# EXTENSION NOTES

Ontario

# SCOTS PINE IN ONTARIO

This extension note discusses the establishment of Scots pine in Ontario and provides a range of management considerations and options for owners of Scots pine plantations and naturally established areas.

Scots pine (*Pinus sylvestris*) is among the most widely distributed conifer species in existence with a natural range that extends from western Scotland to eastern Siberia and from northern Scandanavia to southern Spain. It was among the first European tree species introduced into North America where over time, the species reference as “Scotch pine” became common. This broad natural geographic distribution combined with a substantial range in elevation occurrence has led to considerable biochemical and characteristic variation within the species over its natural range.

Most estimates suggest that there are between 19 and 22 subspecies of Scots pine. Examples of diversity in tree form are evident in many mature Scots pine plantations. Some of the poor tree form often associated with Ontario Scots pine has been attributed back to poorly selected subspecies as the original seed sources used in establishment here. Since its introduction into North America, Scots pine has become widely naturalized through open field seed dispersal and germination.

## HISTORY OF SCOTS PINE ESTABLISHMENT IN ONTARIO

The introduction and early use of Scots pine in Ontario closely followed some of the first provincial reforestation efforts of abandoned agricultural lands that began in the 1920s. These efforts were designed to address impacts such as soil erosion associated with large scale land clearing for agriculture that occurred during the latter half of the 19 century. Scots pine was most frequently planted in association with red, white, and jack pine and to a lesser degree with white spruce and other species. Many of these early plantings utilized Scots pine in alternate row species arrangements, in establishing shelterbelts or in pure blocks. It gained early recognition for its ability to survive and help stabilize some of the drier, more degraded and seriously eroding of these sites and its use for that purpose grew modestly over the decades of reforestation that followed. As a result of these early reforestation efforts, Scots pine still exists as significant species component in many stands contained within the network of municipal and conservation authority forests of southern Ontario.

The inconsistency in tree form is one of the limiting factors impacting management and marketing of Scots pine in Ontario.

## SCOTS PINE AND CHRISTMAS TREES

The planting of Scots pine on private lands was limited prior to the Second World War. Most private land Scots pine planting occurred after the war and was largely associated with an interest in the developing Christmas tree industry. For many southern Ontario landowners, Christmas tree production represented a new economic opportunity using some of their more marginal lands. Scots pine with its good survivability, its attractive needle colour and needle retention characteristics, its fast growth rate and market rotation period, and its capacity to respond favourably to shaping through pruning were some of the attributes that made it a species of choice to many early Christmas tree producers. Scots pine plantings of private land in Ontario peaked in the mid to late 1950s. Within a relatively short time period, the production and outplanting of Scots pine far exceeded market demand for Christmas trees. This shortage of markets and a resulting reluctance by some growers to provide the annual labour necessary in Christmas tree pruning and tending eventually led to thousands of hectares of Scots pine plantation growing well beyond marketability for that purpose. Many of the mature Scots pine plantations found on private lands in Ontario today were originally established as Christmas tree operations. In recent years, Scots pine has lost favour with many Ontario Christmas tree growers due to its high susceptibility to a variety of insects and diseases and to the growing industry trend toward the use of fir varieties as more desirable Christmas tree species.

Difficulties and costs associated with controlling pests such as root collar and pales weevil have influenced many Ontario Christmas tree growers to convert operations away from Scots pine.

The former Midhurst Forest Station reported peak sales of 3.3 million Scots pine seedlings in 1958, a number which declined to 500,000 seedlings by 1967. Sales of Scots pine seedlings held steady at this number until the early 1980s when production was phased out. Christmas tree operations growing spruce or fir such as the one shown above, have replaced many former Scots pine operations.

## CONSIDERATIONS IN MANAGING SCOTS PINE

In its natural range of Europe and in parts of Asia, Scots pine is valued as an important commercial species and is well documented as having significant ecological value and inter-species relationships in their ecosystems. In Ontario, Scots pine is typically viewed less favourably. Although now widely naturalized, Scots pine is an exotic (non-native) tree species that also has invasive tendencies. Its susceptibility to a range of insects and diseases can make it a source for the transfer of some pests to valued native tree species, which can often complicate management decisions. The management of Scots pine can be further complicated by low commercial value, by a localized lack of product markets, and by the limited number of forestry contractors dealing with Scots pine on a consistent basis as is often the case where more desirable species such as red pine is in abundant supply. As such, Scots pine has often been viewed as problematic by many landowners, forest managers, and forest contractors in Ontario.

