ECOLOGICAL ASSESSMENT OF SYCAMORE INVASION IN THE UPPER LEITH VALLEY, DUNEDIN

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ECOLOGICAL ASSESSMENT OF SYCAMORE INVASION IN THE UPPER LEITH VALLEY, DUNEDIN

Dense sycamore stand east of Leith Valley Road.

Contract Report No. 4682

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1. INTRODUCTION

Sycamore (*Acer pseudoplatanus*) is a significant ecological weed in the Dunedin area and elsewhere in New Zealand. It has fast growth, high invasiveness in disturbed habitats, develops into a tall, shady tree that outcompetes indigenous forest tree regeneration, and as a deciduous tree deposits copious leaf litter that smothers small indigenous forest floor plants. Sycamore has a wide habitat range and if its spread is left unchecked, has the potential to significantly increase its local abundance and extent.

Dunedin City Council owns areas of land in the upper Leith Valley, including areas around Sullivans Dam that are managed to produce clean water, that contain areas infested by sycamore. There is evidence that sycamore is actively invading down the Leith Valley, including into nearby areas managed for the conservation of indigenous biodiversity. The City Council therefore commissioned Wildland Consultants to evaluate the sycamore problem in the upper Leith Valley, and provide advice on whether the problem requires action in order to protect local indigenous biodiversity, and if so, what management actions are required. Specifically, the Council required Wildland Consultants to:

- Identify and describe the sycamore issue/problem, illustrated with photographs and maps.
- Assess whether sycamore should be controlled in the upper Leith Valley, in relation to priorities for other sycamore infestations around Dunedin.
- Suggest a strategic approach to address the sycamore problem in the Upper Leith Valley.
- Identify key areas that are vulnerable to sycamore invasion and/or have high biodiversity value, which should be prioritised for management.
- Identify options for sycamore control, and their indicative costs.

2. METHODS

The upper Leith Valley was visited on 22 May 2018, and areas invaded by sycamore were assessed on foot to describe the structure and composition of sycamore-infested sites, to map these areas, and to document the extent of sycamore spread down Leith Valley.

Sycamore distribution elsewhere in Dunedin was assessed using existing staff knowledge, satellite imagery in autumn periods when deciduous foliage is obvious, and a review of relevant site databases to determine sites where sycamore has been detected.

3. EXTENT OF SYCAMORE INVASION IN UPPER LEITH VALLEY

There is an isolated though significant infestation of sycamore in regenerating indigenous forest northwest of Sullivans Dam (Plates 1 and 2), significant infestations

