinger 1990). Abundant seed production and a low life expectance could indicate a typical r-strategy, its colonization of new, strongly disturbed sites a ruderal strategy. But it possesses also characteristics of stress-tolerators like the toxicity of its bark and leaves against game and insect attacks, or its relative shade-tolerance, while in its optimum area, it is known as a typical competitor. This combination of many strategies make of black cherry an ideal weed (Starfinger 1990).

Following characteristics contain important information for an integrated control:

- Black cherry is a bird-disseminated woody plant, but opposit to its dominant area (Husch 1954), the seedling density is strongly affected by the nearness of seed trees. The dispersal by seed doesn't mostly exceed 100 m after a 20-year period (Oosterbaan & Van Tol 1977). More than 20 m from a seed tree, seedlings are already scarcily disseminated, although a maximal dispersal of 600 m has been reported (Starfinger 1990).

- There is a considerable seed predation by different animals. The germination percentage is very low (1-5 %) (Eijsackers & Van de Ham 1990, Starfinger 1990), but seeds regurgitated by birds or voided in feces have a higher percentage of germination than those taken from trees; the species is however little selective in seedbed requirements (Smith 1975).

- Black cherry is a pioneer of the secundary succession, an opportunistic gap species of small to moderately big openings in the canopy (Husch 1954, Hough 1960, Auclair & Cottam 1971), which could benefit from the young, open and disturbed aspect of the European forest on sandy soils (Wallis de Vries 1987). With 10 % of the normal daylight at its disposal, it can form dense substories (Starfinger 1990), with a light intensity of 5 % , survival is hardly influenced (Oosterbaan & Van Tol 1977). Under too close canopies however it droops and dies (Auclair & Cottam 1971).

- Black cherry has the disposal of a burried seed strategy of the short storage type (3-5 years), followed by a germination that is not necessarily cued to disturbance (Eysackers & Van de Ham 1984, Pickett & White 1985), opposite to pin cherry (*Prunus pensylvanica* L.) of which the probable upper limit of seed longevity is 50 years (Marks 1974).

- Black cherry has a preference for not too dry eutrophe soils and was favoured due to the use of organic and chemical fertilizers by the time of the heather afforestations (Stichting Kritisch Bosbeheer 1983, Farjon 1986). Its present vigorous spreading, especially in the N-richer pine forest with *Deschampsia* *flexuosa* (Eijsackers & Van de Ham 1990), is strongly favoured by the enormous atmospheric nitrogen input (Hofmann & al. 1990, Muys 1990), which amounts to 50-100 kg/ha/yr. in these areas.

3.2. Soil ameliorating properties

In order to weigh the gains of black cherry planting against the costs caused by its spreading, it is important to evaluate its real value as a species ameliorating poor sandy soils.

The investigations of Boudru (1946) and Von Wendorff (1954) brought some evidence of soil amelioration by black cherry. Von Wendorff (1954) expected a better growth of the tree crop in presence of a black cherry understory due to its ameliorating properties. Dik & Jager (1970) couldn't affirm this statement : in a comparative experiment, they evaluated the growth of Japanese larch (*Larix leptolepis*) after a 10 year period in stands with and without black cherry control. On dry and moderately humid sites, they found higher increments (10.1 in stead of 7.9 m^3) in the absence of black cherry, suggesting that it is an important concurrent for water and nutrients. But also this statement has to be relativized : in a steady situation, black cherry will be replaced by other vegetation like the grass *Deschampsia flexuosa*, which has a considerable water and nutrient demand too (Van den Tweel 1984).

We compared the nutrient content of freshly fallen foliage litter of Scots pine and black cherry sampled from the same site on dry sandy soil (Maddelein & Muys 1992). Black cherry litter appeared to be significantly richer for the important nutrients Mg, K and P. The C/N-ratio, a good indicator for the palatability of the litter, was significantly better for black cherry (Table 1).