## SEED PRODUCTION AND DISPERSAL

Scots pine is typically a prolific producer of seed, which can disperse considerable distances with wind or by other means and which tends to germinate well under favourable light and soil conditions. Seedling progression into fields and meadows is common where Scots pine seed sources are located nearby. Scots pine seed can also infiltrate and germinate in adjacent forest stands and commonly becomes established along perimeter areas of existing plantations. It can also become established within stand interiors where favourable light conditions exist such as through stand openings created in plantation thinning operations. Undesirable regeneration and succession to Scots pine can be most problematic within an existing Scots pine plantation, especially where there is an absence of established shade tolerant species within the plantation understorey. In some cases, sudden reductions in the density of the plantation crown canopy can occur through insect, disease or through other natural disturbances, effectively creating ideal conditions for the rapid re-establishment of Scots pine.

A common scene in parts of southern Ontario, Scots pine has successfully infiltrated a large portion of this abandoned field.

This Scots pine plantation was infected with Diplodia blight causing considerable mortality in the mature trees. The resulting sudden influx of sunlight reaching the forest floor created ideal conditions for the germination of new Scots pine seedlings, most of which were also infected by the same disease. Seedlings of several other tree species, such as the red oak protected by tubex shelters above, were planted because of the lack of suitable natural succession.

# INSECTS AND DISEASES OF SCOTS PINE

There are well in excess of 100 documented insect or disease issues associated with Scots pine in Ontario, many of which are introduced pests. Some are regionalized in their current distribution but many extend throughout the North American range of Scots pine. Some of these, such as the pine shoot beetle, are of special concern as the potential ecological and economic impact associated with this pest extends into other tree species.

Some serious pests of Scots pine in Ontario include:

**PINE SHOOT BEETLE** *(Tomicus piniperda)*
First detected in southwestern Ontario in 1992, the Pine Shoot Beetle has quickly become a major pest in Scots pine and a significant source of concern for native pine species. The adult beetles are small (3 to 5 mm long), black to dark brown in colour, and cylindrical in shape. Beetles attack healthy tree shoots by tunneling in the pith towards the branch tips, resulting in shoot death. They also bore under the bark of the main tree stem to lay eggs where the subsequent feeding on the cambium by the developing larvae can cause tree mortality through girdling. A quarantine restricting the movement of many unprocessed pine products has been established by the Canadian Food Inspection Agency in an attempt to slow the spread of this pest. Landowners with infestations can help reduce populations by properly disposing of potential brood materials (branches, logs) through burying, burning (where permitted), or chipping.

**DIPLODIA TIP BLIGHT** *(Sphaeropsis sapinea)*
Diplodia tip blight is a serious disease most affecting Scots and Austrian pine in Ontario. The disease is characterized initially by stunting and browning on the current year's needles causing mortality of new shoots. It can also be characterized by small pitch cankers that form under the bark of branches and on the main stem and by the presence of small black fruiting bodies on infected tissue and older cones.

This disease can kill trees of any size and is responsible for extensive decline and mortality in Scots pine, particularly where found on low-moisture stressed sites in Ontario. Prevention of the disease is impractical, if not impossible, in most plantation settings while treating stands already infected should in most cases involve conversion to species with low susceptibility to the disease.

**PINE ROOT COLLAR WEEVIL** *(Hylobius radicis)*
**AND PALES WEEVIL** *(Hylobius pales)*
Root collar weevil and Pales weevil along with the Northern pine weevil (Pissodes approximates) have all been problematic pests in Scots pine, particularly in Christmas tree operations where trees are frequently harvested. These

This Scots pine plantation (top photo) was infected with Diplodia blight causing considerable mortality in the mature trees. The resulting sudden influx of sunlight reaching the forest floor created ideal conditions for the germination of new Scots pine seedlings, most of which were infected by the same disease. Seedlings of several other tree species, such as the red oak shown protected by a tubex shelter, were planted because of the lack of desirable natural succession. In contrast, the Scots pine plantation (bottom photo) has good natural hardwood species succession eliminating the need for supplemental tree planting.

weevils generally attack trees at or near ground level and depending on the weevil species, will tunnel beneath the bark or into the root systems in their larval stages causing deformities and possibly mortality. The adult stages of all three weevils will feed on the bark of young branch shoots in late summer causing discolouration and crooking. As these pests are attracted to oils and resins exuded from freshly cut stumps, cultural population control can be effective by extending the frequency of cutting cycles within infected plantations to several years.