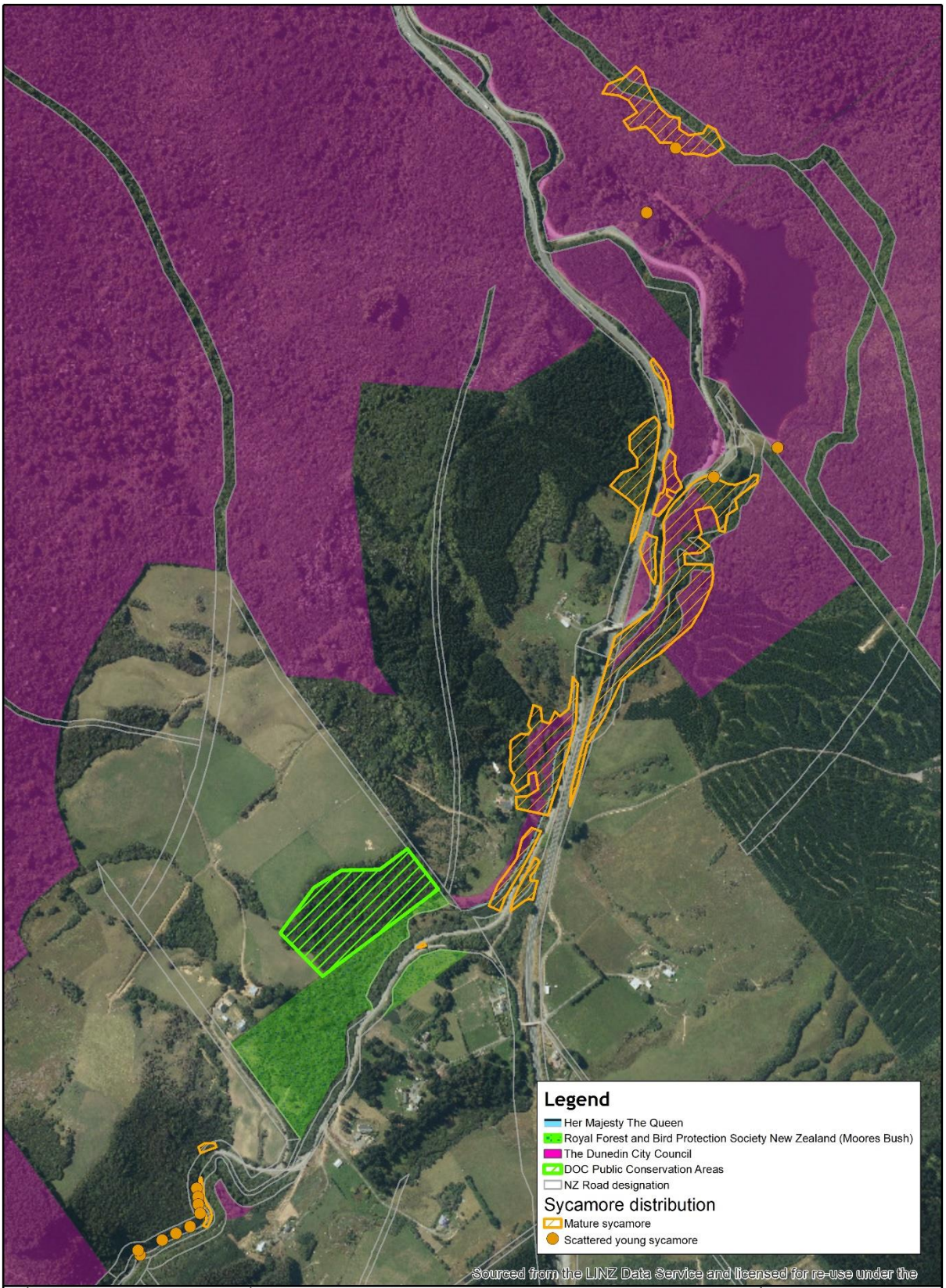
on both sides of State Highway 1 below Sullivans Dam (Plate 3), and scattered groves of mature trees and saplings further down Leith Valley Road (Plate 4) (Figure 1).

Plate 1: Isolated stand of sycamore (the deciduous trees in the centre) surrounded by regenerating indigenous forest northwest of Sullivans Dam.

Plate 2: Understorey of the isolated sycamore stand, showing the deep layer of sycamore leaves that inhibits ground layer vegetation.

Plate 3: Sycamore (deciduous trees) on both sides of State Highway 1 below the Leith Valley Road overbridge. Most of this infested land is owned by Dunedin City Council or the Crown.

Plate 4: Sycamore (deciduous trees on right, and saplings with yellow foliage on bank at left) on both sides of Leith Valley Road, above the Morrisons Burn confluence.



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Data Acknowledgment

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Figure 1: Distribution of sycamore in the Sullivans Dam and upper Leith Valley area.

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Scale: 1:8,909
Date: 18/06/2018
Cartographer: KM
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Active sycamore invasion is more prevalent in open habitats such as roadsides, forest margins, and rough grassland. It is actively invading along the Leith Valley road, where open riparian areas and mown banks above the road are readily invaded by sycamore (Figure 1). Sycamore saplings were also present on the margins of mown clearings at the south end of Sullivans Dam.

