Ffion Maguire BSc Hons AMRSB Tech.Arbor.A
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The Fight for Cinderella – How Forestry Plantations are Covertly Reducing Peatlands via Wind.

Ffion Maguire BSc Hons AMRSB Tech.Arbor.A

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Abstract

Peatlands cover just 3% of the global land mass, however, are one of the most important habitats in the world, due to associated ecosystem services. In Scotland, peatlands were once thought to have minimal environmental value, resulting in extensive planting of conifers in peatlands during the 20th century, following a timber shortage after the World Wars. Afforestation is a major threat to peatland ecosystems. Procedures to drain the peat, associated with tree planting, can have irreversible effects on future water balance and peat accumulation. Furthermore, afforestation results in ongoing threats to non-forested peatland, as wind-dispersed seeds from forestry plantations can cause naturally occurring afforestation, due to ecological succession. This study aimed to identify the ‘risk zone’ around forestry plantations, where peatlands are more susceptible to naturally occurring afforestation, through seed trap and lodgepole pine count studies in The Flow Country, Scotland. The greatest abundance of conifer seed and regeneration was recorded at 20 m from the forest, although evidence of seed dispersal was recorded up to 120.9 m. Variance in seed rain abundance was observed between sites, and there was a variance of seasonal seed rain abundance in comparison to relevant literature, as seeds were predominantly recorded during summer. Furthermore, microtopography was identified to impact conifer germination patterns, as higher densities of conifers were recorded on flat ground and ridges, than furrows. This study provides a step forward in understanding the management considerations for peatlands adjacent to forestry plantations and it was determined that ongoing management of conifer regeneration in peatlands will be required within 120 m of forestry plantations. The results also prove that seed traps are a suitable method for researching seed rain abundance, whilst highlighting limitations that need to be addressed. Furthermore, a need to consider naturally occurring afforestation when smoothing peat for restoration purposes was identified.

Declarations

I declare that this work has not previously been accepted in substance for any degree and is not being concurrently submitted in candidature for any degree.

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This thesis is the result of my own investigations, except where otherwise stated. Other sources are acknowledged by giving explicit references. A bibliography is appended.

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Statement of Contribution

Statement of Contribution

Student Details

Student Name: Ffion Maguire
Student Number: [redacted]
Project Title: The Fight for Cinderella – How Forestry Plantations are Covertly Reducing Peatlands via Wind.

Contributor Role	Contributor
Conceptualisation	FM, CF & JW
Data curation	FM
Formal analysis	FM
Funding acquisition	FM, CF & JW
Investigation	FM
Field support	AM & EE
Methodology	FM, CF & JW
Project administration	FM & CF
Resources	FM, CF, JW, TC & EE
Software	FM
Supervision	CF
Validation	FM
Visualization	FM
Writing – original draft preparation	FM
Writing – review and editing	CF & FM

FM – Ffion Maguire (MRes Student)
CM – Professor Cynthia Froyd (Supervisor)
JW – Dr Jon Walker (Assistance with project set up)
EE – Euan Edgar (Assistance with site selection and seed trap installation)
TC – Tim Cockerill (Assistant with site selection and permissions)
AM – Alexander Macdonald (Field support to prevent lone working)

Student

Signed: [redacted] Date: 28/02/2024

Supervisor

Signed: [redacted] Date: 28/2/24

Statement of Expenditure

Statement of Expenditure

Student Details

Student Name: Ffion Maguire
Student Number: [redacted]
Project Title: The Fight for Cinderella – How Forestry Plantations are Covertly Reducing Peatlands via Wind.

Equipment or consumables

Equipment and consumables purchased by Swansea University are listed below. All purchases were bought from Highland Industrial Supplies, Amazon or B&Q. All prices listed are inclusive on VAT. Items include:

- Debris Netting 2m x 50m: £51.84 (incl. VAT) from Highland Industrial Supplies;
- x 20 x 1.2m (4ft) Tall Square Garden Tree Stakes – HC4 Pressure Treated: £209.94 (incl. VAT) from Amazon EU S.a.r.L;
- 105 Proplas Black 14L Buckets: £126.00 (incl. VAT) from B&Q;
- 60m Stanley Tape Measure: £31.20 (incl. VAT) from B&Q; and
- Gorilla Black Duct Tape (L) 9m (W) 25.4mm: £4.20 from B&Q.

Other

No other spending was accrued by Swansea University for the completion of this research.

Declaration

I hereby certify that the above information is true and correct to the best of my knowledge.

Student

Signed: [redacted] Date: 27/02/2024

Supervisor

Signed: [redacted] Date: 27/2/24

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Tables and Figures

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Abbreviations

Abbreviation	Definition
BRIG	Biodiversity Reporting and Information Group
CO^2	Carbon dioxide
°C	Degrees Celsius
FLS	Forestry and Land Scotland
g	Grames
Gt	Gigatonnes
Habitats Directive	European Union Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
km	Kilometres
km^2	Kilometres squared
L	Litre
m	Metres
m^2	Metres squared
mm	Millimetres
OECD	Organisation for Economic Co-operation and Development
SAC	Special Area of Conservation
SNH	Scottish Natural Heritage (now NatureScot)
SPA	Special Protection Area
UK	United Kingdom
UNESCO	United Nations Educational, Scientific and Cultural Organization

1 Introduction

1.1 What are Peatlands?

Peatlands are terrestrial wetland ecosystems, which are supported by a naturally accumulated layer of peat at the surface (Szajdak *et al*., 2014). There is no globally recognised definition of 'peat' or 'peatland' (Lourenco *et al*., 2022). However, in Scotland, peat is generally described as a substrate comprised of ≥60% dead organic material (Chapman *et al*., 2009; Feng *et al*., 2021; Finlayson *et al*., 2021; Soil Survey Scotland, 1984), that is ≥0.5 metres (m) thick (Aitkenhead, 2016; Bruneau & Johnson, 2014; Burton, 1996; Chapman *et al*., 2009; Finlayson *et al*., 2021; Hambley, 2016; Holden *et al*., 2004; Lourenco *et al*., 2022). Peat is formed by a natural accumulation of organic material, derived from plants growing in waterlogged conditions (Moore, 1989; Piatkowski *et al*., 2021). Consequently, peatlands are most commonly found in areas of positive water balance (Gorham, 1991). The water obstructs the flow of oxygen from the atmosphere, slowing the rate of decomposition of dead plants. As a result, partially decomposed dead plants become compacted from the weight of the new vegetation growing above and other decaying plant matter (Clymo, 2012). Once the biomass produced by the decaying vegetation exceeds the decomposition rate, peat begins to accumulate (Batzer *et al*., 2016; Charman, 1990).

The Joint Nature Conservation Committee (JNCC) classifies peatland habitat as 'mires' (Bragg 2002; JNCC, 2010; Littlewood, *et al*., 2010), which are categorised as either 'fen' or 'bog' (Batzer *et al*., 2016; JNCC, 2010). A fen is supported by precipitation and ground water (JNCC, 2010; Littlewood *et al*., 2010; Wieder & Vitt, 2001), whilst a bog is supported exclusively by precipitation (JNCC, 2010; Littlewood *et al*., 2010). JNCC further categorises bogs as either 'raised bog' or 'blanket bog' (JNCC, 2010). Raised bogs generally have deep peat deposits of approximately 4 – 8 m thick, and are usually found in the lowlands, on estuarine flats, river flood plains or other level areas with obstructed drainage (JNCC, 2010). Blanket bogs generally have thinner peat deposits than raised bogs, at approximately 2 – 5 m thick, and are usually found in the highlands (JNCC, 2010). Blanket bogs are comprised of *Sphagnum*-rich vegetation, forming a blanket over a variety of different surfaces, on level to moderately sloping ground (JNCC, 2010).

Sphagnum moss is one of the most important genus of plant species within a peatland ecosystem, as it is essential in the process of peat formation (Clymo, 1987; Clymo, 1998;

Rochefort, 2000; Rydin *et al*., 2006), therefore, *Sphagnum* moss is often referred to as an 'ecosystem engineer' (Norby *et al*., 2019; Piatkowski *et al*., 2021; Rochefort, 2000; Van Breemen, 1995). *Sphagnum* moss facilitates the formation of peat by drawing up water from the catotelm (the lower peat layers below the active acrotelm layer in which living plants are found), through capillary action, thus maintaining a water source at surface level (Morris *et al*., 2011b; Thompson & Waddington, 2008). Furthermore, *Sphagnum* mosses are more resistant to decay due to their acidity (Hájek *et al*., 2011; Wang *et al*., 2018), and therefore, form the majority of the organic material within the catotelm layer (Hájek *et al*., 2011; Kuhry, 1997; Turetsky, 2003).

1.2 Why are Peatlands Important?

Peatlands are often titled the 'Cinderella habitat' of the natural world (Byg *et al*., 2023; Lindsay, 1992; Lindsay, 1993). Despite playing a key role in Scotland's cultural and natural heritage, the importance of peatlands to Scotland's landscape and biodiversity has, for many years, been overlooked. Historically, peatlands were assumed to have little economical or ecological value in comparison to other native ecosystems (Byg *et al*., 2017; Marsden & Ebmeier, 2012; Waylen *et al*., 2016). The acidic, low nutrient, waterlogged conditions make peatlands hostile environments for much of Scotland's native fauna and flora, therefore it was generally assumed that peatlands were areas of low ecological value (Andersen *et al*., 2016; Byg *et al*., 2017; Johnston & Soulsby, 2000). However, in reality, peatland habitats support a diverse range of species, many of which are considered to be peatland specialists (i.e. rely solely or largely on peatland ecosystems) (Alsila *et al*., 2020; Batzer *et al*., 2016; Desrochers & Van Duinen, 2006; Littlewood *et al*., 2010; Spitzer *et al*., 1999). Lowland raised bogs, blanket bogs and lowland fens are listed as priority habitats in the United Kingdom (UK) Biodiversity Action Plan (Biodiversity Reporting and Information Group (BRIG), 2011; Littlewood *et al*., 2010; Marsden & Ebmeier, 2012), whilst blanket bog is also protected under Annex I of the European Union Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (commonly referred to as the 'Habitats Directive') (Marsden & Ebmeier, 2012). Scottish peatlands are known to support nationally and internationally important species, including: globally rare plant communities comprised of species such as *Sphagnum*, cotton-grass (*Eriophorum* spp.), heather (*Calluna vulgaris*) and other ericaceous species, purple moor-grass (*Molinia caerulea*), sundews (*Drosera* spp.) and marsh saxifrage (*Saxifraga hirculus*) (Artz *et al*., 2014; Littlewood *et al*., 2010; Marsden &

Ebmeier, 2012; Minayeva *et al.*, 2017; NatureScot, 2023a; NatureScot, 2023b); bird assemblages, comprised of Anseriformes (waterfowl), Accipitriformes and Falconiformes (diurnal birds of prey), Charadriiformes (in particular, waders), Galliformes (game fowl), Gaviiformes (divers and loons) and Strigiformes (owls) (Alsila *et al.*, 2020; Artz *et al.*, 2014; Littlewood *et al.*, 2010; Minayeva *et al.*, 2016; Minayeva *et al.*, 2017; NatureScot, 2023c; Pearce-Higgins *et al.*, 2008); and invertebrate assemblages, comprised of Araneae (spiders), Coleoptera (beetles), Dytiscidae (diving beetles), Hemiptera (true bugs), Lepidoptera (butterflies and moths) and Odonata (damselflies and dragonflies) (Artz *et al.*, 2014; Batzer, 2016; Downie *et al.*, 1998; Pearce-Higgins *et al.*, 2008; Spitzer *et al.*, 1999). Subsequently, although peatlands may not generally be as biodiverse as other native ecosystems, they have high ecological value (Minayeva *et al.*, 2016). For example, in Scotland, peatlands are known to support European Protected Species, such as otter (*Lutra lutra*) and marsh saxifrage (NatureScot, 2023a), and nationally scarce species, such as *Sphagnum lindbergii*, *Sphagnum majus*, bog orchid (*Hammarbya paludosa*) and *Oreodytes alpinus* (NatureScot, 2023b).

Peatlands also provide essential ecosystem services, in particular, climate regulation (Andersen *et al.*, 2016; Payne *et al.*, 2018). Globally, peatlands hold over one-third of the carbon present in all soils, which is similar to the amount of carbon in the atmosphere (Hargreaves *et al.*, 2003; Payne *et al.*, 2018; Yu *et al.*, 2010). For comparison, northern peatlands, covering approximately 2% of the global land surface, are estimated to store 415±150 gigatonnes (Gt) of carbon (Beaulne *et al.*, 2021; Hugelius *et al.*, 2020), whilst boreal biome forests, covering approximately 8% of the global land surface are estimated to store just 272±23 Gt of carbon (Beaulne *et al.*, 2021; Pan *et al.*, 2011). Peatlands are able to capture and store large amounts of carbon in a process called carbon sequestration (Alexandrov *et al.*, 2020; Anderson & Peace, 2017; Belyea & Malmar, 2004; Ferretto *et al.*, 2019; Lunt *et al.*, 2019). Plants growing within peatlands take in carbon dioxide (CO_2) during photosynthesis. The carbon is converted and stored within the plant cells. Usually when a plant dies, the carbon would be released back into the atmosphere during decomposition, however in peatlands, plants never fully decay, and instead form peat (see Section 1.1: What are Peatlands?). Therefore, the carbon is retained within the plant cells and is not released back into the atmosphere. Consequently, peat is considered to be a carbon sink (Belyea & Malmar, 2004; Lunt *et al.*, 2019; Sloan *et al.*, 2018). The increase of carbon within the Earth's atmosphere is widely considered to be the main driving factor of global warming (Matthews *et al.*, 2009; Solomon *et al.*, 2009). Therefore, the process of carbon sequestration, during which peatlands capture and store carbon, is considered to result in a positive contribution to climate regulation (Carlson *et al*., 2010; Joosten *et al*., 2016).

Although peatlands are found in almost every country on the planet, they are estimated to cover just 3% of the worlds' landmass (Gilbert, 2013; Humpenöder *et al*., 2020; Lourenco *et al*., 2022; Xu *et al*., 2018). Scotland holds approximately 13% of the world's blanket bog (Artz & Chapman, 2016), with peatlands estimated to cover up to 22% of the total land area of Scotland (approximately 1.7 million hectares (ha)) (Artz *et al*., 2013; Charman *et al*., 2009). However, approximately 90% of lowland raised bogs and 50% of blanket bogs in Scotland are expected to no longer resemble their natural state (Artz *et al*., 2013). This is predominantly a result of human activity, such as pollution, agriculture and afforestation (Humpenöder *et al*., 2020; Marsden & Ebmeier, 2012).

1.3 The History of Afforestation of Peatlands

Archaeological studies indicate that peatlands were once important ritual sites and sources of food and materials (McDermott, 2007; Van de Noort & O'Sullivan, 2007). Prior to the 19th century, peatlands were mainly used for their peat, which could be burned as a fuel source (Johnston & Soulsby, 2000). However, peatlands were generally considered to be barren and inappropriate for most forms of land-use (Andersen *et al*., 2016). Therefore, people began to try and rework the land, so that it might be used for other purposes, such as agriculture (Johnston & Soulsby, 2000; Rawlins & Morris, 2010; Smout, 1997; Van de Noort & O'Sullivan, 2007). In the 18th and 19th century, tree planting in peatlands became more common (Campbell *et al*., 2019; Payne *et al*., 2018; Sloan *et al*., 2018). Nonetheless, it was generally a difficult task, which required the use of hand tools to dig suitable holes for tree planting (Payne *et al*., 2018).

Excessive felling of woodlands due to timber requirements during the First and Second World Wars resulted in the depletion of timber resources in the UK (Stevenson & Mackay, 1991). This led to the establishment of the Forestry Commission (now Forestry and Land Scotland (FLS) in Scotland) in the 20th century (Heitzman, 2003; Ritchie & Haggith, 2005). FLS's main objective was to develop a national forest estate for timber production, with additional regards to landscape value, social aspects, and where appropriate, public recreation (Edlin, 1969; Oosthoek, 2013). FLS also aimed to assist private landowners with financial grants and technical advice, to develop their own properties for timber production, research and forestry education, to advance the science and practice of forestry (Edlin, 1969; Oosthoek, 2013). The increased need for timber production and new tax incentives led estate owners to begin experimenting with the use of ploughs, which would facilitate the planting of larger areas of peatlands in less time (Anderson & Peace, 2017; Ritchie & Haggith, 2005; Warren, 2000). This led to the development of forestry-specific ploughs, such as the Cuthbertson plough (Edwards, 1962; O'Carroll *et al.*, 1981; Payne *et al.*, 2018; Stevenson & Mackay, 1991).

Technological advances, such as forestry-specific ploughs and improved tractors allowed large scale tree planting on peatlands for the first time (Edlin, 1969; Edwards, 1962; O'Carroll *et al.*, 1981; Payne *et al.*, 2018; Stevenson & Mackay, 1991), as these machines made it possible to plough peatland, creating the ridges and furrows that are still used today (Barrop, 2022; Edwards, 1962; O'Carroll *et al.*, 1981). The furrows act as drains, collecting water and funnelling it away from the forestry plantation, drying the landscape and improving growing conditions for trees. Whilst the ridges, elevated above ground-level, provide suitable growing habitat on which trees can be planted (Barrop, 2022; Sloan *et al.*, 2018). Planting in peatlands often resulted in a poor-quality timber crop (Bain *et al.* 2011; Minkkinen *et al.*, 2002; Sloan *et al.*, 2018), however in the 20th century, planting on peatland was still advantageous for landowners, due to the tax benefits introduced by FLS (Ritchie & Haggith, 2005). This resulted in the afforestation of a large portion of peatlands in Scotland, and it is estimated that 17% of peatlands in Scotland are now forested (Bain *et al.*, 2011; Campbell *et al.*, 2019; Vanguelova *et al.*, 2018), 87% of which is predicted to be former blanket bog (Campbell *et al.*, 2019; Vanguelova *et al.*, 2018).

1.4 Impacts of Afforestation of Peatlands

Afforestation of peatlands results in significant environmental consequences, including biodiversity loss, soil erosion, changes to water regulation and the reduction, or reversal, of benefits associated with ecosystem services, such as carbon sequestration (Bain *et al.*, 2011; Graham *et al.*, 2015; Lachance *et al.*, 2005; Lewis *et al.*, 2012; Lindsay *et al.*, 2014a; Sloan *et al.*, 2018).

Initially, it is the ground preparation works undertaken to facilitate planting on peatland that cause sudden drastic changes to the carbon and water dynamics, resulting in severe habitat degradation (Hargreaves *et al*., 2003; Waddington & Price, 2000). The water balance within a peatland ecosystem is essential in the production of peat (see Section 1.1: What are Peatlands?). Prior to planting, peatlands are ploughed, which drains the site, due to the creation of ridges and furrows (Barrop, 2022; Campbell *et al*., 2019; Edwards, 1962; O'Carroll *et al*., 1981). Water is collected within the furrows and funnelled away from the forestry plantation (as described in Section 1.3: The History of Afforestation of Peatlands) (Barrop, 2022; Sloan *et al*., 2018). This initial ground preparation work results in the rapid removal of surface water and begins the process of drying the peat (Lindsay *et al*., 2014b). These drastic changes to the microtopography of the habitat can completely alter the water system, which may be difficult to reverse (Holden, 2005). A secondary drying effect is caused by the trees themselves. Trees take up water through the roots during the photosynthesis process. This water is then lost through evapotranspiration (Sarkkola *et al*., 2010; Waddington *et al*., 2015). The level of water loss is further increased as the canopy densifies, due to the interception of rainfall with the canopy, and subsequent evaporation (Anderson *et al*., 2000; Farrick & Price, 2009; Waddington *et al*., 2015). As water is lost from the substrate, it can cause the peat to subside (Beheim, 2006; Sloan *et al*., 2018; Sloan *et al*., 2019). Thus, afforestation of peatlands has been found to cause subsidence of the surface peat layer, an overall reduction in thickness and an increase in bulk density (Anderson *et al*., 2000; Sloan *et al*., 2019). Subsidence of the peat layer can increase the sediment load within adjacent water systems, causing eutrophication and a decrease in water quality (Langslow, 1983). In addition, changes to abiotic conditions associated with shading from trees and the accumulation of conifer needle litter can reduce the suitability of the ecosystem for *Sphagnum* moss (Campbell *et al*., 2019), which is essential to the formation of new peat and ongoing peat accumulation (see Section 1.1: What Are Peatlands?).

However, perhaps the most recognised impact associated with afforestation of peatlands, is the alterations to the carbon sequestration process. In the absence of degradation, peatlands are thought to be one of the most efficient terrestrial carbon sinks (Adesiji *et al*., 2015; Evans *et al*., 2016; Humpenöder *et al*., 2020). The rate of carbon sequestration varies in accordance with the flora, microtopography and climate (Ferretto *et al*., 2019), although, previous studies have reported carbon accumulation rates of 13–21 grams (g) carbon m^{-2} $year^{-1}$ (48–77 g CO_2 m^{-2} $year^{-1}$), 18 g carbon m^{-2} $year^{-1}$ in northern peatlands (66 g CO_2 m^{-2} $year^{-1}$) (Clymo *et* *al*., 1998; Yu *et al*., 2009) and 16.3 g carbon m^{-2} $year^{-1}$ in The Flow Country, Scotland (60 g CO_2 m^{-2} $year^{-1}$) (Ratcliffe *et al*., 2018). Nevertheless, degradation of peatland ecosystems can result in a reversal of the carbon sequestration process (Ferretto *et al*., 2019; Humpenöder *et al*., 2020; Wilson *et al*., 2016), as drying of the peat, subsidence and compression caused by the weight of growing trees, causes carbon stored within the catotelm to be released (Wilson *et al*., 2016). In this instance, the peatland becomes a source of carbon emissions into the atmosphere (Ferretto *et al*., 2019; Wilson *et al*., 2016). It is commonly known that trees are able to sequester carbon, and that like peatlands, forests and woodlands also act as important carbon sinks (Kongsager *et al*., 2013; Milne & Brown, 1997; Patenaude *et al*., 2003). The carbon sequestration process of trees is similar to that of *Sphagnum* moss (Alexandrov *et al*., 2020; Anderson & Peace, 2017; Belyea & Malmar, 2004; Ferretto *et al*., 2019; Lunt *et al*., 2019). Trees take in CO_2 during photosynthesis and store carbon in their cells as they grow (Jin *et al*., 2023; Weissert *et al*., 2017). However, unlike the plants growing within peatland ecosystems, trees generally decompose at the end of their life cycle, releasing the carbon back into the atmosphere (Liu *et al*., 2013; Marra *et al*., 2018). For trees growing within forestry plantations, this process may be accelerated due to harvesting and usage of the timber (Härtl *et al*., 2017; Nunery & Keeton, 2009; Seidl *et al*., 2007). Although there is some evidence to suggest that carbon loss due to degradation of peatlands can be compensated for via tree growth (Byrne & Farrell, 2005; Hargreaves *et al*., 2003), research actively comparing the productivity of carbon sequestration between both habitats found that peat can store more carbon than the aboveground and belowground biomass of trees growing on former peatland (Beaulne *et al*., 2021; Jovani-Sancho *et al*., 2021). Therefore, afforestation is anticipated to result in an overall increase in carbon emissions (Beaulne *et al*., 2021; Jovani-Sancho *et al*., 2021; Lindsay *et al*., 2014a), which is supported by the findings of Sloan (2019) and Ratcliffe (2015).

The loss of peatland ecosystems to forested habitat can also cause biodiversity loss and changes to ecological communities (Lachance *et al*., 2005; Langslow, 1983; Oxbrough *et al*., 2006; Stroud *et al*., 1987). As many of the species that make up peatland ecosystems are specialists, a loss of specific resources associated with peatlands due to afforestation can result in the loss or reduction to local, regional, or even international populations of species (Alsila *et al*., 2020; Batzer *et al*., 2016; Desrochers & Van Duinen, 2006; Lachance *et al*., 2005; Littlewood *et al*., 2010; Loisel & Gallego-Sala, 2022; Oxbrough *et al*., 2006; Spitzer *et al*., 1999). For example, a previous study identified alterations to spider communities from specialist species to generalist species, due to afforestation of peatland in Ireland (Oxbrough *et al*., 2006). Furthermore, alterations to moorland avian assemblages have been observed in afforested peatlands in Caithness and Sutherland, Scotland, for example the loss of dunlin (*Calidris alpina*) (Stroud *et al*., 1987). Unfortunately, research suggests that peatland communities are likely to be difficult to restore once they have been lost (Loisel & Gallego-Sala, 2022), and although there is evidence of partial, or sometimes near complete recovery of peatland ecosystems, it can take decades to achieve and may require human intervention (Hugron *et al*., 2020). Hence, afforestation of peatlands has the potential to result in irreversible changes to biodiversity. As biodiversity is generally known to enhance the resilience of ecosystems, the loss of biodiversity due to afforestation may cause further impacts to peatland ecosystems in the future, due to currently unknown threats such as pests and diseases (Loisel & Gallego-Sala, 2022).

Unfortunately, the extent of peatland degradation due to afforestation is not limited to the area in which trees have been planted, and research suggests that the biodiversity and hydrological conditions of peatland-adjacent forestry plantations will undergo changes over time, due to edge effects (Anderson & Peace, 2017; Langslow, 1983; Lindsay *et al*., 2014a; Wilson *et al*., 2014). Thus, the International Union for Conservation of Nature (ICUN) identified peatland habitats that either surround, or are hydrologically connected to afforested peatland, as areas of concern (Eckstein *et al*., 2011; Lindsay *et al*., 2014a; Woziwoda & Kopéc, 2014). Edge effects have been found to be particularly critical to populations of breeding birds that utilise peatlands (Anderson & Peace, 2017; Wilson *et al*., 2014). A study undertaken in The Flow Country, Scotland, identified that dunlin and golden plover (*Pluvialis apricaria*) were likely to avoid areas of peatland within 700 m of forestry plantations (Wilson *et al*., 2014). In Sutherland and County Durham, England, a lower abundance of wader species, including common snipe (*Gallinago gallinago*), curlew (*Numenius arquata*), golden plover, greenshank (*Tringa nebularia*), lapwing (*Vanellus vanellus*) and redshank (*Tringa totanus*), was identified within 400 m of forestry plantations, extending to >400 m for dunlin (Stroud *et al*., 1990). In northern Scotland, a study recorded a reduction in the abundance of dunlin and red grouse (*Lagopus lagopus*) adjacent to forestry plantations (Hancock *et al*., 2009). Furthermore, results of bird surveys in both northern England and Caithness and Sutherland, Scotland, suggest that moorland birds avoid forest edges, as a reduction in moorland bird densities was observed within the perimeter of peatlands adjacent forestry plantations (Langslow, 1983; Stroud *et al*., 1987). Consequently, there is evidence to suggest that there are adverse impacts upon the spatial distribution of bird species, associated with edge effects caused by the afforestation of peatlands (Anderson & Peace, 2017; Langslow, 1983; Stroud *et al*., 1987; Wilson *et al*., 2014). There is a lack of scientific literature relating to the impacts of edge effects caused by afforestation of peatlands on other animal groups (although Hancock *et al*. (2020) identified evidence of mammalian predators making use of forestry tracks and Littlewood *et al*. (2021) identified evidence of small mammals making use of forestry plantations via camera trapping methodologies). However, as birds can be an appropriate indicator of environmental change (Mekonen, 2017), it is anticipated that alterations to avian species distributions may be reflected among other animal groups.

Furthermore, edge effects impacting upon the abiotic conditions of peatland adjacent forestry plantations have also been identified (Anderson & Peace, 2017; Shotbolt *et al*., 1998). A study researching changes to blanket bog immediately adjacent to forestry plantations, in Caithness, Scotland, determined that subsidence of the peat was expected to occur up to 40 m from the forest, by the end of the first crop rotation (Shotbolt *et al*., 1998). Subsequently, it was advised that a buffer zone of 40 m is required between forestry plantations and valuable peatland areas to prevent substantial degradation (Anderson & Peace, 2017; Shotbolt *et al*., 1998). Hydrological processes are essential to the formation of peat. Therefore, drying of the peat adjacent to forestry plantations is likely to impact upon peat accumulation (Moore, 1989; Piatkowski *et al*., 2021), whilst also improving the growing conditions for trees (Barrop, 2022; Sloan *et al*., 2018). In time, this could contribute to naturally occurring afforestation due to ecological succession (Velde *et al*., 2021).

1.5 Natural Afforestation due to Ecological Succession

Ecological succession is the process in which the species compositions that make up one ecological community (or habitat type) change over time, resulting in a new habitat type. Non-native species have potential to cause sudden and unexpected changes to species compositions, which can result in ecological succession. Non-native species can cause ecological succession through various pathways, such as outcompeting native plants or causing alterations to abiotic conditions and subsequently reducing suitability for native plants (Manchester & Bullock, 2001; Prach & Walker, 2011). For example, in 2023, it was estimated that kudzu (*Pueraria montana*), a woody vine native to eastern Asia, had established and spread over 30,000 kilometres squared (km^2) in the United States, decimating previous ecological communities by growing over and shading out other plants (i.e. outcompeting other species for light and other resources) (Kovach-Hammons & Marshall, 2023). Whilst rhododendron (*Rhododendron ponticum*), a woody shrub, has caused alterations to ground flora of woodlands and other native habitats in the UK. This is due to its ability to shade out native plants and release toxins into the soil which make it harder for native plants to grow (Dehnen-Schmutz *et al*., 2004; Manzoor *et al*., 2018; Stephenson *et al*., 2006).

Traditionally, non-native coniferous trees (hereafter referred to as ‘conifers’) have been favoured for forestry, due to their growth rate and size at maturity (Campbell *et al*., 2019). Conifers generally grow more rapidly than broadleaved trees and have greater heights at maturity. Historically, a mixed crop of lodgepole pine (*Pinus contorta*) and Sitka spruce (*Picea sitchensis*) was generally favoured for forestry plantations on peatland in Scotland (Campbell *et al*., 2019; Edwards, 1962; Sloan *et al*., 2018). Lodgepole pine does not generally produce high quality timber (Pyatt, 1993; Sloan *et al*., 2018), however lodgepole pine is able to tolerate poor growing conditions, whilst actively beginning the process of drying the peat. Therefore, lodgepole pine was traditionally planted as a ‘nurse species’, with the expectation that the crop would begin an ecological regime shift, improving the growing conditions to facilitate the growth of less tolerant, but more profitable, conifer species. (Barrop, 2022; Edwards, 1962; Pyatt, 1993; Sloan *et al*., 2018). Sitka spruce is a more economically profitable species, although is less tolerant of wet conditions. Hence, Sitka spruce was generally planted on the second rotation, with the expectation that the lodgepole pine crop would have already begun to dry the soils (Barrop, 2022; Edwards, 1962; Oosthoek, 2013; Sloan *et al*., 2018; Stroud *et al*., 2015). Consequently, forestry plantations in Scotland are dominated by a mix of lodgepole pine and Sitka spruce, which are both non-native species, and the forestry industry has resulted in the mass planting of conifers outside their natural range (Campbell *et al*., 2019; Wyse *et al*., 2022).

Despite this theory, crops of lodgepole pine and Sitka spruce planted on peatland have been largely unsuccessful in the Scottish Highlands for the purpose of forestry (Ray & Schweizer, 1994; Sloan *et al*., 2018). Lodgepole pine and Sitka spruce crops planted on peatland in the Scottish Highlands generally produce low yields of poor quality timber. Hence, despite being able to survive in the suboptimal conditions of a peatland, the species composition is not likely to be hugely profitable.

Nonetheless, the morphological traits which make lodgepole pine and Sitka spruce most suited for planting in peatlands, also means that the species are more effectively able to escape cultivation and spread rapidly (Barrop, 2022; Campbell *et al*., 2019; Pyatt, 1993; Sloan *et al*., 2018; Wyse *et al*., 2022). This is a considerable issue for peatlands that are situated within close proximity to forestry plantations, as they are at continuous risk of naturally occurring afforestation (Eckstein *et al*., 2011; Woziwoda & Kopéc, 2014). As a result, forestry plantations pose an ongoing threat to peatlands, and if natural occurring afforestation is not appropriately managed, forestry plantations are likely to continue to contribute towards habitat loss and degradation, even if planting on peatlands is stopped (Eckstein *et al*., 2011; Woziwoda & Kopéc, 2014).

Conifer seeds are generally dispersed via zoochory (i.e. animals) or anemochory (i.e. wind) (Broome *et al*., 2007; Broome *et al*., 2016; Contreras *et al*., 2016; Leslie *et al*., 2017; Lurz *et al*., 2004; Summers, 2018; Vander Wall, 1992; Vander Wall, 2008). Dispersal methods are usually pre-determined by the morphology and size of the seed (Benkman, 1995; Contreras *et al*., 2016; Leslie *et al*., 2017; Tomback & Linhart, 1990). The seeds of lodgepole pine and Sitka spruce are dispersed almost exclusively via wind (Ledgard, 2001; Nathan *et al*., 2011; Organisation for Economic Co-operation and Development (OECD), 2006; Vander Wall, 2008; Zhang *et al*., 2020). The seeds are small in size, which makes them less desirable to animals, but ensures that they can travel greater distances via wind (Hewitt & Kellman, 2002a; Hewitt & Kellman, 2002b). Furthermore, the seeds are winged, which expands potential dispersal distance (Benkman, 1995; Greene & Johnson, 1990; Peterson *et al*., 1997; Vander Wall, 2008; Viereck & Little 1972). The deposition of seeds is often referred to as 'seed rain'. Seasonality of seed rain is generally site specific and there are variations in the records of seasonal seed rain abundance within different areas (Mair, 1973; Mckenzie *et al*., 2007). However, seeds are generally expected to disperse from their cones in autumn, with the highest abundance of seed rain occurring within the first few months (Harris, 1969; OECD, 2006; Ruth, 1958). Almost all of the seed is expected to have dispersed by the end of winter, although it is possible that a low abundance of seed may disperse during the spring and summer months (Broome *et al*., 2016; Harris, 1969; Mckenzie *et al*., 2007; Nixon & Worrell, 1999; OECD, 2006; Ruth, 1958). When seed rain from forestry plantations falls over peatland habitats, there is the potential for seedlings to germinate. This begins the process of naturally occurring afforestation due to ecological succession (Eckstein *et al*., 2011; Woziwoda & Kopéc, 2014).

1.6 Hypothesis and Aims of Study

Perceptions of peatlands have changed over time (Collier, 2014). It is now well understood that peatlands are one of Scotland's most important environmental assets due to their unique ecology and ecosystem services (Marsden & Ebmeier, 2012), in particular, water regulation and carbon sequestration (Bain *et al*., 2011; Evans *et al*., 2016). Thus, in recent years, sustainable peatland management has become increasingly more important in the UK political agenda (Whitfield *et al*., 2011), as links between peatland ecosystem services and climate change have been established. The Scottish Government have stated that they aim to restore 40% of the estimated 600,000 ha of degraded peatlands by 2030 (The Scottish Government, 2017). This includes afforested peatlands that are not supporting good quality timber production (Sloan *et al*., 2018; Scottish Natural Heritage (SNH) (now NatureScot), 2015). Therefore, the question as to the extent of peatlands that are at ongoing risk of naturally occurring afforestation due to nearby forestry plantations is of critical importance.

There are gaps in the current literature that must be filled to ensure that appropriate areas for new peatland restoration projects are targeted and that no new forestry plantations are established that could impact upon existing favourable peatland habitats. This research aims to identify the extent and distribution of conifer seed outside of two forestry plantations in the Flow Country, Scotland, to gain further understanding of the area around forestry plantations that peatlands may be at risk of naturally occurring afforestation. This research will contribute towards the understanding of edge effects caused by forestry plantations adjacent to peatlands. Thus, assisting in the development of a theoretical 'risk zone' around forestry plantations, where peatland habitats and their associated ecological communities and ecosystem services, are at risk of degradation. This will ensure that site selection for future peatland restoration programmes is cost-effective and that areas at high risk of naturally occurring afforestation are avoided. In addition, the research will provide necessary evidence to support new policy associated with changes of land use for forestry plantations and pull-back.

As the lodgepole pine and Sitka spruce seeds are expected to be relatively uniform in size and shape within forest populations (due to minimal diversity in age and genetics within a forestry crop), it is hypothesised that the seeds of each species will be deposited at similar distances from the forest (i.e. peak distances). However, as the seeds are predominantly dispersed via wind and there can be variation in the abiotic conditions during dispersal, it is hypothesised that a proportion of the seeds may disperse at much greater distances. Furthermore, due to the similarities between the seeds of lodgepole pine and Sitka spruce, it is hypothesised that seed dispersal for both species will follow similar distribution patterns.

The aim of the project is to gain understanding of the dispersal distances of lodgepole pine and Sitka spruce seed, with the objective of identifying a theoretical 'risk zone' around forestry plantations, where peatlands are at risk of naturally occurring afforestation. The assumptions will be tested with the use of field data, including the collection of seed rain deposition and the recording of lodgepole pine regeneration.

2 Methodology

2.1 Site Selection

2.1.1 The Flow Country

In Caithness and Sutherland, situated in the Scottish Highlands, is one of the largest and most intact blanket bog systems in the world, commonly referred to as 'The Flow Country' (Lindsay *et al*., 1998). The Flow Country covers an area of approximately 40,000 km^2. The climate is generally cool and wet, with a mean annual temperature of 8 degrees Celsius (^{o}C) (Hambley, *et al*., 2019; Met Office, 2024), thus providing ideal conditions for the formation and accumulation of peat (Moore, 1989; Piatkowski *et al*., 2021). The Flow Country is considered to be of high conservation importance, and in 2022, formally became a candidate for United Nations Educational, Scientific and Cultural Organization (UNESCO) World Heritage Site Status (The Flow Country Partnership, 2024). What's more, The Flow Country is home to the Caithness and Sutherland Peatlands Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site (NatureScot, 2023a; NatureScot, 2023b; NatureScot, 2023c).

The Flow Country includes peatland habitats listed within Annex I of the Habitats Directive, including blanket bog, depressions on peat substrates, acid peat-stained lakes and ponds, wet heathland with cross-leaved heath (*Erica tetralix*), clear-water lochs with aquatic vegetation and poor to moderate nutrient levels, and very wet mires often identified by an unstable 'quaking' surface (NatureScot, 2023a). Additionally, the peatlands are known to support two European Protected Species, including otter and marsh saxifrage (NatureScot, 2023a), two nationally scarce moss species (*Sphagnum lindbergii* and *Sphagnum majus*), a nationally scarce highland plant (bog orchid), a nationally rare water beetle (*Oreodytes alpinus*), freshwater pearl mussel (*Margaritifera margaritifera*) (NatureScot, 2023b), and internationally important ornithological populations, including red-throated diver (*Gavia stellata*), black-throated diver (*Gavia arctica*), hen harrier (*Circus cyaneus*), golden eagle (*Aquila chrysaetos*), merlin (*Pluvialis apricaria*), golden plover, wood sandpiper (*Tringa glareola*), short-eared owl (*Asio flammeus*), dunlin, common scoter (*Melanitta nigra*), greenshank and wigeon (*Anas penelope*) (NatureScot, 2023c).

Despite its importance, The Flow Country, like many other peatland ecosystems, has suffered from degradation due to afforestation. It has been estimated that the original blanket bog system covered an area of 4013.75 km^2 (Lindsay *et al*., 1988; Stroud *et al*., 1987), although in 1987, it was determined that 17% of the original blanket bog system (793.5 km^2) within The Flow Country had been lost, or was programmed to be lost, due to afforestation (Lindsay *et al*., 1988; Stroud *et al*., 1987). However, this figure is estimated on the area of forestry plantations exclusively, and therefore, the actual extent of loss of the blanket bog system is expected to be higher, due to natural afforestation caused by ecological succession.

2.1.2 Lochies and Benmore

This study was conducted at two different sites, both of which were situated in Sutherland, within the far south of The Flow Country (hereafter referred to as 'Lochies' and 'Benmore') (Figure 1; Lindsay *et al*., 1998). The land at both Lochies and Benmore is owned and managed by FLS.

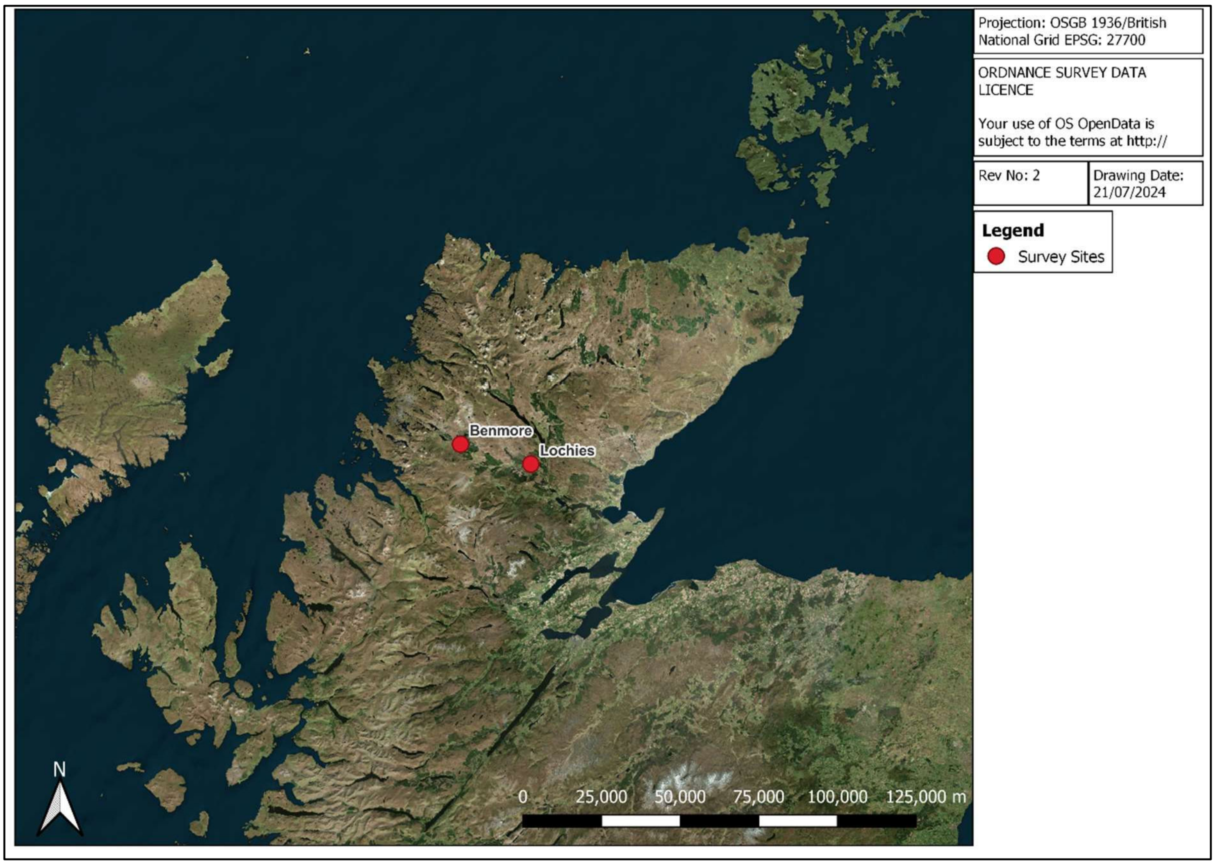

Figure 1: Map showing the location of Lochies and Benmore.

Lochies is situated just off the A839, approximately 6.7 km south-west of Lairg, Scotland (approximate central grid reference: NC 5243 0174) (Figure 2). The survey area was situated along the south-western edge of the forestry crop, stretching from approximately NC 5227 0180 in the north-west to NC 5227 0180 in the south-east (Figure 2).