**WESTERN GALL RUST** *(Endocronartium harknessi)*
Western gall rust is recognizable by the distinct globose galls that form on the branches or main stem of infected trees. The powdery yellowish-orange coloured spores that are associated with rust diseases appear here on the surface of the galls from May to July. Western gall rust is somewhat unique in that the disease does not require an alternate plant species as a host to complete its life cycle, unlike that of Eastern gall rust (*Cronartium quercum*) which appears identical on infected pine but which requires oak as an alternate host. Tree tissue beneath galls is usually killed which in turn causes the tree parts beyond the galled area to die. Trees under ten years of age are much more prone to mortality from gall rusts.

**SCLERODERRIS CANKER** *(Gremmeniella abietina)*
There are two known strains of this fungus in Ontario. The North American strain will infect young trees but rarely kills trees over two metres tall. The European strain had been reported to kill larger trees. The first indication of infection is a reddish-orange discolouration at the base of needles in May or June. The needles also bend down. In summer, the needles and branch tips turn yellow to brown. The fungus then grows back to the main stem, where it eventually forms a canker that can kill the portion of the tree above that point. Because the fungus usually infects lower branches, pruning is an effective control measure.

## SCOTS PINE MARKETS

From a processed wood products perspective, Scots pine has similar properties to the more commonly processed Ontario species of red or jack pine. Markets however, can be limited or localized in nature. The variation in individual tree form and in tree size as well as the accessible wood volume contained within a plantation are some of the main factors impacting Scots pine marketability. The presence and quantity of organisms affecting wood quality, the proximity of the stand to mills or other processing facilities, the consideration of quarantine restrictions and the availability of harvesting contractors are other significant factors impacting marketability. In some circumstances, landowners who are undertaking operations in adjoining stands, such as red pine thinning, or who are marketing Scots pine as a minor component of a larger, more diverse species sales contract are often more successful than those simply negotiating the sale of Scots pine. The availability of markets, in a general sense, is improving in Ontario. It is always wise to contact local logging contractors and forestry consultants to discuss potential markets and local product requirements prior to planning your operation.

### SCOTS PINE PRODUCTS

**Pulpwood**
<2.54 metre (m) in length  generally a minimum top end diameter of 8 centimetre (cm)
**Wood Chips**
>2.54 m in length  generally a minimum top end diameter of 8 cm (end product will determine whether bark must be removed)
**Boltwood**
>2.54 m in length  between a 10 and 20 cm top end diameter (stems must be straight)
**Sawlogs**
>2.54 m in length  generally a minimum top end diameter of 20 cm.

## MANAGEMENT OPTIONS FOR CONSIDERATION

For reasons both practical and economic, landowners must often evaluate and assess closely, their options with respect to undertaking an active management approach with Scots pine stands. Some options, such as implementing a stand conversion operation, may require a significant investment of both time and money. Some common things worth considering in the decision making process include:

- To what extent does Scots pine occupy the property
- What impact does it have on overall property goals and objectives
- What are the likely ecological, forest health, property value, hazard risk, or other impacts likely to be if left unmanaged
- What treatment options exist and are there examples to view
- What are the costs and long-term commitments associated with treatments
- What product market opportunities exist
- Are there local regulations, such as tree cutting by-laws, that may influence treatment
- What help and expertise is available?