The isolated stand of sycamore is relatively contained by young indigenous broadleaved forest, but a few sycamore saplings were present on the margins of the stand. Sycamore saplings observed approximately 130 metres away in a stand of tall conifers and regenerating forest near Leith Valley Road (Figure 1) are likely to have established from seed dispersed by wind from the isolated stand.

Stands of sycamore on the eastern side of State Highway 1 generally have indigenous tree saplings such as pāte (*Schefflera digitata*), soft tree fern (*Cyathea smithii*), kōtukukuku (*Fuchsia excorticata*), hupiro (*Coprosma foetidissima*) and larger ground cover species such as *Astelia fragrans* and shield fern (*Polystichum vestitum*).

4. PRIORITISATION OF SYCAMORE CONTROL

4.1 Overview

This section of report describes the local distribution of sycamore in Dunedin, known projects involving sycamore control, factors that favour control of sycamore in the upper Leith Valley, and factors that are disadvantages for sycamore control at this site.

4.2 Local distribution of sycamore

Sycamore has established in various parts of Dunedin, often in urban and peri-urban areas. Significant infestations are present at Ravensbourne, on the margins of Signal Hill Reserve, in the Port Chalmers Town Belt and adjacent urban area, at Ross Creek and in the lower Leith Valley, and in Flagstaff Forest and in the adjacent Silverstream Valley. More localised infestations occur above Logan Park School, in the Dunedin Town Belt, at Deborah Bay, and near Roseneath. Isolated sycamore trees are present in many other locations in Dunedin.

At most of these sycamore infestation sites, sycamore is actively invading indigenous forest and scrub, particularly on forest margins and in riparian habitats.

4.3 Current control of sycamore

In partnership with the New Zealand Transport Agency, Dunedin City Council has helped to fund sycamore control along the road and cycleway adjacent to the suburb of Ravensbourne. Control of sycamore is followed by planting of indigenous tree and shrub species.

Sycamore is also one of the weed species that has been controlled by contractors in the Dunedin Town Belt.

4.4 Sycamore in the upper Leith Valley

Sycamore in the upper Leith Valley is worthy of control because:

- Of all the areas described above, the upper Leith Valley contains potentially affected indigenous vegetation and habitats of the highest ecological value, including regionally uncommon cedar (*Libocedrus bidwillii*) forest and mature podocarp/broadleaved forest.
- A sizeable proportion of the infestation occurs on land managed by Dunedin City Council and Crown agencies.
- The infestations are in the upper catchment, and control of them would reduce downstream invasion by sycamore.
- The sycamore infestations are close to Leith Saddle, which provides a gateway for future sycamore invasion into the Waitati Valley catchment.
- Indigenous forest and regenerating forest vegetation is close to all the areas occupied by sycamore, providing sources to allow development of closed-canopy indigenous forest, which is more resistant to sycamore invasion, after sycamore control.

Factors that are disadvantageous for sycamore control in the upper Leith Valley include:

- The significant size of the sycamore infestation, which will require more resources for control.
- Successful control would also require sycamore control on adjacent private land.
- Significant roads pass through the infested areas, increasing the level of resources required to manage health and safety risks.

Other factors, such as high public visibility of control at this site, should also be borne in mind, as they could result in either positive or negative public perceptions.

5. STRATEGY FOR SYCAMORE CONTROL

5.1 Priorities

A suggested strategy for sycamore control in the upper Leith Valley could incorporate the following priorities:

Priority 1

Control the mature and regenerating sycamore on the margins of Leith Valley Road and Leith Stream, between Moores Bush and confluence of the Morrisons Burn (Figure 1). These sycamores are a relatively small infestation, with high potential for further spread up and down Leith Valley Road.

Priority 2

Control the isolated stand of sycamore to the northwest of Sullivans Dam.

Priority 3

Progressively control the more extensive infestation of sycamore between Sullivans Dam and Moores Bush, working from the edges of this infestation toward its centre.