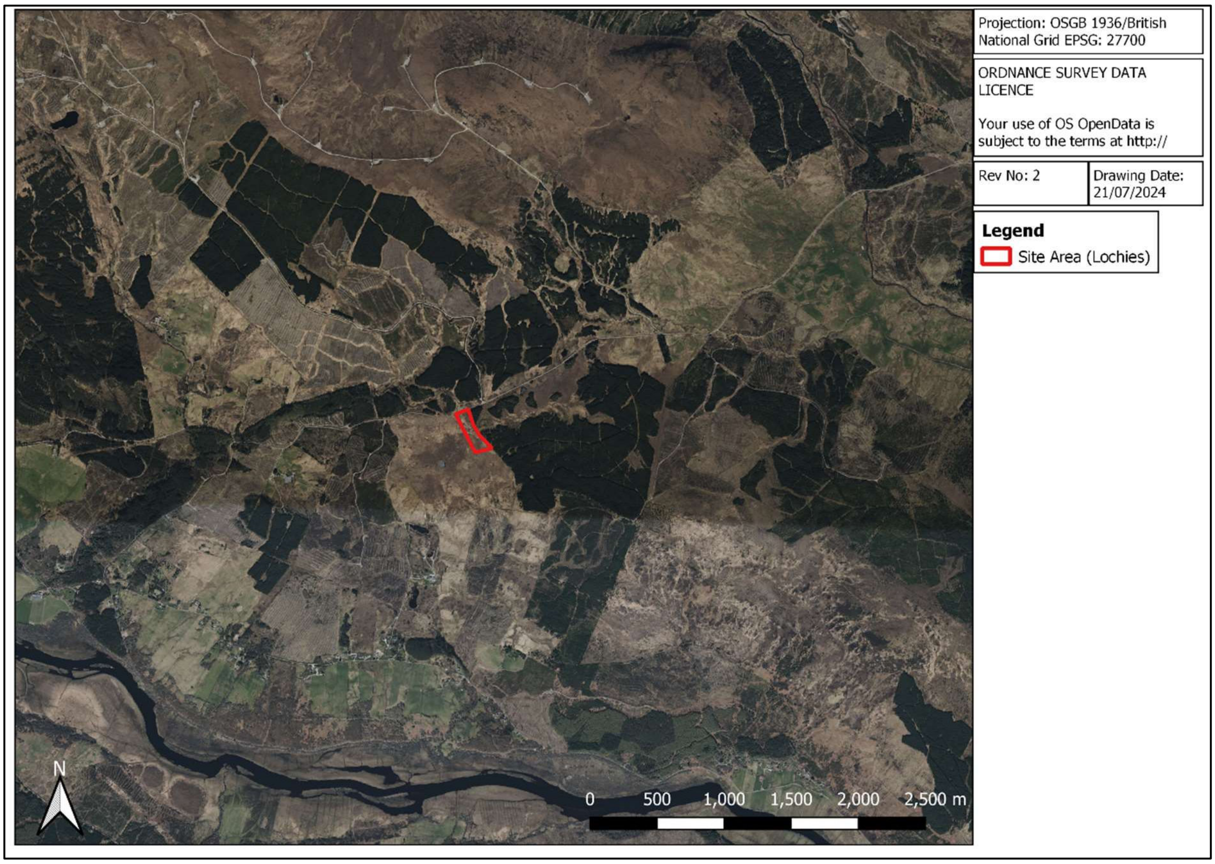

Figure 2: Map showing the location of Lochies.

The forest at Lochies was a mixed crop of 60% lodgepole pine and 40% Sitka spruce, however the south-western forest edge was dominated by lodgepole pine with a low abundance of Sitka spruce (<25%). According to FLS, the forestry crop at the site was planted in 1988 (FLS, 2024). The oldest satellite imagery identified for the site was taken in 1985. The imagery is of poor quality, likely due to the technology available at that time. However, a review of the images, with reference to images of higher quality taken at later dates, confirmed that there was no forestry crop present towards the north-east of the survey area in 1985, and that an established conifer plantation was present by 2004 (Figure 3; Google, 2024a).

Figure 3: Historical satellite imagery of Lochies in 1985 (left) and 2004 (right) obtained from Google Earth Pro, showing conifers were planted on the land north-east of the survey area between 1985 and 2004, and evidence of the absence of a forestry crop within the survey area between 1985 and 2004 (Google, 2024a).

The survey area, situated towards the south-west of the forestry plantation, was comprised of peatland. No definitive evidence was identified to suggest that the survey area was formerly planted (Google, 2024a), however the microtopography of the landscape suggests that the land was previously ploughed (i.e. a ridge-furrow matrix was present). The historical imagery demonstrates that there was no forestry crop present within the survey area between 1985 and 2023 (Figure 3; Google 2024a), although it is possible that there was a forestry crop on the land prior to 1985 (this cannot be confirmed due to data limitations) (Figure 3; Google, 2024a). The ecological composition of the survey area at Lochies was characteristic of a wet modified bog, as described by JNCC (JNCC, 2010), although patches of *Sphagnum*-rich blanket bog were present within wetter parts of the survey area. The habitat type was considered to be typical of a former blanket bog that has been degraded, due to historical ploughing.

Although no evidence of a forestry crop was identified within the survey area, the historical satellite imagery of the site does provide evidence that self-set conifers were previously present and have since been removed. It is expected that these conifers were regeneration, sourced from the adjacent forestry crop (Figure 4; Google 2024a) and that they were removed for peatland restoration purposes. Conifer regeneration was present in satellite images of the site taken in 2019 but absent in satellite images taken in 2023 (Figure 4; Google, 2024a). Furthermore, conifer regeneration was evident on images of the survey area taken from the adjacent highway (A839) in 2021, but absent from images taken in 2023 (Google, 2024b). As no conifers were removed from the survey area during the seed trap installation period or survey period (January – October 2022), it was concluded that the conifer regeneration was likely removed at some time during 2021. Conifer brash was present within the survey area, immediately adjacent to the forest, and it is expected that this was the remnants of the conifer regeneration removal works undertaken in 2021. Since the restoration works to remove conifer regeneration in 2021, it was noted that new afforestation had occurred, and conifer seedlings were observed growing within the survey area.

Figure 4: Historical satellite imagery of Lochies in 2019 (left) and 2023 (right) obtained from Google Earth Pro showing that conifer regeneration situated towards the south-west of the forest edge was removed between 2019 and 2023 (Google Earth, 2024a).

Benmore is situated just off the A837, approximately 11.2 km north-west of Oykel Bridge, Scotland (approximate central grid reference: NC 3007 0784) (Figure 5). The survey area was situated along the north-eastern edge of the forestry crop, stretching from approximately NC 2908 5822 in the north-west to NC 3007 2464 in the south-east (Figure 5).

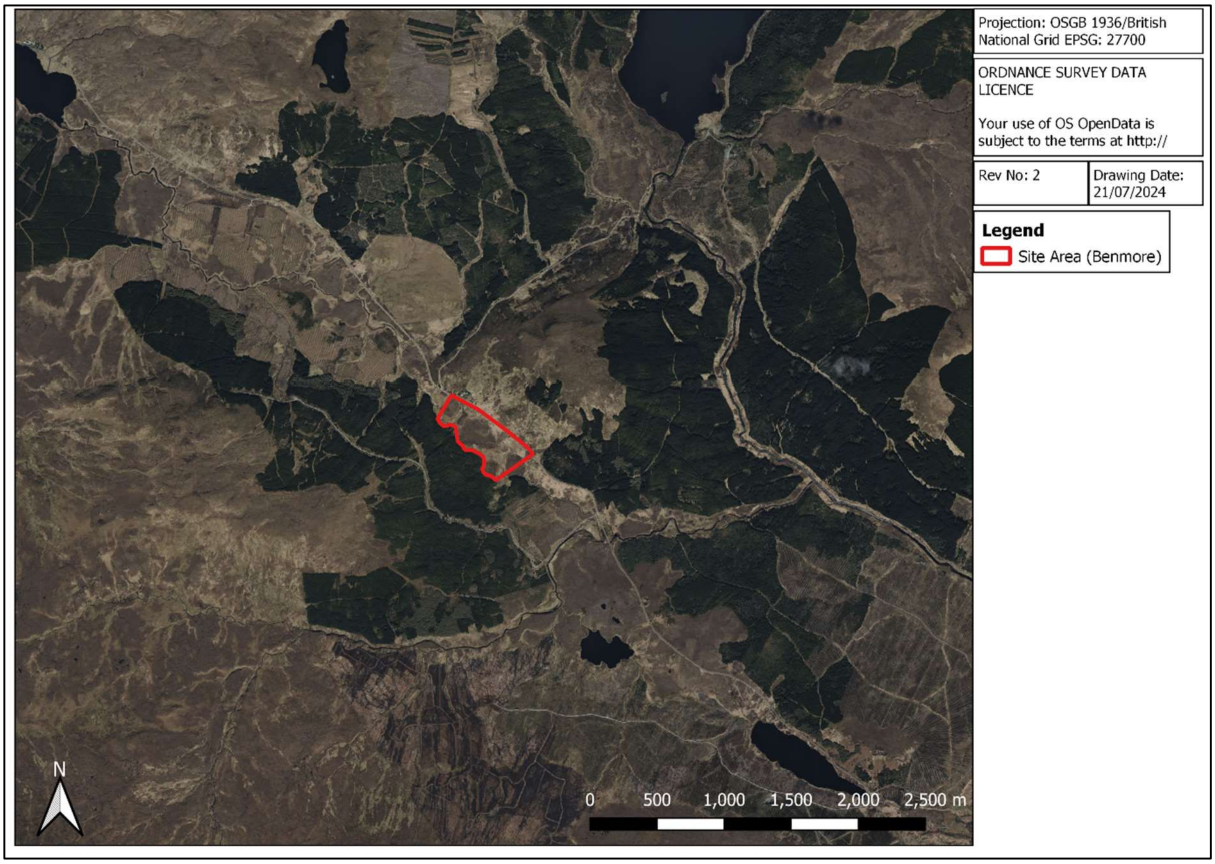

Figure 5: Map showing the location of Benmore.

The forest was a mixed crop of 60% lodgepole pine and 40% Sitka spruce, however the north-eastern forest edge was dominated by lodgepole pine, with a low abundance of Sitka spruce (<10%), which increased towards the north-east (between 10 – 25%). According to FLS, the forestry crop at the site was planted in 1985 (FLS, 2024). As with Lochies, the historical satellite imagery taken in 1985 is of poor quality, likely due to the technology available at that time. However, a review of the images, with reference to images of higher quality imagery taken at later dates, confirmed that the area of forestry crop situated towards the south-west of the survey area remained the same between 1985 and 2024 (Figure 6; Google, 2024a).

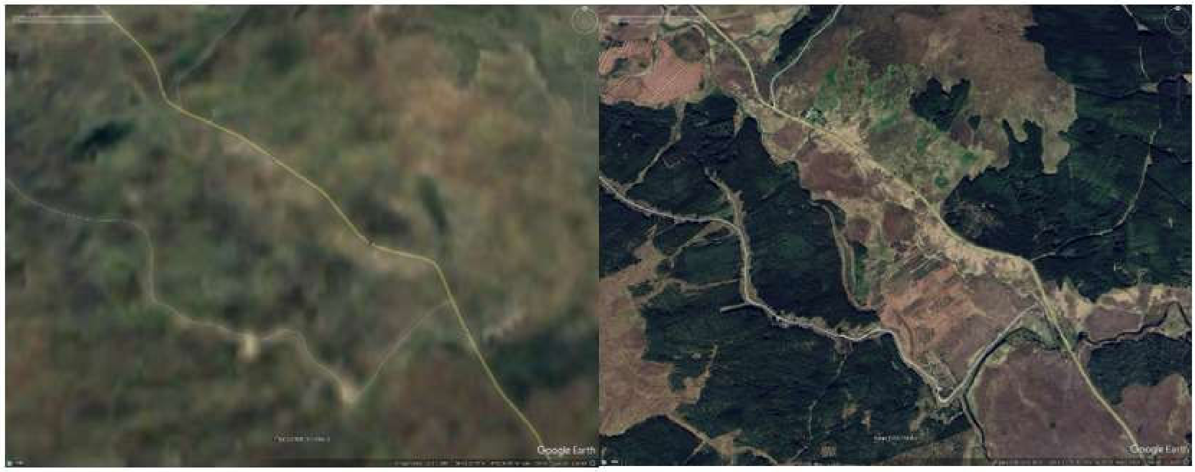

Figure 6: Historical satellite imagery of Benmore in 1985 (left) and 2023 (right) obtained from Google Earth Pro, showing that the area of forestry plantation adjacent to the survey area remained consistent between 1985 and 2023, and evidence of the absence of a forestry crop within the survey area between 1985 and 2023 (Google, 2024a).

The survey area, situated towards the north-east of the forestry plantation, was comprised of peatland. An artificial drain ran along the north-eastern border of the forest, containing a healthy abundance of *Sphagnum* moss. The ecological communities within the survey area were indicative of a matrix of wet modified bog and *Sphagnum*-rich blanket bog, which evidently alternates due to undulations in the landscape. It was evident that the trees within the forestry crop adjacent to the survey area were planted on former peatland, as *Sphagnum* dominated the ground vegetation layer. Subsequently, the plantation appeared to yield a poor-quality timber crop, particularly towards the forest edge, and many of the trees were considered to have low vitality.

Similarly to Lochies, no definitive evidence was identified to suggest that the survey area was formerly planted (Google, 2024a), however the microtopography of the landscape suggests that the land was previously ploughed (i.e. a ridge-furrow matrix was present). The historical imagery demonstrates that there was no forestry crop present within the survey area between 1985 and 2023 (Figure 6; Google 2024a), although it is possible that there was a forestry crop on the land prior to 1985 (this cannot be confirmed due to data limitations) (Figure 6; Google, 2024a).

Since the end of the data collection period (October 2023), FLS have implemented land management practices within the survey area to restore the former peatland habitat. Conifer regeneration within the peatland immediately adjacent to the forestry plantation was removed and the peat substrate was smoothed, removing the former ridges and furrows and restoring the microtopography to that of a natural peatland habitat.

The survey areas at Lochies and Benmore were chosen for a variety of reasons. The survey areas at both Lochies and Benmore ran perpendicular to the forest edge, therefore ensuring that the forestry plantation was only adjacent to one side of the survey area, to prevent confounding seed rain deposition (Figure 2; Figure 5). Furthermore, apart from the forest edge to be surveyed, there were no forested areas within the immediate proximity to the peatland, thus minimising potential for inaccurate results due to other seed sources (Figure 2; Figure 5). At Lochies, the peatland along the south-western edge of the forest was surveyed, whilst at Benmore, the peatland along the north-eastern edge of the forest was surveyed. Therefore, there was considered to be compensation for potential bias associated with the prevailing wind direction (south-west). In addition, the sites were chosen due to accessibility and safety.

2.2 Data Collection

2.2.1 Seed Rain Study

Studies designed to monitor seed rain abundance can provide insight into the dispersal distances and seasonality of seed rain (Cottrell, 2004; Morris *et al*., 2011a). Seed traps are commonly used to record seed rain abundance (Clark *et al*., 2005). However, a key limitation to seed rain abundance studies is the suitability of the seed trap design for the target species and research aims (Morris *et al*., 2011a). A review of former studies, which used seed traps to record seed rain abundance, was undertaken to inform the seed trap design. During which, three main seed trap design types were identified, including funnel traps (or sometimes referred to as gravity traps), sticky traps and mesh traps (Bullock *et al*., 2006; Cottrell, 2004; Harms *et al*., 2000; Morris *et al*., 2011a).

Previous studies to identify seed rain abundance of conifers, were most commonly found to use a mesh trap design. For example, a study to monitor seed rain of silver fir (*Abies alba*) in the Black Forest, Germany, utilised a mesh trap comprised of a 1 metre squared (m^2) net mounted on four wooden posts (Cremer *et al*., 2012). A similar mesh trap design was used to record seed fall of three conifer species, including Douglas fir (*Pseudotsuga menziesii*), western hemlock (*Tsuga heterophylla*) and western redcedar (*Thuja plicata*), in west-central

Oregon, North America (Gashwiler, 1969); record seed rain along a gradient of degradation in a Caribbean dry forest (Wolfe *et al.*, 2019); and to understand how density-dependant recruitment enhances seedling diversity on Barro Colorado, Panemá (Harms *et al.*, 2000). Whilst the data collected during these studies provides evidence of the suitability of the mesh trap design for monitoring seed rain abundance of conifers, the studies all took place within a forest and made use of mesh traps at height. As the current study required the use of seed traps to monitor seed rain abundance outside the forest, a mesh trap design was likely to be unsuitable, and would require the construction of large structures to support the mesh nets (Cremer *et al.*, 2012; Gashwiler, 1969; Harms *et al.*, 2000; Morris *et al.*, 2011a).

Sticky traps were also deemed to be largely unsuitable for this study. Similarly to mesh traps, it is necessary to install sticky traps at height, in order to ensure that they are capturing wind-dispersed seeds (Chabrerie & Alard, 2005; Cottrell, 2004; Huenneke & Graham, 1987; Morris *et al.*, 2011a). Furthermore, studies reviewing different seed trap designs determined that sticky traps are generally less effective than other seed trap design types (Chabrerie & Alard, 2005; Cottrell, 2004; Morris *et al.*, 2011a).

Funnel traps are usually placed on the ground, collecting seeds as they fall (Cottrell, 2004; Morris *et al.*, 2011a). For this reason, it was determined that funnel traps were likely to be the most appropriate seed trap design type for monitoring distance. As the traps would collect the seed where it would naturally fall, rather than intersecting the seed during dispersal, which could result in inaccurate results, due to the seeds potential dispersal distance being restricted. Furthermore, studies reviewing different seed trap design types identified funnel traps as being the most effective design for seed rain studies (Cottrell, 2004; Morris *et al.*, 2011a). A study was formerly undertaken comparing three seed trap designs, including a sticky trap and two funnel traps. The two funnel trap designs included within the study were the Melbourne trap (which has been engineered to capture seeds in flight by funnelling the wind down into a bucket) and a bucket trap (Morris *et al.*, 2011a). The study concluded that, overall, Melbourne traps were the preferable seed trap design. However, it was acknowledged that bucket traps were able to capture a more diverse range of species than Melbourne traps and provided a cheaper alternative (Morris *et al.*, 2011a). A similar bucket trap design was used successfully in Illinois, USA, to measure seed rain and hydrochory in rivers (Middleton, 1995); in Louisiana, USA, to identify patterns of spatial distribution and seed dispersal among bottomland hardwood species (Reid *et al.*, 2014); and in Dorset, England, to determine long distance seed dispersal of grassland species by wind (Bullock & Clarke, 2000). Furthermore, when considering the difficulties of taking materials out into the field, and the feasibility of carrying materials relatively long-distances through peatland, the bucket trap was considered to be most appropriate. The materials are relatively lightweight, can be carried by hand and easily constructed in the field. No literature was identified providing evidence of the suitability of bucket traps for seed rain studies on conifers. However, considering the suitability of the seed trap design in wind-dispersal seed rain studies (Bullock & Clarke, 2000; Cottrell, 2004; Middleton, 1995; Morris *et al*., 2011a; Reid *et al*., 2014), cost and ease of transportation, construction and installation, the bucket trap design was considered to be the most suitable for this study.

The seed traps used for this study were comprised of a 14 litre (L) bucket made from recycled proplas (PP) material. Scaffolding debris netting was cut into 1 m^2 and suspended within the buckets to create a mesh basket which would capture seeds whilst allowing water to fall through. This prevented seeds from being suspended within water for long periods of time, which may have degraded the quality of the seed and reduced scope for identification. The mesh was held to the bucket by metal wire, which was woven through the netting and around the rim of the bucket. Duct tape was placed around the edge of the bucket as a precautionary approach, to prevent fauna from entering the buckets and becoming trapped, should the scaffolding debris netting degrade (Figure 7). Wooden stakes were hammered into place at each survey point, and one seed trap was tied to each stake using metal wire. This ensured that the seed traps remained in place for the entirety of the study. Materials were pre-prepared (i.e. cut to shape), prior to going to the survey sites to ensure ease of transportation and assembly. The seed traps were then constructed immediately prior to installation *in-situ*. The seed traps were constructed and installed over a period of four days during January 2022, with assistance from FLS.

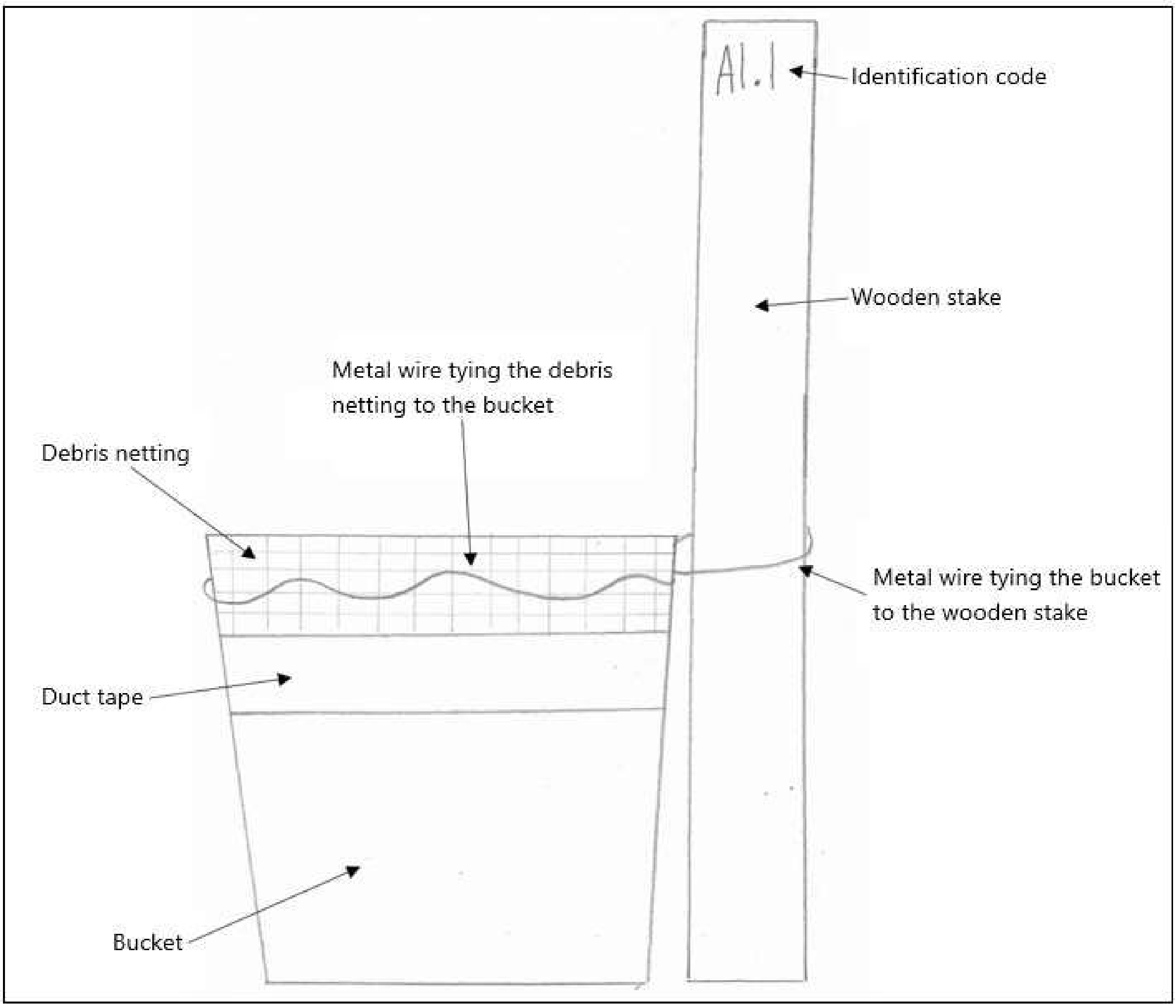

Figure 7: Diagram of the seed trap design utilised within this study.

It was decided that five areas would be chosen for survey, due to the area of land available within Lochies and Benmore and the anticipated time limitations of each survey sampling period. Due to the differences in size of Lochies and Benmore (approximately 0.03 km^2 and 0.20 km^2 respectively), two survey areas were installed within Lochies (survey areas A and B) (Figure 8), and three survey areas were installed within Benmore (survey areas C, D and E) (Figure 9). In order to prevent bias, the exact areas selected for survey were chosen via a random sampling method prior to the installation date. Within each of the five survey areas, three transects were measured out, 1.5 m apart from one another. A transect length of 60 m was chosen, as it was identified within several relevant sources that lodgepole pine seed generally disperse within 60 m from the seed source (Alexander, 1974; Anderson, 2003; Barth, 1970; Clements, 1910; Dahms & Barrett, 1975; Lotan, 1975; OECD, 2010; Pfister & Daubenmire, 1975; Shearer, 1981; Tackle, 1964). Due to the similarities between the morphology of Sitka spruce and lodgepole pine seeds, a transect length of 60 m was considered to be appropriate for both species (Benkman, 1995; Contreras *et al*., 2016; Leslie *et al*., 2017; Tomback & Linhart, 1990). All transects started at 0 m from the forest edge and stretched out perpendicular to the forest edge. Seed traps were installed at 10 m intervals along the transects, starting at 0 m (i.e. the forest edge). Therefore, 105 seed traps were installed in total, including 21 seed traps within each survey area, comprised of 7 seed traps along each transect. To ensure the seed trap in which each seed was sourced could be distinguished, each seed trap was given a nominal identification code, comprised of its survey area letter and unique number (i.e. A.1, A.2 and A.3 for example).

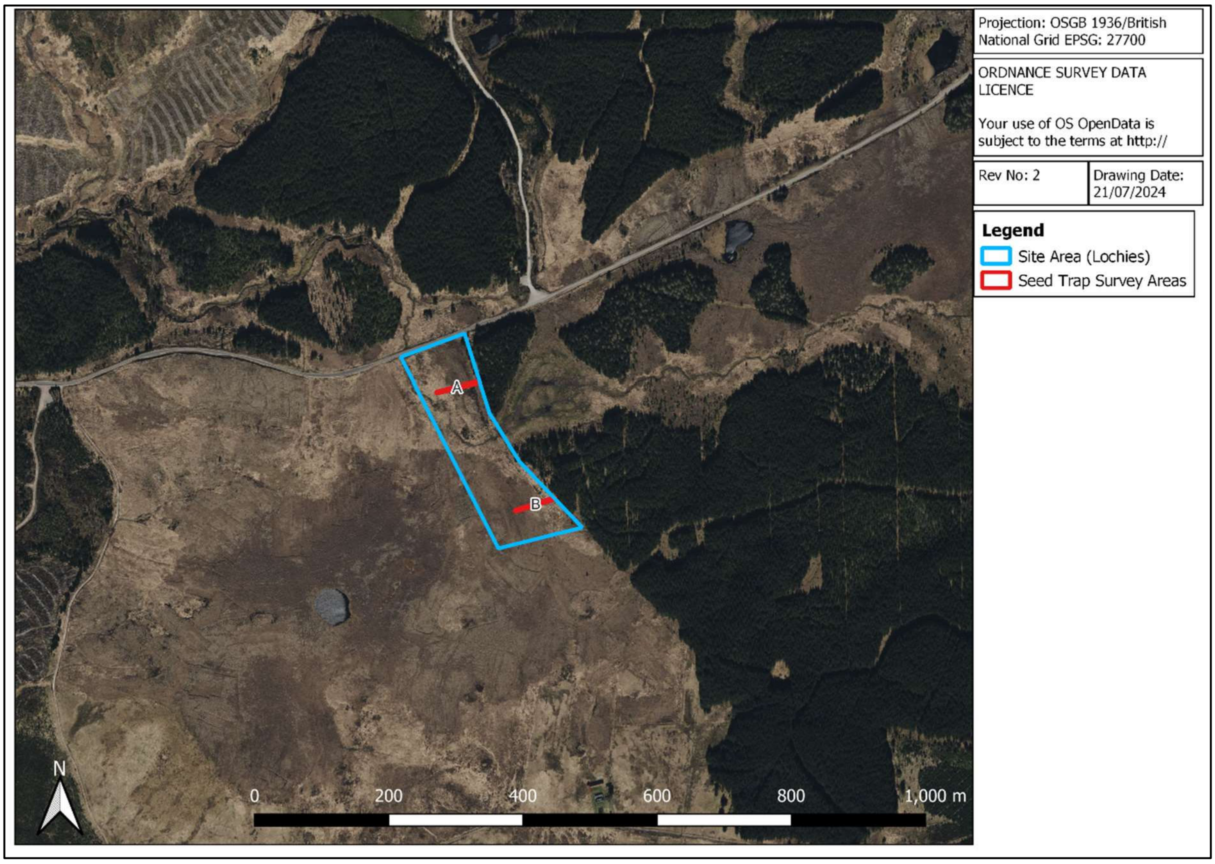

Figure 8: Approximate location of survey areas A and B for the seed trap data collection, situated within Lochies.

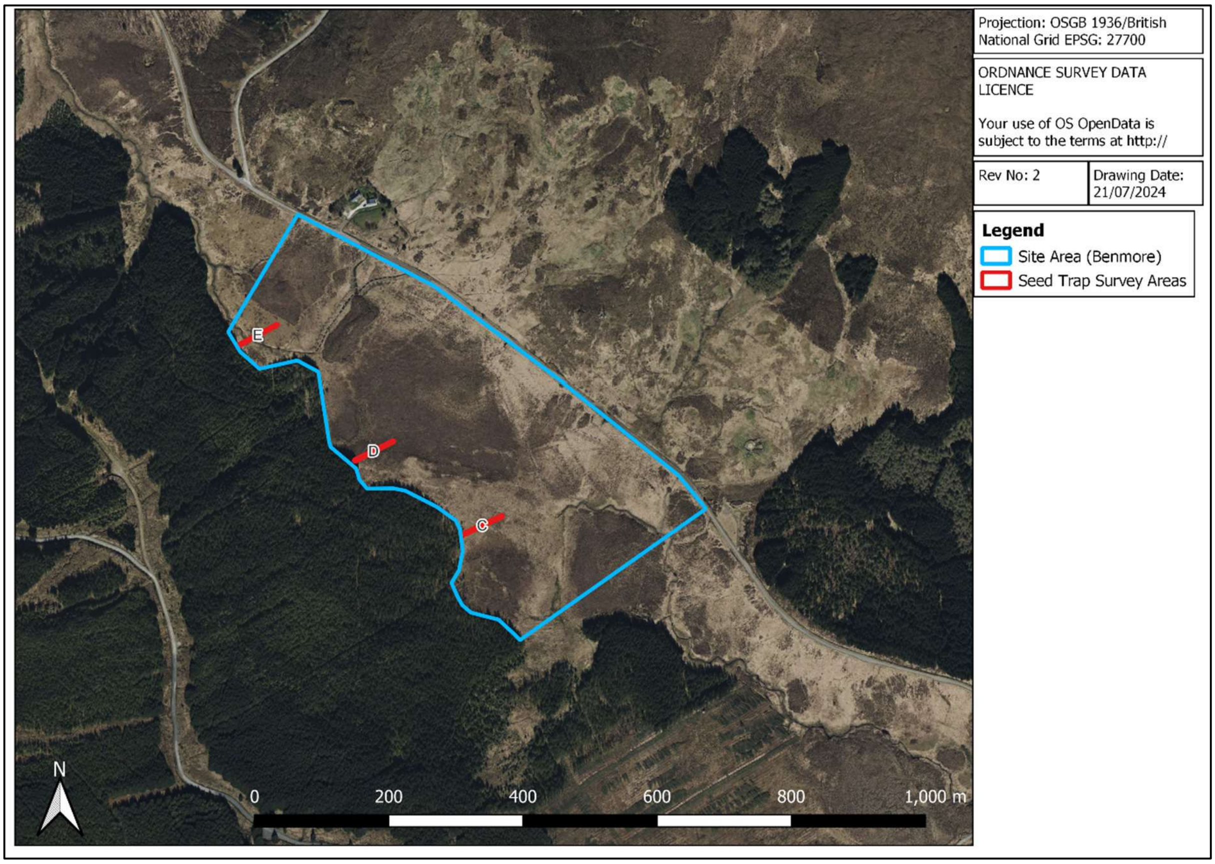

Figure 9: Approximate location of survey areas C, D and E for the seed trap data collection, situated within Benmore.

The seed traps were inspected a total of eighteen times between February and October 2022, with approximately two-week intervals between each visit. During each site visit, all of the seeds collected within each seed trap were removed. Seeds were placed in Ziplock bags, which were labelled with their seed trap identification code. Only seeds of conifers were counted, as these species were the focus of the study. The species of each seed was identified and counted using a magnifying glass. Lodgepole pine seeds are generally larger than Sitka spruce and are usually very dark (almost black). Whilst Sitka spruce seeds are generally slightly smaller, brown in colour and with a mottled surface (Kolotelo, 1997). There can be variation in the colour, pattern and size of each seed, making the different species look very similar, hence there was considered to be potential for human error with this methodology. However, every effort was taken to achieve accurate results, and a more thorough inspection could not have been completed without DNA analysis. Seed rain data was inputted into a Microsoft Excel Spreadsheet after each site visit.

2.2.2 Lodgepole Pine Count Data

The abundance of conifers growing within the peatland was recorded as a supplement to the data collected during the seed trap study, to improve understanding of the germination of conifers outside of the forest, within the peatland. All of the conifers recorded were lodgepole pine, as no Sitka spruce (or other conifer species) were identified as part of the data collection. As Sitka spruce have previously been recorded escaping cultivation into peatlands in Scotland (Campbell *et al*., 2019) it is possible that the lack of Sitka spruce regeneration was due to the hydrology of the site, as lodgepole pine are able to tolerate wetter conditions (Campbell *et al*., 2019), or due to the age of the existing conifer crop, as it takes Sitka spruce longer to reach maturity (Malcolm, 1987; Nyland, 1998; Petty *et al*., 1995; Philipson, 1987; Quine, 2001). Alternatively, it is possible that a low abundance of Sitka spruce regeneration was present within the survey area and were not recorded as part of the data collection, due to the limited number of survey transects. Due to time constraints data was only collected at Benmore. Two site visits were undertaken to collect the data in May 2023. To ensure clarity when discussing the two different data sets collected as part of this study, records of lodgepole pine regeneration will hereafter be referred to as 'lodgepole pine count data'.

Ten survey transects were chosen using a random sampling method to prevent bias (Figure 10). Each survey transect was 150 m long, starting at the edge of the forest (0 m). The survey transects were marked out using a measuring tape, perpendicular to the forest edge. All conifers, including seedlings, saplings and trees within 1.5 m of the transect line in each direction (3 m in total) were recorded, along with the root collar diameter (RCD), the height of the stem from its base to the top of apical bud (hereafter referred to as 'height') and the distance which it was growing from the forest. Furthermore, the microtopography on which each of the lodgepole pine was growing was classified and recorded. Lodgepole pine count data was inputted into a Microsoft Excel Spreadsheet after each site visit.

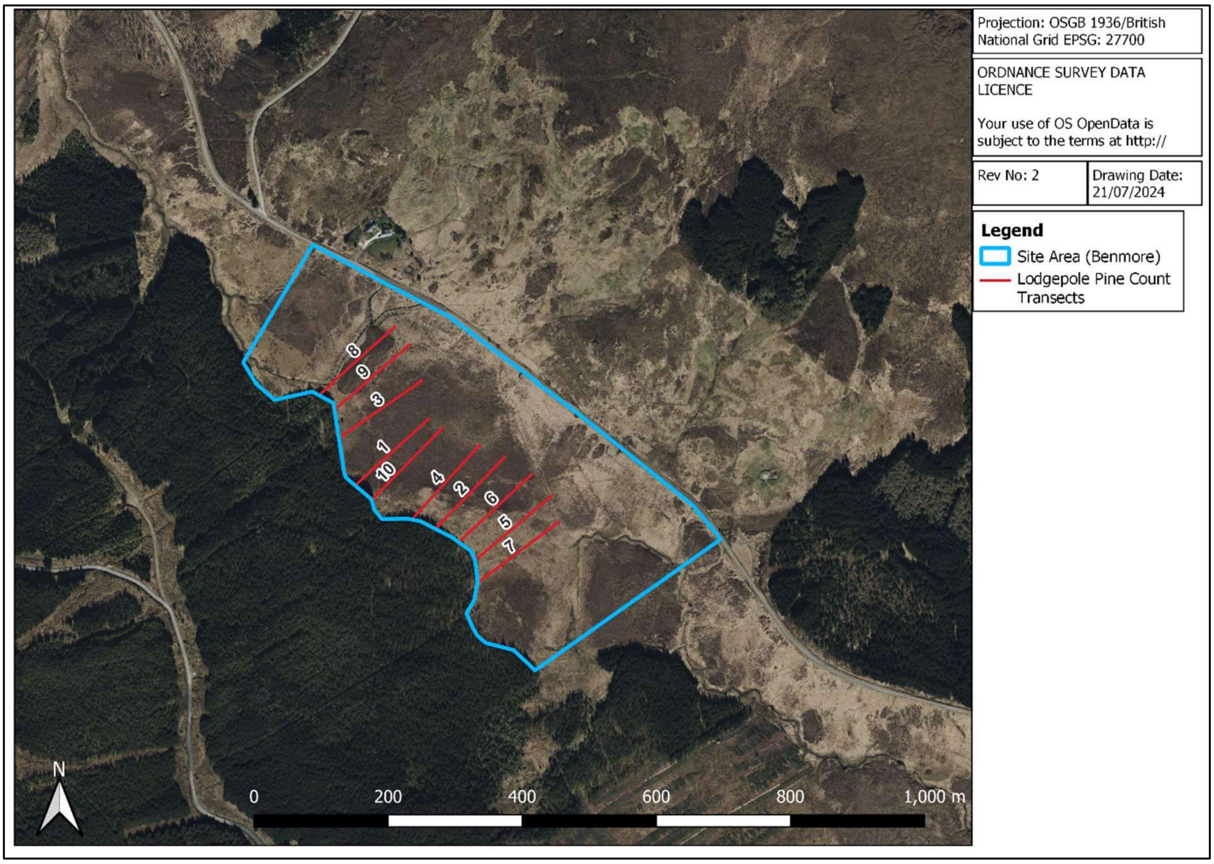

Figure 10: Approximate location of the ten survey transects utilised during the lodgepole pine count data collection, situated within Benmore.

In order to gain an understanding of germination patterns of lodgepole pine within the peatland over time, the age of the lodgepole pine recorded during this study was considered. As the year at which each lodgepole pine germinated was unknown, the stem dimensions were recorded as a proxy for age. This allowed each lodgepole pine to be categorised into one of three age classifications, as per the Woodland Carbon Code, including seedlings (<50 centimetres (cm) tall), saplings (>50 cm tall with a diameter at breast height (DBH) <70 mm) and trees (>50 cm tall with a DBH >70 mm) (Woodland Carbon Code, 2021). To avoid confusion when differentiating between the age classifications, in particular 'tree', all lodgepole pine recorded during the lodgepole pine count data study are referred to as 'lodgepole pine'. As such, 'tree' specifically refers to a lodgepole pine within that specific age category. To ensure that the diameter of the stem of each lodgepole pine could be assessed, regardless of height, the RCD of each lodgepole pine was used during data analysis as a measure of the stems thickness.

The RCD was recorded using two different methods. On day one, the RCD was calculated by running a piece of string around the base of the stem and then measuring the length of the string required. The circumference was then converted into the diameter using the equation '$D = C/\pi$' using Microsoft Excel software (where 'D' refers to the diameter and 'C' refers to the circumference). However, this method proved to be time consuming and there were considered to be greater opportunities for human error. Therefore, on day two of the data collection period, a digital vernier calliper was used to measure the RCD in the field. The use of a digital vernier calliper to identify the RCD was found to be much more efficient, whilst also providing more accurate and precise results. However, limitations to this methodology were still identified, particularly due to the nature of the habitat and dense vegetation, such as *Sphagnum* moss and heather (*Calluna* spp.), which made it difficult to determine the ground level and identify the true base of the lodgepole pine. The same limitation was identified when measuring the height of the plant. The height was measured using a measuring tape, from the base of the lodgepole pine to the top of the apical bud. Due to dense moss and foliage, the exact base of the lodgepole pine was, at times, difficult to identify, hence there was potential for inaccuracies. However, every attempt was made to ensure that the data was as accurate as possible.

To determine whether the formerly ploughed ridge-furrow structure of the peat had any impact upon the successful germination of lodgepole pine at Benmore, the microtopography on which each lodgepole pine was growing was considered. The microtopography on which the lodgepole pine was growing was categorised into one of three topographical classifications, including ridge, furrow or flat (where the ground was evidently flat, or the presence of a ridge or furrow was not obviously apparent) and recorded.

2.3 Statistical Analysis

Statistical analysis was completed using Microsoft Excel and R Studio. Packages "ggplot", "ggplot2", "ggpubr", "tidyverse", "broom", "AICcmodavg", "dplyr" and "MASS" were installed within R Studio to complete the appropriate analysis and create suitable figures to display the results. For all statistical analysis, a p-value of ≤ 0.05 (alongside a z value of <-2.58 or >2.58 where relevant), was considered appropriate to reject a null hypothesis (as described below). In addition, a t-value of <-2 or >2, or a f-value of <0.05 (as generated by the associated models) was considered to be statistically significant.

To analyse the seed trap data, all seed traps at each 10 m interval was tallied to determine the total number of seeds recorded at each distance point. A Poisson distribution analysis was used to test the null hypothesis that distance would have no impact upon seed rain abundance. The Poisson distribution model in R Studio cannot run appropriately if there are any null results, and therefore, in order to avoid negative infinity log-transformed values for any recordings of '0' and ensure that all data sets were treated equally, '1' was added to all seed rain abundance values to remove null results (including results >0).

To assess the effect of timing of year on seed rain abundance, all months were categorised into one of four season classifications, as per Table 1.

Table 1: Seasonal classification in which each month of the year was categorised.

Season	Month
Autumn	September
	October
	November
Winter	December
	January
	February
Spring	March
	April
	May
Summer	June
	July
	August

To analyse the correlation between the RCD and height of the lodgepole pine recorded, a Pearsons R test for correlation was undertaken. The relationship between age (using stem dimensions as a proxy for age) and the distance that lodgepole pine were growing from the forest edge was tested using a linear model.

Finally, the effect of microtopographic position on lodgepole pine establishment was analysed using an ANOVA to test the null hypothesis that lodgepole pine abundance would not fluctuate due to microtopography.

2.4 Quantum Geographic Information System

Figures presented within this report depicting maps of the geographical locations of the sites, survey areas and transects were all drawn with the use of Quantum Geographic Information System (QGIS).

3 Results

3.1 Seed Rain Data Analysis

3.1.1 Variation of Seed Rain Abundance over Distance

Lodgepole pine seeds were recorded within all survey areas except for survey area B (situated in Lochies). Sitka spruce seeds were only recorded at Benmore, in survey areas C and D. Overall, a total of 337 lodgepole pine seeds were recorded during the entire survey period, whilst only 13 Sitka spruce seeds were recorded. A much higher abundance of lodgepole pine seed was recorded at Benmore than Lochies (327 lodgepole pine seeds at Benmore (97% of the lodgepole pine seeds recorded) and 10 lodgepole pine seeds at Lochies (3% of the lodgepole pine seeds recorded)) (Figure 11). The majority of lodgepole pine seeds were recorded within survey area C (148 lodgepole seeds; 44% of the lodgepole pine seeds recorded) (Figure 11), whilst the majority of Sitka spruce seeds were recorded in survey area E (9 Sitka spruce seeds; 69% of the Sitka spruce seeds recorded) (Figure 11).