The annual leaf litter production of a black cherry understory in a 40-year old Scots pine stand on dry sandy soil accounts for 1021 ± 186 kg/ha, which is about 28 % of total foliage litter production. Since herbal vegetation is absent under black cherry, about 74 % of all Mg and 71 % of all K which cycles through the above-ground biomass of this pine stand, cycles through black cherry. These foundings are affirmed by Umweltbundesamt (1990). Since black cherry has a spreading, superficial form of root system (Fowells 1965, Auclair & Cottam 1971) mainly situated in the ectorganic horizon, we suppose that mobile cations, such as Mg and K follow a short-circuit through black cherry and consequently don't become available for the growth of the pine crop.

According to Eijsackers & Oldenkamp (1976), an apparent proof of soil amelioration induced by black cherry would be that pine needles, mixed with cherry leaf litter decompose faster than needle litter in pure pine stands. We controlled the validity of this hypothesis with a litterbag experiment in a 40-year old Scots pine stand on dry sandy soil, partly provided with a black cherry understory, partly without (Maddelein & Muys 1992). As already reported by Umweltbundesamt (1990), black cherry litter decomposed significantly faster than pine litter, although the decomposition of pine litter was satisfactory and anyhow better than feared in the 1930's (cfr. 2.1.)(Dik & Jager 1970). Pine litter however didn't decompose faster under a black cherry understory than under a pure pine canopy (Figure 1).

Table 1. C/N-ratio and nutrient concentrations (mg/kg) of freshly fallen foliage litter.

SPECIES		C/N	Ca	Mg	K	Na	P
PINUS SILVESTRIS	AVG	52.45	128	469	29	5	370
	STD	6.15	10	72	4	1	40
PRUNUS SEROTINA	AVG	24.98	139	3334	183	3	978
	STD	2.61	36	426	25	1	89

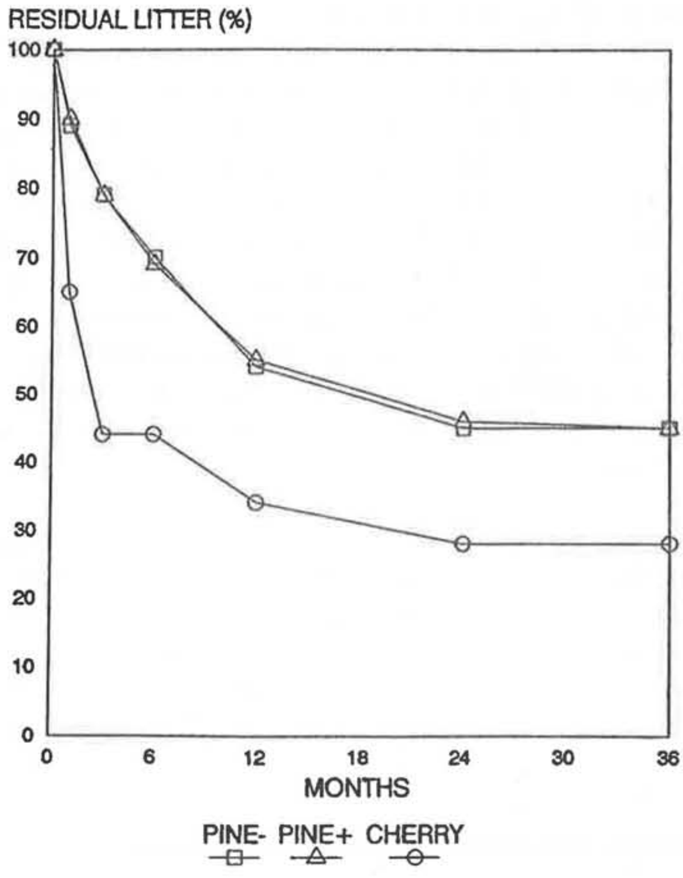

Figure 1. Procentual mass loss of cherry and pine foliage litter incubated in a 40-year old pine stand.
(-) : without cherry understory
(+) : with cherry understory

The *Padus serotina-Culto-Pinetum sylvestris* (Hofmann 1991) is a result of both the succesful strategies of black cherry and a series of anthropogenic disturbances : the the working and fertilization of the soil, the cultivation of heliophilous pionier species (pine) and the eutrophication of the soil by air pollution. Black cherry undoubtedly played an important role in the creation of a microclimate and a humus layer in the first generation forest. This role has become superfluous. Black cherry might be an important competitor for nutrients and water and it blocks any evolution towards a mixed, indigenous forest ecosystem.