Priority 4

Monitor all control sites for sycamore re-invasion and regeneration, and to assess progress toward post-control goals for control sites.

Consultation

Consultation with Crown agencies and private landholders that manage or administer sycamore-infested and vulnerable land in the project area should be undertaken at an early stage, so that by the time control of the more extensive infestations needs to be undertaken, permission and potential funding contributions from these landholders has been obtained.

As the bulk of the sycamore infestation in the upper Leith Valley is on Dunedin City Council-owned and managed land, the Dunedin City Council should take major responsibility for control of sycamore in this area.

5.2 Control of other weeds

During field work to assess the extent of the sycamore infestation, scattered trees of macrocarpa (*Cupressus macrocarpa*) and radiata pine (*Pinus radiata*) were observed on the eastern margin of Sullivans Dam (Plate 5) and on the eastern slopes above the dam. If sycamore control is undertaken in the upper Leith Valley, it would be logical to control these scattered conifer trees at the same time.

Plate 5: Young macrocarpa tree on the eastern margin of Sullivans Dam.

Plate 6: Scattered young radiata pine trees (arrowed) emerging from broadleaved forest on the upper eastern slopes above Sullivans Dam.

6. METHODS AND COSTS FOR SYCAMORE CONTROL

6.1 Control methods

Sycamore can be controlled in a variety of ways, but as sycamore has very good re-sprouting ability, most of these methods require application of an appropriate herbicide.

Sycamore seedlings can be pulled by hand, but can require intensive effort when dense patches of seedlings are present.

Sycamore can be controlled by spraying of herbicide onto foliage, which is only practical for small saplings, or dense infestations that are suitable for aerial spraying of herbicide. Spraying of foliage can only be done when sycamore is in-leaf with full green foliage.

Sycamore trees and saplings can be cut and felled, with the stumps requiring application of herbicide to prevent re-sprouting. Cut stumps should be monitored to ensure that this is effective.

Larger sycamore trees can be bored with holes, with these holes being then filled with herbicide. Alternatively, frilling involves making cuts into the basal trunk and then immediately filling with herbicide.

Herbicides typically used to control sycamore are those incorporating Picloram or Metulfuron as the active ingredient. Both of these are capable of significant adverse effects on non-target indigenous trees and shrubs. Undiluted Glyphosate is sometimes used for filling bore holes and cuts in sycamore trunks. Glyphosate affects all contacted vegetation but has a less persistent effect on non-target vegetation.

Basal bark spraying involves application of a mixture of Triclopyr and an oil-based surfactant/penetrant to the basal section of tree trunks. The herbicide enters the bark and is translocated to all parts of the tree, thus can be very effective. This process can take time, with this depending on tree size and species. Basal bark spraying should not be undertaken in very wet weather when the spray mix is vulnerable to emulsification, making it ineffective, and causing spray elements to enter run-off.

6.2 Control costs

Removal of sycamore from an 0.8 hectare area at Ravensbourne cost Dunedin City Council $17,924, but as this location was adjacent to roads, cycle paths, and a railway, it would have required felling and disposal of sycamore trees, incorporating substantial clean-up costs to remove tree debris after control.

A less intensive operation involving basal bark spraying only and leaving the trees standing would be much less expensive, as little as $2,000 per hectare for stands of mature trees. Much also depends on the density and size distribution of the sycamore stand.

Costs are therefore estimated for three scenarios of different intensity:

6.2.1 Scenario 1. Low intensity using basal bark spraying only

This scenario exclusively uses basal bark spraying and killing trees standing with no other mechanised operation.

For a medium density infestation with a relatively healthy native understory, control costs of approximately $2,000 total per hectare would be required, including a contractor day rate of $600/day for two days, plus allowance for basal spray material ($730.00)

For a high density stand, the costs would be higher, approximately $3000/ha where the majority of trees are less than 30cm stem diameter, or with terrain and vegetation that makes access difficult.