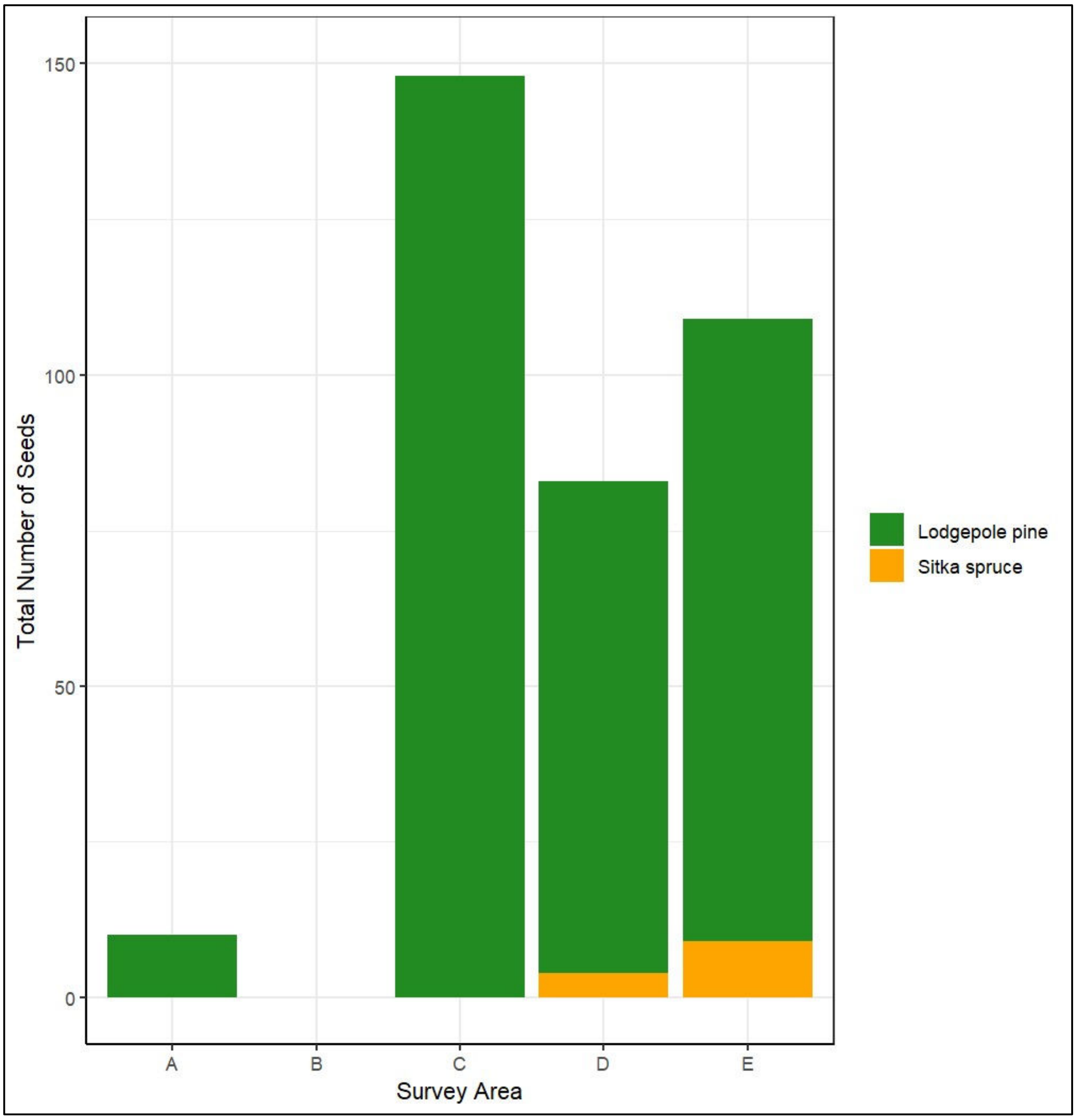

Figure 11: Total number of lodgepole pine and Sitka spruce seeds recorded at Lochies (survey areas A and B) and Benmore (survey areas C, D and E).

The highest abundance of lodgepole pine seeds and all Sitka spruce seeds were captured at 0 m (82% of the lodgepole pine seeds recorded and 100% of the Sitka spruce seeds recorded) (Figure 12). As Sitka spruce seeds were only recorded within seed traps situated at 0 m from the forest edge, it cannot be confirmed that the seed traps successfully captured any wind-dispersed Sitka spruce seeds, as there is potential that the seeds simply fell from adjacent trees. The maximum dispersal distance of lodgepole pine seeds recorded at Lochies and Benmore was 50 m (Figure 12). When considering only the lodgepole pine seeds which dispersed outside of the forest (i.e. >0 m), the highest abundance of lodgepole pine seeds was recorded at 20 m (48% of the lodgepole pine seeds recorded >0 m from the forest edge) (Figure 12). However, all of the seeds recorded within seed traps situated at 20 m from the forest edge were recorded at Benmore. All of the lodgepole pine seeds recorded within seed traps >0 m from the forest edge at Lochies, were recorded within seed traps situated at 50 m from the forest edge (Figure 12).

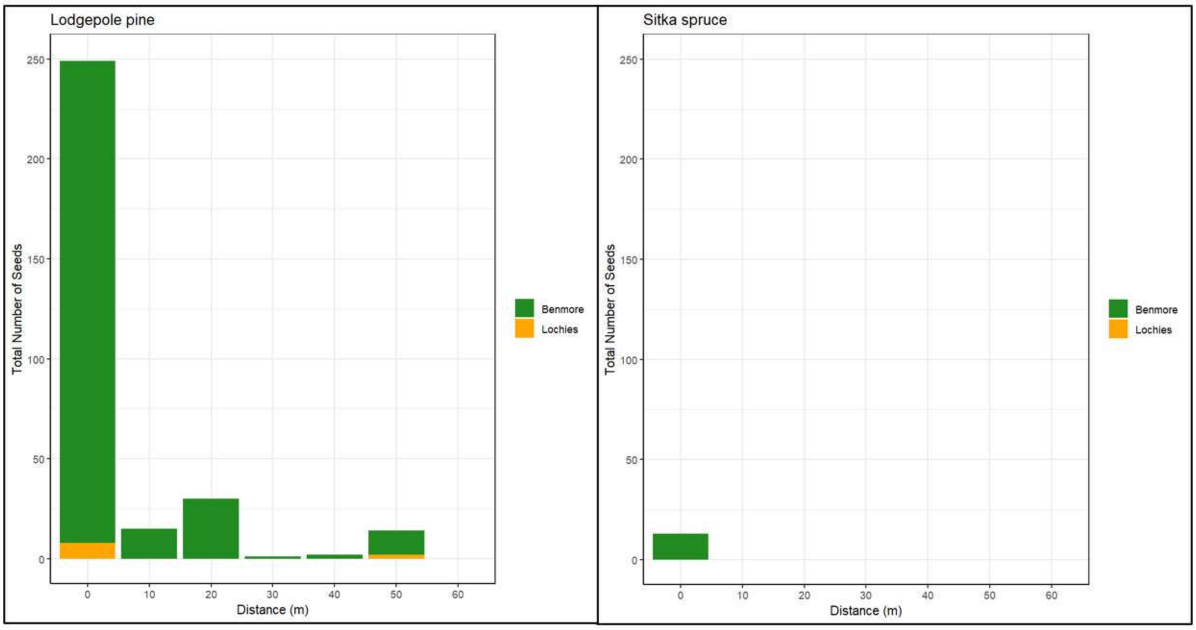

Figure 12: Total number of seeds recorded at each distance point at Lochies and Benmore during the data collection period from February to October 2022.

No trend was identified between seed rain abundance and distance for either lodgepole pine or Sitka spruce. Nevertheless, a statistically significant relationship was identified between the seed rain abundance of lodgepole pine and distance ($z = 16.40$, $p = <0.001$) and the seed rain abundance of all seeds (i.e. all of the lodgepole pine and Sitka spruce combined) and distance ($z = 12.30$, $p = <0.001$). The results suggest that, although seed rain is not normally distributed, distance is likely to be a predictor variable of seed rain abundance for lodgepole pine seeds. The results indicate that seeds are not deposited at a gradually increasing or decreasing rate, however, are deposited within similar ranges from one another (i.e. 'peak distances'). These results were expected, as the seeds of each species are anticipated to be of similar size and weight, thus are likely to be carried similar distances from the forest and be deposited within the same general area, rather than being deposited gradually over distance with increasing or decreasing abundance.

No statistically significant relationship was identified between the abundance of seed rain of Sitka spruce and distance ($z = 0.79$, $p = 0.43$). However, it cannot be fully determined whether the method captured any wind-dispersed Sitka spruce seeds, and a limited number of Sitka spruce seeds were recorded. Therefore, there are considered to be limitations to the analysis and the results for Sitka spruce cannot be considered to be reliable.

3.1.2 Seasonal Variation in Seed Rain Abundance

The seed rain data collection period was between February and October 2022. No lodgepole pine or Sitka spruce seeds were recorded within the seed traps between February to May 2022 (Figure 13). Lodgepole pine seeds were recorded in the seed traps at Lochies and Benmore between June and August 2022, however, were only recorded at Benmore during September and October 2022 (Figure 13). Sitka spruce seeds were only recorded at Benmore, and were identified between June and October 2022, with the exception of September 2022, during which no Sitka spruce seeds were recorded (Figure 13). As lodgepole pine and Sitka spruce seeds were only recorded at Lochies between June and August 2022, all seeds recorded between September and October 2022 were recorded at Benmore (Figure 13).

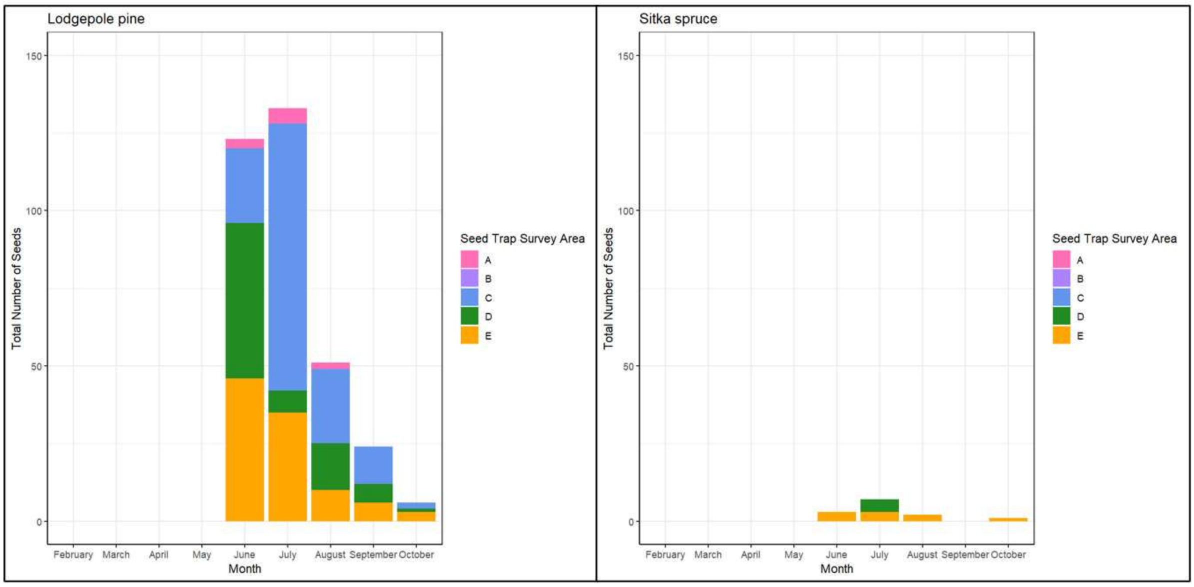

Figure 13: Total number of lodgepole pine (left) and Sitka spruce (right) seeds identified within each survey area during each month of the data collection period between February to October 2022.

The highest abundance of lodgepole pine and Sitka spruce seeds was recorded in July 2022 (35% of all lodgepole pine seeds and 54% of all Sitka spruce seeds recorded) (Figure 13). However, when considering each of the survey areas individually, it was identified that the highest abundance of lodgepole pine seeds at survey areas D and E was actually recorded in June 2022 (Figure 13). An equal number of Sitka spruce seeds were recorded in survey area

E during June and July 2022 (Figure 13). A decrease in the abundance of lodgepole pine seeds was recorded between August and October 2022 (Figure 13). A similar trend was observed for Sitka spruce, with the exception of 1 seed recorded in October 2022 (Figure 13).

The effect of time of year on seed rain abundance was also considered with reference to the seasons (as described in Table 1). No lodgepole pine or Sitka spruce seeds were recorded during months associated with winter (Figure 14; Table 1). The highest abundance of lodgepole pine and Sitka spruce seeds was recorded during months associated with summer (91% of all lodgepole pine seeds and 92% of all Sitka spruce seeds recorded) (Figure 14; Table 1). Lodgepole pine and Sitka spruce seeds were only recorded during months associated with autumn at Benmore (Figure 14; Table 1), and with a much lower abundance than that of months associated with summer (9% of all lodgepole pine seeds and 8% of all Sitka spruce seeds recorded). Despite the variance in seed abundance, the seasonal distribution of lodgepole pine seeds and Sitka spruce seeds was near identical, which was expected due to the similarities of the ecological nature of both species.

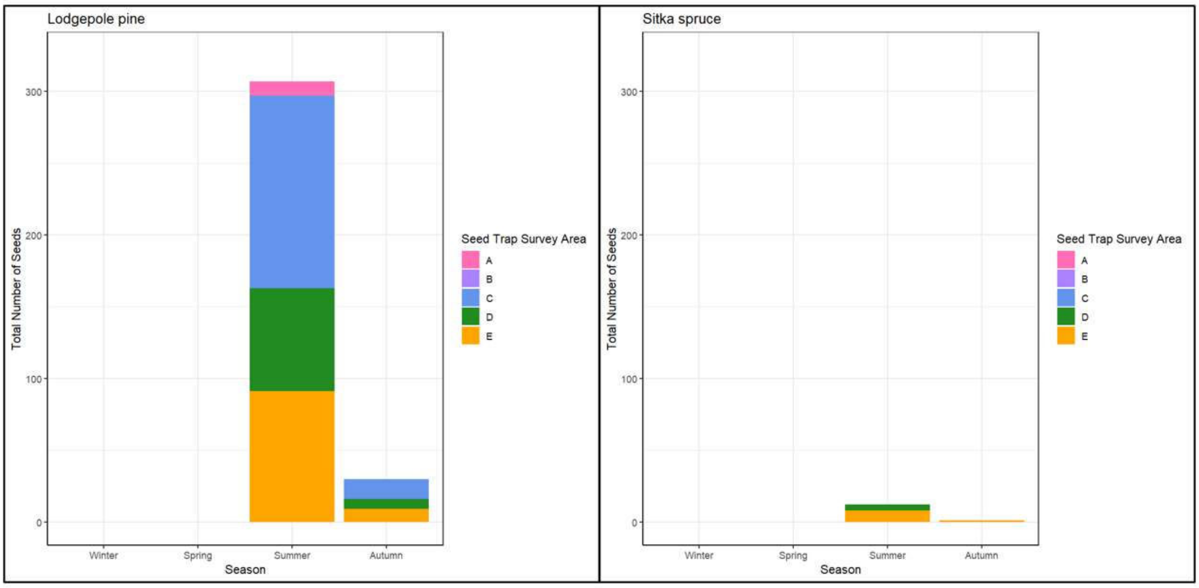

Figure 14: Total number of lodgepole pine (left) and Sitka spruce (right) seeds recorded during each season (as outlined in Table 1) of the data collection period between February to October 2022.

3.2 Lodgepole Pine Count Data Analysis

3.2.1 Use of Stem Dimensions as a Proxy for Age

The height and diameter of a conifers stem can be used as a proxy for age (Sumida *et al*., 2013; Wheater *et al*., 2011; Woodland Carbon Code, 2021), however as peatland conditions are generally sub-optimal for conifers, it was unknown whether the stems would grow as expected. Generally, a positive correlation would be observed between the stem height and diameter of growing juvenile trees, as the height is expected to increase each year (primary growth), whilst the stem is expected to increase in thickness (secondary growth) (Kahle *et al*., 2008; Rinn, 2015). To make certain that the stem dimensions could be used as a proxy for age within this study, and that general age classifications, such as those outlined within the Woodland Carbon Code Survey Protocol (Woodland Carbon Code, 2021), would be appropriate, the correlation between the height and RCD of the lodgepole pine recorded during the data collection at Benmore was analysed. A positive trend was observed between the RCD and height of the lodgepole pine, which was further supported by the statistical analysis, as a statistically significant correlation between the height and RCD ($t = 15.21$, $p = <0.001$). These results indicate that the lodgepole pine recorded were exhibiting an increase in both primary and secondary growth as expected, despite the suboptimal conditions, and that the stem dimensions would likely be an appropriate proxy for age within the further statistical analysis of this study.

3.2.2 Germination Patterns of Lodgepole Pine Growing in Peatland

Germination patterns of the lodgepole pine regeneration were investigated to identify whether there was any evidence of ongoing ecological succession. Evidence of ecological succession could include a distribution of lodgepole pine regeneration at various ages, relating to the distance in which they were growing from the forest edge for example.

A total number of 256 lodgepole pine were recorded. The closest lodgepole pine growing to the forest was recorded at 0.5 m from the forest edge (Figure 15). The maximum distance that lodgepole pine were recorded growing from the forest edge was 120.9 m (Figure 15). The average distance that lodgepole pine were recorded growing from the forest edge amongst all transects was 22.58 m (Figure 15). The mean distances at which seedlings and saplings were recorded growing from the forest was 21.72 m and 27.06 m respectively. Only one tree was recorded during the study, the tree was situated at 87.5 m from the forest edge.

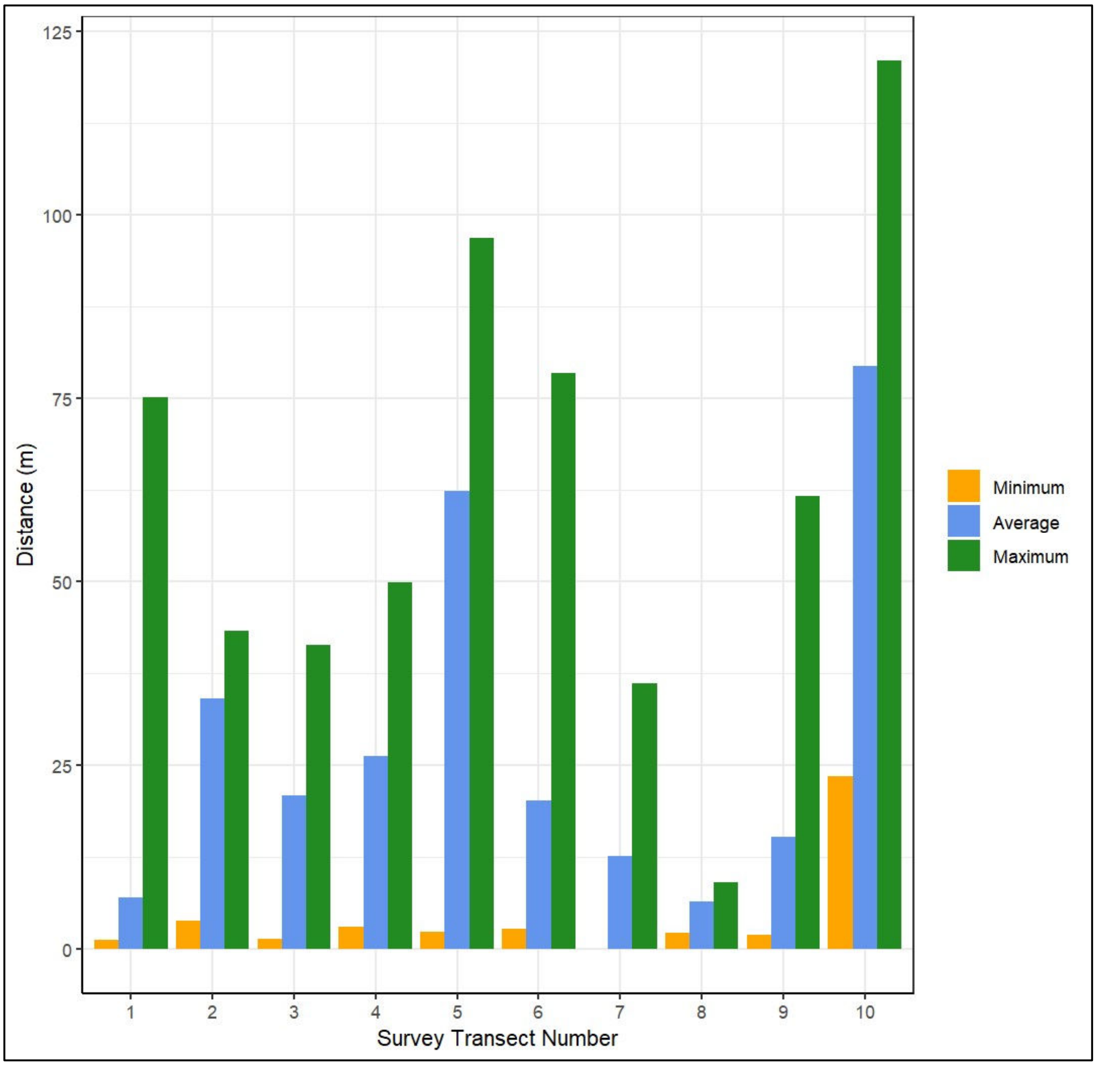

Figure 15: The minimum, maximum and average distances at which lodgepole pine were recorded from the forest within each survey transect.

The distances at which lodgepole pine were recorded growing from the forest fluctuated between transects, and there was a range of 73.84 m between the minimum and maximum average distances recorded for each individual transect (Figure 15). However, it was determined that for the majority of transects (8 out of 10 survey transects), the average distance that lodgepole pine were recorded growing from the forest was <50 m, and that for the majority of transects (9 out of 10 survey transects), the maximum distance that lodgepole pine were recorded growing from the forest was <100 m (Figure 15).

The lodgepole pine at transect 10 were identified to have the greatest average distance from the forest (79.35 m from the forest edge) and the lodgepole pine recorded at the greatest distance from the forest edge (120.9 m) was recorded at transect 10 (Figure 15). In addition, the greatest distance between the forest and the closest lodgepole pine to the forest edge was also recorded at transect 10 (23.45 m) (Figure 15). Therefore, it was determined that lodgepole pine at transect 10 were generally growing at greater distances from the forest than those in other transects. Nonetheless, a similar trend was not observed between other transects. For example, the transect with the shortest average and maximum distance that lodgepole pine within the transect were recorded growing from the forest edge was transect 8 (6.53 m and 9.05 m, respectively) (Figure 15). However, the closest lodgepole pine recorded to the forest edge was recorded at transect 2 (0.05 m from the forest edge) (Figure 15). Therefore, there did not appear to be a trend in the ranges that lodgepole pine were recorded from the forest between transects.

The stem dimensions (in particular the RCD and height) of the lodgepole pine were used within the statistical analysis as a proxy for age (as described in Section 3.2.1: Use of Stem Dimensions as a Proxy for Age), to determine whether there were any trends between the age of the lodgepole pine and the distance in which they were growing from the forest, which could indicate ecological succession. A positive trend was identified between the RCD and distance and the height and distance (Figure 16). These findings were supported by the statistical analysis, which determined that there was a statistically significant relationship between both the RCD and distance ($t = 9.39$, $p = <0.001$) and the height and distance ($t = 7.17$, $p = <0.001$). Further analysis of both stem dimensions (i.e. RCD and height) and distance also identified a statistically significant relationship ($t = 8.31$, $p = <0.001$). These findings suggest that lodgepole pine growing at greater distances from the forest are likely to be older than those closer to the forest edge. Generally, ecological succession would be expected to result in a negative trend between age and distance. It would be expected that lodgepole pine closest to the forest would be larger and older, having benefited from improved conditions close to the forest edge, such as shelter and increased drainage and nutrients. As a positive trend was identified at Benmore, it suggests that there is not any evidence of ongoing ecological succession at this time. However, the findings provide evidence that afforestation is beginning to occur at great distances from the forest edge and that the lodgepole pine are growing as expected, despite the suboptimal conditions. Thus, the results may provide evidence of the early stages of ecological succession.

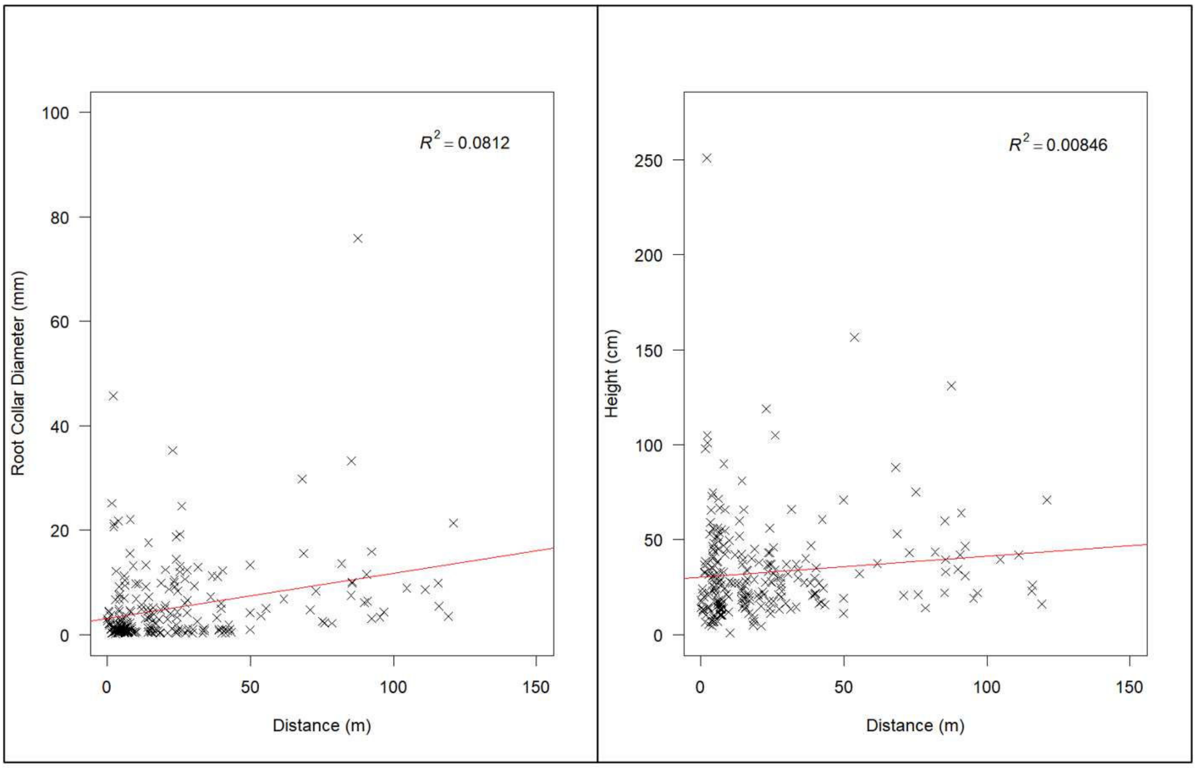

Figure 16: Height and RCD of all lodgepole pine recorded in relation to the distance from the forest.

3.2.3 Distribution of Lodgepole Pine Growing within a Ridge-Furrow Matrix

The highest abundance of lodgepole pine was recorded on ridges (52%) (Figure 17), whilst the lowest abundance of lodgepole pine were recorded in furrows (10%) (Figure 17). 38% of lodgepole pine were recorded growing on flat ground (Figure 17). Seedlings and saplings were recorded growing on ridges, furrows and flat ground. Only one tree was recorded, and it was growing on a ridge. Despite the variance between the total number of lodgepole pine within each topographical category, no statistically significant relationship was identified between the microtopography and lodgepole pine abundance ($f = 0.48$, $p = 0.64$).

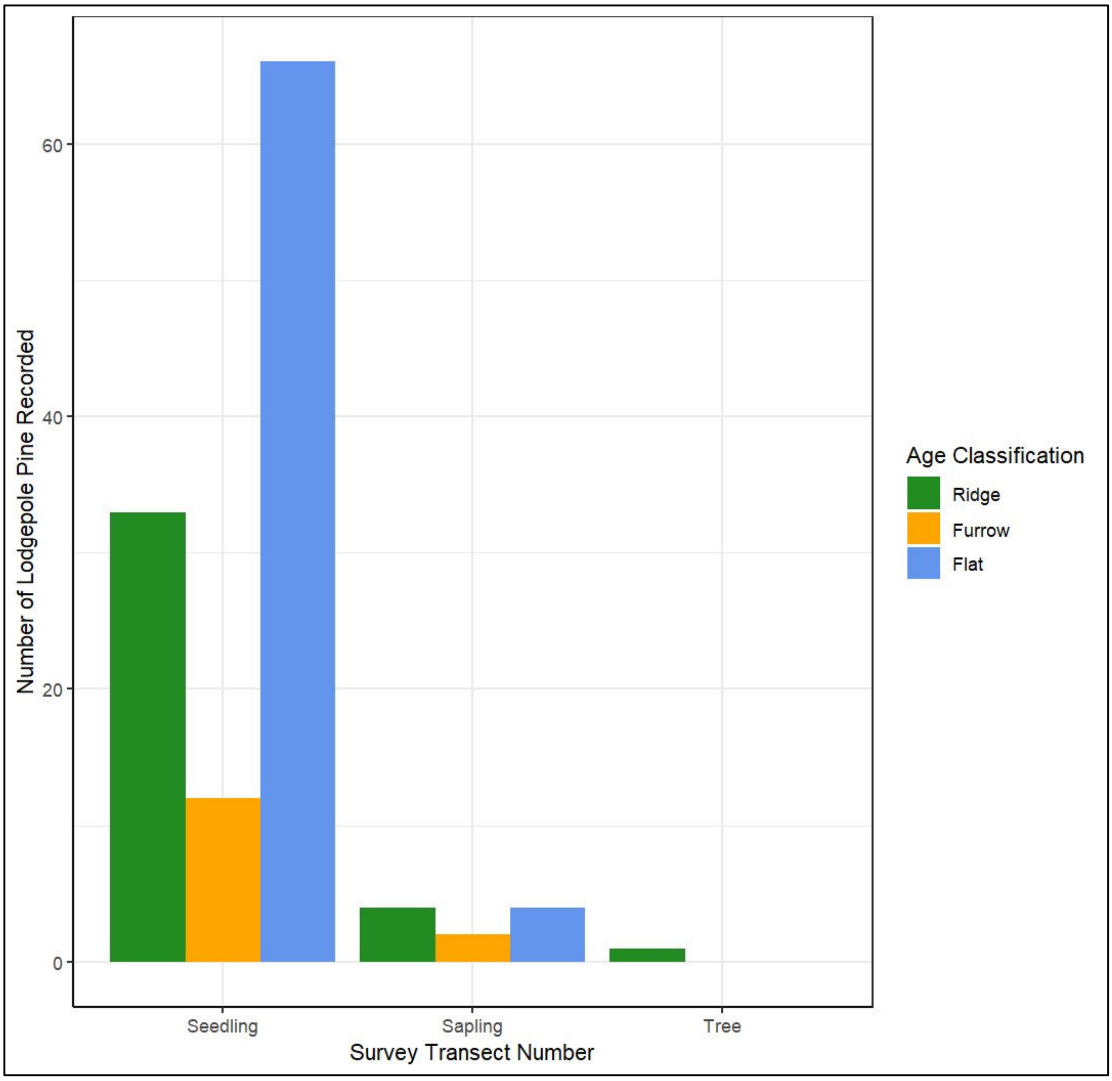

Figure 17: Total number of lodgepole pine recorded within each microtopography classification, including 'ridge', 'furrow' and 'flat' ground.

The number of lodgepole pine recorded within each microtopography classification varied between transects (Figure 18), however, it is important to note that not all transects provided representation of each of the three microtopography classifications. Nonetheless, where all three microtopography classifications were present (i.e. transects 6, 7, 9 and 10) (Figure 18), a variation between the percentage of lodgepole pine within each microtopography classification was observed.

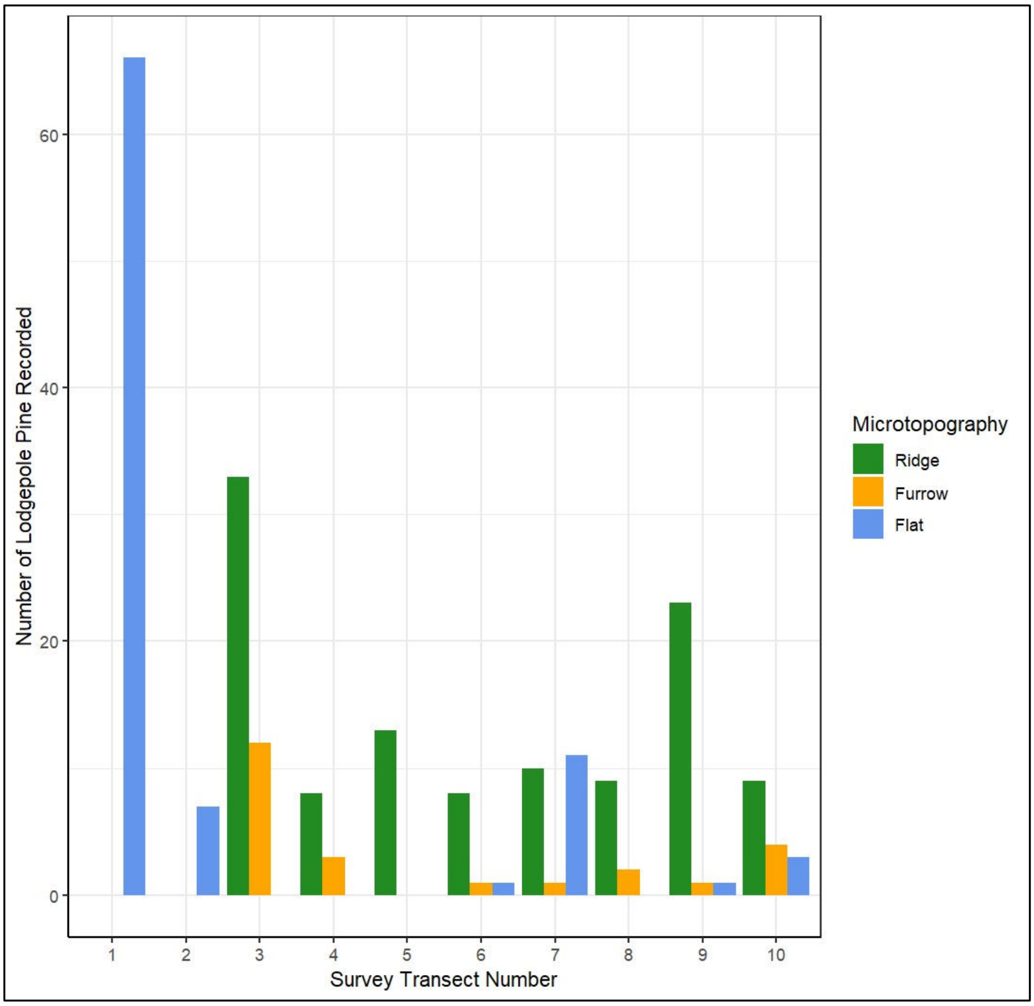

Figure 18: The total number of lodgepole pine recorded on each of the three microtopography classifications ('ridge', 'furrow' and 'flat' ground), within each of the survey transects (noting that not all microtopography classifications were represented at each transect).

At transects 6, 9 and 10, the highest abundance of lodgepole pine was recorded on ridges (80%, 92% and 60%, respectively). However, at transect 7, an equal abundance of lodgepole pine was recorded on ridges and flat ground (46% and 46%, respectively). At transects 6 and 7, the lowest abundance of lodgepole pine was recorded in furrows (7% and 8%, respectively). However, an equal abundance of lodgepole pine was recorded in furrows and on flat ground at transect 9 (4% and 4%, respectively), whilst at transect 10, a higher abundance of lodgepole pine was recorded in furrows than on flat ground (25% and 15%, respectively). Overall, these results show that lodgepole pine are more likely to germinate on ridges, however, it was identified that lodgepole pine can also germinate and be successful in furrows and on flat ground (Figure 18).

4 Discussion

4.1 Dispersal Distance of Seed from Coniferous Forestry Plantations

The seeds of lodgepole pine and Sitka spruce are morphologically adapted to dispersal via wind, which is the principal dispersal method for both species (Ledgard, 2001; Nathan *et al*., 2011; OECD, 2006; Vander Wall, 2008; Zhang *et al*., 2020). An understanding of the distances that conifer seeds are likely to disperse from forestry plantations into peatland via wind, is essential in identifying the theoretical 'risk zone' in which peatlands are at risk of naturally occurring afforestation, due to ecological succession (Greene & Johnson, 1996; Nygaard & Øyen, 2017).

Studies have previously been carried out to determine the potential dispersal distances of lodgepole pine and Sitka spruce seed via wind, with the use of seed rain sampling and seedling counts. Particularly within formerly planted peatlands (i.e. clear-felled peatland areas). Seedling counts to monitor the spread of Sitka spruce in Norway, recorded seedlings growing a mean distance of 74 m and 41 m from the forest edge at two different sites, with a peak abundance occurring at 50 m from the forest edge and decreasing with distance (Nygaard & Øyen, 2017). Whilst other studies determined that Sitka spruce seed generally disperses at distances of 60 – 80 m from the parent tree (Bianchi *et al*., 2019; Nixon & Worrell, 1999; von Ow *et al*., 1996). However, there are records of Sitka spruce seeds dispersing much greater distances (Mair, 1973; OECD, 2006), for example in Norway, Sitka spruce saplings were recorded growing up to 996 m away from the forest stand (Nygaard & Øyen, 2017). Wind-speed and seed size are likely to be the most pre-determining factors of long-distance seed dispersal (Benkman, 1995; Nathan *et al*., 2011), although other changes in conditions, such as the presence of snow and ice can also result in greater dispersal distances (Despain, 2001; Greene & Johnson, 1997).

Similar results have been identified for lodgepole pine, likely due to the similarities in morphology between lodgepole pine and Sitka spruce seeds (Benkman, 1995; Contreras *et al*., 2016; Leslie *et al*., 2017; Tomback & Linhart, 1990). The results of a study in New Zealand suggest that lodgepole pine seeds generally disperse within 50 m from the forest (Ledgard, 2001), whilst other scientific literature reported a general dispersal distance of approximately 60 m (Alexander, 1974; Anderson, 2003; Barth, 1970; Clements, 1910; Pfister & Daubenmire, 1975; Shearer, 1981; Tackle, 1964). In addition, previous studies determined that sufficient seed to restock an area (i.e. create forest habitat), often only occurs within 60 m of the seed source (Dahms & Barrett, 1975; Lotan, 1975; OECD, 2010), hence, it is expected that initial afforestation is only likely to occur within 60 m from the existing forest edge. Nonetheless, as with Sitka spruce, there is evidence to suggest that the seeds of lodgepole pine can travel further. A study undertaken in Alberta, Canada, recorded seeds travelling at least 330 feet (approximately 100.5 m), from the forest edge (Crossley, 1995) and a study in Sweden researching the dispersal ecology of lodgepole pine, recorded seeds dispersing within 120 m of the parent tree (Despain, 2001; McCaughey *et al*., 1986).

During this study, Sitka spruce seeds were only identified in seed traps placed at 0 m from the forest edge (Figure 12), therefore it is unknown whether the seed traps successfully collected wind-dispersed Sitka spruce seeds, or whether the seeds had simply fallen from adjacent trees. Lodgepole pine seeds, however, were successfully captured at distances >0 m at both Lochies and Benmore (Figure 12), and the results of this study were considered to be supportive of the findings of other relevant literature. The majority of lodgepole pine seeds were recorded in seed traps situated at 0 m from the forest edge (Figure 12), however as with Sitka spruce, it is not possible to determine whether these seeds were dispersed via wind. Nonetheless, the majority of lodgepole pine seeds recorded outside of the forest (i.e. >0 m from the forest edge), were collected in seed traps situated at 20 m from the forest edge (Figure 12). The peak abundance of seed rain was reflected in the results of the lodgepole pine count study, as the mean distance at which lodgepole pine were recorded growing from the forest edge was 22.58 m (or 20 m when rounding to the nearest 10 m for comparison with the seed trap data) (Figure 16). Ultimately, analysis of the data determined that there is a statistically significant relationship between both the abundance of seed rain and distance and the abundance of lodgepole pine regeneration and distance. The two data sets provide evidence that lodgepole pine seeds predominantly disperse and germinate at approximately 20 m from the forest edge (Figure 12; Figure 16).

However, it is worth considering the large variance between the maximum distance at which seeds were recorded dispersing from the forest edge during the seed trap data collection and the maximum distance that lodgepole pine were recorded growing from the forest edge during the lodgepole pine count study. The maximum distance at which lodgepole pine seeds were recorded from the forest edge was 50 m (Figure 12), which was supportive of the findings by Ledgard (2001), who identified a maximum dispersal distance of 50 m during a seed trap collection study (Ledgard, 2001). However, evidence of seed dispersal (i.e. lodgepole pine regeneration) was recorded at a maximum distance of 120.9 m from the forest edge during the lodgepole pine count study (Figure 16). These findings are similar to that of McCaughey *et al*., 1986, who also reported seeds dispersing up to 120 m from the seed source (Despain, 2001; McCaughey *et al*., 1986). The seed traps were only designed to collect wind-dispersed seed. Other methods of dispersal, such as zoochory, are reported to result in larger dispersal distances for some tree species (Broome *et al*., 2016; Summers, 2018; Vander Wall, 1992; Vander Wall, 2008). However, the seeds of lodgepole pine are almost exclusively dispersed via wind, and therefore, it seems unlikely that zoochory would be the leading factor in such varied results (Ledgard, 2001; Nathan *et al*., 2011; OECD, 2006; Vander Wall, 2008). It should also be considered that the area in which the lodgepole pine regeneration was recorded may have been previously forested (see Section 2.1.2: Lochies and Benmore), therefore it is possible that seedlings could have germinated from an existing seed bank (Alvarez-Buylla & Martínez-Ramos, 1990; Pakeman & Small, 2005). Nonetheless, it is considered more likely that variations in weather conditions have resulted in the greater dispersal distances observed during the lodgepole pine count study (Despain, 2001; Lotan 1975). Many studies reviewing the dispersal distance of lodgepole pine determined that most seed rain, or regeneration, was situated within <100 m of the forest. However, reported that seeds are capable of dispersing at much greater distances, largely due to weather conditions, such as strong winds, thunderstorms and snow (Despain, 2001; Greene & Johnson, 1997; Mair, 1973; McCaughey *et al*., 1986; OECD, 2006), all of which are common in the Scottish Highlands. Therefore, the results are not entirely unexpected and are supportive of findings from previous research. Although, due to the distances at which lodgepole pine were identified from the forest edge, it is acknowledged that if the seed trap transects had been extended beyond 60 m, it is possible that wind-dispersed seeds would have been recorded at greater distances. Therefore, a longer transect would likely have been appropriate to identifying the maximum dispersal distances of conifer seed at Lochies and Benmore, which are both situated in the Scottish Highlands and exposed to high winds, thunderstorms and snow.