## CONTROLLING REGENERATION AND FIELD INFILTRATION

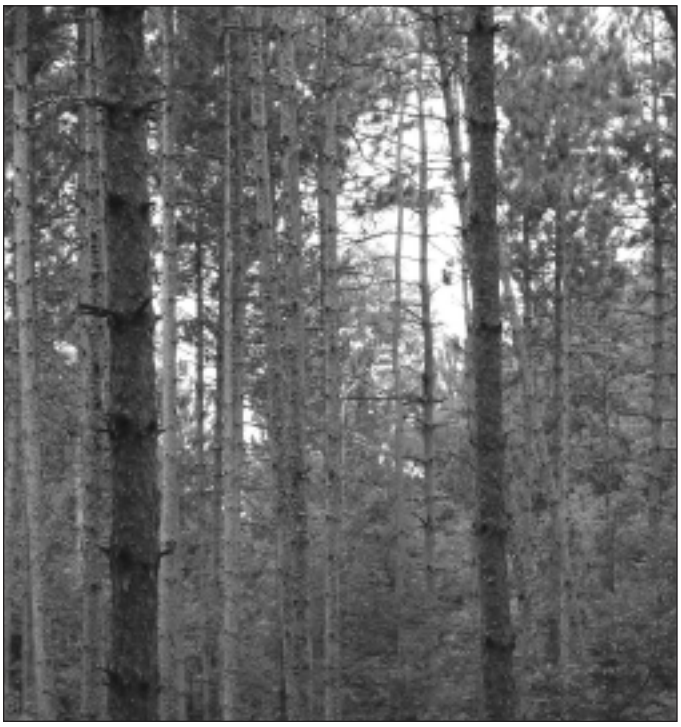
In acknowledging some the issues associated with Scots pine, it is advisable for most landowners to consider undertaking some form of control action in limiting its continued succession on their properties. Seedling to sapling sized Scots pine that have encroached into fields, meadows, within fence rows and shelterbelts, are found as scattered individuals within an understorey or competing with other planted trees or shrubs, can easily be removed by hand clipping at ground level. Larger treatment areas and slightly larger tree diameters can be more effectively removed using mechanical tending equipment. Brush (clearing) saws are effective tools where trying to select Scots pine for removal among more desirable tree species or under the canopy of an established plantation. A bush hog type mower (gyro-mower) may be a cost effective alternative to a brush saw in field applications where vegetation removal does not need to be selective. Chainsaws are also effective tools where removing larger Scots pine and may be a viable option for landowners experienced and comfortable with their use. The control of Scots pine successional growth should be accompanied by the identification and where feasible, elimination of the seed source. As Scots pine seed can remain viable for a number of years, periodic re-treatment may occasionally be necessary.

## DESIRABLE NATURAL SUCCESSION

The conversion through natural succession of Scots pine plantation to a mixed or hardwood forest is generally a highly desirable management objective. Fortunate landowners; those with Scots pine located in close proximity to hardwood or mixed forest seed sources; may find a significant understorey of desirable species such as hard maple, beech, ash, black cherry, oak,white pine, or other species have naturally developed within their plantation. In these instances, landowners often have significant management flexibility and can shift their management emphasis to manipulation of the Scots pine overstorey toward advancing their established successional growth. In some instances, variations in the overstorey treatment employed will maximize the potential species diversity eventually present. In other instances, no management activity may be a viable option in the advancement of the established understorey. In an active management approach, the type and degree of thinning activity or the selected overstorey removal treatment to be contemplated will depend on past stand treatments, on the density, composition, and arrangement of the understorey, on operational considerations and will likely be influenced by product marketability.

## MIXED SPECIES PLANTATIONS CONTAINING SCOTS PINE

Scots pine, as a minor component within a mixed species plantation, can often be most effectively managed through thinning in row removal or early selection treatment applications. Early removal reduces the time span in which Scots pine can disseminate seed effectively reducing future efforts to control establishing regeneration. Alternate row species planting arrangements involving Scots pine were reasonably common and were often implemented as a means of broadening future land use options or in minimizing the risk of complete planting failure should one species perform poorly. Mixed species plantations involving the utilization of Scots pine in random or patch planting arrangements were also common and often located the Scots pine on degraded sites. It is more likely that removal of Scots pine in these instances may require several thinning treatments over an extended period of time in order to ensure the stability of the residual stand and to potentially maximize the environmental and economic benefits of the other species present in the plantation. The removal of all Scots pine present in one operation may however be a feasible and desirable option. The creation of small canopy openings within an established plantation can often speed up the natural succession process and improve wildlife habitat and bio-diversity. As Scots pine was frequently planted on degraded sites, a major consideration in opting for its complete removal should be the assessment and rationalization of how the site will respond after cutting. In general terms, where regeneration to desirable species seems likely, complete removal is a viable option. The size (scale) of the removal, the relative health and marketability of the Scots pine, and your overall property goals and objectives will also influence this decision.