4. PRACTICE

The method of control of black cherry depends on the type of black cherry vegetation (Lemmens & Van Tol 1977). Seedlings can be uprooted. This was done in many nature reserves and community forests, sometimes by volunteers. (Stichting Kritisch Bosbeheer 1983). The damage can be bigger than the gain : residual roots resprout (Lemmens & Van Tol 1977) and the soil disturbance creates a germination bed for new seedlings (Eijsackers & Oldenkamp 1976). Older trees can be dug out manually or pulled out by a tool mounted on a tractor. This tool is extremely useful when natural regeneration of the main tree species is expected, if not, the created seedbed is used by black cherry. If natural regeneration is not aimed, a combined method gives best results. At first, black cherries are cut by a portable brushcutter, or in older stands which are easily accessible, by a tractor-mounted brush-cutter. The stumps can then be directly treated with a 7 % glyphosate solution or ammonium sulphamate cristals or one can wait until summer and spray the leaves of the sprouting stumps during overcast weather with a watery 1 % glyphosate solution. If stumps are not treated chemically, they can produce seeds within three years and reach more than 60 % of their original coverage after five years (Dik & Jager 1970). In general, control should always start before the felling of the tree crop (Borrmann 1988).

The use of non-selective biocides is not free of criticism. The formerly used 2,4,5-T-ester was forbidden in the Netherlands in 1978 because of environmental and health reasons : it appeared to have moderate to strong toxic effects on isopods, millepeds, Collembola and Carabids; it contained dioxines which are toxic for human beings (Eijsackers & Oldenkamp 1976, Eijsackers 1980). Also ammonium sulphamate showed side-effects : it is very mobile and when washed out by rain, it affects soil fauna (Eijsackers & Chardon 1979) and can damage the tree crop (Lemmens & Van Tol 1977). Glyphosate, tested since 1973, is now generally used because of its rapid fixation and breakdown in the soil (Jager & Oosterbaan 1979) and its relative respect for soil fauna. Some complaints of irritation and headache are known from forest workers spraying this product. Therefore, brush-cutters with a portable knapsack sprayer have been designed, which treat the stump directly after cutting with a 5 % glyphosate solution. The results of this tools are disappointing (Schaafsma & Rotteveel 1989).

Another possible method is to cover the stump with a plastic foil during two years (Starfinger 1990). Most promising, however, is the combined mechanical/biological control. Directly after the cutting of the stump, it is treated with mycelia of the fungus *Chondrostereum purpureum* (Pers. ex. Fr.) Pouzar, the silverleaf disease. The effectiveness is very high. Other *Prunus*-species are also susceptible, but because this fungus is very general in nature, the added infection pressure is smaller than the natural one (Scheepens & Hoogerbrugge 1988, De Jong 1989). An annually treated area of 1000 ha would be sufficient to commercialize this method of biological control (De Jong 1989). The suppression by very shady trees, like beech and douglas fir is another possibility (Lemmens & Van Tol 1977).
In nature reserves, other techniques like ringbarking and pulling down black cherry could be tested. Control by browsing is only possible with deer : the leaves are toxic for cattle and are hardly eaten by roedeer (Stichting Kritisch Bosbeheer 1983).

Black cherry control is very expensive. The labour of mechanical control can vary between 1 man-day per ha for uprooting scarcily disseminated seedlings and 60 man-days for pulling out very dense understories with a tractor mounted tool, i.e. a cost between 100 and 6000 dollars per ha (Van Boghout, oral communication). In the case of combined control, treatment with a tractor-mounted bruch-cutter costs 260 dollars/ha, the chemical foliage spraying 580 dollars/ha, glyphosate comprised (Versteynen 1991). The cost for a total control campaign in an 800 ha pine forest, containing 140 ha with few cherry (< 40 % crown cover), 120 ha many cherry (40-70 %) and 290 ha with abundant cherry (> 70 %) would attain 1 million dollar (Van Boghout, personal communication).