Additionally, due to the implications of weather on seed dispersal distances, in particular wind, it is possible that the orientation of the forest edge could be a variable of seed dispersal distance. It would generally be expected that seeds would disperse at greater distances in the opposing direction of the prevailing wind. The prevailing wind direction for the sites at

Lochies and Benmore was south-west. The survey areas at Lochies and Benmore were situated at contrasting orientations from one another, with the forest edge at Lochies facing south-west and the forest edge at Benmore facing north-east. A greater abundance of seed rain was identified at Benmore than Lochies (Figure 11). Although these findings could be due to factors such as annual seed shed variations and age of the forestry crop, it is possible that the results were due to the variation in orientation of the forest edges in relation to the prevailing wind direction. In order to fully understand the impacts of the prevailing wind direction on seed dispersal distance, additional survey works incorporating the study of several forests, with edges of varied orientations, located with close proximity (to ensure they are subjected to the same weather conditions) would be required.

4.2 Additional Understanding of the Ecology of Conifers Species in Peatland

4.2.1 Seasonal Variation of Seed Rain

The seasonality of seed rain is influential in the successful germination of seedlings, as the conditions need to be appropriate for the seed to survive and begin to develop. Thus, seasonality of seed rain is often associated with seedling vitality and successful recruitment. Seeds that disperse during inappropriate growing conditions are unlikely to survive (OECD, 2006). Late dispersal of seeds has the potential to hinder seedling germination, due to seasonal changes to the abiotic conditions. Although seasonality of seed rain is not directly associated with natural afforestation of peatlands, it provides further insight into the ecological processes associated with afforestation.

The seed trap data collection period was February to October 2022. No seeds were identified within the seed traps between February and May 2022. Lodgepole pine and Sitka spruce seeds were first recorded within the seed traps in June 2022, whilst the greatest abundance of lodgepole pine and Sitka spruce seeds was recorded in July 2022 (Figure 13). The variation in seed rain abundance recorded during this study is not considered to be supportive of the findings reported within relevant literature. Lodgepole pine and Sitka spruce are reported to have corresponding seed shed patterns (Broome *et al*., 2016; Nixon & Worrell, 1999). It is generally understood that both species begin to shed their seed in autumn, and that more than half of the seed is expected to disperse within the first few months (Harris, 1969; OECD, 2006; Ruth, 1958). Previous studies determined that by February, approximately 90% of the seed will have dispersed, and the remaining seed will disperse throughout the next growing season (Harris, 1969; Mckenzie *et al*., 2007; OECD, 2006; Ruth, 1958). In Scotland, lodgepole pine and Sitka spruce are expected to shed seeds between November to April (Broome *et al*., 2016; Nixon & Worrell, 1999), with the majority of seed dispersing by the end of January (Mckenzie *et al*., 2007). However, it was reported that cones can retain their seed until April during damp conditions (Mckenzie *et al*., 2007). A study undertaken in Inverness-shire, a little over 50 km from Lochies and Benmore, found that 40% of Sitka spruce seed was deposited between October and November, 51% between December and January and just 9% between February and April (Mair, 1973; Mckenzie *et al*., 2007). Although, in Roxburghshire, south-east Scotland, 2% of the Sitka spruce was deposited between October and November, 20% between December and January and 72% between February and April (Mair, 1973; Mckenzie *et al*., 2007). During the current study, 2% of the seed was recorded in October, 0% between February and April and the remaining 82% between the months of May and September. In the aforementioned study by Mair (1973), seed rain data did not appear to have been collected between May and September (Mair, 1973; Mckenzie *et al*., 2007). Whilst in the current study, seed rain data was not collected during November, December or January (see Section 2.2.1: Seed Rain Study). It is acknowledged that due to data gaps in both the current and previous studies, a direct comparison of the seed rain abundance for the months of May to September and November to January cannot be made.

Nonetheless, despite the gaps in seed rain data in both the current and previous studies, an assessment of the seed rain abundance recorded during this study can still be made with reference to the results of relevant literature. In particular, the comparison of the seed rain abundance recorded between February and April and between July and September is surprising, when considering the results of previous studies (Mair, 1973; Mckenzie *et al*., 2007). The results suggest that the majority of seed rain did not disperse during autumn and winter, but instead dispersed during the summer months (Harris, 1969; OECD, 2006; Ruth, 1958). Nonetheless, as the seed traps could not be inspected during November, December or January 2022, it is acknowledged that a key data collection period may have been missed, and that the majority of seed could have fallen during the autumn/winter period (between November and January) and was not detected. However, as Mair (1973) identified variation in seed rain abundance during each month between two different locations (i.e. Inverness-shire and Roxburghshire) (Mair, 1973; Mckenzie *et al*., 2007), it is plausible to assume that lodgepole pine and Sitka spruce within the area of Lochies and Benmore simply have different seed-shed patterns. Nevertheless, such a drastic shift is considered unlikely, as all seed recorded, with the exception of that in October 2022, was recorded outside of months previously associated with seed rain (Figure 13) (Mair, 1973; Mckenzie *et al.*, 2007).

It should also be considered that the results of the literature detailed above were recorded over 50 years ago, and therefore, it is possible that there may have been ecological shifts, due to changes in seasonal temperatures caused by climate change. As such, the variation between the results within the specified literature and the results of this study, suggests there is a requirement for up-to-date research on the seasonality of seed-shed of conifers in Scotland. In addition, it is noted that there may be variations in seed-shed of conifers situated on the edge of forests, due to ‘edge effects’, for example, increased exposure to wind (Mckenzie *et al.*, 2007). No literature was identified researching the specific variation of seed rain, between conifers situated within the forest to those located on the forest edge. As seeds dispersing into peatland are more likely to be sourced from conifers situated at the edge of the forest, further investigation on this matter is required.

4.2.2 Impacts of Microtopography upon Successful Germination of Lodgepole Pine in Peatland

Historically, peatlands were ploughed to prepare them for planting, which created a matrix of ridges and furrows throughout the landscape (Barrop, 2022; Edwards, 1962). Although it could not be determined if the survey areas at Benmore and Lochies were planted prior to 1985 (see Section 2.1.2: Lochies and Benmore), both sites show evidence of former ploughing, due to remnant ridges and furrows.

Despite the variance in abundance of lodgepole pine within each of the three microtopography classifications (ridges, furrows and flat ground) (Figure 17), no statistically significant relationship between lodgepole pine abundance and microtopography was identified. It total 256 lodgepole pine were recorded. 52% of the lodgepole pine recorded were identified on ridges, 10% in furrows and 38% on flat ground (Figure 17). Thus, the highest abundance of lodgepole pine was recorded on ridges, whilst the lowest abundance of lodgepole pine was recorded in furrows. These results were anticipated, as historically, trees were planted on ridges to ensure successful germination, whilst furrows collected water and were generally inhospitable for tree growth (Barrop, 2022; Binns, 1962; Edwards, 1962; Sloan *et al.*, 2018). The creation of ridges and furrows within peatland habitats results in alterations to the ecological processes of peat formation, causing habitat degradation which can lead to loss of peatland habitats. Therefore, ground smoothing, a technique to remove the ridge-furrow matrix, is often considered to be the first step in peatland restoration programmes. Ground smoothing aims to restore the former microtopography of the substrates, thus re-balancing the water table and activating the re-commencement of peat formation (Anderson & Peace, 2017). It can be determined from the results of this study that conifers are more likely to grow on flat ground than in furrows (Figure 17). As such, it would be expected that ground smoothing of formerly ploughed peatland might initially create more opportunities for new conifer regeneration to establish, by increasing the area of viable land for conifers to germinate. However, as natural peatland processes recommence and the hydrology of the peatland restores, growing conditions for conifers are expected to decline, resulting in less conifer regeneration outside of the forest. Subsequently, afforestation due to natural succession is expected to decelerate as recruitment declines. Therefore, although ground smoothing could result in a temporary increase in conifer recruitment within peatland, the technique is expected to decrease risk of afforestation over time. Simultaneously, ground smoothing is expected to improve the conditions for peatland plant communities, thus resulting in an overall positive benefit for peatland restoration.

4.2.3 Germination Patterns of Lodgepole Pine in Relation to Ecological Succession

A review of historical satellite imagery and further communication with FLS, confirmed that no forestry plantation has been present within the survey area at Benmore since 1985 (the status of the land prior to 1985 cannot be confirmed due to the lack of available data) (FLS, 2024; Google, 2024a). As such, lodgepole pine growing within the peatland are anticipated to be regeneration from the existing forestry crop, situated towards the south-west of the survey area. It is unknown whether any conifer regeneration was removed from the site prior to the commencement of the field work (i.e. January 2022), and no evidence of conifer regeneration removal was identified.

The germination patterns of conifer regeneration growing within the peatland at Benmore was investigated to determine whether there was any evidence of ongoing ecological succession. Such as a clear negative trend towards age and distance, demonstrating that there was generational regeneration stretching from the forest out into the peatland. On analysis of the relationship between age (i.e. height and RCD as a proxy for age), and distance, it was determined that there was a statistically significant relationship between age and distance, however, a positive trend was observed. As this trend would not generally be expected in association with ecological succession, it is expected that the findings could be a result of seed dispersal distances, as described in previous sections. Furthermore, none of the lodgepole pine recorded were considered to be of an appropriate maturity to produce viable seed, and therefore their maximal age is expected to be 10 years old (Nyland, 1998). Hence the conifer regeneration at Benmore is not expected to have contributed to recruitment of any younger individuals within the peatland. As no evidence of conifer regeneration removal was identified, it cannot be confirmed whether afforestation within the peatland is a recent occurrence, or whether former regeneration was previously removed to prevent ecological succession. Therefore, it cannot be determined whether the existing conifer regeneration is sourced from the existing forestry crop, or a result of secondary regeneration from previously existing trees. Nonetheless, it is assumed that if removal works were previously undertaken, efforts would have been made to remove all conifer regeneration, and that the existing conifers are a direct result of the planted forestry crop. Thus, the presence of conifer regeneration is not considered to provide evidence of ecological succession at Benmore, although does provide evidence that there is potential for ecological succession to occur. Specifically, if the existing conifer regeneration is not removed, it would be expected that the lodgepole pine would begin to contribute towards ecological succession within the next ten years (Nyland, 1998).

4.3 Recommendations for Peatland Management Based on Findings

As described in Section 4.1: Dispersal Distance of Seed from Coniferous Forestry Plantations, the results determined that lodgepole pine seeds dispersing outside of the forest (i.e. >0 m), predominantly disperse and germinate at approximately 20 m from the forest edge (Figure 12). However, evidence of seed dispersal (i.e. lodgepole pine regeneration), was recorded at a maximum distance of 120.9 m from the forest edge (Figure 16). These findings were supportive of the results reported in relevant literature. In particular, Ledgard (2001), who recorded lodgepole pine seed dispersing within 50 m from the forest edge (Ledgard, 2001), and Despain (2001) and McCaughey *et al.* (1986), who recorded lodgepole pine seeds dispersing within 120 m of the parent tree (Despain, 2001; McCaughey *et al.*, 1986).

The data collected did not provide suitable results for Sitka spruce to make an assessment of the seed dispersal distance of the species. However, studies on Sitka spruce seed dispersal appear to have similar findings to that of lodgepole pine (Bianchi *et al*., 2019; Nixon & Worrell, 1999; Nygaard & Øyen, 2017; von Ow *et al*., 1996) and the dispersal morphology and ecology of the species is relatively similar (Benkman, 1995; Greene & Johnson, 1990; Hewitt & Kellman, 2002a; Hewitt & Kellman, 2002b; Ledgard, 2001; Nathan *et al*., 2011; OECD, 2006; Peterson *et al*., 1997; Vander Wall, 2008; Viereck & Little, 1972). Therefore, it may be possible to make assumptions on the dispersal of Sitka spruce seeds, based on the findings for lodgepole pine.

The findings of the study can be used to determine the theoretical area around forestry plantations, in which afforestation of peatland habitats is likely to occur. The area in which natural afforestation is likely to occur, should be taken into account when choosing new land for forestry plantations and when identifying suitable areas of peatland for restoration programmes. Any peatland habitat within the risk zone is likely to need ongoing management to prevent afforestation, and hence, may not be suitable for some restoration programmes, due to financial and time constraints. It has previously been suggested that new forests should not be planted within 200 m of protected peatland areas in Norway (Nygaard & Øyen, 2017). There are records of lodgepole pine and Sitka spruce seeds dispersing at much greater distances (Mair, 1973; OECD, 2006). However, the findings of this study, supported by previous literature, determines that the seed rain generally falls within 120 m of the forest edge, peaking at approximately 20 m. It is possible that seeds will disperse beyond these boundaries, although recruitment is unlikely to be sufficient to result in habitat loss due to afforestation, providing any regeneration is removed prior to reaching maturity. Conifer regeneration that reaches maturity could begin to produce viable seed, which could then disperse at greater distances into the peatland, with its source location already being located outside of the forest. This would then commence the process of ecological succession.

As such, it can be determined that a buffer zone of 200 m between forestry plantations and peatland is also likely to be appropriate to prevent afforestation within the Scottish Highlands (Nygaard & Øyen, 2017), providing regeneration is managed within appropriate timescales (based on the ecology of the species within the forestry crop). Furthermore, this buffer zone could potentially be reduced to 120 m, based on the findings of this study. However, as discussed in Section 4.1: Dispersal Distance of Seed from Coniferous Forestry Plantations, additional survey works will be required to determine the impacts of the prevailing wind direction on seed dispersal distance. It is possible that the risk zone for each specific site could be further defined by the orientation of the forest edge. Thus, resulting in none-symmetrical risk zones around the forest, based on expectations of seed dispersal for each orientation.

Nonetheless, despite the distances identified to prevent afforestation, a much greater buffer zone is expected to be required to minimise the potential for other edge effects associated with forestry adjacent peatland to occur. A buffer zone of 40 m was previously recommended to prevent changes to abiotic conditions of peat substrates, due to forestry plantations (Anderson & Peace, 2017; Shotbolt *et al.*, 1998). Hence, potential impacts to peatland associated with changes to hydrological conditions are expected to be mitigated within the recommended buffer zone to minimise potential for naturally occurring afforestation. However, to minimise potential for alterations to ecological communities, in particular alterations to the spatial distribution of ornithological populations, such as waders, a buffer zone of 800 m was previously advised (Stroud & Reed, 1986). Thus, the risk zone for potential impacts to ecological communities is considered to be much greater than that required to mitigate potential impacts associated with afforestation and hydrological changes. Therefore, it is expected that the findings of this study will predominantly aid the understanding of the required management zones to prevent afforestation, rather than the risk zone itself. Which in this case, will be largely defined by the potential impacts to ornithological species, caused by forestry plantations adjacent to peatlands.

As discussed in Section 4.2.2: Impacts of Microtopography upon Successful Germination of Lodgepole Pine in Peatland, the ground smoothing of formerly ploughed peatland is generally considered to be an important step during peatland restoration (Anderson & Peace, 2017). Although no statistically significant relationship was identified between the abundance of lodgepole pine regeneration and microtopography, a higher abundance of lodgepole pine regeneration was recorded on flat ground than in furrows. This may suggest that ground smoothing could facilitate tree growth, by increasing the area of flat ground, which appears to be more viable for successful conifer germination (Binns, 1962; Edwards, 1962). However, benefits to conifer recruitment associated with ground smoothing are expected to be temporary, as the restoration of natural peatland hydrological processes is anticipated to result in an increase in water within the substrate, which will decrease the suitability for conifers and likelihood of successful germination. In time, this could potentially cause the substrates to become inhabitable for conifers altogether. As such it is not suggested that the findings of this study should be a cause for avoiding ground smoothing techniques, but that the immediate effects of ground smoothing on increased risk of afforestation should be considered and incorporated into restoration programmes. Specifically, ongoing management of conifer regeneration outside of the forest will need to be implemented and costed for within the initial and long-term management plan, with the expectation that the risk of afforestation is likely to decline over time. Removal of any conifers growing within peatland will need to be implemented before the regeneration itself begins producing viable cones, as this could result in a second generation of conifer encroachment and promote ecological succession. Therefore, an understanding of the specific ecology of the conifer species growing within any adjacent forestry crops is essential, due to the variances in which different conifer species reach maturity. For example, lodgepole pine start producing viable seed at 5 to 10 years (Nyland, 1998), whilst Sitka spruce do not begin to produce seed until 20 – 25 years (Malcolm, 1987; Petty *et al.*, 1995; Philipson, 1987; Quine, 2001).

4.4 Review of Methodology for Data Collection

4.4.1 Seed Trap Data Collection

Ultimately, the seed trap model used within this study was relatively simple, comprised of a mesh net suspended within a bucket (for further details, please refer to Section 2.2.1: Seed Rain Study). The buckets, netting, wire and wooden stakes used to construct the traps were relatively light weight and could be carried by hand, across the peatland, at both Lochies and Benmore. The simple design meant that the bucket traps could be constructed *in situ* and installed with ease. Furthermore, the design was cost effective, and subsequently, a greater number of bucket traps could be installed to record a larger data set, thus, improving the reliability of the results.

A transect length of 60 m was chosen for the seed rain study, to incorporate the area previously reported to contain the highest abundance of seed rain deposition and regeneration for both lodgepole pine and Sitka spruce (Alexander, 1974; Anderson, 2003; Barth, 1970; Clements, 1910; Dahms & Barrett, 1975; Ledgard, 2001; Lotan, 1975; Nygaard & Øyen, 2017; OECD, 2010; Pfister & Daubenmire, 1975; Shearer, 1981; Tackle, 1964). A peak abundance of seed rain was recorded at 20 m from the forest edge. These results were supported by the lodgepole pine count study, which determined that the average distance at which lodgepole pine were growing from the forest edge was 22.58 m. Therefore, it can be assumed that the chosen transect length of 60 m was sufficient in appropriately identifying the peak dispersal distances of lodgepole pine and Sitka spruce seed, which was the primary objective of this study. As the identification of peak dispersal distances provides evidence of the area at which peatlands are most at risk of naturally occurring afforestation, due to ecological succession.

However, as the seed trap transects were 60 m long, the maximum distance that conifer seeds could be recorded from the forest edge was 60 m. The greatest distance that seeds were recorded in the seed traps from the forest edge was 50 m. However, during the lodgepole pine count data collection, evidence of seed dispersal (i.e. lodgepole pine regeneration) was recorded at a distance of 120.9 m from the forest edge. Therefore, the initial transect length of 60 m was not considered to be long enough to identify the maximum distance at which conifer seeds can disperse from the forest edge. As described in Section 4.1: Dispersal Distance of Seed from Coniferous Forestry Plantations, Sitka spruce seed was previously recorded dispersing at distances of 996 m from the forest stand (Nygaard & Øyen, 2017), whilst lodgepole pine has previously been recorded dispersing at distances of 120 m from the parent tree (Despain, 2001; McCaughey *et al*., 1986). Hence, there is evidence to suggest that the seeds of both species can disperse at much greater distances than could be represented by the seed trap data collection. For future studies interested in the maximum dispersal distances of wind-dispersed conifer seeds, it would be recommended that a greater transect length be implemented, in order to capture seeds dispersing beyond peak dispersal distances and ensure that the maximum dispersal distance is identified. Nonetheless, as the identification of maximum dispersal distances of conifer seed was not considered to be the primary objective of this study, the methodology used, including the seed trap transect length, was considered to be appropriate for the projects requirements.

A study to review seed traps in terrestrial plant communities concluded that funnel traps (for example bucket traps) were most effective when placed at approximately 1 m from ground level (Cottrell, 2004; Kollmann & Goetze, 1998). The simple design of the bucket traps used within this study meant that the traps were placed at ground level, with the bucket lip marking the maximum height of the internal suspended net (350 mm). It is thought that height of the bucket traps may have impacted upon the reliability and accuracy of the data. In some locations within Lochies and Benmore, the vascular plant communities of the peatland habitat grew above the top of the bucket, in particular patches of heather, situated on drier areas of wet modified bog. This resulted in debris within the seed traps, which needed to be regularly maintained. Furthermore, it is possible that lodgepole pine and Sitka spruce seeds may have become caught up in the vegetation, and subsequently not fallen into the seed traps. Additionally, the height of the buckets limited the seasonal distribution of the data. During the months of January, November and December 2022, the buckets were largely covered in snow, therefore no data could be collected. As previous studies on the seasonality of seed rain of lodgepole pine and Sitka spruce identified the autumn and winter months as the primary seasons for seed dispersal (Harris, 1969; Mair, 1973; Mckenzie *et al.*, 2007; OECD, 2006; Ruth, 1958), it is possible that a key data collection period was missed, which may have impacted upon the reliability and accuracy of the results.

Additionally, there is concern that the seed trap design was not appropriate for capturing wind-dispersed Sitka spruce seed. Sitka spruce seeds were only recorded in seed traps situated at 0 m from the forest edge. Hence no Sitka spruce seeds were identified outside of the forest. Therefore, it is unknown whether the seed traps successfully captured wind-dispersed Sitka spruce seeds, or whether the seeds had simply fallen from trees immediately adjacent to the seed traps. As such, the results for Sitka spruce are considered to be relatively unreliable for this study. In addition, no Sitka spruce seeds were recorded at Lochies. The seeds of Sitka spruce seeds are morphologically similar to the seeds of lodgepole pine, and therefore, would be expected to have similar dispersal patterns (Benkman, 1995; Contreras *et al.*, 2016; Leslie *et al.*, 2017; Tomback & Linhart, 1990). However, the abundance of Sitka spruce within the forests at Lochies and Benmore was much lower than that of lodgepole pine, particularly at the forest edge (see Section 2.1.2: Lochies and Benmore). Therefore, there were likely less opportunities to successfully capture Sitka spruce seed. This is supported by the lack of Sitka spruce regeneration recorded during the initial conifer count data collection (where Sitka spruce would have been included if present). Furthermore, it is possible that the species had limited seed-shed that year due to annual variation in coning densities (Broome e*t al.*, 2016; Mckenzie *et al.*, 2007). In addition, it is worth noting that the majority of lodgepole pine seed was also recorded at 0 m from the forest edge, thus dispersal patterns were not entirely dissimilar between the two species. Although, as lodgepole pine seeds were recorded at a distance of up to 50 m from the forest edge, it can be confirmed that the seed traps successfully captured wind-dispersed lodgepole pine seed.

All transects were installed perpendicular to the forest edge, stretching immediately outwards from the forest. The placement of the transects failed to account for bias due to wind direction within each site. Installing additional transects at various radial intervals would prevent bias due to wind direction (Clark *et al*., 2005), however, it would make it difficult to determine the true dispersal distance, thus conflicting with the aims of this study. Furthermore, as the transects at Lochies and Benmore were situated at opposing orientations, with the transects at Lochies facing south-west, towards the prevailing wind direction and the transects at Benmore facing north-east, away from the prevailing wind direction, there was considered to be some compensation for wind bias.

The primary constraint of the study was time, which resulted in limitations to the study, particularly regarding the methodology and the length of data collection. A pilot study is generally required for most seed trap studies, to ensure that the seed trap design is suitable for the target species and that the placement of the seed traps, including the height and orientation, is appropriate (Kollomann & Goetze 1998). The completion of a pilot study would have allowed for revisions to the seed trap design, or the comparison of several different designs to choose the best fit. In addition, a pilot study would have allowed greater understanding of the most appropriate number of seed traps required to collect adequate data. Furthermore, the peak locations at which seeds generally disperse from the forests could have been identified to improve site selection (Kollomann & Goetze 1998). As the study period was limited to one-year, it was not possible to complete a pilot study without sacrificing several months of the data collection period. However, it is possible that this study could be considered to be a pilot study in itself, in order to aid future research on the topic.

It is advised that the results of this study should be interpreted with an element of caution, as the data only demonstrates a snapshot of the seed rain within the study sites over a single year (2022), and at only two different sites (Lochies and Benmore). It is possible that there may be annual variations in seed-shed that could not be accounted for, that would need to be assessed during a long-term study, recording observations at each site over several years. Furthermore, in order to gain a more thorough understanding of the dispersal distances of conifer seed into peatland from forestry plantations in Scotland, it would be advisable that future studies focus on a greater number of sites. Time constraints limited the frequency of data collection, as the seed traps could only be visited approximately every two weeks. Additionally, a limited number of transects could be installed (twenty-one in total, situated within five survey areas over two sites). In future studies, it would be recommended that a greater number of transects be installed, in order to improve accuracy and ensure that the results observed are repeatable along the perimeter of the forest. The installation of seed traps on different edges of the same forest (i.e. at each orientation), would also help to improve understanding of the impacts of prevailing wind direction on seed dispersal. Topographical features, such as mountains could also impact upon wind speeds, thus the landscape of the wider locality should be considered when identifying appropriate study sites, and it would be recommended that a variety of topographical landscapes be selected. If the prevailing wind speed and topography are found to impact upon seed dispersal distances, it is possible that non-symmetrical 'risk zones' will need to be considered, with varied buffer zones surrounding the forestry crop, depending on its location and orientation.

The precision of the data could have been improved with more frequent inspections of the seed traps, whilst the installation of a greater number of transects spread over different sites would improve the reliability and accuracy of the results. The survey of a greater number of sites may also provide clarity on the variance between the seasonality of the seed rain recorded during this study, and the results reported in other relevant literature (Broome *et al.*, 2016; Mair, 1973; Mckenzie *et al.*, 2007; Nixon & Worrell, 1999). Daily recordings of the weather conditions would also provide improved supplementary information, to determine whether the conditions, such as high wind speed, have an impact upon the results.

Another limitation of the study is the potential for long-distance dispersal of seeds from different seed sources, to impact the results. The results do not provide any evidence of the specific seed source. Therefore, it is possible that some of the seeds collected during the seed rain study could have originated from other forests, within the wider locality of the sites. In this instance, the actual dispersal distance of the seeds would be much greater than represented in this study. Genetic testing would be required to confirm the specific seed source, which was not possible as part of this study. For example, a previous study used DNA barcoding in frugivory and seed dispersal studies to determine the effectiveness of seed dispersal by animals (González-Varo *et al.*, 2014), whilst other studies reported using DNA sequencing endocarp genotype comparisons to identify parent trees (Godoy & Jordano, 2001; Johnson *et al.*, 2017). Suitable methodologies to detect the genetic source of seeds would be beneficial within seed rain studies, to ensure that the seed collected originated from the target source (i.e. the forestry crop) (Godoy & Jordano, 2001; González-Varo *et al.*, 2014; Johnson *et al*., 2017). However, no literature was identified to suggest that genetic testing has previously been used to research wind dispersal of conifer seeds.

4.4.2 Lodgepole Pine Count Data Collection

Seedling counts have previously been used successfully to monitor Sitka spruce regeneration presence and abundance (Bianchi *et al*., 2019), natural regeneration of lodgepole pine (Eggertsson *et al*., 2022), and afforestation of low-productivity peatlands (Sundström & Hånell, 1999). However, during these studies, seedling counts were recorded within survey plots. For this study, survey transects were considered to be most appropriate, as the data was predominantly collected to record the spatial distribution of conifers from the forest. Due to time constraints, lodgepole pine count data was only collected at Benmore, along ten 150 m survey transects.

The lodgepole pine count data collection was completed to provide supplementary information to the seed trap study, in particular, further understanding of the distances that conifers were germinating from the forest edge. Lodgepole pine regeneration growing outside of the forest, within the peatland, was considered to provide evidence of wind-dispersed seeds, on the assumption that lodgepole pine seeds are predominantly dispersed via wind (Ledgard, 2001; OECD, 2006; Nathan *et al*., 2011; Vander Wall, 2008; Zhang *et al*., 2020). In addition to distance, the height, RCD and microtopography classification in which the lodgepole pine was growing (i.e. ridge, furrow or flat ground) was recorded.

An assessment of the height and diameter of a trees stem is a common methodology to categorising its approximate age. The DBH is generally used as a measurement of the stem diameter. 'Breast height' is generally considered to be at 1.3 m (Bianchi *et al*., 2019; Sundström & Hånell, 1999; Wheater *et al*., 2011), however, all of the lodgepole pine recorded were <1.3 m tall, except for one juvenile tree. Therefore, in order to successfully capture the growth rate of the plants, the RCD was recorded as an alternative (Menes & Mohammed, 1995). The method was previously used successfully to calculate the effective seedling recruitment distance from *Pilgerodendron uviferum* seed trees (Bannister *et al*., 2014), and to determine the relationship between height growth of juvenile Scots pine (*Pinus sylvestris*) from seeds with different spectrometric features (Novikova *et al*., 2023).

The survey transects utilised for the lodgepole pine count data collection were 150 m. As the maximum distance that lodgepole pine regeneration was recorded from the forest edge during the lodgepole pine count data collection was 120.9 m, the transect length appeared to be sufficient in capturing the maximum dispersal distance. However, as with the transects utilised for the seed trap data collection, it is possible that longer transects would have recorded lodgepole pine (or possibly Sitka spruce), growing at much greater distances from the forest (Despain, 2001; McCaughey *et al.*, 1986; Nygaard & Øyen, 2017). Alternatively, a greater transect length would have improved certainty in the findings that 120 m was in fact the maximum distance that lodgepole pine were growing from the forest. Furthermore, only ten transects were surveyed during the lodgepole pine data collection. In future studies, it would be recommended that a greater number of transects be surveyed, in order to improve the accuracy and reliability of the results. It is possible that Sitka spruce may have been captured if a greater number of transects were surveyed, or that a larger abundance of conifers would have been recorded growing close to, or further away from, the forest edge.

The survey transects were installed visually, with the use of a measuring tape, although their placement could have been improved with the use of a Global Positioning System (GPS) device, to ensure that the angle of placement was directly perpendicular to the forest edge. Furthermore, as with the seed rain data, it was not possible to determine the true source of the lodgepole pine, thus there is potential that individuals were sourced from other forests within the wider locality. However, this limitation would be difficult to rectify without the use of appropriate genetic analysis. The designation of the appropriate microtopographical category in which each lodgepole pine was growing was also determined visually. Technological advances in methods such as Ligh Detection and Ranging (LIDAR), could be used to improve the accuracy of microtopographical classifications in future studies.

As outlined in Section 2.1.2: Lochies and Benmore, it is not known whether any conifer regeneration was removed from the peatland at Benmore prior to the commencement of the field works (January 2022), or whether the survey area was planted with a forestry crop at any time prior to 1985. Hence, the maximum possible age of the lodgepole pine regeneration recorded cannot be accurately determined. However, as none of the lodgepole pine regeneration recorded was of an appropriate maturity to produce viable seed, it is anticipated that all lodgepole pine recorded were <10 years old, as the species generally begin to shed seed within 5 – 10 years (Nyland, 1998). Furthermore, the use of the height and RCD measurements as a proxy for age, in relation to the Woodland Carbon Code Survey Protocol (Woodland Carbon Code, 2021), was considered to be appropriate in categorising lodgepole pine into appropriate age classifications. However, as peatland is generally considered to be sub-optimal for conifers, it is possible that growth has been stunted (Bain *et al*., 2011) and that the lodgepole pine recorded were older than expected. A more reliable way of aging the lodgepole pine regeneration would have been tree-ring dating. However, as permission to remove conifers had not been granted as part of the land permissions from FLS, this method was not utilised during this study. If future studies on the topic are undertaken, it would be recommended to gain permission to remove the conifers so that tree-ring dating could be completed, to provide a more accurate recording of the age of each conifer.

Overall, this supplementary data was considered to provide some useful insight into the germination patterns of lodgepole pine regeneration within peatland, and appropriately identified evidence of seed dispersal at greater distances than the seed traps. The lodgepole pine count methodology was considered to be fast and effective, allowing a substantial amount of data to be collected on individual lodgepole pine within a relatively short time period, thus the methodology would be considered suitable for future research projects.

4.5 Recommendations for Further Research

In order to ensure that long-term goals for peatland restoration are met, better ways of coping with afforestation, due to ecological succession, need to be identified. The results of this study are considered to provide important insight into the future research requirements of peatland restoration, in aiding site selection, with consideration of potential for naturally occurring afforestation, due to ecological succession (Eckstein *et al*., 2011; Woziwoda & Kopéc, 2014). Ultimately, it is understood that the majority of limitations associated with this research were due to time constraints. The installation of a greater number of survey transects over a greater number of survey sites, investigated over a longer time period, would improve the accuracy and reliability of the results. In particular, the completion of a pilot study would be advisable to refine the methodology, including the design and placement of seed traps. Ongoing monitoring of the germination of new conifer regeneration within peatland and subsequent growth is highly recommended. Furthermore, monitoring of weather conditions throughout the survey period would improve understanding of variation of seed rain dispersal distances caused by extreme weather events.

5 Conclusion

In Scotland, peatlands were historically thought to have minimal ecological or economical value (Byg *et al.*, 2017; Marsden & Ebmeier, 2012; Waylen *et al.*, 2016). Thus, in the 20th century, large areas of peatland were planted with conifers, due to timber shortages following the 1st and 2nd World Wars (Bain *et al.*, 2011; Campbell *et al.*, 2019; Vanguelova *et al.*, 2018). However, positive environmental benefits of peatland ecosystems, such as unique species compositions and carbon sequestration, are now better understood, and efforts are being undertaken to restore Scottish peatlands (Marsden & Ebmeier, 2012; Sloan *et al.*, 2018; The Scottish Government, 2017; Whitfield *et al.*, 2011). Nevertheless, non-forested peatlands are still under constant threat of naturally occurring afforestation, due to ecological succession (Eckstein *et al.*, 2011; Woziwoda & Kopéc, 2014).

Lodgepole pine and Sitka spruce have historically been favoured for planting on peatland in Scotland (Campbell *et al.*, 2019; Edwards, 1962; Sloan *et al.*, 2018). Both species disperse their seed almost exclusively via wind (Ledgard, 2001; Nathan *et al.*, 2011; OECD, 2006; Vander Wall, 2008; Zhang *et al.*, 2020), which increases potential for long-distance dispersal. Furthermore, the species are better able to cope with the suboptimal conditions of a peatland. Subsequently, there is potential for lodgepole pine and Sitka spruce seeds to disperse outside of the forest and for conifer regeneration to grow in peatland habitats. This study has been undertaken to determine the theoretical 'risk zone' around forestry plantations, in which peatland habitats are at risk of naturally occurring afforestation, caused by wind-dispersed conifer seeds.

No evidence of Sitka spruce was identified outside of the forest (i.e. >0 m) during this study. However, due to the similarities between the morphology and dispersal strategies of lodgepole pine and Sitka spruce seeds (Benkman, 1995; Contreras *et al.*, 2016; Leslie *et al.*, 2017; Tomback & Linhart, 1990), it may be possible to make assumptions of Sitka spruce, in conjunction with the results of lodgepole pine. As it is known that Sitka spruce do escape cultivation into peatland habitat, for example at Whitelee Windfarm and Blacklaw Wind Farm, situated in the central belt of Scotland (Campbell *et al.*, 2019). The results of this study show that lodgepole pine seeds generally disperse and germinate within 20 m of the forest, although evidence of seed dispersal (i.e. lodgepole pine regeneration), was identified up to 120.9 m from the forest edge. It is possible that seeds may disperse at greater distances, however recruitment is unlikely to be adequate to result in habitat loss (Dahms & Barrett, 1975; Lotan, 1975; OECD, 2010). As potential impacts to peatland ornithological communities have been recorded at up to 800 m from forestry plantations, it is expected that the existing requirements for 800 m buffer zones would be sufficient in ensuring that areas proposed for peatland restoration schemes are well outwith areas at high risk of afforestation (Stroud & Reed, 1986). However, to ensure that peatlands remain in favourable condition, it is likely that ongoing management to remove conifer regeneration will be required within 120 m from any forestry crops, particularly within the first 20 m of the forest edge. Management schedules should be determined by the minimum coning age of the conifer species growing within the adjacent forestry plantation. The results also provide evidence to suggest that ground smoothing may temporarily improve conditions for conifers. This should be considered when undertaking peatland restoration within areas nearby forestry plantations, as it is likely that management to control conifer regeneration will be required until the hydrological conditions of the peatland are restored. Correspondingly, any new forestry plantations situated >800 m away from high-quality peatland habitat should have a management plan in place to manage conifer regeneration within 120 m of the forestry crop, to ensure that conifer regeneration does not result in ecological succession that will begin to encroach upon the 800 m buffer area. Where feasible, the ability of a conifer species to escape cultivation into peatland areas should be considered during species selection for any new forestry plantations proposed within the vicinity of peatland habitats.

Additionally, the results recorded during the seed trap study, indicated seasonal variation in seed rain abundance, which is not supportive of the findings within relevant literature. The majority of seed was collected in summer, rather than autumn as expected (Mair, 1973; Mckenzie *et al*., 2007). Thus, it is likely that further research will be necessary to determine whether seeding patterns at Lochies and Benmore are variable to other locations, or whether the discrepancy was due to the absence of data for the months of January, November and December 2022.

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Appendix 1: Health and Safety and Risk Assessments

Science fieldwork risk assessment (UG/PGT/PGR)

You must not carry out fieldwork until this risk assessment has been approved by your Supervisor. See the Fieldwork Risk Assessment Guidance document to complete this form.

Risk Assessment Outcome:

Risk Rating: Negligible/Low risk **Submitted Date:** 21 Sep 2021
Approved Date: 22 Sep 2021 **Approved by:** Cynthia Froyd

Student Details

Student Number:	[redacted]	**Project Supervisor:**	Prof Cynthia Froyd
Course:	Biosciences	**Level:**	7

Assessor:	Ffion Maguire	**Assessment Date:**	22/09/2021
Contact Number:	[redacted]	**No. of Participants:**	1
Next of Kin:	Alexander Macdonald	**Next of Kin Contact Number:**	[redacted]
Name of field assistant(s) – Lone working is only permitted in exceptional circumstances, with the agreement of your Supervisor.			
Alexander Macdonald			
Brief outline of the research / fieldwork activity*			
Placing seed traps along three 60m transects at each site. Collecting seeds from traps at regular intervals. Counting seedlings along the three 60m transects at each site.			
List of methods to be used. Use the button 'Add Method' below to add each method details.			
A transect line is to be run from the forest edge for 60 m. There will be three transect lines at each site. Seed traps will be placed at 10m intervals along the transect line. Seedlings will be counted and identified.			
Ethics approval number:	SU-Ethics-Student-170921/4461		
Activity Start Date:*	06/09/2021	**Activity End Date:***	30/11/2021
Location of activity (site name, region etc.):*			
Site 1: Invershin; Site 2: Lochies; Site 3: Loch Beannach; Site 4: Loch Beag na Fuaralachd; Site 5: Braehour			
UK Map Reference or LAT LON (if outside UK):	Site 1: NH 50860 97880; Site2: NC 52250 01790; Site 3: NC 57730 12750; Site 4: NC 59250 15790; Site 5: ND 11830 49150		
What 3 words Reference (what3words.com):	Site 1: trim.heckler.mills; Site 2: hero.condense.formation; Site 3: airstrip.narrating.design; Site 4: referral.matchbox.jetliner; Site 5: makeup.growth.bounded		
Nearest hospital with A&E (incl. postcode for use with a satnav / app):*			
Raigmore Hospital, Old Perth Road, Inverness IV2 3UJ			
Approx. distance from field site:	Site 1: 47.5 miles; Site 2: 54.0 miles; Site 3: 53.6 miles; Site 4: 56.8 miles; Site 5: 104.0 miles		
Is there mobile phone coverage?	Yes		
If there is no phone reception, how will you summon help?			
Via radio			
Contact Name for Check-in/Safe return (Ensure that they know where you are going, your expected return time, your Supervisor's name).			
Contact Name: ROAVR Group / Matt Harmsworth Supervisors name: Cynthia Froyd			
Frequency of check-ins/Communication Plan (e.g. start and end of each day)			
Every two hours			
Map of field site (Identify route to nearest hospital with an A&E Department)			
Hospital routes.docx			

Risk Assessment - Hazards

- **Fill in the grid with the appropriate information. Extend the table as required.**
- **See Examples of some hazards associated with fieldwork in Fieldwork Risk Assessment Guidance document.**

Step1	**Step2**				**Step3**			
Description of Hazard	**Who may be harmed and how**	**S**	**L**	**R**	**Controls/actions required (to eliminate/reduce the risk)**	**S**	**L**	**R**
Coronavirus	All participants	1	1	1	As the field work will take place outside in a remote location, the risk of infection is low. However, masks will be worn if at any point participants need to go inside. Hands will be washed before and after using equipment.	1	1	1
Hypothermia/Frostbite/Sunburn/Heat stroke/heat exhaustion	All participants	2	1	2	Wear correct clothing e.g. warm jackets in the cold weather. Bring suncream and water to site. Caps and sunglasses can be worn to minimise effects of the sun. Avoid working mid day in hot conditions.	1	1	1
Poor Visibility	All participants	2	1	2	Avoid driving in poor weather conditions. Avoid working in poor visibility e.g. fog as may result in slips/trips and falls.	1	1	1
Dehydration	All participants	1	1	1	Drunk plenty of fluids throughout the day.	1	1	1
Manuel handling/placing seed traps and canes	Any participant using heavy equipment	2	2	2	Ensure correct lifting techniques are used e.g. lift using knees and hips	1	1	1
Potential lone working	Lone workers	2	2	2	Have check in/safe return system set up with ROAVR Group	1	1	1
Risk of injury	All participants	3	2	6	Always bring first aid kit to site. Have hospital routes planned.	2	2	2
Working on forestry sites	All participants	2	2	2	Always wear PPE e.g. high vis, helmet and steel toe cap boots. Attend site induction	1	1	1
Slips, trips and falls	All participants	2	2	2	Be mindful of uneven and wet ground. Wear appropriate footwear	1	1	1
A drill will be used to construct the seed traps	All participants	2	2	2	Correct handling techniques using manufactures guidelines	2	1	2
Risk (R) = (SxL): LOW (1-2), MODERATE (3-5), HIGH (6-9).								
Coronavirus: Whilst coronavirus remains in circulation you must include this hazard in your risk assessment.								

BIOSCIENCES TRAINING PROFORMA (v1. AFR2023)

NAME OF TRAINEE	NAME OF TRAINER(S)	DATE(S)
Ffion Maguire	Cynthia Froyd	13/10/23 (refresher)

It is the responsibility of the PI or supervisor to determine the local training needs for each trainee and to ensure the trainee has suitable access to this training.

This form must be used to record the health and safety training **and** training in specific procedures. The trainer must ensure the competence of the trainee in each area before signing the form. This may be done by any or a combination of the following:

- Written test
- Oral test
- Practical demonstration by the trainee
- Reference to completed on-line training provided by University

Level of attainment competency of the trainee (use the codes A-D below and place these in the right-hand boxes within the tables)

A: The task must be directly supervised.

B: The supervisor's advice and approval must be sought before the procedure is started.

C: The work entails risks that require careful attention to safety. The trainee has been trained in the task and demonstrated competence.

D: The risks are insignificant and carry no special supervisory considerations.