For sparse infestations of sycamore, control using basal spray application may cost less than $1,000/ha.

6.2.2 Scenario 2. Moderate intensity using a variety of methods

This scenario uses a combination of felling, mulching, removal, traffic control and other considerations plus a component of killing trees standing with X-Tree basal. Costs are estimated at $10,000-$20,000/ha but are very context-specific and relative to the proportion of each method required. Other factors influencing costs include sycamore density, the need to involve arborists, traffic control requirements, and/or chipping, mulching or removal of felled sycamore tree from site.

6.2.3 Scenario 3. High intensity using only high intensity methods

Scenario 3 uses exclusively high intensity control methods, including felling/cutting, dragging, chipping and pasting/spraying of cut-stumps. No dead standing trees are left. Typically, these operations occur in sites with high amenity values and/or in public recreation areas. Costs are estimated at $40,000-$60,000/ha. As in Scenario 2, costs are dependent on additional factors.

6.3 Suggested control method

Basal bark spraying is likely to be the most cost-efficient technique for use on mature sycamore trees and large sycamore saplings at the upper Leith Valley site, where access for knapsack spraying is reasonable. This technique would allow the sprayed trees to remain standing as dead trees and progressively lose branches and fall. Basal bark spraying when applied appropriately is also associated with fewer non-target effects. Regeneration of indigenous tree species in control sites would therefore not be affected.

Basal bark spraying would ultimately result in stands of dead sycamore; as sycamore is deciduous, winter stands have a similar appearance. Post-control access is easier when basal bark spraying is used, compared with felling of trees.

Felling sycamore trees using chainsaw and/or hand tools, and pasting stumps with herbicide, will likely also be required, but would not be the main technique. It would be used on smaller diameter sycamore trees and saplings, and where larger sycamore

trees need to be cleared from publicly-used areas. For example, adjacent to a track that passes from Leith Valley Road through sycamore forest on the east side of State Highway 1, to provide access to a live firing range.

Some cutting, dragging, and chipping of felled sycamore trees may be required in sites with higher amenity value, such as adjacent to the public roads that pass through the site.

Apart from roadsides and the track to the firing range, there appears to be little public use of areas dominated by sycamore in the upper Leith Valley.

For these reasons, basal bark spraying is suggested for use as the main approach for controlling sycamore in the upper Leith Valley, with limited felling of sycamore, and dragging and chipping felled sycamore where required.

6.4 Post-control management

In areas on the eastern side of State Highway 1, natural regeneration of indigenous tree species in sycamore control sites should be a viable strategy for the establishment of invasion-resistant post-control indigenous vegetation.

On the western side of State Highway 1, where sycamore occurs above rough pasture and shrubland, there is likely to be less natural regeneration of indigenous tree species, so planting of ecologically-appropriate indigenous trees is likely to be desirable after control.

All sycamore control sites should be monitored for 2-3 years after control to ensure that any regeneration of sycamore is identified and dealt with.

7. CONCLUSIONS

Sycamore control in the upper Leith Valley is warranted because of the presence of high value indigenous vegetation and habitat affected by sycamore invasion, the strategic importance of the site as a source of sycamore invasion of other areas, and because most of the sycamore-infested land is administered by Dunedin City Council.

The general priority for the site is to initially control sycamore infestations on the margins of the project area, and then progressively undertake control into the large central infestation of sycamore on either side of State Highway 1.

Consultation with landholders with sycamore-infested land in the project area or land that is vulnerable to such infestation should be undertaken, to gain access for control and to potentially gain external resources to assist with control.

The main suggested technique for sycamore control in the upper Leith Valley is basal bark spraying, which is a cost-effective technique in areas where sycamores do not have to be felled. Some felling and possibly chipping of felled sycamore is also likely to be required adjacent to public roads and access tracks.

ACKNOWLEDGMENTS

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