5. POLICY

Altough in 1950 the uncontrolled spreading of black cherry was known as good as now, the interpretation of facts differed enormously, according to the then current insights into silviculture : the absolute dominance of the economic forest function, the clearcutting system with short rotations and the use of fast-growing exotic species. Nowadays, the opinions have changed drastically for two reasons :

- the poor rentability of this age class system, due to low timber prices and high labour costs for the everlasting artificial reforestation, always coupled with costful black cherry combat operations;

- the public opinion, translated in the progressive new Flemish forest law (1990) which strives for silviculture, based on ecological principles : natural regeneration, use of indigenous species, longer rotations, sustainable production of high quality timber.

This option is only realizable in the absence of black cherry. So how to get rid of this species ? In the past, the Belgian and Dutch approach of the problem was very different :

- In Belgium, control was only focused on the regeneration period (from 5 years before the final cutting until the crown closure (Versteynen 1991)

- In the Netherlands, millions of guilders were yearly spent for the complete extinction of the species. Black cherry control threatened to become a goal on its own since its was the principal point in most management plans (Stichting Kritisch Bosbeheer 1983).

Nor the minimalistic approach, nor the 'Prunoneurosis' have solved the black cherry problem. Black cherry is indeed the symptom, not the cause of ecosystem disturbances and has a clear regulating function (Sloet van Oldruitenborgh 1982). Therefore, the restoration of the ecosystem equilibrium is the real long-term solution. Control of black cherry species must be an integrated part of the management of the ecosystem as a whole. It is possible that in the complete absence of management, black cherry disappears by his own, but that can take centuries, a period that can socially not be justified (Stichting Kritisch Bosbeheer 1983).

Our management plan has short and long term objectives. The short-term plan will necessarily focus on direct control of black cherry, however avoiding soil disturbance as much as possible. The long-term plan will focus on ecosystem stabilization. The money needed to realize this plan can be taken from an existing governmental fund for nature development. In Belgium, Black cherry is general in a forest area of about 50 000 ha. To realize the short-term planning, costs are estimated 2 million dollars yearly.

short-term planning (10-15 years)

1. Issuing a total prohibition of cultivation, trade and planting of black cherry;

2. Avoiding the further dispersal of seeds by the control of seed trees :
   removal (cutting and smearing of stump with chemical or biological biocide) of all seed trees in public forests on the occasion of the thinnings. Six years later (normal thinning cycle), issuing a total prohibition of flowering black cherry, including private gardens;

3. Meanwhile, subsidized control of black cherry in private and public non-state forests of more than 20 ha (forest grouping of smaller properties is additionally subsidized), with a combined method (mechanical/chemical or mechanical/biological).

4. Continuation of control on the occasion of stand regeneration in public forests. Soil-disturbing methods (pulling out) only allowed to further natural regeneration.

5. Total combat of black cherry with non soil-disturbing methods in big isolated state owned forests. This will be the pilote forests for silviculture on ecological basis.

6. Anticipating further dispersal of the problem by removing all black cherry specimen in public forests where the invasion just started.

Long-term planning (50 years)

1. Follow-up care of the treated areas since a certain re-emergence of black cherry from dispersed or burried seed and badly treated stumps has to be expected.

2. Establishment of an ecological equilibrium through the maintenance of soil rest and conversion into mixed stands by the underplanting of indigenous tree species. (Farjon 1986, Maddelein 1990, Borrmann 1990). Shade-tolerant broadleaved species, more adapted to higher N-levels than pine, such as oak, beech, linden or maple are suitable for this purpose.

5. CONCLUSIONS

Black cherry is one of the numerous examples illustrating the risk of introducing exotic species. It threatens the survival of the indigenous tree species, inhibits forest regeneration and competes with the tree crop for water and nutrients. It's uncontrolled spreading is due to mainly anthropogenic factors, being mainly its introduction, the soil disturbance, the establishment of pine monocultures and the atmospheric pollution. Its sustained control is an extremely costful operation, but justified when integrated in a global ecosystem management plan. The proposed plan is based on the combination of the knowledge on black cherry ecology, as well as its possible methods of control.

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