BASIC LABORATORY PROCEDURES (if field or desk-based only then place N/A in boxes. Extend table as necessary)

PROCEDURE	TRAINING ACHIEVED, METHOD OF ASSESSMENT & LEVEL OF ATTAINMENT (A-D codes)
Laboratory induction	N/A
Use of analytical balances	N/A
Use of fume hoods	N/A
Use of pipettes	N/A
Use of toxic chemicals	N/A
Use of systemic health hazards (e.g. carcinogens/mutagens)	N/A
Handling of sharps (e.g. needles, blades)	N/A
Safe disposal of chemical waste	N/A
Storage of chemicals	N/A

SPECIALIST LABORATORY PROCEDURES (complete the table using those procedures specific to your laboratory and/or project. Extend table as necessary)

PROCEDURE	TRAINING ACHIEVED, METHOD OF ASSESSMENT & LEVEL OF ATTAINMENT
	N/A

FIELD-BASED PROCEDURES (extend table as necessary. Use N/A where necessary)

PROCEDURE	TRAINING ACHIEVED, METHOD OF ASSESSMENT & LEVEL OF ATTAINMENT
General field induction by supervisor	B Ffion Maguire has already conducted one year of fieldwork at these sites under previous risk assessments. We held a refresher fieldwork safety discussion on 13/10/23 and have agreed procedures in place to mitigate risk (no lone working plus check in and out with both local land manager and supervisor (via e-mail)).
Safe working on research vessel/rib (to be assessed by boat staff)	N/A
RYA Sea Survival course (for regular boat users)	N/A
SCUBA diving (N.B. approver is Dr Nicole Esteban)	N/A
Shore- or boat-based snorkel surveys	N/A

OFFICE-BASED ('Dry') PROCEDURES (extend table as necessary)

PROCEDURE	TRAINING ACHIEVED, METHOD OF ASSESSMENT & LEVEL OF ATTAINMENT
Awareness of posture, monitor level, etc. (complete Document from central H&S entitled *DSE Self-Assessment Checklist* & HSE *Working with display screen equipment* leaflet). Participation of training course 695 on DSE is mandatory for staff. See https://staff.swansea.ac.uk/healthsafety/training/	N/A

SIGNATURES:

Trainee [redacted]

Trainer/Supervisor(s)/Approvers...... [redacted] ....

Date......23/10/23.............................

(Reassessment due......1/3/24..........................)

COMPLETED FORM, ONCE SIGNED OFF, SHOULD BE KEPT WITH RISK ASSESSMENTS AND PROTOCOLS. IT IS THE TRAINEE'S RESPONSIBILITY TO STORE THIS FORM EITHER AS A PAPER VERSION OR ELECTRONICALLY.

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Off Campus Activities & Fieldwork Risk Assessment (Moderate/ High) - Red Form

This form should be completed for moderate/ high risk fieldwork activities

- For low-risk activities in the United Kingdom (e.g., attending conferences/ business meetings/ museums or other low risk-controlled sites) use the **green form**.
- If the fieldwork is arranged jointly between one or more Faculties/ PSUs, a shared risk assessment and authorisation should be undertaken.
- If travelling as a group undertaking the same activity, only one risk assessment form needs to be completed along with the **Participant Declaration and Information Form.**

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General Information This section MUST be completed by the Fieldwork Risk Assessor (leader)

Fieldwork Risk Assessor				
Name:	Ffion Maguire		Please Specify	Staff ☐ PG Student ☒ UG Student ☐ Other ☒
Staff/ Student Number:	[redacted]			
Email:	[redacted]		Tel:	[redacted]
Faculty/ PSU:	Bioscience		School:	Swansea University
Risk Assessment Date:	12/10/2023			
Expected Departure Date:	22/10/2023		Expected Return Date:	
Number of persons taking part in this field trip:	Supervisors:	0	Participants:	2

Line Manager/ Supervisor of Fieldwork Risk Assessor			
Name:	Dr Cynthia Froyd	Department:	Bioscience
Email:	[redacted]	Tel:	5254

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Fieldwork Information	
Fieldwork/ Research Title:	Afforestation of Peatlands in the Flow Country
Type of fieldwork: Please include a brief description and goal of the type of work to be performed e.g., collection of samples, observation of animals/ environment, interviews with human subjects, etc.	Dismantle and removal of field equipment.
Please provide details of the activities to be undertaken e.g., interviewing, quadrating, snorkelling, diving, rock climbing	105 seed traps have been placed within peatland habitats in Caithness and Sutherland. The seed traps comprise of a 1L plastic bucket with a $1x1m^2$ net placed within. The seed traps are each attached to a wooden stake to retain their position. The field work will entail the dismantle and removal of these seed traps due to an end to the collection period.
Level of Risk of Fieldwork Please see risk categories in guidance document to determine the risk levels. This will determine the level of authorisation.	Moderate ☒ High ☐

Additional forms included (see Staff H&S Pages or PG H&S Pages)	
Participant Declaration and Information Form (group travel only)	☐
International Travel Risk Assessment Form (where applicable)	☐

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Insurance

Insurance: Please provide details of insurance cover. See guidance for further information. Email Insurance@Swansea.ac.uk	Swansea University Cover Staff - Insurance webpage Students - Insurance webpage Additional insurance required: Yes ☐ No ☒ If yes, please give details:

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Location & Communication for Fieldwork

Location of Fieldwork(s): (This may be general location and NGR/GPS/what three words coordinates)	Site 1: Approximately NC52270180 to NC52620132; and Site 2: Approximately NC52620132 to NC52620132.	
Nearest Town/ City: (Name, distance from site)	Site 1: Lairg, approximately 5.3 miles away (9 minutes by car); and Site 2: Lairg, approximately 22.5 miles away (38 minutes by car).	
Mobile Phone Coverage https://www.gsma.com/coverage/	**Primary Number:**	[redacted]
	Coverage:	Good ☐ Sparse ☒ None ☐
	If none, nearest location with coverage:	Generally basic coverage (i.e. suitable for phone call) once away from the forest edge.
Local contact details (if applicable)	Name:	Ruaridh Maxwell
	Tel:	[redacted]
	Email:	N/A
Satellite phone/ device You must know how to contact emergency services via Sat Phone. 999/ 911 typically does not work.	Device Carried:	Yes ☒ No ☐
	Number:	Participant 1: [redacted]; and Participant 2: [redacted]
Radio	Radio Carried:	Yes ☐ No ☒
	Radio Channel:	N/A
	Who can be contacted using this radio?	N/A
Other: List any other communication devices/ methods that may be used.	Both participants will carry mobile phones. Both phones are on different phone networks, one of which is EE which is generally the best coverage in the area.	

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Nearby Facilities: What facilities are available at or near the site: restrooms, water, public phone, shop? If there are no facilities, where are the nearest welfare services/ what provisions will you have in place?	The nearest public restroom is in Lairg, there are a few small local shops and hotels on route to Lairg and between Sites 1 and 2 if required.	
Down Time (see guidance for definitions): Are side trips planned or allowed during free time? If yes, please describe the activities. Are there restrictions, specific rules, or expected code of conduct? Have these activities been risk assessed? Is insurance in place for these activities?	N/A	
Complete the shaded section below for: Fieldwork in the United Kingdom ONLY **This section is already included in the International Travel Forms**		
Swansea University Contact	Name:	Dr Cynthia Froyd – email when back from field
	Phone number(s):	5254
	Email:	[redacted]
	Frequency of check ins: e.g., Daily, at end of workday, etc. (State GMT or other)	Daily at end of workday.

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	Detail actions to follow if the traveller fails to make contact:	Contact safety contact, Ruaridh Maxwell
Accommodation details If not known, please complete prior to travelling and share with your Swansea University contact.	N/A	
Emergency Contacts	Swansea University Security:	[redacted]
	SafeZone App:	Downloaded Yes ☒ No ☐
	Travel Planet Emergency Number:	[redacted]
Personal Emergency Contact details (if applicable) Only complete if sole fieldworker, group leader. Group information will be collected on participant information form.	Phone:	Participant 1: [redacted] Participant 2: [redacted]
	Email:	Participant 1: [redacted] Participant 2: [redacted]

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Fieldwork Risk Assessment

This risk assessment relates to the activities you will be carrying out during your fieldwork in the countries you are visiting. See guidance for examples of things to consider in this section.

What are the hazards?	Who may be harmed? How may they be harmed?	Controls/ Mitigation	By Whom	By When
Driving to and from the site.	Participants and other road users. Physical harm due to traffic accident.	• Drive at a speed that is not only reflective of the speed limit but also current conditions; • Take regular breaks as needed; • Allow for plenty of time for driving to and from the site; • Park in suitable, safe places to check directions and eat/drink etc; and • Check vehicle prior to usage (i.e. oil, screen wash, tires etc).	Ffion Maguire	Prior to field work on the 22/10/2023.
Bad weather.	Participants. Hypothermia, heat stroke etc.	• Wear clothing appropriate to the weather conditions; • Drink plenty of water; and • Check for weather warnings and do not attend site when weather is a considerable hazard.	Ffion Maguire	Prior to field work on the 22/10/2023.

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What are the hazards?	Who may be harmed? How may they be harmed?	Controls/ Mitigation	By Whom	By When
Walking along roads.	Participants. Physical harm due to traffic accident.	• All participants to wear high-vis clothing at all times; • Walk sensible along the side of the road, facing the traffic; • Avoid walking on roads were feasible; • Stop and keep in as traffic passes; and • Be aware of surroundings.	Ffion Maguire	Prior to field work on the 22/10/2023.
Working in peatland.	Participants. Drowning and physical injury.	• Wear appropriate clothing; • Avoid patches of blanket bog; • No lone working; • All participants to wear high-vis clothing at all times; and • Wear suitable footwear.	Ffion Maguire	Prior to field work on the 22/10/2023.
Slips, trips and falls.	Participants. Physical injury.	• Wear suitable footwear; and • Maintain awareness of surroundings.	Ffion Maguire	Prior to field work on the 22/10/2023.
Disease such as Weil's disease, Lyme disease and tetanus.	Participants. Short-term or long-term illness.	• Avoid touching stagnant water if any cuts or scratches on skin; • Wear gloves to avoid contact with water; • Always wash hands before eating or touching eyes or mouth; • Wear suitable footwear.	Ffion Maguire	Prior to field work on the 22/10/2023.
Insect bites and stings.	Participants. Short-term discomfort and pain.	• Wear mosquito nets and insect repellent spray if necessary.	Ffion Maguire	Prior to field work on the 22/10/2023.
Injury from hand tools and manual handling.	Participants. Physical injury.	• Use hand tools properly; and • Wear protective gloves.	Ffion Maguire	Prior to field work on the 22/10/2023.

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What are the hazards?	Who may be harmed? How may they be harmed?	Controls/ Mitigation	By Whom	By When
Cuts, scratches and lacerations.	Participants. Physical injury.	• Wear long-sleeved tops and trousers to prevent exposed skin; and • Wear protective gloves.	Ffion Maguire	Prior to field work on the 22/10/2023.

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First aid requirements

Name	Contact number whilst in the field:	Qualification Tick the qualification held	Expiry Date	First Aid Kit Carried	Specialist equipment carried? *If yes, please give details*	
Ffion Maguire	[redacted]	☐Fully Trained – First Aid at Work (3 days) ☐Emergency First Aid (1 day) ☐Mountain (wilderness) First Aid Trained (2 day) ☐Mental Health First Aid ☐Other – *please specify*		☒Yes ☐No	☐Yes ☒No	
Alexander Macdonald	[redacted]	☐Fully Trained – First Aid at Work (3 days) ☐Emergency First Aid (1 day) ☐Mountain(wilderness) First Aid Trained (2 Day) ☐Mental Health First Aid ☐Other – *please specify*		☐Yes ☒No	☐Yes ☐No	

Add additional boxes as required.

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Training and Competency Requirements

List here any specific training or qualifications that need to be achieved as part of this fieldwork. This will have been identified during risk assessment above.

Training	Required for (supervisors /participants/skipper or named individual etc)	Achieved		Training date if applicable
		Yes	No	
Example - Water safety	*Participants*	☐	☐	*22.02.22*
		☐	☐	

Add additional boxes as required.

Emergency Planning

Nearest Hospital(s) (to field working site) information: (Include name, distance from site, phone number, address, and postal code).	Site 1: Raigmore Hospital; 64.5 miles (approximately 1hr 31mins from site); 01463 704000; Raigmore Hospital, Old Perth Road, Inverness, IV2 3UJ; and Site 1: Raigmore Hospital; 53.8 miles (approximately 1hr 12mins from site); 01463 704000; Raigmore Hospital, Old Perth Road, Inverness, IV2 3UJ.
Emergency evacuation plan for site: Where abstraction may be difficult provide details of your evacuation plan and transportation options to the nearest hospital.	☐ if not applicable check the box. Helicopter would likely be the fastest mode of transport to the hospital.

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Fieldwork Contingency Planning

If the fieldwork risk assessor becomes unable to lead the group for any reason e.g., becomes ill. What contingency do you have in place? i.e., will the students be able to continue/return to accommodation etc.?	N/A
If disruption to your fieldwork/ research has financial implications, what contingency do you have planned?	N/A

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Equipment List

It is important the equipment list is completed in full. If something happens to the equipment in transit or it is stolen, then there is a record of equipment that can be provided to the University insurers.

Use this list to specify items of clothing/footwear, include also, sun creams, water bottles, mobile phones. Specify items of equipment that will be taken by fieldwork organiser such as life jackets first aid kits, GPS equipment, sample pots etc. Include items of communication equipment such as mobile phones, satellite phones, etc.

Item	Provided by participant	Provided by the University	Sourced locally
High-vis jacket	☒	☐	☐
Mobile phone	☒	☐	☐
Water bottle	☒	☐	☐
Hammer	☒	☐	☐
Pliers	☒	☐	☐
Appropriate footwear	☒	☐	☐
Rubble bags	☐	☐	☒
Rope	☐	☐	☒

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Brief Itinerary

Date	Depart from	Depart time	Destination	Arrival time	Destination address or coordinates if applicable	Mode of travel and company name and flight no if applicable.	Activities and other information
22/10/2023	Ardersier, Inverness.	06:00	Site 1.	08:00		Van.	Driving to Site 1.
22/10/2023	Site 1.	12:00	Site 2.	13:00		Van.	Driving to Site 2.
22/10/2023	Site 2.	19:00	Ardersier.	21:00	29 Nairn Road, Ardersier, Inverness, IV2 7SF.	Van.	Driving to Ardersier, Inverness.

HEALTH & SAFETY
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Fieldwork Declarations

Field Risk Assessor(s):			
When signing this document, as the Field team leader you are confirming you: • Have personally, considered and understand the nature of the risks and the potential impact(s) and have considered steps to reduce and mitigate the risks associated with the fieldwork. • Have completed a suitable and sufficient fieldwork risk assessment. • Are fit to undertake the activity/ fieldwork, are not participating against medical advice and reasonable adjustments have been agreed where required. • All information and responses given are true and accurate to the best of my knowledge and belief. • If group leader, will ensure the information is shared with all participants, and will ensure the participant declaration and information form, and health declarations (where appropriate) are completed prior to travel. • All information and responses given are true and accurate to the best of my knowledge and belief.			
Name:	**Signature:**	**Faculty:**	**Date:**
Ffion Maguire	[redacted]	Bioscience	12/10/2023

Once completed please send to the appropriate Faculty/ PSU teams for approval.

Fieldwork Authorisation

If the Fieldwork involves more than one Faculty/ PSU. Authorisation is required for all Faculty/ PSU's involved.

Approver		
By signing this document, I am confirming I have read the fieldwork risk assessment and I am satisfied that the proposed reasonable precautions are in place for the activity.		
Approval Moderate Risk:		
Line Manager/ Supervisor	**Name:**	Cynthia Froyd
	Signature:	[redacted]
	Faculty/PSU:	FSE
	Date:	20/10/23

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HEALTH & SAFETY
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Head of department /Programme Director	**Name:**	
	Signature:	
	Faculty/PSU:	
	Date:	
High Risk:		
Head of School/ Director of PSU OR Head of L&T/ Research	**Name:**	
	Signature:	
	Faculty/PSU:	
	Date:	

Swansea University
Prifysgol Abertawe

HEALTH & SAFETY
IECHYD A DIOGELWCH

Appendix 1 - Accommodation Safety

Field Course Leader Accommodation Safety Checklist		
If it has not been possible to verify the safety standards of accommodation through an approved travel agent, completing this form using the Fieldwork guidance document is one method you can use to help establish whether acceptable standards are in place. **Please complete the table below, *if required*, to confirm that an assessment has been completed:** ☒ This is not required		
	Checked	Comments
Fire Safety	☐	
Security	☐	
Building Safety Issues	☐	
Local Environment	☐	

☐ I have completed the review and consider that the accommodation is safe to use.

☐ I have considered and noted relevant points to include in the fire brief to fieldworkers on arrival.

☐ **This accommodation must be assessed on arrival.**

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HEALTH & SAFETY
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Appendix 2: Accident reporting *only to be used if online form is inaccessible.

It is important that all accidents are investigated and, as soon as possible, a factual report, including any statements taken, should be forwarded to the University Safety Office. Whilst adverse events are usually reported online, it would be useful in some cases to have printed versions of the adverse event form to be completed when access to the university systems may not be possible or practicable. This procedure is important because serious accidents may have to be reported to the appropriate authorities.

All members of staff accompanying a fieldtrip must be aware of the emergency arrangements and the means of contacting the emergency services. It is also useful to be able to take photographs of the accident/incident and location(s) where appropriate and you can do so without compromising the health and safety of those involved.

The completed details of this form should be emailed to healthandsafety@swansea.ac.uk as soon as reasonably practicable. If this is not possible, please phone your University Contact and provide the details over the phone.

What is being reported?			
Date:		**Time:**	
Brief Details (What, where, when, who and emergency measures taken):			
Details of Injury (Person):			
What first aid was administered:			
Damage (Equipment/ Property/ Habitat):			
Witnesses (Name, Occupation and Tel No):			
Who was involved in the adverse event?			
Full Name:			
Age and DOB:			
Occupation/Course of study (if student):			
Job Title:			
University Faculty / PSU or Employer:			
Email:			
Tel:			
Full Name:			
Status:			
SU Staff/ Student number:			
Visitor:			
Other (specify):			
Has the adverse event resulted in an absence from fieldwork?		Yes ☐ No ☐	
If yes, for how long?			
Reported by:			
Name:			
Job Title:			
Tel:		Email:	
Date			

HSA- 10136-03

Version 1.0
This document is not controlled if printed

Appendix 2: Ethics Approval

Student Projects Ethics Assessment - 20/21

Student Details

Name:	Ffion Maguire
Student Number:	[redacted]
Level:	7
Course:	Biosciences
Project Supervisor:	Prof Cynthia Froyd
Last Updated Date:	17 Sep 2021, 9:18 a.m.
Last Reviewed Date:	3 Sep 2021, 4:25 p.m.
Reviewed by:	Cynthia Froyd

Projects Ethics Assessment Status

Project Title	Status	Approval Number
Conifer encroachment upon peat bogs	Completed	SU-Ethics-Student-170921/4461

Project Ethics Assessment

It is mandatory requirement to complete this Project Ethics Assessment before starting any project in the College. Any further assessments can be submitted as and when required. A unique reference number will be generated and sent to you by email for each of the completed Ethics Assessment below.

Approval Number: SU-Ethics-Student-170921/4461

Reference Number: STU_BIOL_157539_030921153547_1

Status: Completed

You will find useful documents at: Ethics Resources

Project Title: Conifer encroachment upon peat bogs

Project Start Date: 06/09/2021

Project Duration: 12 months

Please respond to questions below as accurately as possible and tick the DECLARATION box at the end of the form before submitting to your supervisor.

Please answer only relevant questions as instructed below.

1. Have you read information within the University's Research Ethics and Governance Framework document that is relevant to your research?

◉ Yes. Go to 2

○ No. **STOP.** You **cannot** begin your project without reading it. Then Go to 2.

2. Does the study make use of OR generate data?

◉ Yes. Go to 3

○ No. Tick DECLARATION box and Save this form. You can begin your project once your supervisor has reviewed this assessment.

3. Does the study only make use of data which are already in the public domain?

○ Yes. Tick DECLARATION box and Save this form. You can begin your project once your supervisor has reviewed this assessment.

◉ No. Go to 4

4. Does your study pose a potential risk to the environment, such as the escape of invasive species, genetically modified organisms (GMO), work involving human or animal pathogens, environmental contaminants, radioactive material or active outdoor vegetation fires?

○ Yes. **STOP.** Tick DECLARATION box and Save this form. Complete a **Environmental risk review form** and submit to the College Ethics Committee using the dedicated link which will appear at the top of this form once saved.

◉ No. Go to 5

5. Does your study involve **humans** as the focus of research, or make use of data collected from human subjects?

○ Yes. Go to 10

◉ No. Go to 6

6. Does your study involve a living vertebrate, cephalopod or decapod crustacean?

○ Yes. Go to 7

◉ No. Tick DECLARATION box and Save this form. You can begin your project once your supervisor has reviewed this assessment.

7. Is your study interventional (i.e it involves capture, handling, contact and/or confinement ⓘ)?

○ Yes. Go to 8

○ No. **STOP.** Tick DECLARATION box and Save this form. Complete an **Animal vertebrate review form** and submit to the College Ethics Committee using the dedicated link which will appear at the top of this form once saved.

8. Is the intervention being carried out by Swansea University staff or students?

○ Yes. Go to 9

○ No. **STOP.** Tick DECLARATION box and Save this form. Complete an **Animal vertebrate review form** and submit to the College Ethics Committee using the dedicated link which will appear at the top of this form once saved.

9. Is the work being carried out in the field (UK or internationally) or at Swansea University campuses?

○ Yes. **STOP.** Tick DECLARATION box and Save this form. Complete an **AWERB review form** and submit to the AWERB group using the dedicated link which will appear at the top of this form once saved.

○ No. **STOP.** Tick DECLARATION box and Save this form. Complete an **Animal vertebrate review form** and submit to the College Ethics Committee using the dedicated link which will appear at the top of this form once saved.

10. Does the proposed research involve any of the following?

You will find **Human Research Subjects Example Definitions** at: Ethics Resources

A. Vulnerable people, protected groups or participants unable to give informed consent. ⓘ ○ Yes ○ No

B. Sensitive topics or research material. ⓘ ○ Yes ○ No

C. Deception, misrepresentation or covert research. ⓘ ○ Yes ○ No

D. A risk of harm, distress or damage to anyone. ⓘ ○ Yes ○ No

E. Collection of **personal data** or **sensitive personal data** as defined in UK law (Data Protection Act; General Data Protection Regulation). ⓘ ○ Yes ○ No

F. Any other aspects that pose significant ethical concerns? ⓘ ○ Yes ○ No

G. Data collection from research participants without prior, recorded, informed consent? ⓘ ○ Yes ○ No

H. The sharing of data or confidential information beyond the initial consent given? ⓘ ○ Yes ○ No

I. A lack of anonymity for research participants? ⓘ ○ Yes ○ No

If Yes to **any** of the above, **STOP.** Tick DECLARATION box and Save this form. Complete a **Human Research Ethics review form** and submit to the College Ethics Committee using the dedicated link which will appear at the top of this form once saved.

If No to **all** the above, Tick DECLARATION box and Save this form. You can begin your project once your supervisor has reviewed this assessment.

CONFLICTS OF INTEREST

Tick this box if there are any conflicts of interest to be declared. ⓘ ☐

Please email College Ethics Committee with details of conflicts: cosethics@swan.ac.uk. Please note, an approval number cannot be given until approval has been given by the College ethics committee and you should not start data collection until this has been given.

DECLARATION

I certify that the answers to the questions given above are true and accurate to the best of my knowledge and belief and I take full responsibility for it. I also confirm that I have read the University's Policy Framework on Research Ethics & Governance and will abide by its ethical guidelines, as well as the ethical principles underlying good practice appropriate to my discipline. ☑

Other Information to Project Supervisor

This comments box is for communications between the student and supervisor. The ethics committee do not see this.

```
The project will include seed collection and population counts. Seed traps will have escape routes for small mammals etc.
```

Feedback:

Please pass any comments related to the Ethics Review Procedure to: **Rebecca Stringwell (r.stringwell@swansea.ac.uk)**

Appendix 3: Land-use Permit

Forestry and Land Scotland
Coilltearachd agus Fearann Alba

REFERENCE **NH21-45**
REGIONAL OFFICE NAME **Golspie Office, North Region** ADDRESS **The Links, Golspie Business Park, Golspie, KW10 6UB**
TELEPHONE NUMBER **0300 067 6100**
FLS EMAIL ADDRESS enquiries.north@forestryandland.gov.scot

PERMISSION FOR AN ACTIVITY between

The Scottish Ministers acting through **Forestry and Land Scotland**, an executive agency established pursuant to the Forestry and Land Management (Scotland) Act 2018 and having a place of business at Great Glen House, Leachkin Road, Inverness IV3 8NW (hereinafter referred to as **FLS)** and

The Permit Holder Ffion Maguire, Swansea University College of Science, 77c Towerhill Crescent, Cradlehall, Inverness, IV2 5GZ, [redacted] (hereinafter referred to as the **Permit Holder)**

1. DEFINITIONS

In this Permission, the following words and expressions shall have the meanings respectively ascribed to them:

(a) **Charge** means the sum of NIL

(b) **Duration** means the period from the Start Date to 31st Oct 2022;

(c) **FLS Land** means land owned by the Scottish Ministers and managed by FLS;

(d) **Permission** means this agreement;

(e) **Plan** means the plan forming Part 2 of the Schedule annexed to this Permission;

(f) **Regional Manager** means the regional manager in charge of the Regional Office (or such other official as FLS may notify to the Permit Holder from time to time);

(g) **Regional Office** means the Regional Office detailed above (or such other address as FLS may notify to the Permit Holder from time to time);

(h) **Rights** means the rights set out in paragraph 2(a) of this Permission; and

(i) **Site** means that part of FLS Land shown shaded red on the attached Plans.

(j) **Start Date** means 4th November 2021

1 | Permission for an Activity |

2. THE RIGHTS GRANTED

(a) FLS hereby gives to the Permit Holder a non-exclusive permission to (i) place and monitor 5 seed traps at 2 different sites (the **Activity**) and (ii) enter the Site for the Activity (together hereinafter referred to as **the Rights**), subject to the following provisions.

(b) Without prejudice to the other provisions of this Permission, the Rights are also subject to the specific conditions (if any) set out in Part 1 of the Schedule annexed:

(c) This Permission is personal to the Permit Holder and, for the avoidance of any doubt, the Rights hereby granted cannot be transferred or otherwise assigned or novated to any other person without the prior written agreement of FLS.

3. THE DURATION

(a) This Permission shall endure for the Duration.

(b) This Permission will subsist at the discretion of FLS who may revoke it at any time on giving written notice to the Permit Holder. If the revocation is to meet FLS requirements a refund of the Charge will be made unless a suitable alternative location can be provided for exercise of the Rights. If the revocation arises as a result of the Permit Holder (or any person for whom they are legally responsible) breaching any of the terms of this Permission no refund will be made.

4. THE CHARGE

The Permit Holder will pay the Charge to FLS prior to the Start Date.

5. CONDITIONS

(a) The Permit Holder will exercise the Rights (i) so as to cause as little interference as is reasonably practicable to FLS's use and enjoyment of the FLS Land, (ii) so as to cause as little damage as is reasonably practicable to the Site and/or any other part of the FLS Land, and (iii) subject to and in accordance with all other provisions of this Permission.

In particular, but in no way exhaustive, the Permit Holder will ensure:

- compliance with all legislation affecting the use of the Site and/or exercise of the Rights
- there is no smoking or lighting of fires on FLS Land;
- all gates on FLS Land are left in the position as found;
- reasonable care is taken to prevent disturbance to wild fauna and flora and to agricultural livestock and that dogs are kept under control at all times; and
- compliance with any instructions issued by the Regional Manager or their authorised representative.

(b) No part of the FLS Land other than the Site may be used for the Activity.

(c) No warranty whatsoever is given by FLS as to the suitability (whether physical or otherwise) of the Site. The responsibility for ensuring that the Site and/or the Access Route are safe and suitable for the Activity and exercise of the Rights will rest with the Permit Holder. The Permit Holder will ensure that public rights of way are not impeded.

(d) The Permit Holder will be responsible for obtaining any planning or other necessary consents required in connection with the exercise of the Rights and/or any alterations or works permitted under paragraph 5(l), below.

(e) The Permit Holder will pay compensation for or make good to the satisfaction of FLS all physical damage caused by the exercise of the Rights and/or as a result of any alterations or works permitted under paragraph 5(l), below. The Permit Holder will clear all equipment and litter brought onto the Site and/or other FLS Land by the Permit Holder and/or all persons authorised by the Permit Holder all to the satisfaction of FLS.

(f) The Permit Holder will indemnify FLS against all claims arising from any loss or damage, or injury or death to any person arising from the exercise of the Rights or any breach of this Permission and will (if required by FLS) throughout the Duration maintain an insurance policy with a reputable insurance company in an amount of not less than £2 million in respect of any one claim. The amount of any such insurance shall not limit the liability of the Permit Holder to FLS. Where such insurance is required by FLS, the Permit Holder will produce a certificate for such insurance to FLS not less than 14 days prior to the commencement of the Duration together with (if requested by FLS) a receipt for the premium paid.

(g) The Permit Holder will ensure that adequate and proper arrangements are made to the satisfaction of the Regional Manager to protect the safety of all persons on the Site throughout the Duration by express or implied invitation from the Permit Holder and all other persons likely to be within the vicinity of the Site during the Duration. The arrangements may include:

- Signing to warn of the Activity
- Checking the Site and/or the Access Route after the Activity and/or expiry of the Duration
- Carrying out a risk assessment
- Arrangements for medical assistance

(h) The Permit Holder will advise FLS within 24 hours of any accident or incident arising out of the exercise of the Rights involving the Permit Holder or any person on the Site by express or implied invitation from the Permit Holder where such accident or incident has been the subject to a notification to the Health and Safety Executive or has resulted in any person being hospitalised.

(i) FLS will ensure that all holders of a contract to provide services to, or purchase goods from, FLS on the Site are notified of this Permission and the Rights granted, including details of the Site, and will instruct them to notify any sub-contractors and their employees.

(j) FLS will ensure that all regional FLS staff are notified of this Permission and the Site.

(k) The Rights are subject to the rights of all other persons in occupation of the Site as tenants of FLS or otherwise authorised by FLS to use the Site for any legitimate purpose. As such, it is necessary in the interests of management of such FLS Land for such other persons to notify the Permit Holder of events which may affect or restrict the Permit Holder's use of the Site. In these circumstances FLS will disclose the Permit Holder's details to such other persons for this purpose only.

By signing this Permission, the Permit Holder agrees to such disclosure by FLS to such other persons.

(l) The Permit Holder undertakes to FLS not to make any alterations to the Site and/or carry out any works on the Site without the prior written consent of FLS.

6. ACCESS PROTOCOLS

Where any rights of vehicular access are granted to the Permit Holder in terms of this Permission, the Permit Holder shall exercise such rights (and shall procure that all persons authorised by the Permit Holder shall exercise such rights) strictly in accordance with the following provisions (and any conditions set out in Part 1 of the Schedule annexed to this Permission):

(a) The Permit Holder shall allow responsible public access in accordance with the Land Reform (Scotland) Act 2003 and the Scottish Outdoor Access Code (or any subsequent document substituted for or replacing the same) and shall respect the rights of members of the public who are exercising such access responsibly.

7. MISCELLANEOUS PROVISIONS (a)

Notices

(i) All notices or other communications under this Permission will be in writing and sent to the person and address in paragraph 7(a)(ii) below. They may be given, and will be deemed received:

- by first-class post: two working days after posting;
- by hand: on delivery;
- by email: on receipt of a delivery read return mail from the correct email address.

(ii) Notices will be sent:

- to FLS at: the Regional Office or the FLS Email Address detailed on page 1 of this Permission (in each case marked for the attention of the Regional Manager); and
- to the Permit Holder at: the postal address or the email address detailed in the designation of the Permit Holder on page 1 of this Permission.

(b) This Permission does not create any rights in favour of third parties under the Contract (Third Party Rights) (Scotland) Act 2017 to enforce or otherwise invoke any provision of this Permission.

(c) This Permission shall be construed in accordance with the law of Scotland.

In the interests of safety FLS strongly recommends that the Permit Holder and all persons authorised by the Permit Holder carry a mobile phone and first aid kit and leave details of the mobile number, route and expected return time with a friend, relative or responsible person.

8. ACCEPTANCE

The Permit Holder hereby accepts the foregoing conditions and agrees to pay the Charge

Signed *Ffion Maguire* Date 04/12/2021
Ffion Maguire
Swansea University College of Science

Please sign and return both copies of this Permission (including the Plan) to the nominated FLS contact as noted below before taking access.

Name of nominated FLS contact – Tim Cockerill

Signed on behalf of FLS pp. .[redacted] Date ....5th Nov 2021......
Tim Cockerill
Peatland Restoration Forester

This is the Schedule in the foregoing Permission between The Scottish Ministers (acting through Forestry and Land Scotland) and Ffion Maguire

Part 1

Specific Conditions

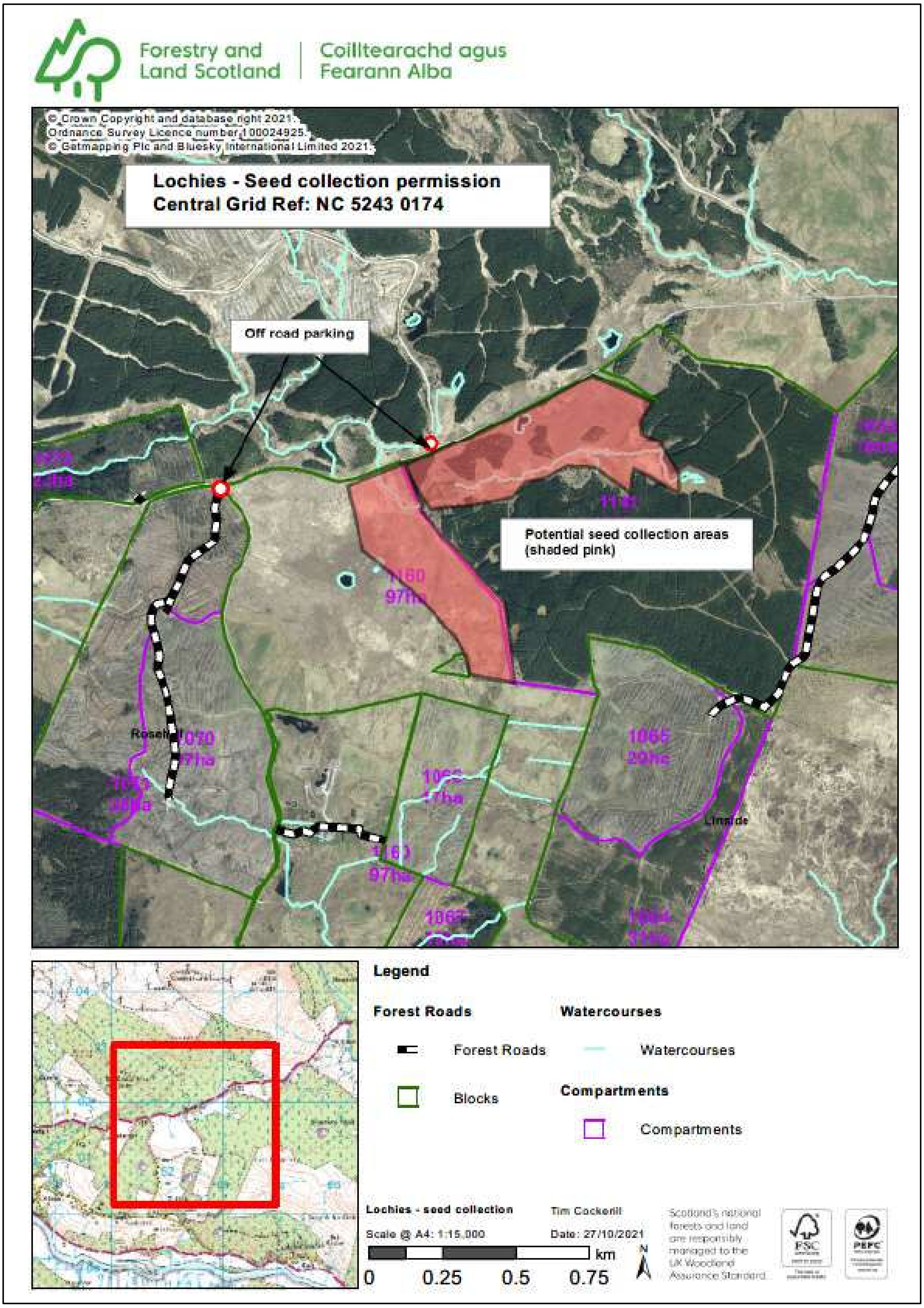
1. Please contact the Deer Controllers at least 24 hours ahead of taking access:

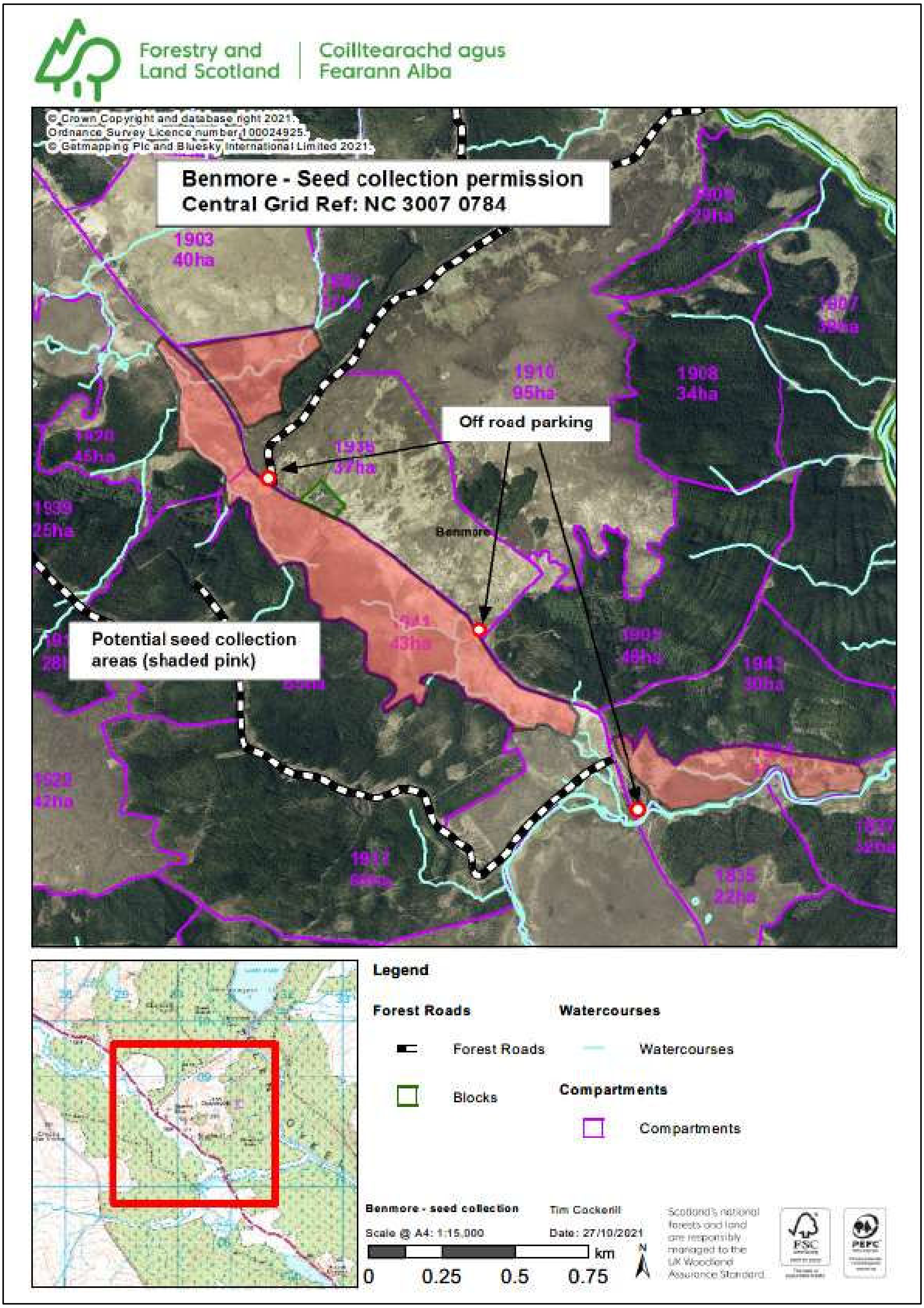
- Sites 1 - contact Roland McMeekin [redacted]
- Sites 2 - contact Stuart Macdonald

Signed *Ffion Maguire* Date 04/12/2021
Swansea University College of Science

Part 2

Plan (separately attached)


Forestry and Land Scotland
Coilltearachd agus Fearann Alba
© Crown Copyright and database right 2021. Ordnance Survey Licence number 100024925. © Getmapping Plc and Bluesky International Limited 2021.
Lochies - Seed collection permission
Central Grid Ref: NC 5243 0174
Off road parking
Potential seed collection areas (shaded pink)
Legend
Forest Roads
Forest Roads
Blocks
Watercourses
Watercourses
Compartments
Compartments
Lochies - seed collection
Scale @ A4: 1:15,000
Tim Cockerill
Date: 27/10/2021
0 0.25 0.5 0.75 km
Scotland's national forests and land are responsibly managed to the UK Woodland Assurance Standard
FSC
PEFC


Forestry and Land Scotland
Coilltearachd agus Fearann Alba
© Crown Copyright and database right 2021. Ordnance Survey Licence number 100024925.
© Getmapping Plc and Bluesky International Limited 2021.
Benmore - Seed collection permission
Central Grid Ref: NC 3007 0784
1903 40ha
1910 95ha
1908 34ha
1920 45ha
1938 37ha
1939 25ha
1909 48ha
1922 42ha
1835 22ha
Off road parking
Benmore
Potential seed collection areas (shaded pink)
Legend
Forest Roads
Forest Roads
Blocks
Watercourses
Watercourses
Compartments
Compartments
Benmore - seed collection
Scale @ A4: 1:15,000
Tim Cockerill
Date: 27/10/2021
0 0.25 0.5 0.75 km
N