The owner of this recently thinned mixed plantation of Scots pine and red pine plans on removing the full Scots pine component over the course of several thinning treatments.

# STAND CONVERSIONS

A stand conversion involves the use of one or more silvicultural treatments designed to change the dominant species (working group) present within the stand boundary. Stand conversions can take advantage of desirable established natural regeneration, can utilize an artificial means of regenerating the stand, such as tree planting or seeding, or can utilize both. Stand conversions may also involve a complete or partial harvesting (removal) of the established trees, the re-arrangement or elimination of slash and debris following harvest, the use of site preparation equipment in advance of seeding or planting, and may also require follow-up tending treatments to assist in the continued growth of the desired trees established.

There are many factors and circumstances that precede the decision to implement a stand conversion treatment. With Scots pine, a decision toward a stand conversion is usually precipitated by tree health factors (example - presence or risk of a serious insect or disease infestation), for long-term economic or property objective reasons, or to interrupt a seemingly continuous cycle of species succession back to Scots pine. Whatever the reasons, a well planned and cautious approach in implementing stand conversions is recommended. Staging the work over several years and frequently monitoring the conditions present after any treatment are good options.

This large Scots pine clearcut area was infected with Diplodia blight but was treated early in the infection stage while most of the trees were economically salvageable. Once clearcut, a front-mounted root rake was utilized to move leftover slash into burnable piles. The site was hand planted the following year using tree species that are not susceptible to infection from Diplodia.

### CONVERSIONS USING TREE PLANTING:

Tree planting is an effective means of enhancing sporadic quantities of natural regeneration and is an effective substitute in its absence. Planted trees can also be utilized to compete with and eventually replace undesirable species, such as re-establishing Scots pine regeneration within an established plantation. In most stand conversion scenarios, tree planting most frequently would follow harvesting and site preparation treatments however, in some circumstances, such as in a declining Scots pine plantation, underplanting is worthy of consideration. Selecting the appropriate species for planting in Scots pine stand conversions requires consideration of the risk of transferring any problems to the seedlings that were associated with the original stand in addition to other site suitability characteristics.

### CONVERSIONS AND HARVESTING:

Clearcuts in Scots pine have often been utilized as an operational means of implementing a species conversion. The benefits in clearcutting include maximizing available wood volumes for a sales contract, the ability to eliminate completely both Scots pine seed source and the impact of insect or disease issues associated with the trees present, and to potentially confine the subsequent treatments, such as tree planting, to a shorter overall time span. Most difficulties associated with Scots pine clearcuts involve increased potential for mortality in planted trees and long-term tending issues associated with the germination of viable Scots pine seed and invasion by other undesirable species.
Smaller patch cuts significantly reduce the risks and potential costs associated with the regeneration aspect of Scots pine stand conversions.

### CONVERSIONS AND SITE PREPARATION:

Site preparation may be a necessary component of Scots pine conversion. Consideration for its use will most likely depend on the cultural or physical need to remove slash following harvesting but may also be considered desirable in the physical establishment of tree planting microsites.

## ENVIRONMENTAL CONSIDERATIONS

Despite the forest health issues and invasive tendencies associated with Scots pine, the species has provided a number of environmental benefits in Ontario. Its value in stabilizing and improving many seriously degraded and eroding landscapes and its value in assisting with native species succession are two such benefits. In some instances, field invasion by Scots pine has developed to a stage where it provides effective cover and is utilized as wildlife travel corridors. Scots pine cones are readily utilized as a winter food source by squirrels and other wildlife species.

## CONCLUSION

Scots pine as a product producing resource has been largely under-utilized in Ontario beyond its use in the Christmas tree industry. While its use in present day afforestation is not recommended, many established plantations and shelterbelts containing Scots pine are continuing to provide environmental benefits and may also provide a source of economic return. The susceptibility of the species to a variety of pests and its prolific seeding habits in most cases warrant efforts to limit its continued naturalization through manual or mechanical removal of significant seed sources and of naturally established field regeneration and advanced growth individuals. Owners of plantations with either a minor or major Scots pine component should carefully assess the associated values and condition of their stands prior to planning and undertaking any management operations.

### FOR FURTHER READING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