Appendix 4: R Code

```
# MRres Dissertation
# Ffion Maguire

################################################################################
################################################################################
################################################################################

# Packages

library(ggplot2)
library(ggpubr)
library(tidyverse)
library(broom)
library(AICcmodavg)
library(dplyr)
library(MASS)
library(ggplot)

################################################################################
################################################################################
################################################################################

# Section 3.1: Seed Rain Data Analysis

view(SeedTrapData)
names(SeedTrapData)

str(SeedTrapData)

SeedTrapData$`Distance (m)` <-factor(SeedTrapData$`Distance (m)`)
SeedTrapData$`No. of Seeds` <-as.numeric(SeedTrapData$`No. of Seeds`)
SeedTrapData$`Species` <-factor(SeedTrapData$`Species`)
SeedTrapData$`Poisson No. of Seeds` <-as.numeric(SeedTrapData$`Poisson No. of Seeds`)
SeedTrapData$Season <-factor(SeedTrapData$Season)
SeedTrapData$Month <- factor(SeedTrapData$Month)

SeedTrapData$Month <- factor(SeedTrapData$Month, levels = c("February", "March",
"April", "May", "June", "July", "August", "September", "October", "November"))

SeedTrapData$Site <- factor(SeedTrapData$Site, levels = c("Benmore", "Lochies"))

SeedTrapData$Season <- factor(SeedTrapData$Season, levels = c("Winter", "Spring",
"Summer", "Autumn"))

SeedTrapDistance <- SeedTrapData$`Distance (m)`
SeedTrapSeeds <- SeedTrapData$`No. of Seeds`
SeedTrapSpecies <- SeedTrapData$Species
SeedTrapSeedsPoisson <- SeedTrapData$`Poisson No. of Seeds`
```

```
SeedTrapSite <- SeedTrapData$Site
SeedTrapSeason <- SeedTrapData$Season
SeedTrapMonth <- SeedTrapData$Month
SeedTrapArea <- SeedTrapData$`Survey Area`

################################################################################

View(SeedTrapDataLodge)
names(SeedTrapDataLodge)

str(SeedTrapDataLodge)

SeedTrapDataLodge$`Distance (m)` <-factor(SeedTrapDataLodge$`Distance (m)`)
SeedTrapDataLodge$`Poisson No. of Seeds` <-as.numeric(SeedTrapDataLodge$`Poisson
No. of Seeds`)
SeedTrapDataLodge$Season <-factor(SeedTrapDataLodge$Season)

SeedTrapDataLodge$Month <- factor(SeedTrapDataLodge$Month, levels = c("February",
"March", "April", "May", "June", "July", "August", "September", "October", "November"))

SeedTrapDistanceLodge <- SeedTrapDataLodge$`Distance (m)`
SeedTrapSeedsPoissonLodge <- SeedTrapDataLodge$`Poisson No. of Seeds`
SeedTrapSeasonLodge <- SeedTrapDataLodge$Season
SeedTrapMonthLodge <- SeedTrapDataLodge$Month
SeedTrapSeedsLodge <- SeedTrapDataLodge$`No. of Seeds`

################################################################################

View(SeedTrapDataSitka)
names(SeedTrapDataSitka)

str(SeedTrapDataSitka)

SeedTrapDataSitka$`Distance (m)` <-factor(SeedTrapDataSitka$`Distance (m)`)
SeedTrapDataSitka$`Poisson No. of Seeds` <-as.numeric(SeedTrapDataSitka$`Poisson No.
of Seeds`)
SeedTrapDataSitka$Season <-factor(SeedTrapDataSitka$Season)

SeedTrapDataSitka$Month <- factor(SeedTrapDataSitka$Month, levels = c("February",
"March", "April", "May", "June", "July", "August", "September", "October", "November"))

SeedTrapDistanceSitka <- SeedTrapDataSitka$`Distance (m)`
SeedTrapSeedsPoissonSitka <- SeedTrapDataSitka$`Poisson No. of Seeds`
SeedTrapSeasonSitka <- SeedTrapDataSitka$Season
SeedTrapMonthSitka <- SeedTrapDataSitka$Month
SeedTrapSeedsSitka <- SeedTrapDataSitka$`No. of Seeds`

################################################################################
################################################################################
```

Section 3.1.1: Variation of Seed Rain Abundance over Distance

##

Figure 11: Total number of lodgepole pine and Sitka spruce seeds recorded at Lochies (survey areas A and B) and Benmore (survey areas C, D and E).

```
ggplot(SeedTrapData, aes(x = factor(SeedTrapData$`Survey Area`,levels = c("A", "B", "C",
"D", "E", "F")), y = SeedTrapData$`No. of Seeds`))+
  geom_col(aes(fill = SeedTrapData$Species))+
  xlab("Survey Area")+
  ylab("Total Number of Seeds")+
  labs(fill = "")+
  ylim(0, 150) +
  scale_fill_manual(values = c("forestgreen", "orange"))+
  theme(panel.grid.minor = element_line(size = 0.25, linetype = 'solid', colour = "white"))+
  theme_bw()+
  theme(axis.line = element_line(colour = "black"))
```

##

Figure 12: Total number of seeds recorded at each distance point at Lochies and Benmore during the data collection period from February to October 2022.

```
#Lodgepole pine

ggplot(SeedTrapDataLodge, aes(x = factor(SeedTrapDataLodge$`Distance (m)`,levels =
c("0", "10", "20", "30", "40", "50", "60")), y = SeedTrapDataLodge$`No. of Seeds`))+
  geom_col(aes(fill = SeedTrapDataLodge$Site))+
  ggtitle("Lodgepole pine")+
  xlab("Distance (m)")+
  ylab("Total Number of Seeds")+
  labs(fill = "")+
  ylim(0, 250) +
  scale_fill_manual(values = c("forestgreen", "orange"))+
  theme(panel.grid.minor = element_line(size = 0.25, linetype = 'solid', colour = "white"))+
  theme_bw()+
  theme(axis.line = element_line(colour = "black"))

#Sitka spruce

ggplot(SeedTrapDataSitka, aes(x = factor(SeedTrapDataSitka$`Distance (m)`,levels = c("0",
"10", "20", "30", "40", "50", "60")), y = SeedTrapDataSitka$`No. of Seeds`))+
  geom_col(aes(fill = SeedTrapDataSitka$Site))+
  ggtitle("Sitka spruce")+
  xlab("Distance (m)")+
  ylab("Total Number of Seeds")+
  labs(fill = "")+
  ylim(0, 250) +
  scale_fill_manual(values = c("forestgreen", "orange"))+
```

```
  theme(panel.grid.minor = element_line(size = 0.25, linetype = 'solid', colour = "white"))+
  theme_bw()+
  theme(axis.line = element_line(colour = "black"))

################################################################################

# Poisson Distribution Model for both Conifer Species

SeedTrap_model_1 <- glm(SeedTrapSeedsPoisson ~ SeedTrapDistance, family = poisson)

summary(SeedTrap_model_1)

################################################################################

# Poisson Distribution Model for Lodgepole Pine Only

SeedTrap_model_2 <- glm(SeedTrapSeedsPoissonLodge ~ SeedTrapDistanceLodge, family
= poisson)

summary(SeedTrap_model_2)

################################################################################

# Poisson Distribution Model for Sitka Spruce Only

SeedTrap_model_3 <- glm(SeedTrapSeedsPoissonSitka ~ SeedTrapDistanceSitka, family =
poisson)

summary(SeedTrap_model_3)

################################################################################
################################################################################

# Section 3.1.2: Seasonal Variation in Seed Rain Abundance

################################################################################

# Figure 13: Total number of lodgepole pine (left) and Sitka spruce (right) seeds identified
within each survey area during each month of the data collection period between February to
October 2022.

#Lodgepole pine

ggplot(SeedTrapDataLodge, aes(x = factor(SeedTrapDataLodge$Month,levels =
c("February", "March", "April", "May", "June", "July", "August", "September", "October")),
y = SeedTrapDataLodge$`No. of Seeds`))+
  geom_col(aes(fill = SeedTrapDataLodge$`Survey Area`))+
  xlab("Month")+
  ylab("Total Number of Seeds")+
  ggtitle("Lodgepole pine")+
```

```
  ylim(0, 150)+
  labs(fill = "Seed Trap Survey Area")+
  scale_fill_manual(values = c("hotpink1", "mediumpurple1", "cornflowerblue",
"forestgreen", "orange"))+
  theme(panel.background = element_blank())+
  theme(axis.line = element_line(colour = "black"))+
  theme(panel.grid.minor = element_line(size = 0.25, linetype = 'solid', colour = "white"))+
  theme_bw()+
  theme(axis.line = element_line(colour = "black"))

#Sitka spruce

ggplot(SeedTrapDataSitka, aes(x = factor(SeedTrapDataSitka$Month,levels = c("February",
"March", "April", "May", "June", "July", "August", "September", "October")), y =
SeedTrapDataSitka$`No. of Seeds`))+
  geom_col(aes(fill = SeedTrapDataSitka$`Survey Area`))+
  xlab("Month")+
  ylab("Total Number of Seeds")+
  ggtitle("Sitka spruce")+
  ylim(0, 150)+
  labs(fill = "Seed Trap Survey Area")+
  scale_fill_manual(values = c("hotpink1", "mediumpurple1", "cornflowerblue",
"forestgreen", "orange"))+
  theme(panel.background = element_blank())+
  theme(axis.line = element_line(colour = "black"))+
  theme(panel.grid.minor = element_line(size = 0.25, linetype = 'solid', colour = "white"))+
  theme_bw()+
  theme(axis.line = element_line(colour = "black"))

################################################################################

# Figure 14: Total number of lodgepole pine (left) and Sitka spruce (right) seeds recorded
during each season (as demonstrated in Table 1) of the data collection period between
February to October 2022.

#Lodgepole pine

ggplot(SeedTrapDataLodge, aes(x = factor(SeedTrapDataLodge$Season,levels = c("Winter",
"Spring", "Summer", "Autumn")), y = SeedTrapDataLodge$`No. of Seeds`))+
  geom_col(aes(fill = SeedTrapDataLodge$`Survey Area`))+
  xlab("Season")+
  ylab("Total Number of Seeds")+
  ggtitle("Lodgepole pine")+
  ylim(0,325)+
  labs(fill = "Seed Trap Survey Area")+
  scale_fill_manual(values = c("hotpink1", "mediumpurple1", "cornflowerblue",
"forestgreen", "orange"))+
  theme(panel.background = element_blank())+
  theme(axis.line = element_line(colour = "black"))+
  theme(panel.grid.minor = element_line(size = 0.25, linetype = 'solid', colour = "white"))+
```

```
  theme_bw()+
  theme(axis.line = element_line(colour = "black"))

#Sitka spruce

ggplot(SeedTrapDataSitka, aes(x = factor(SeedTrapDataSitka$Season,levels = c("Winter",
"Spring", "Summer", "Autumn")), y = SeedTrapDataSitka$`No. of Seeds`))+
  geom_col(aes(fill = SeedTrapDataSitka$`Survey Area`))+
  xlab("Season")+
  ylab("Total Number of Seeds")+
  ggtitle("Sitka spruce")+
  ylim(0,325)+
  labs(fill = "Seed Trap Survey Area")+
  scale_fill_manual(values = c("hotpink1", "mediumpurple1", "cornflowerblue",
"forestgreen", "orange"))+
  theme(panel.background = element_blank())+
  theme(axis.line = element_line(colour = "black"))+
  theme(panel.grid.minor = element_line(size = 0.25, linetype = 'solid', colour = "white"))+
  theme_bw()+
  theme(axis.line = element_line(colour = "black"))

################################################################################
################################################################################
################################################################################

# Section 3.2: Lodgepole Pine Count Data Analysis

View(TreeCountData)
names(TreeCountData)

str(TreeCountData)

TreeCountData$`Root Collar Diameter (mm)`<- as.numeric(TreeCountData$`Root Collar
Diameter (mm)`)
TreeCountData$`Age Class` <- factor(TreeCountData$`Age Class`)
TreeCountData$Topography <- factor(TreeCountData$Topography)

RCD <-TreeCountData$`Root Collar Diameter (mm)`
Height <-TreeCountData$`Height (cm)`
Distance <-TreeCountData$`Distance (m)`
Age <-TreeCountData$`Age Class`
Topo <-TreeCountData$Topography

################################################################################

View(TreeCountSummary)
names(TreeCountSummary)

TreeCountSummary$Transect <- factor(TreeCountSummary$Transect)
```

```
TreeCountSummary$Sum <- factor(TreeCountSummary$Sum, levels = c("Minimum",
"Average", "Maximum"))

TreeCountSummary$Transect <- factor(TreeCountSummary$Transect, levels = c("1", "2",
"3", "4", "5", "6", "7", "8", "9", "10"))

TreeCountData$Transect <- factor(TreeCountData$Transect, levels = c("1", "2", "3", "4",
"5", "6", "7", "8", "9", "10"))

################################################################################
################################################################################

# Section 3.2.1: Use of Stem Dimensions as a Proxy for Age

cor.test(RCD, Height, method = c("pearson"))

################################################################################
################################################################################

# Section 3.2.2: Germination Patterns of Lodgepole Pine Growing in Peatland

# Figure 15: The minimum, maximum and average distances at which lodgepole pine were
recorded from the forest within each survey transect.

ggplot(TreeCountSummary, aes(fill=TreeCountSummary$Sum,
y=TreeCountSummary$Distance, x=TreeCountSummary$Transect))+
  geom_bar(position="dodge", stat="identity")+
  xlab("Survey Transect Number")+
  ylab("Distance (m)")+
  labs(fill = "")+
  scale_fill_manual(values = c("orange", "cornflowerblue", "forestgreen"))+
  theme(panel.background = element_blank())+
  theme(axis.line = element_line(colour = "black"))+
  theme(panel.grid.minor = element_line(size = 0.25, linetype = 'solid', colour = "white"))+
  theme_bw()+
  theme(axis.line = element_line(colour = "black"))

################################################################################

TreeCount_model_2 <- lm(Distance ~ RCD)

summary(TreeCount_model_2)

################################################################################

TreeCount_model_3 <- lm(Distance ~ Height)

summary(TreeCount_model_3)

################################################################################
```

```
TreeCount_model_4 <- lm(Distance ~ RCD + Height)

summary(TreeCount_model_4)

################################################################################

# Figure 16: Height and RCD of all lodgepole pine recorded in relation to the distance from the forest.

#Root Collar Diameter

mod1 = lm(TreeCountData$`Root Collar Diameter (mm)` ~ TreeCountData$`Distance (m)`)
modsum1 = summary(mod1)

plot(Distance, RCD,
    pch = 4,
    cex=1,
    col='black',
    type = 'p',
    las = 1,
    xlim= c(0,150),
    ylim= c(0,100),
    xlab = expression(paste('Distance (m)')),
    ylab = 'Root Collar Diameter (mm)')

abline(mod1, col = "red")

r2.1 = modsum1$adj.r.squared

modsum1$coefficients

my.p.2 = modsum1$coefficients[2,4]

mylabel.1 = bquote(italic(R)^2 == .(format(r2.1, digits = 3)))
text(x = 125, y = 95, labels = mylabel.1)

# Height

mod2 = lm(TreeCountData$`Height (cm)` ~ TreeCountData$`Distance (m)`)
modsum2 = summary(mod2)

plot(Distance, Height,
    pch = 4,
    cex=1,
    col='black',
    type = 'p',
    las = 1,
    xlim= c(0,150),
    ylim= c(0,275),
```

```
    xlab = expression(paste('Distance (m)')),
    ylab = 'Height (cm)')

abline(mod2, col = "red")

r2.2 = modsum2$adj.r.squared

modsum2$coefficients

my.p.2 = modsum2$coefficients[2,4]

mylabel.2 = bquote(italic(R)^2 == .(format(r2.2, digits = 3)))
text(x = 125, y = 260, labels = mylabel.2)

################################################################################
################################################################################

# Section 3.2.3: Distribution of Lodgepole Pine Growing within a Ridge-Furrow Matrix

View(TopoSummary)
names(TopoSummary)

################################################################################

View(TreeCountTopoData)
names(TreeCountTopoData)

################################################################################

TreeCount_model_4 <- aov(TreeCountTopoData$`No. of Plants` ~
TreeCountTopoData$Topography, data = TreeCountTopoData)

summary(TreeCount_model_4)

################################################################################

# Figure 17: Total number of lodgepole pine recorded within each microtopography
classification, including ‘ridge’, ‘furrow’ and ‘flat’ ground.

ggplot(TopoSummary, aes(fill=TopoSummary$Topography, y=TopoSummary$No.,
x=TopoSummary$Age))+
  geom_bar(position="dodge", stat="identity")+
  xlab("Survey Transect Number")+
  ylab("Number of Lodgepole Pine Recorded")+
  labs(fill = "Age Classification")+
  scale_fill_manual(values = c("forestgreen", "orange", "cornflowerblue"))+
  theme(panel.background = element_blank())+
  theme(axis.line = element_line(colour = "black"))+
  theme(panel.grid.minor = element_line(size = 0.25, linetype = 'solid', colour = "white"))+
  theme_bw()+
```

```
  theme(axis.line = element_line(colour = "black"))
```

##

Figure 18: The total number of lodgepole pine recorded on each of the three microtopography classifications (‘ridge’, ‘furrow’ and ‘flat’ ground), within each of the survey transects (noting that not all microtopography classicisation’s were present at each transect).

```
ggplot(TopoSummary, aes(fill=TopoSummary$Topography, y=TopoSummary$No.,
x=TopoSummary$Transect))+
  geom_bar(position="dodge", stat="identity")+
  xlab("Survey Transect Number")+
  ylab("Number of Lodgepole Pine Recorded")+
  ylim(0, 75)+
  labs(fill = "Microtopography")+
  scale_fill_manual(values = c("forestgreen", "orange", "cornflowerblue"))+
  theme(panel.background = element_blank())+
  theme(axis.line = element_line(colour = "black"))+
  theme(panel.grid.minor = element_line(size = 0.25, linetype = 'solid', colour = "white"))+
  theme_bw()+
  theme(axis.line = element_line(colour = "black"))

################################################################################

TreeCount_model_5 <- aov(RCD ~ Topo)

summary(TreeCount_model_5)

################################################################################
TreeCount_model_6 <- aov(Height ~ Topo)

summary(TreeCount_model_6)

################################################################################

TreeCount_model_7 <- aov(RCD + Height ~ Topo)

summary(TreeCount_model_7)
```

Appendix 5: Raw Data

Table 2: Raw data of seed trap results for lodgepole pine.

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/02/2022	February	Winter	1	A	A1	0	0
05/02/2022	February	Winter	1	A	A2	0	0
05/02/2022	February	Winter	1	A	A3	0	0
05/02/2022	February	Winter	1	A	A4	10	0
05/02/2022	February	Winter	1	A	A5	10	0
05/02/2022	February	Winter	1	A	A6	10	0
05/02/2022	February	Winter	1	A	A7	20	0
05/02/2022	February	Winter	1	A	A8	20	0
05/02/2022	February	Winter	1	A	A9	20	0
05/02/2022	February	Winter	1	A	A10	30	0
05/02/2022	February	Winter	1	A	A11	30	0
05/02/2022	February	Winter	1	A	A12	30	0
05/02/2022	February	Winter	1	A	A13	40	0
05/02/2022	February	Winter	1	A	A14	40	0
05/02/2022	February	Winter	1	A	A15	40	0
05/02/2022	February	Winter	1	A	A16	50	0
05/02/2022	February	Winter	1	A	A17	50	0
05/02/2022	February	Winter	1	A	A18	50	0
05/02/2022	February	Winter	1	A	A19	60	0
05/02/2022	February	Winter	1	A	A20	60	0
05/02/2022	February	Winter	1	A	A21	60	0
05/02/2022	February	Winter	1	B	B1	0	0
05/02/2022	February	Winter	1	B	B2	0	0
05/02/2022	February	Winter	1	B	B3	0	0
05/02/2022	February	Winter	1	B	B4	10	0
05/02/2022	February	Winter	1	B	B5	10	0
05/02/2022	February	Winter	1	B	B6	10	0
05/02/2022	February	Winter	1	B	B7	20	0
05/02/2022	February	Winter	1	B	B8	20	0
05/02/2022	February	Winter	1	B	B9	20	0
05/02/2022	February	Winter	1	B	B10	30	0
05/02/2022	February	Winter	1	B	B11	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/02/2022	February	Winter	1	B	B12	30	0
05/02/2022	February	Winter	1	B	B13	40	0
05/02/2022	February	Winter	1	B	B14	40	0
05/02/2022	February	Winter	1	B	B15	40	0
05/02/2022	February	Winter	1	B	B16	50	0
05/02/2022	February	Winter	1	B	B17	50	0
05/02/2022	February	Winter	1	B	B18	50	0
05/02/2022	February	Winter	1	B	B19	60	0
05/02/2022	February	Winter	1	B	B20	60	0
05/02/2022	February	Winter	1	B	B21	60	0
05/02/2022	February	Winter	2	C	C1	0	0
05/02/2022	February	Winter	2	C	C2	0	0
05/02/2022	February	Winter	2	C	C3	0	0
05/02/2022	February	Winter	2	C	C4	10	0
05/02/2022	February	Winter	2	C	C5	10	0
05/02/2022	February	Winter	2	C	C6	10	0
05/02/2022	February	Winter	2	C	C7	20	0
05/02/2022	February	Winter	2	C	C8	20	0
05/02/2022	February	Winter	2	C	C9	20	0
05/02/2022	February	Winter	2	C	C10	30	0
05/02/2022	February	Winter	2	C	C11	30	0
05/02/2022	February	Winter	2	C	C12	30	0
05/02/2022	February	Winter	2	C	C13	40	0
05/02/2022	February	Winter	2	C	C14	40	0
05/02/2022	February	Winter	2	C	C15	40	0
05/02/2022	February	Winter	2	C	C16	50	0
05/02/2022	February	Winter	2	C	C17	50	0
05/02/2022	February	Winter	2	C	C18	50	0
05/02/2022	February	Winter	2	C	C19	60	0
05/02/2022	February	Winter	2	C	C20	60	0
05/02/2022	February	Winter	2	C	C21	60	0
05/02/2022	February	Winter	2	D	D1	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/02/2022	February	Winter	2	D	D2	0	0
05/02/2022	February	Winter	2	D	D3	0	0
05/02/2022	February	Winter	2	D	D4	10	0
05/02/2022	February	Winter	2	D	D5	10	0
05/02/2022	February	Winter	2	D	D6	10	0
05/02/2022	February	Winter	2	D	D7	20	0
05/02/2022	February	Winter	2	D	D8	20	0
05/02/2022	February	Winter	2	D	D9	20	0
05/02/2022	February	Winter	2	D	D10	30	0
05/02/2022	February	Winter	2	D	D11	30	0
05/02/2022	February	Winter	2	D	D12	30	0
05/02/2022	February	Winter	2	D	D13	40	0
05/02/2022	February	Winter	2	D	D14	40	0
05/02/2022	February	Winter	2	D	D15	40	0
05/02/2022	February	Winter	2	D	D16	50	0
05/02/2022	February	Winter	2	D	D17	50	0
05/02/2022	February	Winter	2	D	D18	50	0
05/02/2022	February	Winter	2	D	D19	60	0
05/02/2022	February	Winter	2	D	D20	60	0
05/02/2022	February	Winter	2	D	D21	60	0
05/02/2022	February	Winter	2	E	E1	0	0
05/02/2022	February	Winter	2	E	E2	0	0
05/02/2022	February	Winter	2	E	E3	0	0
05/02/2022	February	Winter	2	E	E4	10	0
05/02/2022	February	Winter	2	E	E5	10	0
05/02/2022	February	Winter	2	E	E6	10	0
05/02/2022	February	Winter	2	E	E7	20	0
05/02/2022	February	Winter	2	E	E8	20	0
05/02/2022	February	Winter	2	E	E9	20	0
05/02/2022	February	Winter	2	E	E10	30	0
05/02/2022	February	Winter	2	E	E11	30	0
05/02/2022	February	Winter	2	E	E12	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/02/2022	February	Winter	2	E	E13	40	0
05/02/2022	February	Winter	2	E	E14	40	0
05/02/2022	February	Winter	2	E	E15	40	0
05/02/2022	February	Winter	2	E	E16	50	0
05/02/2022	February	Winter	2	E	E17	50	0
05/02/2022	February	Winter	2	E	E18	50	0
05/02/2022	February	Winter	2	E	E19	60	0
05/02/2022	February	Winter	2	E	E20	60	0
05/02/2022	February	Winter	2	E	E21	60	0
20/02/2022	February	Winter	1	A	A1	0	0
20/02/2022	February	Winter	1	A	A2	0	0
20/02/2022	February	Winter	1	A	A3	0	0
20/02/2022	February	Winter	1	A	A4	10	0
20/02/2022	February	Winter	1	A	A5	10	0
20/02/2022	February	Winter	1	A	A6	10	0
20/02/2022	February	Winter	1	A	A7	20	0
20/02/2022	February	Winter	1	A	A8	20	0
20/02/2022	February	Winter	1	A	A9	20	0
20/02/2022	February	Winter	1	A	A10	30	0
20/02/2022	February	Winter	1	A	A11	30	0
20/02/2022	February	Winter	1	A	A12	30	0
20/02/2022	February	Winter	1	A	A13	40	0
20/02/2022	February	Winter	1	A	A14	40	0
20/02/2022	February	Winter	1	A	A15	40	0
20/02/2022	February	Winter	1	A	A16	50	0
20/02/2022	February	Winter	1	A	A17	50	0
20/02/2022	February	Winter	1	A	A18	50	0
20/02/2022	February	Winter	1	A	A19	60	0
20/02/2022	February	Winter	1	A	A20	60	0
20/02/2022	February	Winter	1	A	A21	60	0
20/02/2022	February	Winter	1	B	B1	0	0
20/02/2022	February	Winter	1	B	B2	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/02/2022	February	Winter	1	B	B3	0	0
20/02/2022	February	Winter	1	B	B4	10	0
20/02/2022	February	Winter	1	B	B5	10	0
20/02/2022	February	Winter	1	B	B6	10	0
20/02/2022	February	Winter	1	B	B7	20	0
20/02/2022	February	Winter	1	B	B8	20	0
20/02/2022	February	Winter	1	B	B9	20	0
20/02/2022	February	Winter	1	B	B10	30	0
20/02/2022	February	Winter	1	B	B11	30	0
20/02/2022	February	Winter	1	B	B12	30	0
20/02/2022	February	Winter	1	B	B13	40	0
20/02/2022	February	Winter	1	B	B14	40	0
20/02/2022	February	Winter	1	B	B15	40	0
20/02/2022	February	Winter	1	B	B16	50	0
20/02/2022	February	Winter	1	B	B17	50	0
20/02/2022	February	Winter	1	B	B18	50	0
20/02/2022	February	Winter	1	B	B19	60	0
20/02/2022	February	Winter	1	B	B20	60	0
20/02/2022	February	Winter	1	B	B21	60	0
20/02/2022	February	Winter	2	C	C1	0	0
20/02/2022	February	Winter	2	C	C2	0	0
20/02/2022	February	Winter	2	C	C3	0	0
20/02/2022	February	Winter	2	C	C4	10	0
20/02/2022	February	Winter	2	C	C5	10	0
20/02/2022	February	Winter	2	C	C6	10	0
20/02/2022	February	Winter	2	C	C7	20	0
20/02/2022	February	Winter	2	C	C8	20	0
20/02/2022	February	Winter	2	C	C9	20	0
20/02/2022	February	Winter	2	C	C10	30	0
20/02/2022	February	Winter	2	C	C11	30	0
20/02/2022	February	Winter	2	C	C12	30	0
20/02/2022	February	Winter	2	C	C13	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/02/2022	February	Winter	2	C	C14	40	0
20/02/2022	February	Winter	2	C	C15	40	0
20/02/2022	February	Winter	2	C	C16	50	0
20/02/2022	February	Winter	2	C	C17	50	0
20/02/2022	February	Winter	2	C	C18	50	0
20/02/2022	February	Winter	2	C	C19	60	0
20/02/2022	February	Winter	2	C	C20	60	0
20/02/2022	February	Winter	2	C	C21	60	0
20/02/2022	February	Winter	2	D	D1	0	0
20/02/2022	February	Winter	2	D	D2	0	0
20/02/2022	February	Winter	2	D	D3	0	0
20/02/2022	February	Winter	2	D	D4	10	0
20/02/2022	February	Winter	2	D	D5	10	0
20/02/2022	February	Winter	2	D	D6	10	0
20/02/2022	February	Winter	2	D	D7	20	0
20/02/2022	February	Winter	2	D	D8	20	0
20/02/2022	February	Winter	2	D	D9	20	0
20/02/2022	February	Winter	2	D	D10	30	0
20/02/2022	February	Winter	2	D	D11	30	0
20/02/2022	February	Winter	2	D	D12	30	0
20/02/2022	February	Winter	2	D	D13	40	0
20/02/2022	February	Winter	2	D	D14	40	0
20/02/2022	February	Winter	2	D	D15	40	0
20/02/2022	February	Winter	2	D	D16	50	0
20/02/2022	February	Winter	2	D	D17	50	0
20/02/2022	February	Winter	2	D	D18	50	0
20/02/2022	February	Winter	2	D	D19	60	0
20/02/2022	February	Winter	2	D	D20	60	0
20/02/2022	February	Winter	2	D	D21	60	0
20/02/2022	February	Winter	2	E	E1	0	0
20/02/2022	February	Winter	2	E	E2	0	0
20/02/2022	February	Winter	2	E	E3	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/02/2022	February	Winter	2	E	E4	10	0
20/02/2022	February	Winter	2	E	E5	10	0
20/02/2022	February	Winter	2	E	E6	10	0
20/02/2022	February	Winter	2	E	E7	20	0
20/02/2022	February	Winter	2	E	E8	20	0
20/02/2022	February	Winter	2	E	E9	20	0
20/02/2022	February	Winter	2	E	E10	30	0
20/02/2022	February	Winter	2	E	E11	30	0
20/02/2022	February	Winter	2	E	E12	30	0
20/02/2022	February	Winter	2	E	E13	40	0
20/02/2022	February	Winter	2	E	E14	40	0
20/02/2022	February	Winter	2	E	E15	40	0
20/02/2022	February	Winter	2	E	E16	50	0
20/02/2022	February	Winter	2	E	E17	50	0
20/02/2022	February	Winter	2	E	E18	50	0
20/02/2022	February	Winter	2	E	E19	60	0
20/02/2022	February	Winter	2	E	E20	60	0
20/02/2022	February	Winter	2	E	E21	60	0
06/03/2022	March	Spring	1	A	A1	0	0
06/03/2022	March	Spring	1	A	A2	0	0
06/03/2022	March	Spring	1	A	A3	0	0
06/03/2022	March	Spring	1	A	A4	10	0
06/03/2022	March	Spring	1	A	A5	10	0
06/03/2022	March	Spring	1	A	A6	10	0
06/03/2022	March	Spring	1	A	A7	20	0
06/03/2022	March	Spring	1	A	A8	20	0
06/03/2022	March	Spring	1	A	A9	20	0
06/03/2022	March	Spring	1	A	A10	30	0
06/03/2022	March	Spring	1	A	A11	30	0
06/03/2022	March	Spring	1	A	A12	30	0
06/03/2022	March	Spring	1	A	A13	40	0
06/03/2022	March	Spring	1	A	A14	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
06/03/2022	March	Spring	1	A	A15	40	0
06/03/2022	March	Spring	1	A	A16	50	0
06/03/2022	March	Spring	1	A	A17	50	0
06/03/2022	March	Spring	1	A	A18	50	0
06/03/2022	March	Spring	1	A	A19	60	0
06/03/2022	March	Spring	1	A	A20	60	0
06/03/2022	March	Spring	1	A	A21	60	0
06/03/2022	March	Spring	1	B	B1	0	0
06/03/2022	March	Spring	1	B	B2	0	0
06/03/2022	March	Spring	1	B	B3	0	0
06/03/2022	March	Spring	1	B	B4	10	0
06/03/2022	March	Spring	1	B	B5	10	0
06/03/2022	March	Spring	1	B	B6	10	0
06/03/2022	March	Spring	1	B	B7	20	0
06/03/2022	March	Spring	1	B	B8	20	0
06/03/2022	March	Spring	1	B	B9	20	0
06/03/2022	March	Spring	1	B	B10	30	0
06/03/2022	March	Spring	1	B	B11	30	0
06/03/2022	March	Spring	1	B	B12	30	0
06/03/2022	March	Spring	1	B	B13	40	0
06/03/2022	March	Spring	1	B	B14	40	0
06/03/2022	March	Spring	1	B	B15	40	0
06/03/2022	March	Spring	1	B	B16	50	0
06/03/2022	March	Spring	1	B	B17	50	0
06/03/2022	March	Spring	1	B	B18	50	0
06/03/2022	March	Spring	1	B	B19	60	0
06/03/2022	March	Spring	1	B	B20	60	0
06/03/2022	March	Spring	1	B	B21	60	0
06/03/2022	March	Spring	2	C	C1	0	0
06/03/2022	March	Spring	2	C	C2	0	0
06/03/2022	March	Spring	2	C	C3	0	0
06/03/2022	March	Spring	2	C	C4	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
06/03/2022	March	Spring	2	C	C5	10	0
06/03/2022	March	Spring	2	C	C6	10	0
06/03/2022	March	Spring	2	C	C7	20	0
06/03/2022	March	Spring	2	C	C8	20	0
06/03/2022	March	Spring	2	C	C9	20	0
06/03/2022	March	Spring	2	C	C10	30	0
06/03/2022	March	Spring	2	C	C11	30	0
06/03/2022	March	Spring	2	C	C12	30	0
06/03/2022	March	Spring	2	C	C13	40	0
06/03/2022	March	Spring	2	C	C14	40	0
06/03/2022	March	Spring	2	C	C15	40	0
06/03/2022	March	Spring	2	C	C16	50	0
06/03/2022	March	Spring	2	C	C17	50	0
06/03/2022	March	Spring	2	C	C18	50	0
06/03/2022	March	Spring	2	C	C19	60	0
06/03/2022	March	Spring	2	C	C20	60	0
06/03/2022	March	Spring	2	C	C21	60	0
06/03/2022	March	Spring	2	D	D1	0	0
06/03/2022	March	Spring	2	D	D2	0	0
06/03/2022	March	Spring	2	D	D3	0	0
06/03/2022	March	Spring	2	D	D4	10	0
06/03/2022	March	Spring	2	D	D5	10	0
06/03/2022	March	Spring	2	D	D6	10	0
06/03/2022	March	Spring	2	D	D7	20	0
06/03/2022	March	Spring	2	D	D8	20	0
06/03/2022	March	Spring	2	D	D9	20	0
06/03/2022	March	Spring	2	D	D10	30	0
06/03/2022	March	Spring	2	D	D11	30	0
06/03/2022	March	Spring	2	D	D12	30	0
06/03/2022	March	Spring	2	D	D13	40	0
06/03/2022	March	Spring	2	D	D14	40	0
06/03/2022	March	Spring	2	D	D15	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
06/03/2022	March	Spring	2	D	D16	50	0
06/03/2022	March	Spring	2	D	D17	50	0
06/03/2022	March	Spring	2	D	D18	50	0
06/03/2022	March	Spring	2	D	D19	60	0
06/03/2022	March	Spring	2	D	D20	60	0
06/03/2022	March	Spring	2	D	D21	60	0
06/03/2022	March	Spring	2	E	E1	0	0
06/03/2022	March	Spring	2	E	E2	0	0
06/03/2022	March	Spring	2	E	E3	0	0
06/03/2022	March	Spring	2	E	E4	10	0
06/03/2022	March	Spring	2	E	E5	10	0
06/03/2022	March	Spring	2	E	E6	10	0
06/03/2022	March	Spring	2	E	E7	20	0
06/03/2022	March	Spring	2	E	E8	20	0
06/03/2022	March	Spring	2	E	E9	20	0
06/03/2022	March	Spring	2	E	E10	30	0
06/03/2022	March	Spring	2	E	E11	30	0
06/03/2022	March	Spring	2	E	E12	30	0
06/03/2022	March	Spring	2	E	E13	40	0
06/03/2022	March	Spring	2	E	E14	40	0
06/03/2022	March	Spring	2	E	E15	40	0
06/03/2022	March	Spring	2	E	E16	50	0
06/03/2022	March	Spring	2	E	E17	50	0
06/03/2022	March	Spring	2	E	E18	50	0
06/03/2022	March	Spring	2	E	E19	60	0
06/03/2022	March	Spring	2	E	E20	60	0
06/03/2022	March	Spring	2	E	E21	60	0
20/03/2022	March	Spring	1	A	A1	0	0
20/03/2022	March	Spring	1	A	A2	0	0
20/03/2022	March	Spring	1	A	A3	0	0
20/03/2022	March	Spring	1	A	A4	10	0
20/03/2022	March	Spring	1	A	A5	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/03/2022	March	Spring	1	A	A6	10	0
20/03/2022	March	Spring	1	A	A7	20	0
20/03/2022	March	Spring	1	A	A8	20	0
20/03/2022	March	Spring	1	A	A9	20	0
20/03/2022	March	Spring	1	A	A10	30	0
20/03/2022	March	Spring	1	A	A11	30	0
20/03/2022	March	Spring	1	A	A12	30	0
20/03/2022	March	Spring	1	A	A13	40	0
20/03/2022	March	Spring	1	A	A14	40	0
20/03/2022	March	Spring	1	A	A15	40	0
20/03/2022	March	Spring	1	A	A16	50	0
20/03/2022	March	Spring	1	A	A17	50	0
20/03/2022	March	Spring	1	A	A18	50	0
20/03/2022	March	Spring	1	A	A19	60	0
20/03/2022	March	Spring	1	A	A20	60	0
20/03/2022	March	Spring	1	A	A21	60	0
20/03/2022	March	Spring	1	B	B1	0	0
20/03/2022	March	Spring	1	B	B2	0	0
20/03/2022	March	Spring	1	B	B3	0	0
20/03/2022	March	Spring	1	B	B4	10	0
20/03/2022	March	Spring	1	B	B5	10	0
20/03/2022	March	Spring	1	B	B6	10	0
20/03/2022	March	Spring	1	B	B7	20	0
20/03/2022	March	Spring	1	B	B8	20	0
20/03/2022	March	Spring	1	B	B9	20	0
20/03/2022	March	Spring	1	B	B10	30	0
20/03/2022	March	Spring	1	B	B11	30	0
20/03/2022	March	Spring	1	B	B12	30	0
20/03/2022	March	Spring	1	B	B13	40	0
20/03/2022	March	Spring	1	B	B14	40	0
20/03/2022	March	Spring	1	B	B15	40	0
20/03/2022	March	Spring	1	B	B16	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/03/2022	March	Spring	1	B	B17	50	0
20/03/2022	March	Spring	1	B	B18	50	0
20/03/2022	March	Spring	1	B	B19	60	0
20/03/2022	March	Spring	1	B	B20	60	0
20/03/2022	March	Spring	1	B	B21	60	0
20/03/2022	March	Spring	2	C	C1	0	0
20/03/2022	March	Spring	2	C	C2	0	0
20/03/2022	March	Spring	2	C	C3	0	0
20/03/2022	March	Spring	2	C	C4	10	0
20/03/2022	March	Spring	2	C	C5	10	0
20/03/2022	March	Spring	2	C	C6	10	0
20/03/2022	March	Spring	2	C	C7	20	0
20/03/2022	March	Spring	2	C	C8	20	0
20/03/2022	March	Spring	2	C	C9	20	0
20/03/2022	March	Spring	2	C	C10	30	0
20/03/2022	March	Spring	2	C	C11	30	0
20/03/2022	March	Spring	2	C	C12	30	0
20/03/2022	March	Spring	2	C	C13	40	0
20/03/2022	March	Spring	2	C	C14	40	0
20/03/2022	March	Spring	2	C	C15	40	0
20/03/2022	March	Spring	2	C	C16	50	0
20/03/2022	March	Spring	2	C	C17	50	0
20/03/2022	March	Spring	2	C	C18	50	0
20/03/2022	March	Spring	2	C	C19	60	0
20/03/2022	March	Spring	2	C	C20	60	0
20/03/2022	March	Spring	2	C	C21	60	0
20/03/2022	March	Spring	2	D	D1	0	0
20/03/2022	March	Spring	2	D	D2	0	0
20/03/2022	March	Spring	2	D	D3	0	0
20/03/2022	March	Spring	2	D	D4	10	0
20/03/2022	March	Spring	2	D	D5	10	0
20/03/2022	March	Spring	2	D	D6	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/03/2022	March	Spring	2	D	D7	20	0
20/03/2022	March	Spring	2	D	D8	20	0
20/03/2022	March	Spring	2	D	D9	20	0
20/03/2022	March	Spring	2	D	D10	30	0
20/03/2022	March	Spring	2	D	D11	30	0
20/03/2022	March	Spring	2	D	D12	30	0
20/03/2022	March	Spring	2	D	D13	40	0
20/03/2022	March	Spring	2	D	D14	40	0
20/03/2022	March	Spring	2	D	D15	40	0
20/03/2022	March	Spring	2	D	D16	50	0
20/03/2022	March	Spring	2	D	D17	50	0
20/03/2022	March	Spring	2	D	D18	50	0
20/03/2022	March	Spring	2	D	D19	60	0
20/03/2022	March	Spring	2	D	D20	60	0
20/03/2022	March	Spring	2	D	D21	60	0
20/03/2022	March	Spring	2	E	E1	0	0
20/03/2022	March	Spring	2	E	E2	0	0
20/03/2022	March	Spring	2	E	E3	0	0
20/03/2022	March	Spring	2	E	E4	10	0
20/03/2022	March	Spring	2	E	E5	10	0
20/03/2022	March	Spring	2	E	E6	10	0
20/03/2022	March	Spring	2	E	E7	20	0
20/03/2022	March	Spring	2	E	E8	20	0
20/03/2022	March	Spring	2	E	E9	20	0
20/03/2022	March	Spring	2	E	E10	30	0
20/03/2022	March	Spring	2	E	E11	30	0
20/03/2022	March	Spring	2	E	E12	30	0
20/03/2022	March	Spring	2	E	E13	40	0
20/03/2022	March	Spring	2	E	E14	40	0
20/03/2022	March	Spring	2	E	E15	40	0
20/03/2022	March	Spring	2	E	E16	50	0
20/03/2022	March	Spring	2	E	E17	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/03/2022	March	Spring	2	E	E18	50	0
20/03/2022	March	Spring	2	E	E19	60	0
20/03/2022	March	Spring	2	E	E20	60	0
20/03/2022	March	Spring	2	E	E21	60	0
02/04/2022	April	Spring	1	A	A1	0	0
02/04/2022	April	Spring	1	A	A2	0	0
02/04/2022	April	Spring	1	A	A3	0	0
02/04/2022	April	Spring	1	A	A4	10	0
02/04/2022	April	Spring	1	A	A5	10	0
02/04/2022	April	Spring	1	A	A6	10	0
02/04/2022	April	Spring	1	A	A7	20	0
02/04/2022	April	Spring	1	A	A8	20	0
02/04/2022	April	Spring	1	A	A9	20	0
02/04/2022	April	Spring	1	A	A10	30	0
02/04/2022	April	Spring	1	A	A11	30	0
02/04/2022	April	Spring	1	A	A12	30	0
02/04/2022	April	Spring	1	A	A13	40	0
02/04/2022	April	Spring	1	A	A14	40	0
02/04/2022	April	Spring	1	A	A15	40	0
02/04/2022	April	Spring	1	A	A16	50	0
02/04/2022	April	Spring	1	A	A17	50	0
02/04/2022	April	Spring	1	A	A18	50	0
02/04/2022	April	Spring	1	A	A19	60	0
02/04/2022	April	Spring	1	A	A20	60	0
02/04/2022	April	Spring	1	A	A21	60	0
02/04/2022	April	Spring	1	B	B1	0	0
02/04/2022	April	Spring	1	B	B2	0	0
02/04/2022	April	Spring	1	B	B3	0	0
02/04/2022	April	Spring	1	B	B4	10	0
02/04/2022	April	Spring	1	B	B5	10	0
02/04/2022	April	Spring	1	B	B6	10	0
02/04/2022	April	Spring	1	B	B7	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
02/04/2022	April	Spring	1	B	B8	20	0
02/04/2022	April	Spring	1	B	B9	20	0
02/04/2022	April	Spring	1	B	B10	30	0
02/04/2022	April	Spring	1	B	B11	30	0
02/04/2022	April	Spring	1	B	B12	30	0
02/04/2022	April	Spring	1	B	B13	40	0
02/04/2022	April	Spring	1	B	B14	40	0
02/04/2022	April	Spring	1	B	B15	40	0
02/04/2022	April	Spring	1	B	B16	50	0
02/04/2022	April	Spring	1	B	B17	50	0
02/04/2022	April	Spring	1	B	B18	50	0
02/04/2022	April	Spring	1	B	B19	60	0
02/04/2022	April	Spring	1	B	B20	60	0
02/04/2022	April	Spring	1	B	B21	60	0
02/04/2022	April	Spring	2	C	C1	0	0
02/04/2022	April	Spring	2	C	C2	0	0
02/04/2022	April	Spring	2	C	C3	0	0
02/04/2022	April	Spring	2	C	C4	10	0
02/04/2022	April	Spring	2	C	C5	10	0
02/04/2022	April	Spring	2	C	C6	10	0
02/04/2022	April	Spring	2	C	C7	20	0
02/04/2022	April	Spring	2	C	C8	20	0
02/04/2022	April	Spring	2	C	C9	20	0
02/04/2022	April	Spring	2	C	C10	30	0
02/04/2022	April	Spring	2	C	C11	30	0
02/04/2022	April	Spring	2	C	C12	30	0
02/04/2022	April	Spring	2	C	C13	40	0
02/04/2022	April	Spring	2	C	C14	40	0
02/04/2022	April	Spring	2	C	C15	40	0
02/04/2022	April	Spring	2	C	C16	50	0
02/04/2022	April	Spring	2	C	C17	50	0
02/04/2022	April	Spring	2	C	C18	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
02/04/2022	April	Spring	2	C	C19	60	0
02/04/2022	April	Spring	2	C	C20	60	0
02/04/2022	April	Spring	2	C	C21	60	0
02/04/2022	April	Spring	2	D	D1	0	0
02/04/2022	April	Spring	2	D	D2	0	0
02/04/2022	April	Spring	2	D	D3	0	0
02/04/2022	April	Spring	2	D	D4	10	0
02/04/2022	April	Spring	2	D	D5	10	0
02/04/2022	April	Spring	2	D	D6	10	0
02/04/2022	April	Spring	2	D	D7	20	0
02/04/2022	April	Spring	2	D	D8	20	0
02/04/2022	April	Spring	2	D	D9	20	0
02/04/2022	April	Spring	2	D	D10	30	0
02/04/2022	April	Spring	2	D	D11	30	0
02/04/2022	April	Spring	2	D	D12	30	0
02/04/2022	April	Spring	2	D	D13	40	0
02/04/2022	April	Spring	2	D	D14	40	0
02/04/2022	April	Spring	2	D	D15	40	0
02/04/2022	April	Spring	2	D	D16	50	0
02/04/2022	April	Spring	2	D	D17	50	0
02/04/2022	April	Spring	2	D	D18	50	0
02/04/2022	April	Spring	2	D	D19	60	0
02/04/2022	April	Spring	2	D	D20	60	0
02/04/2022	April	Spring	2	D	D21	60	0
02/04/2022	April	Spring	2	E	E1	0	0
02/04/2022	April	Spring	2	E	E2	0	0
02/04/2022	April	Spring	2	E	E3	0	0
02/04/2022	April	Spring	2	E	E4	10	0
02/04/2022	April	Spring	2	E	E5	10	0
02/04/2022	April	Spring	2	E	E6	10	0
02/04/2022	April	Spring	2	E	E7	20	0
02/04/2022	April	Spring	2	E	E8	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
02/04/2022	April	Spring	2	E	E9	20	0
02/04/2022	April	Spring	2	E	E10	30	0
02/04/2022	April	Spring	2	E	E11	30	0
02/04/2022	April	Spring	2	E	E12	30	0
02/04/2022	April	Spring	2	E	E13	40	0
02/04/2022	April	Spring	2	E	E14	40	0
02/04/2022	April	Spring	2	E	E15	40	0
02/04/2022	April	Spring	2	E	E16	50	0
02/04/2022	April	Spring	2	E	E17	50	0
02/04/2022	April	Spring	2	E	E18	50	0
02/04/2022	April	Spring	2	E	E19	60	0
02/04/2022	April	Spring	2	E	E20	60	0
02/04/2022	April	Spring	2	E	E21	60	0
17/04/2022	April	Spring	1	A	A1	0	0
17/04/2022	April	Spring	1	A	A2	0	0
17/04/2022	April	Spring	1	A	A3	0	0
17/04/2022	April	Spring	1	A	A4	10	0
17/04/2022	April	Spring	1	A	A5	10	0
17/04/2022	April	Spring	1	A	A6	10	0
17/04/2022	April	Spring	1	A	A7	20	0
17/04/2022	April	Spring	1	A	A8	20	0
17/04/2022	April	Spring	1	A	A9	20	0
17/04/2022	April	Spring	1	A	A10	30	0
17/04/2022	April	Spring	1	A	A11	30	0
17/04/2022	April	Spring	1	A	A12	30	0
17/04/2022	April	Spring	1	A	A13	40	0
17/04/2022	April	Spring	1	A	A14	40	0
17/04/2022	April	Spring	1	A	A15	40	0
17/04/2022	April	Spring	1	A	A16	50	0
17/04/2022	April	Spring	1	A	A17	50	0
17/04/2022	April	Spring	1	A	A18	50	0
17/04/2022	April	Spring	1	A	A19	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/04/2022	April	Spring	1	A	A20	60	0
17/04/2022	April	Spring	1	A	A21	60	0
17/04/2022	April	Spring	1	B	B1	0	0
17/04/2022	April	Spring	1	B	B2	0	0
17/04/2022	April	Spring	1	B	B3	0	0
17/04/2022	April	Spring	1	B	B4	10	0
17/04/2022	April	Spring	1	B	B5	10	0
17/04/2022	April	Spring	1	B	B6	10	0
17/04/2022	April	Spring	1	B	B7	20	0
17/04/2022	April	Spring	1	B	B8	20	0
17/04/2022	April	Spring	1	B	B9	20	0
17/04/2022	April	Spring	1	B	B10	30	0
17/04/2022	April	Spring	1	B	B11	30	0
17/04/2022	April	Spring	1	B	B12	30	0
17/04/2022	April	Spring	1	B	B13	40	0
17/04/2022	April	Spring	1	B	B14	40	0
17/04/2022	April	Spring	1	B	B15	40	0
17/04/2022	April	Spring	1	B	B16	50	0
17/04/2022	April	Spring	1	B	B17	50	0
17/04/2022	April	Spring	1	B	B18	50	0
17/04/2022	April	Spring	1	B	B19	60	0
17/04/2022	April	Spring	1	B	B20	60	0
17/04/2022	April	Spring	1	B	B21	60	0
17/04/2022	April	Spring	2	C	C1	0	0
17/04/2022	April	Spring	2	C	C2	0	0
17/04/2022	April	Spring	2	C	C3	0	0
17/04/2022	April	Spring	2	C	C4	10	0
17/04/2022	April	Spring	2	C	C5	10	0
17/04/2022	April	Spring	2	C	C6	10	0
17/04/2022	April	Spring	2	C	C7	20	0
17/04/2022	April	Spring	2	C	C8	20	0
17/04/2022	April	Spring	2	C	C9	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/04/2022	April	Spring	2	C	C10	30	0
17/04/2022	April	Spring	2	C	C11	30	0
17/04/2022	April	Spring	2	C	C12	30	0
17/04/2022	April	Spring	2	C	C13	40	0
17/04/2022	April	Spring	2	C	C14	40	0
17/04/2022	April	Spring	2	C	C15	40	0
17/04/2022	April	Spring	2	C	C16	50	0
17/04/2022	April	Spring	2	C	C17	50	0
17/04/2022	April	Spring	2	C	C18	50	0
17/04/2022	April	Spring	2	C	C19	60	0
17/04/2022	April	Spring	2	C	C20	60	0
17/04/2022	April	Spring	2	C	C21	60	0
17/04/2022	April	Spring	2	D	D1	0	0
17/04/2022	April	Spring	2	D	D2	0	0
17/04/2022	April	Spring	2	D	D3	0	0
17/04/2022	April	Spring	2	D	D4	10	0
17/04/2022	April	Spring	2	D	D5	10	0
17/04/2022	April	Spring	2	D	D6	10	0
17/04/2022	April	Spring	2	D	D7	20	0
17/04/2022	April	Spring	2	D	D8	20	0
17/04/2022	April	Spring	2	D	D9	20	0
17/04/2022	April	Spring	2	D	D10	30	0
17/04/2022	April	Spring	2	D	D11	30	0
17/04/2022	April	Spring	2	D	D12	30	0
17/04/2022	April	Spring	2	D	D13	40	0
17/04/2022	April	Spring	2	D	D14	40	0
17/04/2022	April	Spring	2	D	D15	40	0
17/04/2022	April	Spring	2	D	D16	50	0
17/04/2022	April	Spring	2	D	D17	50	0
17/04/2022	April	Spring	2	D	D18	50	0
17/04/2022	April	Spring	2	D	D19	60	0
17/04/2022	April	Spring	2	D	D20	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/04/2022	April	Spring	2	D	D21	60	0
17/04/2022	April	Spring	2	E	E1	0	0
17/04/2022	April	Spring	2	E	E2	0	0
17/04/2022	April	Spring	2	E	E3	0	0
17/04/2022	April	Spring	2	E	E4	10	0
17/04/2022	April	Spring	2	E	E5	10	0
17/04/2022	April	Spring	2	E	E6	10	0
17/04/2022	April	Spring	2	E	E7	20	0
17/04/2022	April	Spring	2	E	E8	20	0
17/04/2022	April	Spring	2	E	E9	20	0
17/04/2022	April	Spring	2	E	E10	30	0
17/04/2022	April	Spring	2	E	E11	30	0
17/04/2022	April	Spring	2	E	E12	30	0
17/04/2022	April	Spring	2	E	E13	40	0
17/04/2022	April	Spring	2	E	E14	40	0
17/04/2022	April	Spring	2	E	E15	40	0
17/04/2022	April	Spring	2	E	E16	50	0
17/04/2022	April	Spring	2	E	E17	50	0
17/04/2022	April	Spring	2	E	E18	50	0
17/04/2022	April	Spring	2	E	E19	60	0
17/04/2022	April	Spring	2	E	E20	60	0
17/04/2022	April	Spring	2	E	E21	60	0
30/04/2022	April	Spring	1	A	A1	0	0
30/04/2022	April	Spring	1	A	A2	0	0
30/04/2022	April	Spring	1	A	A3	0	0
30/04/2022	April	Spring	1	A	A4	10	0
30/04/2022	April	Spring	1	A	A5	10	0
30/04/2022	April	Spring	1	A	A6	10	0
30/04/2022	April	Spring	1	A	A7	20	0
30/04/2022	April	Spring	1	A	A8	20	0
30/04/2022	April	Spring	1	A	A9	20	0
30/04/2022	April	Spring	1	A	A10	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
30/04/2022	April	Spring	1	A	A11	30	0
30/04/2022	April	Spring	1	A	A12	30	0
30/04/2022	April	Spring	1	A	A13	40	0
30/04/2022	April	Spring	1	A	A14	40	0
30/04/2022	April	Spring	1	A	A15	40	0
30/04/2022	April	Spring	1	A	A16	50	0
30/04/2022	April	Spring	1	A	A17	50	0
30/04/2022	April	Spring	1	A	A18	50	0
30/04/2022	April	Spring	1	A	A19	60	0
30/04/2022	April	Spring	1	A	A20	60	0
30/04/2022	April	Spring	1	A	A21	60	0
30/04/2022	April	Spring	1	B	B1	0	0
30/04/2022	April	Spring	1	B	B2	0	0
30/04/2022	April	Spring	1	B	B3	0	0
30/04/2022	April	Spring	1	B	B4	10	0
30/04/2022	April	Spring	1	B	B5	10	0
30/04/2022	April	Spring	1	B	B6	10	0
30/04/2022	April	Spring	1	B	B7	20	0
30/04/2022	April	Spring	1	B	B8	20	0
30/04/2022	April	Spring	1	B	B9	20	0
30/04/2022	April	Spring	1	B	B10	30	0
30/04/2022	April	Spring	1	B	B11	30	0
30/04/2022	April	Spring	1	B	B12	30	0
30/04/2022	April	Spring	1	B	B13	40	0
30/04/2022	April	Spring	1	B	B14	40	0
30/04/2022	April	Spring	1	B	B15	40	0
30/04/2022	April	Spring	1	B	B16	50	0
30/04/2022	April	Spring	1	B	B17	50	0
30/04/2022	April	Spring	1	B	B18	50	0
30/04/2022	April	Spring	1	B	B19	60	0
30/04/2022	April	Spring	1	B	B20	60	0
30/04/2022	April	Spring	1	B	B21	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
30/04/2022	April	Spring	2	C	C1	0	0
30/04/2022	April	Spring	2	C	C2	0	0
30/04/2022	April	Spring	2	C	C3	0	0
30/04/2022	April	Spring	2	C	C4	10	0
30/04/2022	April	Spring	2	C	C5	10	0
30/04/2022	April	Spring	2	C	C6	10	0
30/04/2022	April	Spring	2	C	C7	20	0
30/04/2022	April	Spring	2	C	C8	20	0
30/04/2022	April	Spring	2	C	C9	20	0
30/04/2022	April	Spring	2	C	C10	30	0
30/04/2022	April	Spring	2	C	C11	30	0
30/04/2022	April	Spring	2	C	C12	30	0
30/04/2022	April	Spring	2	C	C13	40	0
30/04/2022	April	Spring	2	C	C14	40	0
30/04/2022	April	Spring	2	C	C15	40	0
30/04/2022	April	Spring	2	C	C16	50	0
30/04/2022	April	Spring	2	C	C17	50	0
30/04/2022	April	Spring	2	C	C18	50	0
30/04/2022	April	Spring	2	C	C19	60	0
30/04/2022	April	Spring	2	C	C20	60	0
30/04/2022	April	Spring	2	C	C21	60	0
30/04/2022	April	Spring	2	D	D1	0	0
30/04/2022	April	Spring	2	D	D2	0	0
30/04/2022	April	Spring	2	D	D3	0	0
30/04/2022	April	Spring	2	D	D4	10	0
30/04/2022	April	Spring	2	D	D5	10	0
30/04/2022	April	Spring	2	D	D6	10	0
30/04/2022	April	Spring	2	D	D7	20	0
30/04/2022	April	Spring	2	D	D8	20	0
30/04/2022	April	Spring	2	D	D9	20	0
30/04/2022	April	Spring	2	D	D10	30	0
30/04/2022	April	Spring	2	D	D11	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
30/04/2022	April	Spring	2	D	D12	30	0
30/04/2022	April	Spring	2	D	D13	40	0
30/04/2022	April	Spring	2	D	D14	40	0
30/04/2022	April	Spring	2	D	D15	40	0
30/04/2022	April	Spring	2	D	D16	50	0
30/04/2022	April	Spring	2	D	D17	50	0
30/04/2022	April	Spring	2	D	D18	50	0
30/04/2022	April	Spring	2	D	D19	60	0
30/04/2022	April	Spring	2	D	D20	60	0
30/04/2022	April	Spring	2	D	D21	60	0
30/04/2022	April	Spring	2	E	E1	0	0
30/04/2022	April	Spring	2	E	E2	0	0
30/04/2022	April	Spring	2	E	E3	0	0
30/04/2022	April	Spring	2	E	E4	10	0
30/04/2022	April	Spring	2	E	E5	10	0
30/04/2022	April	Spring	2	E	E6	10	0
30/04/2022	April	Spring	2	E	E7	20	0
30/04/2022	April	Spring	2	E	E8	20	0
30/04/2022	April	Spring	2	E	E9	20	0
30/04/2022	April	Spring	2	E	E10	30	0
30/04/2022	April	Spring	2	E	E11	30	0
30/04/2022	April	Spring	2	E	E12	30	0
30/04/2022	April	Spring	2	E	E13	40	0
30/04/2022	April	Spring	2	E	E14	40	0
30/04/2022	April	Spring	2	E	E15	40	0
30/04/2022	April	Spring	2	E	E16	50	0
30/04/2022	April	Spring	2	E	E17	50	0
30/04/2022	April	Spring	2	E	E18	50	0
30/04/2022	April	Spring	2	E	E19	60	0
30/04/2022	April	Spring	2	E	E20	60	0
30/04/2022	April	Spring	2	E	E21	60	0
15/05/2022	May	Spring	1	A	A1	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
15/05/2022	May	Spring	1	A	A2	0	0
15/05/2022	May	Spring	1	A	A3	0	0
15/05/2022	May	Spring	1	A	A4	10	0
15/05/2022	May	Spring	1	A	A5	10	0
15/05/2022	May	Spring	1	A	A6	10	0
15/05/2022	May	Spring	1	A	A7	20	0
15/05/2022	May	Spring	1	A	A8	20	0
15/05/2022	May	Spring	1	A	A9	20	0
15/05/2022	May	Spring	1	A	A10	30	0
15/05/2022	May	Spring	1	A	A11	30	0
15/05/2022	May	Spring	1	A	A12	30	0
15/05/2022	May	Spring	1	A	A13	40	0
15/05/2022	May	Spring	1	A	A14	40	0
15/05/2022	May	Spring	1	A	A15	40	0
15/05/2022	May	Spring	1	A	A16	50	0
15/05/2022	May	Spring	1	A	A17	50	0
15/05/2022	May	Spring	1	A	A18	50	0
15/05/2022	May	Spring	1	A	A19	60	0
15/05/2022	May	Spring	1	A	A20	60	0
15/05/2022	May	Spring	1	A	A21	60	0
15/05/2022	May	Spring	1	B	B1	0	0
15/05/2022	May	Spring	1	B	B2	0	0
15/05/2022	May	Spring	1	B	B3	0	0
15/05/2022	May	Spring	1	B	B4	10	0
15/05/2022	May	Spring	1	B	B5	10	0
15/05/2022	May	Spring	1	B	B6	10	0
15/05/2022	May	Spring	1	B	B7	20	0
15/05/2022	May	Spring	1	B	B8	20	0
15/05/2022	May	Spring	1	B	B9	20	0
15/05/2022	May	Spring	1	B	B10	30	0
15/05/2022	May	Spring	1	B	B11	30	0
15/05/2022	May	Spring	1	B	B12	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
15/05/2022	May	Spring	1	B	B13	40	0
15/05/2022	May	Spring	1	B	B14	40	0
15/05/2022	May	Spring	1	B	B15	40	0
15/05/2022	May	Spring	1	B	B16	50	0
15/05/2022	May	Spring	1	B	B17	50	0
15/05/2022	May	Spring	1	B	B18	50	0
15/05/2022	May	Spring	1	B	B19	60	0
15/05/2022	May	Spring	1	B	B20	60	0
15/05/2022	May	Spring	1	B	B21	60	0
15/05/2022	May	Spring	2	C	C1	0	0
15/05/2022	May	Spring	2	C	C2	0	0
15/05/2022	May	Spring	2	C	C3	0	0
15/05/2022	May	Spring	2	C	C4	10	0
15/05/2022	May	Spring	2	C	C5	10	0
15/05/2022	May	Spring	2	C	C6	10	0
15/05/2022	May	Spring	2	C	C7	20	0
15/05/2022	May	Spring	2	C	C8	20	0
15/05/2022	May	Spring	2	C	C9	20	0
15/05/2022	May	Spring	2	C	C10	30	0
15/05/2022	May	Spring	2	C	C11	30	0
15/05/2022	May	Spring	2	C	C12	30	0
15/05/2022	May	Spring	2	C	C13	40	0
15/05/2022	May	Spring	2	C	C14	40	0
15/05/2022	May	Spring	2	C	C15	40	0
15/05/2022	May	Spring	2	C	C16	50	0
15/05/2022	May	Spring	2	C	C17	50	0
15/05/2022	May	Spring	2	C	C18	50	0
15/05/2022	May	Spring	2	C	C19	60	0
15/05/2022	May	Spring	2	C	C20	60	0
15/05/2022	May	Spring	2	C	C21	60	0
15/05/2022	May	Spring	2	D	D1	0	0
15/05/2022	May	Spring	2	D	D2	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
15/05/2022	May	Spring	2	D	D3	0	0
15/05/2022	May	Spring	2	D	D4	10	0
15/05/2022	May	Spring	2	D	D5	10	0
15/05/2022	May	Spring	2	D	D6	10	0
15/05/2022	May	Spring	2	D	D7	20	0
15/05/2022	May	Spring	2	D	D8	20	0
15/05/2022	May	Spring	2	D	D9	20	0
15/05/2022	May	Spring	2	D	D10	30	0
15/05/2022	May	Spring	2	D	D11	30	0
15/05/2022	May	Spring	2	D	D12	30	0
15/05/2022	May	Spring	2	D	D13	40	0
15/05/2022	May	Spring	2	D	D14	40	0
15/05/2022	May	Spring	2	D	D15	40	0
15/05/2022	May	Spring	2	D	D16	50	0
15/05/2022	May	Spring	2	D	D17	50	0
15/05/2022	May	Spring	2	D	D18	50	0
15/05/2022	May	Spring	2	D	D19	60	0
15/05/2022	May	Spring	2	D	D20	60	0
15/05/2022	May	Spring	2	D	D21	60	0
15/05/2022	May	Spring	2	E	E1	0	0
15/05/2022	May	Spring	2	E	E2	0	0
15/05/2022	May	Spring	2	E	E3	0	0
15/05/2022	May	Spring	2	E	E4	10	0
15/05/2022	May	Spring	2	E	E5	10	0
15/05/2022	May	Spring	2	E	E6	10	0
15/05/2022	May	Spring	2	E	E7	20	0
15/05/2022	May	Spring	2	E	E8	20	0
15/05/2022	May	Spring	2	E	E9	20	0
15/05/2022	May	Spring	2	E	E10	30	0
15/05/2022	May	Spring	2	E	E11	30	0
15/05/2022	May	Spring	2	E	E12	30	0
15/05/2022	May	Spring	2	E	E13	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
15/05/2022	May	Spring	2	E	E14	40	0
15/05/2022	May	Spring	2	E	E15	40	0
15/05/2022	May	Spring	2	E	E16	50	0
15/05/2022	May	Spring	2	E	E17	50	0
15/05/2022	May	Spring	2	E	E18	50	0
15/05/2022	May	Spring	2	E	E19	60	0
15/05/2022	May	Spring	2	E	E20	60	0
15/05/2022	May	Spring	2	E	E21	60	0
29/05/2022	May	Spring	1	A	A1	0	0
29/05/2022	May	Spring	1	A	A2	0	0
29/05/2022	May	Spring	1	A	A3	0	0
29/05/2022	May	Spring	1	A	A4	10	0
29/05/2022	May	Spring	1	A	A5	10	0
29/05/2022	May	Spring	1	A	A6	10	0
29/05/2022	May	Spring	1	A	A7	20	0
29/05/2022	May	Spring	1	A	A8	20	0
29/05/2022	May	Spring	1	A	A9	20	0
29/05/2022	May	Spring	1	A	A10	30	0
29/05/2022	May	Spring	1	A	A11	30	0
29/05/2022	May	Spring	1	A	A12	30	0
29/05/2022	May	Spring	1	A	A13	40	0
29/05/2022	May	Spring	1	A	A14	40	0
29/05/2022	May	Spring	1	A	A15	40	0
29/05/2022	May	Spring	1	A	A16	50	0
29/05/2022	May	Spring	1	A	A17	50	0
29/05/2022	May	Spring	1	A	A18	50	0
29/05/2022	May	Spring	1	A	A19	60	0
29/05/2022	May	Spring	1	A	A20	60	0
29/05/2022	May	Spring	1	A	A21	60	0
29/05/2022	May	Spring	1	B	B1	0	0
29/05/2022	May	Spring	1	B	B2	0	0
29/05/2022	May	Spring	1	B	B3	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/05/2022	May	Spring	1	B	B4	10	0
29/05/2022	May	Spring	1	B	B5	10	0
29/05/2022	May	Spring	1	B	B6	10	0
29/05/2022	May	Spring	1	B	B7	20	0
29/05/2022	May	Spring	1	B	B8	20	0
29/05/2022	May	Spring	1	B	B9	20	0
29/05/2022	May	Spring	1	B	B10	30	0
29/05/2022	May	Spring	1	B	B11	30	0
29/05/2022	May	Spring	1	B	B12	30	0
29/05/2022	May	Spring	1	B	B13	40	0
29/05/2022	May	Spring	1	B	B14	40	0
29/05/2022	May	Spring	1	B	B15	40	0
29/05/2022	May	Spring	1	B	B16	50	0
29/05/2022	May	Spring	1	B	B17	50	0
29/05/2022	May	Spring	1	B	B18	50	0
29/05/2022	May	Spring	1	B	B19	60	0
29/05/2022	May	Spring	1	B	B20	60	0
29/05/2022	May	Spring	1	B	B21	60	0
29/05/2022	May	Spring	2	C	C1	0	0
29/05/2022	May	Spring	2	C	C2	0	0
29/05/2022	May	Spring	2	C	C3	0	0
29/05/2022	May	Spring	2	C	C4	10	0
29/05/2022	May	Spring	2	C	C5	10	0
29/05/2022	May	Spring	2	C	C6	10	0
29/05/2022	May	Spring	2	C	C7	20	0
29/05/2022	May	Spring	2	C	C8	20	0
29/05/2022	May	Spring	2	C	C9	20	0
29/05/2022	May	Spring	2	C	C10	30	0
29/05/2022	May	Spring	2	C	C11	30	0
29/05/2022	May	Spring	2	C	C12	30	0
29/05/2022	May	Spring	2	C	C13	40	0
29/05/2022	May	Spring	2	C	C14	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/05/2022	May	Spring	2	C	C15	40	0
29/05/2022	May	Spring	2	C	C16	50	0
29/05/2022	May	Spring	2	C	C17	50	0
29/05/2022	May	Spring	2	C	C18	50	0
29/05/2022	May	Spring	2	C	C19	60	0
29/05/2022	May	Spring	2	C	C20	60	0
29/05/2022	May	Spring	2	C	C21	60	0
29/05/2022	May	Spring	2	D	D1	0	0
29/05/2022	May	Spring	2	D	D2	0	0
29/05/2022	May	Spring	2	D	D3	0	0
29/05/2022	May	Spring	2	D	D4	10	0
29/05/2022	May	Spring	2	D	D5	10	0
29/05/2022	May	Spring	2	D	D6	10	0
29/05/2022	May	Spring	2	D	D7	20	0
29/05/2022	May	Spring	2	D	D8	20	0
29/05/2022	May	Spring	2	D	D9	20	0
29/05/2022	May	Spring	2	D	D10	30	0
29/05/2022	May	Spring	2	D	D11	30	0
29/05/2022	May	Spring	2	D	D12	30	0
29/05/2022	May	Spring	2	D	D13	40	0
29/05/2022	May	Spring	2	D	D14	40	0
29/05/2022	May	Spring	2	D	D15	40	0
29/05/2022	May	Spring	2	D	D16	50	0
29/05/2022	May	Spring	2	D	D17	50	0
29/05/2022	May	Spring	2	D	D18	50	0
29/05/2022	May	Spring	2	D	D19	60	0
29/05/2022	May	Spring	2	D	D20	60	0
29/05/2022	May	Spring	2	D	D21	60	0
29/05/2022	May	Spring	2	E	E1	0	0
29/05/2022	May	Spring	2	E	E2	0	0
29/05/2022	May	Spring	2	E	E3	0	0
29/05/2022	May	Spring	2	E	E4	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/05/2022	May	Spring	2	E	E5	10	0
29/05/2022	May	Spring	2	E	E6	10	0
29/05/2022	May	Spring	2	E	E7	20	0
29/05/2022	May	Spring	2	E	E8	20	0
29/05/2022	May	Spring	2	E	E9	20	0
29/05/2022	May	Spring	2	E	E10	30	0
29/05/2022	May	Spring	2	E	E11	30	0
29/05/2022	May	Spring	2	E	E12	30	0
29/05/2022	May	Spring	2	E	E13	40	0
29/05/2022	May	Spring	2	E	E14	40	0
29/05/2022	May	Spring	2	E	E15	40	0
29/05/2022	May	Spring	2	E	E16	50	0
29/05/2022	May	Spring	2	E	E17	50	0
29/05/2022	May	Spring	2	E	E18	50	0
29/05/2022	May	Spring	2	E	E19	60	0
29/05/2022	May	Spring	2	E	E20	60	0
29/05/2022	May	Spring	2	E	E21	60	0
12/06/2022	June	Summer	1	A	A1	0	0
12/06/2022	June	Summer	1	A	A2	0	0
12/06/2022	June	Summer	1	A	A3	0	0
12/06/2022	June	Summer	1	A	A4	10	0
12/06/2022	June	Summer	1	A	A5	10	0
12/06/2022	June	Summer	1	A	A6	10	0
12/06/2022	June	Summer	1	A	A7	20	0
12/06/2022	June	Summer	1	A	A8	20	0
12/06/2022	June	Summer	1	A	A9	20	0
12/06/2022	June	Summer	1	A	A10	30	0
12/06/2022	June	Summer	1	A	A11	30	0
12/06/2022	June	Summer	1	A	A12	30	0
12/06/2022	June	Summer	1	A	A13	40	0
12/06/2022	June	Summer	1	A	A14	40	0
12/06/2022	June	Summer	1	A	A15	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
12/06/2022	June	Summer	1	A	A16	50	0
12/06/2022	June	Summer	1	A	A17	50	0
12/06/2022	June	Summer	1	A	A18	50	0
12/06/2022	June	Summer	1	A	A19	60	0
12/06/2022	June	Summer	1	A	A20	60	0
12/06/2022	June	Summer	1	A	A21	60	0
12/06/2022	June	Summer	1	B	B1	0	0
12/06/2022	June	Summer	1	B	B2	0	0
12/06/2022	June	Summer	1	B	B3	0	0
12/06/2022	June	Summer	1	B	B4	10	0
12/06/2022	June	Summer	1	B	B5	10	0
12/06/2022	June	Summer	1	B	B6	10	0
12/06/2022	June	Summer	1	B	B7	20	0
12/06/2022	June	Summer	1	B	B8	20	0
12/06/2022	June	Summer	1	B	B9	20	0
12/06/2022	June	Summer	1	B	B10	30	0
12/06/2022	June	Summer	1	B	B11	30	0
12/06/2022	June	Summer	1	B	B12	30	0
12/06/2022	June	Summer	1	B	B13	40	0
12/06/2022	June	Summer	1	B	B14	40	0
12/06/2022	June	Summer	1	B	B15	40	0
12/06/2022	June	Summer	1	B	B16	50	0
12/06/2022	June	Summer	1	B	B17	50	0
12/06/2022	June	Summer	1	B	B18	50	0
12/06/2022	June	Summer	1	B	B19	60	0
12/06/2022	June	Summer	1	B	B20	60	0
12/06/2022	June	Summer	1	B	B21	60	0
12/06/2022	June	Summer	2	C	C1	0	0
12/06/2022	June	Summer	2	C	C2	0	0
12/06/2022	June	Summer	2	C	C3	0	1
12/06/2022	June	Summer	2	C	C4	10	3
12/06/2022	June	Summer	2	C	C5	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
12/06/2022	June	Summer	2	C	C6	10	0
12/06/2022	June	Summer	2	C	C7	20	0
12/06/2022	June	Summer	2	C	C8	20	0
12/06/2022	June	Summer	2	C	C9	20	0
12/06/2022	June	Summer	2	C	C10	30	0
12/06/2022	June	Summer	2	C	C11	30	0
12/06/2022	June	Summer	2	C	C12	30	0
12/06/2022	June	Summer	2	C	C13	40	0
12/06/2022	June	Summer	2	C	C14	40	0
12/06/2022	June	Summer	2	C	C15	40	0
12/06/2022	June	Summer	2	C	C16	50	0
12/06/2022	June	Summer	2	C	C17	50	0
12/06/2022	June	Summer	2	C	C18	50	0
12/06/2022	June	Summer	2	C	C19	60	0
12/06/2022	June	Summer	2	C	C20	60	0
12/06/2022	June	Summer	2	C	C21	60	0
12/06/2022	June	Summer	2	D	D1	0	0
12/06/2022	June	Summer	2	D	D2	0	1
12/06/2022	June	Summer	2	D	D3	0	0
12/06/2022	June	Summer	2	D	D4	10	0
12/06/2022	June	Summer	2	D	D5	10	0
12/06/2022	June	Summer	2	D	D6	10	0
12/06/2022	June	Summer	2	D	D7	20	10
12/06/2022	June	Summer	2	D	D8	20	0
12/06/2022	June	Summer	2	D	D9	20	15
12/06/2022	June	Summer	2	D	D10	30	0
12/06/2022	June	Summer	2	D	D11	30	0
12/06/2022	June	Summer	2	D	D12	30	0
12/06/2022	June	Summer	2	D	D13	40	0
12/06/2022	June	Summer	2	D	D14	40	0
12/06/2022	June	Summer	2	D	D15	40	0
12/06/2022	June	Summer	2	D	D16	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
12/06/2022	June	Summer	2	D	D17	50	1
12/06/2022	June	Summer	2	D	D18	50	11
12/06/2022	June	Summer	2	D	D19	60	0
12/06/2022	June	Summer	2	D	D20	60	0
12/06/2022	June	Summer	2	D	D21	60	0
12/06/2022	June	Summer	2	E	E1	0	0
12/06/2022	June	Summer	2	E	E2	0	3
12/06/2022	June	Summer	2	E	E3	0	1
12/06/2022	June	Summer	2	E	E4	10	0
12/06/2022	June	Summer	2	E	E5	10	0
12/06/2022	June	Summer	2	E	E6	10	5
12/06/2022	June	Summer	2	E	E7	20	0
12/06/2022	June	Summer	2	E	E8	20	0
12/06/2022	June	Summer	2	E	E9	20	0
12/06/2022	June	Summer	2	E	E10	30	0
12/06/2022	June	Summer	2	E	E11	30	0
12/06/2022	June	Summer	2	E	E12	30	0
12/06/2022	June	Summer	2	E	E13	40	0
12/06/2022	June	Summer	2	E	E14	40	0
12/06/2022	June	Summer	2	E	E15	40	0
12/06/2022	June	Summer	2	E	E16	50	0
12/06/2022	June	Summer	2	E	E17	50	0
12/06/2022	June	Summer	2	E	E18	50	0
12/06/2022	June	Summer	2	E	E19	60	0
12/06/2022	June	Summer	2	E	E20	60	0
12/06/2022	June	Summer	2	E	E21	60	0
29/06/2022	June	Summer	1	A	A1	0	0
29/06/2022	June	Summer	1	A	A2	0	2
29/06/2022	June	Summer	1	A	A3	0	1
29/06/2022	June	Summer	1	A	A4	10	0
29/06/2022	June	Summer	1	A	A5	10	0
29/06/2022	June	Summer	1	A	A6	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/06/2022	June	Summer	1	A	A7	20	0
29/06/2022	June	Summer	1	A	A8	20	0
29/06/2022	June	Summer	1	A	A9	20	0
29/06/2022	June	Summer	1	A	A10	30	0
29/06/2022	June	Summer	1	A	A11	30	0
29/06/2022	June	Summer	1	A	A12	30	0
29/06/2022	June	Summer	1	A	A13	40	0
29/06/2022	June	Summer	1	A	A14	40	0
29/06/2022	June	Summer	1	A	A15	40	0
29/06/2022	June	Summer	1	A	A16	50	0
29/06/2022	June	Summer	1	A	A17	50	0
29/06/2022	June	Summer	1	A	A18	50	0
29/06/2022	June	Summer	1	A	A19	60	0
29/06/2022	June	Summer	1	A	A20	60	0
29/06/2022	June	Summer	1	A	A21	60	0
29/06/2022	June	Summer	1	B	B1	0	0
29/06/2022	June	Summer	1	B	B2	0	0
29/06/2022	June	Summer	1	B	B3	0	0
29/06/2022	June	Summer	1	B	B4	10	0
29/06/2022	June	Summer	1	B	B5	10	0
29/06/2022	June	Summer	1	B	B6	10	0
29/06/2022	June	Summer	1	B	B7	20	0
29/06/2022	June	Summer	1	B	B8	20	0
29/06/2022	June	Summer	1	B	B9	20	0
29/06/2022	June	Summer	1	B	B10	30	0
29/06/2022	June	Summer	1	B	B11	30	0
29/06/2022	June	Summer	1	B	B12	30	0
29/06/2022	June	Summer	1	B	B13	40	0
29/06/2022	June	Summer	1	B	B14	40	0
29/06/2022	June	Summer	1	B	B15	40	0
29/06/2022	June	Summer	1	B	B16	50	0
29/06/2022	June	Summer	1	B	B17	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/06/2022	June	Summer	1	B	B18	50	0
29/06/2022	June	Summer	1	B	B19	60	0
29/06/2022	June	Summer	1	B	B20	60	0
29/06/2022	June	Summer	1	B	B21	60	0
29/06/2022	June	Summer	2	C	C1	0	7
29/06/2022	June	Summer	2	C	C2	0	2
29/06/2022	June	Summer	2	C	C3	0	9
29/06/2022	June	Summer	2	C	C4	10	0
29/06/2022	June	Summer	2	C	C5	10	1
29/06/2022	June	Summer	2	C	C6	10	1
29/06/2022	June	Summer	2	C	C7	20	0
29/06/2022	June	Summer	2	C	C8	20	0
29/06/2022	June	Summer	2	C	C9	20	0
29/06/2022	June	Summer	2	C	C10	30	0
29/06/2022	June	Summer	2	C	C11	30	0
29/06/2022	June	Summer	2	C	C12	30	0
29/06/2022	June	Summer	2	C	C13	40	0
29/06/2022	June	Summer	2	C	C14	40	0
29/06/2022	June	Summer	2	C	C15	40	0
29/06/2022	June	Summer	2	C	C16	50	0
29/06/2022	June	Summer	2	C	C17	50	0
29/06/2022	June	Summer	2	C	C18	50	0
29/06/2022	June	Summer	2	C	C19	60	0
29/06/2022	June	Summer	2	C	C20	60	0
29/06/2022	June	Summer	2	C	C21	60	0
29/06/2022	June	Summer	2	D	D1	0	1
29/06/2022	June	Summer	2	D	D2	0	5
29/06/2022	June	Summer	2	D	D3	0	4
29/06/2022	June	Summer	2	D	D4	10	0
29/06/2022	June	Summer	2	D	D5	10	0
29/06/2022	June	Summer	2	D	D6	10	1
29/06/2022	June	Summer	2	D	D7	20	1

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/06/2022	June	Summer	2	D	D8	20	0
29/06/2022	June	Summer	2	D	D9	20	0
29/06/2022	June	Summer	2	D	D10	30	0
29/06/2022	June	Summer	2	D	D11	30	0
29/06/2022	June	Summer	2	D	D12	30	0
29/06/2022	June	Summer	2	D	D13	40	0
29/06/2022	June	Summer	2	D	D14	40	0
29/06/2022	June	Summer	2	D	D15	40	0
29/06/2022	June	Summer	2	D	D16	50	0
29/06/2022	June	Summer	2	D	D17	50	0
29/06/2022	June	Summer	2	D	D18	50	0
29/06/2022	June	Summer	2	D	D19	60	0
29/06/2022	June	Summer	2	D	D20	60	0
29/06/2022	June	Summer	2	D	D21	60	0
29/06/2022	June	Summer	2	E	E1	0	7
29/06/2022	June	Summer	2	E	E2	0	12
29/06/2022	June	Summer	2	E	E3	0	12
29/06/2022	June	Summer	2	E	E4	10	1
29/06/2022	June	Summer	2	E	E5	10	1
29/06/2022	June	Summer	2	E	E6	10	1
29/06/2022	June	Summer	2	E	E7	20	0
29/06/2022	June	Summer	2	E	E8	20	1
29/06/2022	June	Summer	2	E	E9	20	0
29/06/2022	June	Summer	2	E	E10	30	1
29/06/2022	June	Summer	2	E	E11	30	0
29/06/2022	June	Summer	2	E	E12	30	0
29/06/2022	June	Summer	2	E	E13	40	1
29/06/2022	June	Summer	2	E	E14	40	0
29/06/2022	June	Summer	2	E	E15	40	0
29/06/2022	June	Summer	2	E	E16	50	0
29/06/2022	June	Summer	2	E	E17	50	0
29/06/2022	June	Summer	2	E	E18	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/06/2022	June	Summer	2	E	E19	60	0
29/06/2022	June	Summer	2	E	E20	60	0
29/06/2022	June	Summer	2	E	E21	60	0
10/07/2022	July	Summer	1	A	A1	0	0
10/07/2022	July	Summer	1	A	A2	0	1
10/07/2022	July	Summer	1	A	A3	0	2
10/07/2022	July	Summer	1	A	A4	10	0
10/07/2022	July	Summer	1	A	A5	10	0
10/07/2022	July	Summer	1	A	A6	10	0
10/07/2022	July	Summer	1	A	A7	20	0
10/07/2022	July	Summer	1	A	A8	20	0
10/07/2022	July	Summer	1	A	A9	20	0
10/07/2022	July	Summer	1	A	A10	30	0
10/07/2022	July	Summer	1	A	A11	30	0
10/07/2022	July	Summer	1	A	A12	30	0
10/07/2022	July	Summer	1	A	A13	40	0
10/07/2022	July	Summer	1	A	A14	40	0
10/07/2022	July	Summer	1	A	A15	40	0
10/07/2022	July	Summer	1	A	A16	50	0
10/07/2022	July	Summer	1	A	A17	50	1
10/07/2022	July	Summer	1	A	A18	50	1
10/07/2022	July	Summer	1	A	A19	60	0
10/07/2022	July	Summer	1	A	A20	60	0
10/07/2022	July	Summer	1	A	A21	60	0
10/07/2022	July	Summer	1	B	B1	0	0
10/07/2022	July	Summer	1	B	B2	0	0
10/07/2022	July	Summer	1	B	B3	0	0
10/07/2022	July	Summer	1	B	B4	10	0
10/07/2022	July	Summer	1	B	B5	10	0
10/07/2022	July	Summer	1	B	B6	10	0
10/07/2022	July	Summer	1	B	B7	20	0
10/07/2022	July	Summer	1	B	B8	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
10/07/2022	July	Summer	1	B	B9	20	0
10/07/2022	July	Summer	1	B	B10	30	0
10/07/2022	July	Summer	1	B	B11	30	0
10/07/2022	July	Summer	1	B	B12	30	0
10/07/2022	July	Summer	1	B	B13	40	0
10/07/2022	July	Summer	1	B	B14	40	0
10/07/2022	July	Summer	1	B	B15	40	0
10/07/2022	July	Summer	1	B	B16	50	0
10/07/2022	July	Summer	1	B	B17	50	0
10/07/2022	July	Summer	1	B	B18	50	0
10/07/2022	July	Summer	1	B	B19	60	0
10/07/2022	July	Summer	1	B	B20	60	0
10/07/2022	July	Summer	1	B	B21	60	0
10/07/2022	July	Summer	2	C	C1	0	17
10/07/2022	July	Summer	2	C	C2	0	38
10/07/2022	July	Summer	2	C	C3	0	20
10/07/2022	July	Summer	2	C	C4	10	0
10/07/2022	July	Summer	2	C	C5	10	0
10/07/2022	July	Summer	2	C	C6	10	0
10/07/2022	July	Summer	2	C	C7	20	0
10/07/2022	July	Summer	2	C	C8	20	0
10/07/2022	July	Summer	2	C	C9	20	0
10/07/2022	July	Summer	2	C	C10	30	0
10/07/2022	July	Summer	2	C	C11	30	0
10/07/2022	July	Summer	2	C	C12	30	0
10/07/2022	July	Summer	2	C	C13	40	0
10/07/2022	July	Summer	2	C	C14	40	0
10/07/2022	July	Summer	2	C	C15	40	0
10/07/2022	July	Summer	2	C	C16	50	0
10/07/2022	July	Summer	2	C	C17	50	0
10/07/2022	July	Summer	2	C	C18	50	0
10/07/2022	July	Summer	2	C	C19	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
10/07/2022	July	Summer	2	C	C20	60	0
10/07/2022	July	Summer	2	C	C21	60	0
10/07/2022	July	Summer	2	D	D1	0	0
10/07/2022	July	Summer	2	D	D2	0	2
10/07/2022	July	Summer	2	D	D3	0	3
10/07/2022	July	Summer	2	D	D4	10	0
10/07/2022	July	Summer	2	D	D5	10	0
10/07/2022	July	Summer	2	D	D6	10	0
10/07/2022	July	Summer	2	D	D7	20	0
10/07/2022	July	Summer	2	D	D8	20	0
10/07/2022	July	Summer	2	D	D9	20	0
10/07/2022	July	Summer	2	D	D10	30	0
10/07/2022	July	Summer	2	D	D11	30	0
10/07/2022	July	Summer	2	D	D12	30	0
10/07/2022	July	Summer	2	D	D13	40	0
10/07/2022	July	Summer	2	D	D14	40	0
10/07/2022	July	Summer	2	D	D15	40	0
10/07/2022	July	Summer	2	D	D16	50	0
10/07/2022	July	Summer	2	D	D17	50	0
10/07/2022	July	Summer	2	D	D18	50	0
10/07/2022	July	Summer	2	D	D19	60	0
10/07/2022	July	Summer	2	D	D20	60	0
10/07/2022	July	Summer	2	D	D21	60	0
10/07/2022	July	Summer	2	E	E1	0	9
10/07/2022	July	Summer	2	E	E2	0	13
10/07/2022	July	Summer	2	E	E3	0	9
10/07/2022	July	Summer	2	E	E4	10	0
10/07/2022	July	Summer	2	E	E5	10	0
10/07/2022	July	Summer	2	E	E6	10	0
10/07/2022	July	Summer	2	E	E7	20	0
10/07/2022	July	Summer	2	E	E8	20	0
10/07/2022	July	Summer	2	E	E9	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
10/07/2022	July	Summer	2	E	E10	30	0
10/07/2022	July	Summer	2	E	E11	30	0
10/07/2022	July	Summer	2	E	E12	30	0
10/07/2022	July	Summer	2	E	E13	40	0
10/07/2022	July	Summer	2	E	E14	40	0
10/07/2022	July	Summer	2	E	E15	40	0
10/07/2022	July	Summer	2	E	E16	50	0
10/07/2022	July	Summer	2	E	E17	50	0
10/07/2022	July	Summer	2	E	E18	50	0
10/07/2022	July	Summer	2	E	E19	60	0
10/07/2022	July	Summer	2	E	E20	60	0
10/07/2022	July	Summer	2	E	E21	60	0
24/07/2022	July	Summer	1	A	A1	0	0
24/07/2022	July	Summer	1	A	A2	0	0
24/07/2022	July	Summer	1	A	A3	0	0
24/07/2022	July	Summer	1	A	A4	10	0
24/07/2022	July	Summer	1	A	A5	10	0
24/07/2022	July	Summer	1	A	A6	10	0
24/07/2022	July	Summer	1	A	A7	20	0
24/07/2022	July	Summer	1	A	A8	20	0
24/07/2022	July	Summer	1	A	A9	20	0
24/07/2022	July	Summer	1	A	A10	30	0
24/07/2022	July	Summer	1	A	A11	30	0
24/07/2022	July	Summer	1	A	A12	30	0
24/07/2022	July	Summer	1	A	A13	40	0
24/07/2022	July	Summer	1	A	A14	40	0
24/07/2022	July	Summer	1	A	A15	40	0
24/07/2022	July	Summer	1	A	A16	50	0
24/07/2022	July	Summer	1	A	A17	50	0
24/07/2022	July	Summer	1	A	A18	50	0
24/07/2022	July	Summer	1	A	A19	60	0
24/07/2022	July	Summer	1	A	A20	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
24/07/2022	July	Summer	1	A	A21	60	0
24/07/2022	July	Summer	1	B	B1	0	0
24/07/2022	July	Summer	1	B	B2	0	0
24/07/2022	July	Summer	1	B	B3	0	0
24/07/2022	July	Summer	1	B	B4	10	0
24/07/2022	July	Summer	1	B	B5	10	0
24/07/2022	July	Summer	1	B	B6	10	0
24/07/2022	July	Summer	1	B	B7	20	0
24/07/2022	July	Summer	1	B	B8	20	0
24/07/2022	July	Summer	1	B	B9	20	0
24/07/2022	July	Summer	1	B	B10	30	0
24/07/2022	July	Summer	1	B	B11	30	0
24/07/2022	July	Summer	1	B	B12	30	0
24/07/2022	July	Summer	1	B	B13	40	0
24/07/2022	July	Summer	1	B	B14	40	0
24/07/2022	July	Summer	1	B	B15	40	0
24/07/2022	July	Summer	1	B	B16	50	0
24/07/2022	July	Summer	1	B	B17	50	0
24/07/2022	July	Summer	1	B	B18	50	0
24/07/2022	July	Summer	1	B	B19	60	0
24/07/2022	July	Summer	1	B	B20	60	0
24/07/2022	July	Summer	1	B	B21	60	0
24/07/2022	July	Summer	2	C	C1	0	1
24/07/2022	July	Summer	2	C	C2	0	5
24/07/2022	July	Summer	2	C	C3	0	5
24/07/2022	July	Summer	2	C	C4	10	0
24/07/2022	July	Summer	2	C	C5	10	0
24/07/2022	July	Summer	2	C	C6	10	0
24/07/2022	July	Summer	2	C	C7	20	0
24/07/2022	July	Summer	2	C	C8	20	0
24/07/2022	July	Summer	2	C	C9	20	0
24/07/2022	July	Summer	2	C	C10	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
24/07/2022	July	Summer	2	C	C11	30	0
24/07/2022	July	Summer	2	C	C12	30	0
24/07/2022	July	Summer	2	C	C13	40	0
24/07/2022	July	Summer	2	C	C14	40	0
24/07/2022	July	Summer	2	C	C15	40	0
24/07/2022	July	Summer	2	C	C16	50	0
24/07/2022	July	Summer	2	C	C17	50	0
24/07/2022	July	Summer	2	C	C18	50	0
24/07/2022	July	Summer	2	C	C19	60	0
24/07/2022	July	Summer	2	C	C20	60	0
24/07/2022	July	Summer	2	C	C21	60	0
24/07/2022	July	Summer	2	D	D1	0	0
24/07/2022	July	Summer	2	D	D2	0	0
24/07/2022	July	Summer	2	D	D3	0	2
24/07/2022	July	Summer	2	D	D4	10	0
24/07/2022	July	Summer	2	D	D5	10	0
24/07/2022	July	Summer	2	D	D6	10	0
24/07/2022	July	Summer	2	D	D7	20	0
24/07/2022	July	Summer	2	D	D8	20	0
24/07/2022	July	Summer	2	D	D9	20	0
24/07/2022	July	Summer	2	D	D10	30	0
24/07/2022	July	Summer	2	D	D11	30	0
24/07/2022	July	Summer	2	D	D12	30	0
24/07/2022	July	Summer	2	D	D13	40	0
24/07/2022	July	Summer	2	D	D14	40	0
24/07/2022	July	Summer	2	D	D15	40	0
24/07/2022	July	Summer	2	D	D16	50	0
24/07/2022	July	Summer	2	D	D17	50	0
24/07/2022	July	Summer	2	D	D18	50	0
24/07/2022	July	Summer	2	D	D19	60	0
24/07/2022	July	Summer	2	D	D20	60	0
24/07/2022	July	Summer	2	D	D21	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
24/07/2022	July	Summer	2	E	E1	0	1
24/07/2022	July	Summer	2	E	E2	0	1
24/07/2022	July	Summer	2	E	E3	0	2
24/07/2022	July	Summer	2	E	E4	10	0
24/07/2022	July	Summer	2	E	E5	10	0
24/07/2022	July	Summer	2	E	E6	10	0
24/07/2022	July	Summer	2	E	E7	20	0
24/07/2022	July	Summer	2	E	E8	20	0
24/07/2022	July	Summer	2	E	E9	20	0
24/07/2022	July	Summer	2	E	E10	30	0
24/07/2022	July	Summer	2	E	E11	30	0
24/07/2022	July	Summer	2	E	E12	30	0
24/07/2022	July	Summer	2	E	E13	40	0
24/07/2022	July	Summer	2	E	E14	40	0
24/07/2022	July	Summer	2	E	E15	40	0
24/07/2022	July	Summer	2	E	E16	50	0
24/07/2022	July	Summer	2	E	E17	50	0
24/07/2022	July	Summer	2	E	E18	50	0
24/07/2022	July	Summer	2	E	E19	60	0
24/07/2022	July	Summer	2	E	E20	60	0
24/07/2022	July	Summer	2	E	E21	60	0
07/08/2022	August	Summer	1	A	A1	0	1
07/08/2022	August	Summer	1	A	A2	0	0
07/08/2022	August	Summer	1	A	A3	0	1
07/08/2022	August	Summer	1	A	A4	10	0
07/08/2022	August	Summer	1	A	A5	10	0
07/08/2022	August	Summer	1	A	A6	10	0
07/08/2022	August	Summer	1	A	A7	20	0
07/08/2022	August	Summer	1	A	A8	20	0
07/08/2022	August	Summer	1	A	A9	20	0
07/08/2022	August	Summer	1	A	A10	30	0
07/08/2022	August	Summer	1	A	A11	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
07/08/2022	August	Summer	1	A	A12	30	0
07/08/2022	August	Summer	1	A	A13	40	0
07/08/2022	August	Summer	1	A	A14	40	0
07/08/2022	August	Summer	1	A	A15	40	0
07/08/2022	August	Summer	1	A	A16	50	0
07/08/2022	August	Summer	1	A	A17	50	0
07/08/2022	August	Summer	1	A	A18	50	0
07/08/2022	August	Summer	1	A	A19	60	0
07/08/2022	August	Summer	1	A	A20	60	0
07/08/2022	August	Summer	1	A	A21	60	0
07/08/2022	August	Summer	1	B	B1	0	0
07/08/2022	August	Summer	1	B	B2	0	0
07/08/2022	August	Summer	1	B	B3	0	0
07/08/2022	August	Summer	1	B	B4	10	0
07/08/2022	August	Summer	1	B	B5	10	0
07/08/2022	August	Summer	1	B	B6	10	0
07/08/2022	August	Summer	1	B	B7	20	0
07/08/2022	August	Summer	1	B	B8	20	0
07/08/2022	August	Summer	1	B	B9	20	0
07/08/2022	August	Summer	1	B	B10	30	0
07/08/2022	August	Summer	1	B	B11	30	0
07/08/2022	August	Summer	1	B	B12	30	0
07/08/2022	August	Summer	1	B	B13	40	0
07/08/2022	August	Summer	1	B	B14	40	0
07/08/2022	August	Summer	1	B	B15	40	0
07/08/2022	August	Summer	1	B	B16	50	0
07/08/2022	August	Summer	1	B	B17	50	0
07/08/2022	August	Summer	1	B	B18	50	0
07/08/2022	August	Summer	1	B	B19	60	0
07/08/2022	August	Summer	1	B	B20	60	0
07/08/2022	August	Summer	1	B	B21	60	0
07/08/2022	August	Summer	2	C	C1	0	3

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
07/08/2022	August	Summer	2	C	C2	0	4
07/08/2022	August	Summer	2	C	C3	0	9
07/08/2022	August	Summer	2	C	C4	10	0
07/08/2022	August	Summer	2	C	C5	10	0
07/08/2022	August	Summer	2	C	C6	10	0
07/08/2022	August	Summer	2	C	C7	20	0
07/08/2022	August	Summer	2	C	C8	20	0
07/08/2022	August	Summer	2	C	C9	20	0
07/08/2022	August	Summer	2	C	C10	30	0
07/08/2022	August	Summer	2	C	C11	30	0
07/08/2022	August	Summer	2	C	C12	30	0
07/08/2022	August	Summer	2	C	C13	40	0
07/08/2022	August	Summer	2	C	C14	40	0
07/08/2022	August	Summer	2	C	C15	40	0
07/08/2022	August	Summer	2	C	C16	50	0
07/08/2022	August	Summer	2	C	C17	50	0
07/08/2022	August	Summer	2	C	C18	50	0
07/08/2022	August	Summer	2	C	C19	60	0
07/08/2022	August	Summer	2	C	C20	60	0
07/08/2022	August	Summer	2	C	C21	60	0
07/08/2022	August	Summer	2	D	D1	0	1
07/08/2022	August	Summer	2	D	D2	0	7
07/08/2022	August	Summer	2	D	D3	0	3
07/08/2022	August	Summer	2	D	D4	10	0
07/08/2022	August	Summer	2	D	D5	10	0
07/08/2022	August	Summer	2	D	D6	10	0
07/08/2022	August	Summer	2	D	D7	20	0
07/08/2022	August	Summer	2	D	D8	20	0
07/08/2022	August	Summer	2	D	D9	20	0
07/08/2022	August	Summer	2	D	D10	30	0
07/08/2022	August	Summer	2	D	D11	30	0
07/08/2022	August	Summer	2	D	D12	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
07/08/2022	August	Summer	2	D	D13	40	0
07/08/2022	August	Summer	2	D	D14	40	0
07/08/2022	August	Summer	2	D	D15	40	0
07/08/2022	August	Summer	2	D	D16	50	0
07/08/2022	August	Summer	2	D	D17	50	0
07/08/2022	August	Summer	2	D	D18	50	0
07/08/2022	August	Summer	2	D	D19	60	0
07/08/2022	August	Summer	2	D	D20	60	0
07/08/2022	August	Summer	2	D	D21	60	0
07/08/2022	August	Summer	2	E	E1	0	0
07/08/2022	August	Summer	2	E	E2	0	1
07/08/2022	August	Summer	2	E	E3	0	1
07/08/2022	August	Summer	2	E	E4	10	0
07/08/2022	August	Summer	2	E	E5	10	0
07/08/2022	August	Summer	2	E	E6	10	0
07/08/2022	August	Summer	2	E	E7	20	0
07/08/2022	August	Summer	2	E	E8	20	0
07/08/2022	August	Summer	2	E	E9	20	0
07/08/2022	August	Summer	2	E	E10	30	0
07/08/2022	August	Summer	2	E	E11	30	0
07/08/2022	August	Summer	2	E	E12	30	0
07/08/2022	August	Summer	2	E	E13	40	1
07/08/2022	August	Summer	2	E	E14	40	0
07/08/2022	August	Summer	2	E	E15	40	0
07/08/2022	August	Summer	2	E	E16	50	0
07/08/2022	August	Summer	2	E	E17	50	0
07/08/2022	August	Summer	2	E	E18	50	0
07/08/2022	August	Summer	2	E	E19	60	0
07/08/2022	August	Summer	2	E	E20	60	0
07/08/2022	August	Summer	2	E	E21	60	0
20/08/2022	August	Summer	1	A	A1	0	0
20/08/2022	August	Summer	1	A	A2	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/08/2022	August	Summer	1	A	A3	0	0
20/08/2022	August	Summer	1	A	A4	10	0
20/08/2022	August	Summer	1	A	A5	10	0
20/08/2022	August	Summer	1	A	A6	10	0
20/08/2022	August	Summer	1	A	A7	20	0
20/08/2022	August	Summer	1	A	A8	20	0
20/08/2022	August	Summer	1	A	A9	20	0
20/08/2022	August	Summer	1	A	A10	30	0
20/08/2022	August	Summer	1	A	A11	30	0
20/08/2022	August	Summer	1	A	A12	30	0
20/08/2022	August	Summer	1	A	A13	40	0
20/08/2022	August	Summer	1	A	A14	40	0
20/08/2022	August	Summer	1	A	A15	40	0
20/08/2022	August	Summer	1	A	A16	50	0
20/08/2022	August	Summer	1	A	A17	50	0
20/08/2022	August	Summer	1	A	A18	50	0
20/08/2022	August	Summer	1	A	A19	60	0
20/08/2022	August	Summer	1	A	A20	60	0
20/08/2022	August	Summer	1	A	A21	60	0
20/08/2022	August	Summer	1	B	B1	0	0
20/08/2022	August	Summer	1	B	B2	0	0
20/08/2022	August	Summer	1	B	B3	0	0
20/08/2022	August	Summer	1	B	B4	10	0
20/08/2022	August	Summer	1	B	B5	10	0
20/08/2022	August	Summer	1	B	B6	10	0
20/08/2022	August	Summer	1	B	B7	20	0
20/08/2022	August	Summer	1	B	B8	20	0
20/08/2022	August	Summer	1	B	B9	20	0
20/08/2022	August	Summer	1	B	B10	30	0
20/08/2022	August	Summer	1	B	B11	30	0
20/08/2022	August	Summer	1	B	B12	30	0
20/08/2022	August	Summer	1	B	B13	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/08/2022	August	Summer	1	B	B14	40	0
20/08/2022	August	Summer	1	B	B15	40	0
20/08/2022	August	Summer	1	B	B16	50	0
20/08/2022	August	Summer	1	B	B17	50	0
20/08/2022	August	Summer	1	B	B18	50	0
20/08/2022	August	Summer	1	B	B19	60	0
20/08/2022	August	Summer	1	B	B20	60	0
20/08/2022	August	Summer	1	B	B21	60	0
20/08/2022	August	Summer	2	C	C1	0	6
20/08/2022	August	Summer	2	C	C2	0	1
20/08/2022	August	Summer	2	C	C3	0	1
20/08/2022	August	Summer	2	C	C4	10	0
20/08/2022	August	Summer	2	C	C5	10	0
20/08/2022	August	Summer	2	C	C6	10	0
20/08/2022	August	Summer	2	C	C7	20	0
20/08/2022	August	Summer	2	C	C8	20	0
20/08/2022	August	Summer	2	C	C9	20	0
20/08/2022	August	Summer	2	C	C10	30	0
20/08/2022	August	Summer	2	C	C11	30	0
20/08/2022	August	Summer	2	C	C12	30	0
20/08/2022	August	Summer	2	C	C13	40	0
20/08/2022	August	Summer	2	C	C14	40	0
20/08/2022	August	Summer	2	C	C15	40	0
20/08/2022	August	Summer	2	C	C16	50	0
20/08/2022	August	Summer	2	C	C17	50	0
20/08/2022	August	Summer	2	C	C18	50	0
20/08/2022	August	Summer	2	C	C19	60	0
20/08/2022	August	Summer	2	C	C20	60	0
20/08/2022	August	Summer	2	C	C21	60	0
20/08/2022	August	Summer	2	D	D1	0	1
20/08/2022	August	Summer	2	D	D2	0	2
20/08/2022	August	Summer	2	D	D3	0	1

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/08/2022	August	Summer	2	D	D4	10	0
20/08/2022	August	Summer	2	D	D5	10	0
20/08/2022	August	Summer	2	D	D6	10	0
20/08/2022	August	Summer	2	D	D7	20	0
20/08/2022	August	Summer	2	D	D8	20	0
20/08/2022	August	Summer	2	D	D9	20	0
20/08/2022	August	Summer	2	D	D10	30	0
20/08/2022	August	Summer	2	D	D11	30	0
20/08/2022	August	Summer	2	D	D12	30	0
20/08/2022	August	Summer	2	D	D13	40	0
20/08/2022	August	Summer	2	D	D14	40	0
20/08/2022	August	Summer	2	D	D15	40	0
20/08/2022	August	Summer	2	D	D16	50	0
20/08/2022	August	Summer	2	D	D17	50	0
20/08/2022	August	Summer	2	D	D18	50	0
20/08/2022	August	Summer	2	D	D19	60	0
20/08/2022	August	Summer	2	D	D20	60	0
20/08/2022	August	Summer	2	D	D21	60	0
20/08/2022	August	Summer	2	E	E1	0	0
20/08/2022	August	Summer	2	E	E2	0	3
20/08/2022	August	Summer	2	E	E3	0	1
20/08/2022	August	Summer	2	E	E4	10	0
20/08/2022	August	Summer	2	E	E5	10	0
20/08/2022	August	Summer	2	E	E6	10	0
20/08/2022	August	Summer	2	E	E7	20	3
20/08/2022	August	Summer	2	E	E8	20	0
20/08/2022	August	Summer	2	E	E9	20	0
20/08/2022	August	Summer	2	E	E10	30	0
20/08/2022	August	Summer	2	E	E11	30	0
20/08/2022	August	Summer	2	E	E12	30	0
20/08/2022	August	Summer	2	E	E13	40	0
20/08/2022	August	Summer	2	E	E14	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/08/2022	August	Summer	2	E	E15	40	0
20/08/2022	August	Summer	2	E	E16	50	0
20/08/2022	August	Summer	2	E	E17	50	0
20/08/2022	August	Summer	2	E	E18	50	0
20/08/2022	August	Summer	2	E	E19	60	0
20/08/2022	August	Summer	2	E	E20	60	0
20/08/2022	August	Summer	2	E	E21	60	0
05/09/2022	September	Autumn	1	A	A1	0	0
05/09/2022	September	Autumn	1	A	A2	0	0
05/09/2022	September	Autumn	1	A	A3	0	0
05/09/2022	September	Autumn	1	A	A4	10	0
05/09/2022	September	Autumn	1	A	A5	10	0
05/09/2022	September	Autumn	1	A	A6	10	0
05/09/2022	September	Autumn	1	A	A7	20	0
05/09/2022	September	Autumn	1	A	A8	20	0
05/09/2022	September	Autumn	1	A	A9	20	0
05/09/2022	September	Autumn	1	A	A10	30	0
05/09/2022	September	Autumn	1	A	A11	30	0
05/09/2022	September	Autumn	1	A	A12	30	0
05/09/2022	September	Autumn	1	A	A13	40	0
05/09/2022	September	Autumn	1	A	A14	40	0
05/09/2022	September	Autumn	1	A	A15	40	0
05/09/2022	September	Autumn	1	A	A16	50	0
05/09/2022	September	Autumn	1	A	A17	50	0
05/09/2022	September	Autumn	1	A	A18	50	0
05/09/2022	September	Autumn	1	A	A19	60	0
05/09/2022	September	Autumn	1	A	A20	60	0
05/09/2022	September	Autumn	1	A	A21	60	0
05/09/2022	September	Autumn	1	B	B1	0	0
05/09/2022	September	Autumn	1	B	B2	0	0
05/09/2022	September	Autumn	1	B	B3	0	0
05/09/2022	September	Autumn	1	B	B4	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/09/2022	September	Autumn	1	B	B5	10	0
05/09/2022	September	Autumn	1	B	B6	10	0
05/09/2022	September	Autumn	1	B	B7	20	0
05/09/2022	September	Autumn	1	B	B8	20	0
05/09/2022	September	Autumn	1	B	B9	20	0
05/09/2022	September	Autumn	1	B	B10	30	0
05/09/2022	September	Autumn	1	B	B11	30	0
05/09/2022	September	Autumn	1	B	B12	30	0
05/09/2022	September	Autumn	1	B	B13	40	0
05/09/2022	September	Autumn	1	B	B14	40	0
05/09/2022	September	Autumn	1	B	B15	40	0
05/09/2022	September	Autumn	1	B	B16	50	0
05/09/2022	September	Autumn	1	B	B17	50	0
05/09/2022	September	Autumn	1	B	B18	50	0
05/09/2022	September	Autumn	1	B	B19	60	0
05/09/2022	September	Autumn	1	B	B20	60	0
05/09/2022	September	Autumn	1	B	B21	60	0
05/09/2022	September	Autumn	2	C	C1	0	1
05/09/2022	September	Autumn	2	C	C2	0	0
05/09/2022	September	Autumn	2	C	C3	0	0
05/09/2022	September	Autumn	2	C	C4	10	0
05/09/2022	September	Autumn	2	C	C5	10	0
05/09/2022	September	Autumn	2	C	C6	10	0
05/09/2022	September	Autumn	2	C	C7	20	0
05/09/2022	September	Autumn	2	C	C8	20	0
05/09/2022	September	Autumn	2	C	C9	20	0
05/09/2022	September	Autumn	2	C	C10	30	0
05/09/2022	September	Autumn	2	C	C11	30	0
05/09/2022	September	Autumn	2	C	C12	30	0
05/09/2022	September	Autumn	2	C	C13	40	0
05/09/2022	September	Autumn	2	C	C14	40	0
05/09/2022	September	Autumn	2	C	C15	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/09/2022	September	Autumn	2	C	C16	50	0
05/09/2022	September	Autumn	2	C	C17	50	0
05/09/2022	September	Autumn	2	C	C18	50	0
05/09/2022	September	Autumn	2	C	C19	60	0
05/09/2022	September	Autumn	2	C	C20	60	0
05/09/2022	September	Autumn	2	C	C21	60	0
05/09/2022	September	Autumn	2	D	D1	0	0
05/09/2022	September	Autumn	2	D	D2	0	0
05/09/2022	September	Autumn	2	D	D3	0	1
05/09/2022	September	Autumn	2	D	D4	10	0
05/09/2022	September	Autumn	2	D	D5	10	0
05/09/2022	September	Autumn	2	D	D6	10	0
05/09/2022	September	Autumn	2	D	D7	20	0
05/09/2022	September	Autumn	2	D	D8	20	0
05/09/2022	September	Autumn	2	D	D9	20	0
05/09/2022	September	Autumn	2	D	D10	30	0
05/09/2022	September	Autumn	2	D	D11	30	0
05/09/2022	September	Autumn	2	D	D12	30	0
05/09/2022	September	Autumn	2	D	D13	40	0
05/09/2022	September	Autumn	2	D	D14	40	0
05/09/2022	September	Autumn	2	D	D15	40	0
05/09/2022	September	Autumn	2	D	D16	50	0
05/09/2022	September	Autumn	2	D	D17	50	0
05/09/2022	September	Autumn	2	D	D18	50	0
05/09/2022	September	Autumn	2	D	D19	60	0
05/09/2022	September	Autumn	2	D	D20	60	0
05/09/2022	September	Autumn	2	D	D21	60	0
05/09/2022	September	Autumn	2	E	E1	0	1
05/09/2022	September	Autumn	2	E	E2	0	2
05/09/2022	September	Autumn	2	E	E3	0	1
05/09/2022	September	Autumn	2	E	E4	10	0
05/09/2022	September	Autumn	2	E	E5	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/09/2022	September	Autumn	2	E	E6	10	0
05/09/2022	September	Autumn	2	E	E7	20	0
05/09/2022	September	Autumn	2	E	E8	20	0
05/09/2022	September	Autumn	2	E	E9	20	0
05/09/2022	September	Autumn	2	E	E10	30	0
05/09/2022	September	Autumn	2	E	E11	30	0
05/09/2022	September	Autumn	2	E	E12	30	0
05/09/2022	September	Autumn	2	E	E13	40	0
05/09/2022	September	Autumn	2	E	E14	40	0
05/09/2022	September	Autumn	2	E	E15	40	0
05/09/2022	September	Autumn	2	E	E16	50	0
05/09/2022	September	Autumn	2	E	E17	50	0
05/09/2022	September	Autumn	2	E	E18	50	0
05/09/2022	September	Autumn	2	E	E19	60	0
05/09/2022	September	Autumn	2	E	E20	60	0
05/09/2022	September	Autumn	2	E	E21	60	0
16/09/2022	September	Autumn	1	A	A1	0	0
16/09/2022	September	Autumn	1	A	A2	0	0
16/09/2022	September	Autumn	1	A	A3	0	0
16/09/2022	September	Autumn	1	A	A4	10	0
16/09/2022	September	Autumn	1	A	A5	10	0
16/09/2022	September	Autumn	1	A	A6	10	0
16/09/2022	September	Autumn	1	A	A7	20	0
16/09/2022	September	Autumn	1	A	A8	20	0
16/09/2022	September	Autumn	1	A	A9	20	0
16/09/2022	September	Autumn	1	A	A10	30	0
16/09/2022	September	Autumn	1	A	A11	30	0
16/09/2022	September	Autumn	1	A	A12	30	0
16/09/2022	September	Autumn	1	A	A13	40	0
16/09/2022	September	Autumn	1	A	A14	40	0
16/09/2022	September	Autumn	1	A	A15	40	0
16/09/2022	September	Autumn	1	A	A16	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
16/09/2022	September	Autumn	1	A	A17	50	0
16/09/2022	September	Autumn	1	A	A18	50	0
16/09/2022	September	Autumn	1	A	A19	60	0
16/09/2022	September	Autumn	1	A	A20	60	0
16/09/2022	September	Autumn	1	A	A21	60	0
16/09/2022	September	Autumn	1	B	B1	0	0
16/09/2022	September	Autumn	1	B	B2	0	0
16/09/2022	September	Autumn	1	B	B3	0	0
16/09/2022	September	Autumn	1	B	B4	10	0
16/09/2022	September	Autumn	1	B	B5	10	0
16/09/2022	September	Autumn	1	B	B6	10	0
16/09/2022	September	Autumn	1	B	B7	20	0
16/09/2022	September	Autumn	1	B	B8	20	0
16/09/2022	September	Autumn	1	B	B9	20	0
16/09/2022	September	Autumn	1	B	B10	30	0
16/09/2022	September	Autumn	1	B	B11	30	0
16/09/2022	September	Autumn	1	B	B12	30	0
16/09/2022	September	Autumn	1	B	B13	40	0
16/09/2022	September	Autumn	1	B	B14	40	0
16/09/2022	September	Autumn	1	B	B15	40	0
16/09/2022	September	Autumn	1	B	B16	50	0
16/09/2022	September	Autumn	1	B	B17	50	0
16/09/2022	September	Autumn	1	B	B18	50	0
16/09/2022	September	Autumn	1	B	B19	60	0
16/09/2022	September	Autumn	1	B	B20	60	0
16/09/2022	September	Autumn	1	B	B21	60	0
16/09/2022	September	Autumn	2	C	C1	0	3
16/09/2022	September	Autumn	2	C	C2	0	4
16/09/2022	September	Autumn	2	C	C3	0	3
16/09/2022	September	Autumn	2	C	C4	10	0
16/09/2022	September	Autumn	2	C	C5	10	1
16/09/2022	September	Autumn	2	C	C6	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
16/09/2022	September	Autumn	2	C	C7	20	0
16/09/2022	September	Autumn	2	C	C8	20	0
16/09/2022	September	Autumn	2	C	C9	20	0
16/09/2022	September	Autumn	2	C	C10	30	0
16/09/2022	September	Autumn	2	C	C11	30	0
16/09/2022	September	Autumn	2	C	C12	30	0
16/09/2022	September	Autumn	2	C	C13	40	0
16/09/2022	September	Autumn	2	C	C14	40	0
16/09/2022	September	Autumn	2	C	C15	40	0
16/09/2022	September	Autumn	2	C	C16	50	0
16/09/2022	September	Autumn	2	C	C17	50	0
16/09/2022	September	Autumn	2	C	C18	50	0
16/09/2022	September	Autumn	2	C	C19	60	0
16/09/2022	September	Autumn	2	C	C20	60	0
16/09/2022	September	Autumn	2	C	C21	60	0
16/09/2022	September	Autumn	2	D	D1	0	1
16/09/2022	September	Autumn	2	D	D2	0	1
16/09/2022	September	Autumn	2	D	D3	0	3
16/09/2022	September	Autumn	2	D	D4	10	0
16/09/2022	September	Autumn	2	D	D5	10	0
16/09/2022	September	Autumn	2	D	D6	10	0
16/09/2022	September	Autumn	2	D	D7	20	0
16/09/2022	September	Autumn	2	D	D8	20	0
16/09/2022	September	Autumn	2	D	D9	20	0
16/09/2022	September	Autumn	2	D	D10	30	0
16/09/2022	September	Autumn	2	D	D11	30	0
16/09/2022	September	Autumn	2	D	D12	30	0
16/09/2022	September	Autumn	2	D	D13	40	0
16/09/2022	September	Autumn	2	D	D14	40	0
16/09/2022	September	Autumn	2	D	D15	40	0
16/09/2022	September	Autumn	2	D	D16	50	0
16/09/2022	September	Autumn	2	D	D17	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
16/09/2022	September	Autumn	2	D	D18	50	0
16/09/2022	September	Autumn	2	D	D19	60	0
16/09/2022	September	Autumn	2	D	D20	60	0
16/09/2022	September	Autumn	2	D	D21	60	0
16/09/2022	September	Autumn	2	E	E1	0	0
16/09/2022	September	Autumn	2	E	E2	0	2
16/09/2022	September	Autumn	2	E	E3	0	0
16/09/2022	September	Autumn	2	E	E4	10	0
16/09/2022	September	Autumn	2	E	E5	10	0
16/09/2022	September	Autumn	2	E	E6	10	0
16/09/2022	September	Autumn	2	E	E7	20	0
16/09/2022	September	Autumn	2	E	E8	20	0
16/09/2022	September	Autumn	2	E	E9	20	0
16/09/2022	September	Autumn	2	E	E10	30	0
16/09/2022	September	Autumn	2	E	E11	30	0
16/09/2022	September	Autumn	2	E	E12	30	0
16/09/2022	September	Autumn	2	E	E13	40	0
16/09/2022	September	Autumn	2	E	E14	40	0
16/09/2022	September	Autumn	2	E	E15	40	0
16/09/2022	September	Autumn	2	E	E16	50	0
16/09/2022	September	Autumn	2	E	E17	50	0
16/09/2022	September	Autumn	2	E	E18	50	0
16/09/2022	September	Autumn	2	E	E19	60	0
16/09/2022	September	Autumn	2	E	E20	60	0
16/09/2022	September	Autumn	2	E	E21	60	0
17/10/2022	October	Autumn	1	A	A1	0	0
17/10/2022	October	Autumn	1	A	A2	0	0
17/10/2022	October	Autumn	1	A	A3	0	0
17/10/2022	October	Autumn	1	A	A4	10	0
17/10/2022	October	Autumn	1	A	A5	10	0
17/10/2022	October	Autumn	1	A	A6	10	0
17/10/2022	October	Autumn	1	A	A7	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/10/2022	October	Autumn	1	A	A8	20	0
17/10/2022	October	Autumn	1	A	A9	20	0
17/10/2022	October	Autumn	1	A	A10	30	0
17/10/2022	October	Autumn	1	A	A11	30	0
17/10/2022	October	Autumn	1	A	A12	30	0
17/10/2022	October	Autumn	1	A	A13	40	0
17/10/2022	October	Autumn	1	A	A14	40	0
17/10/2022	October	Autumn	1	A	A15	40	0
17/10/2022	October	Autumn	1	A	A16	50	0
17/10/2022	October	Autumn	1	A	A17	50	0
17/10/2022	October	Autumn	1	A	A18	50	0
17/10/2022	October	Autumn	1	A	A19	60	0
17/10/2022	October	Autumn	1	A	A20	60	0
17/10/2022	October	Autumn	1	A	A21	60	0
17/10/2022	October	Autumn	1	B	B1	0	0
17/10/2022	October	Autumn	1	B	B2	0	0
17/10/2022	October	Autumn	1	B	B3	0	0
17/10/2022	October	Autumn	1	B	B4	10	0
17/10/2022	October	Autumn	1	B	B5	10	0
17/10/2022	October	Autumn	1	B	B6	10	0
17/10/2022	October	Autumn	1	B	B7	20	0
17/10/2022	October	Autumn	1	B	B8	20	0
17/10/2022	October	Autumn	1	B	B9	20	0
17/10/2022	October	Autumn	1	B	B10	30	0
17/10/2022	October	Autumn	1	B	B11	30	0
17/10/2022	October	Autumn	1	B	B12	30	0
17/10/2022	October	Autumn	1	B	B13	40	0
17/10/2022	October	Autumn	1	B	B14	40	0
17/10/2022	October	Autumn	1	B	B15	40	0
17/10/2022	October	Autumn	1	B	B16	50	0
17/10/2022	October	Autumn	1	B	B17	50	0
17/10/2022	October	Autumn	1	B	B18	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/10/2022	October	Autumn	1	B	B19	60	0
17/10/2022	October	Autumn	1	B	B20	60	0
17/10/2022	October	Autumn	1	B	B21	60	0
17/10/2022	October	Autumn	2	C	C1	0	0
17/10/2022	October	Autumn	2	C	C2	0	1
17/10/2022	October	Autumn	2	C	C3	0	1
17/10/2022	October	Autumn	2	C	C4	10	0
17/10/2022	October	Autumn	2	C	C5	10	0
17/10/2022	October	Autumn	2	C	C6	10	0
17/10/2022	October	Autumn	2	C	C7	20	0
17/10/2022	October	Autumn	2	C	C8	20	0
17/10/2022	October	Autumn	2	C	C9	20	0
17/10/2022	October	Autumn	2	C	C10	30	0
17/10/2022	October	Autumn	2	C	C11	30	0
17/10/2022	October	Autumn	2	C	C12	30	0
17/10/2022	October	Autumn	2	C	C13	40	0
17/10/2022	October	Autumn	2	C	C14	40	0
17/10/2022	October	Autumn	2	C	C15	40	0
17/10/2022	October	Autumn	2	C	C16	50	0
17/10/2022	October	Autumn	2	C	C17	50	0
17/10/2022	October	Autumn	2	C	C18	50	0
17/10/2022	October	Autumn	2	C	C19	60	0
17/10/2022	October	Autumn	2	C	C20	60	0
17/10/2022	October	Autumn	2	C	C21	60	0
17/10/2022	October	Autumn	2	D	D1	0	0
17/10/2022	October	Autumn	2	D	D2	0	1
17/10/2022	October	Autumn	2	D	D3	0	0
17/10/2022	October	Autumn	2	D	D4	10	0
17/10/2022	October	Autumn	2	D	D5	10	0
17/10/2022	October	Autumn	2	D	D6	10	0
17/10/2022	October	Autumn	2	D	D7	20	0
17/10/2022	October	Autumn	2	D	D8	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/10/2022	October	Autumn	2	D	D9	20	0
17/10/2022	October	Autumn	2	D	D10	30	0
17/10/2022	October	Autumn	2	D	D11	30	0
17/10/2022	October	Autumn	2	D	D12	30	0
17/10/2022	October	Autumn	2	D	D13	40	0
17/10/2022	October	Autumn	2	D	D14	40	0
17/10/2022	October	Autumn	2	D	D15	40	0
17/10/2022	October	Autumn	2	D	D16	50	0
17/10/2022	October	Autumn	2	D	D17	50	0
17/10/2022	October	Autumn	2	D	D18	50	0
17/10/2022	October	Autumn	2	D	D19	60	0
17/10/2022	October	Autumn	2	D	D20	60	0
17/10/2022	October	Autumn	2	D	D21	60	0
17/10/2022	October	Autumn	2	E	E1	0	1
17/10/2022	October	Autumn	2	E	E2	0	1
17/10/2022	October	Autumn	2	E	E3	0	1
17/10/2022	October	Autumn	2	E	E4	10	0
17/10/2022	October	Autumn	2	E	E5	10	0
17/10/2022	October	Autumn	2	E	E6	10	0
17/10/2022	October	Autumn	2	E	E7	20	0
17/10/2022	October	Autumn	2	E	E8	20	0
17/10/2022	October	Autumn	2	E	E9	20	0
17/10/2022	October	Autumn	2	E	E10	30	0
17/10/2022	October	Autumn	2	E	E11	30	0
17/10/2022	October	Autumn	2	E	E12	30	0
17/10/2022	October	Autumn	2	E	E13	40	0
17/10/2022	October	Autumn	2	E	E14	40	0
17/10/2022	October	Autumn	2	E	E15	40	0
17/10/2022	October	Autumn	2	E	E16	50	0
17/10/2022	October	Autumn	2	E	E17	50	0
17/10/2022	October	Autumn	2	E	E18	50	0
17/10/2022	October	Autumn	2	E	E19	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/10/2022	October	Autumn	2	E	E20	60	0
17/10/2022	October	Autumn	2	E	E21	60	0

Table 3: Raw data of seed trap results for Sitka spruce.

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/02/2022	February	Winter	1	A	A1	0	0
05/02/2022	February	Winter	1	A	A2	0	0
05/02/2022	February	Winter	1	A	A3	0	0
05/02/2022	February	Winter	1	A	A4	10	0
05/02/2022	February	Winter	1	A	A5	10	0
05/02/2022	February	Winter	1	A	A6	10	0
05/02/2022	February	Winter	1	A	A7	20	0
05/02/2022	February	Winter	1	A	A8	20	0
05/02/2022	February	Winter	1	A	A9	20	0
05/02/2022	February	Winter	1	A	A10	30	0
05/02/2022	February	Winter	1	A	A11	30	0
05/02/2022	February	Winter	1	A	A12	30	0
05/02/2022	February	Winter	1	A	A13	40	0
05/02/2022	February	Winter	1	A	A14	40	0
05/02/2022	February	Winter	1	A	A15	40	0
05/02/2022	February	Winter	1	A	A16	50	0
05/02/2022	February	Winter	1	A	A17	50	0
05/02/2022	February	Winter	1	A	A18	50	0
05/02/2022	February	Winter	1	A	A19	60	0
05/02/2022	February	Winter	1	A	A20	60	0
05/02/2022	February	Winter	1	A	A21	60	0
05/02/2022	February	Winter	1	B	B1	0	0
05/02/2022	February	Winter	1	B	B2	0	0
05/02/2022	February	Winter	1	B	B3	0	0
05/02/2022	February	Winter	1	B	B4	10	0
05/02/2022	February	Winter	1	B	B5	10	0
05/02/2022	February	Winter	1	B	B6	10	0
05/02/2022	February	Winter	1	B	B7	20	0
05/02/2022	February	Winter	1	B	B8	20	0
05/02/2022	February	Winter	1	B	B9	20	0
05/02/2022	February	Winter	1	B	B10	30	0
05/02/2022	February	Winter	1	B	B11	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/02/2022	February	Winter	1	B	B12	30	0
05/02/2022	February	Winter	1	B	B13	40	0
05/02/2022	February	Winter	1	B	B14	40	0
05/02/2022	February	Winter	1	B	B15	40	0
05/02/2022	February	Winter	1	B	B16	50	0
05/02/2022	February	Winter	1	B	B17	50	0
05/02/2022	February	Winter	1	B	B18	50	0
05/02/2022	February	Winter	1	B	B19	60	0
05/02/2022	February	Winter	1	B	B20	60	0
05/02/2022	February	Winter	1	B	B21	60	0
05/02/2022	February	Winter	2	C	C1	0	0
05/02/2022	February	Winter	2	C	C2	0	0
05/02/2022	February	Winter	2	C	C3	0	0
05/02/2022	February	Winter	2	C	C4	10	0
05/02/2022	February	Winter	2	C	C5	10	0
05/02/2022	February	Winter	2	C	C6	10	0
05/02/2022	February	Winter	2	C	C7	20	0
05/02/2022	February	Winter	2	C	C8	20	0
05/02/2022	February	Winter	2	C	C9	20	0
05/02/2022	February	Winter	2	C	C10	30	0
05/02/2022	February	Winter	2	C	C11	30	0
05/02/2022	February	Winter	2	C	C12	30	0
05/02/2022	February	Winter	2	C	C13	40	0
05/02/2022	February	Winter	2	C	C14	40	0
05/02/2022	February	Winter	2	C	C15	40	0
05/02/2022	February	Winter	2	C	C16	50	0
05/02/2022	February	Winter	2	C	C17	50	0
05/02/2022	February	Winter	2	C	C18	50	0
05/02/2022	February	Winter	2	C	C19	60	0
05/02/2022	February	Winter	2	C	C20	60	0
05/02/2022	February	Winter	2	C	C21	60	0
05/02/2022	February	Winter	2	D	D1	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/02/2022	February	Winter	2	D	D2	0	0
05/02/2022	February	Winter	2	D	D3	0	0
05/02/2022	February	Winter	2	D	D4	10	0
05/02/2022	February	Winter	2	D	D5	10	0
05/02/2022	February	Winter	2	D	D6	10	0
05/02/2022	February	Winter	2	D	D7	20	0
05/02/2022	February	Winter	2	D	D8	20	0
05/02/2022	February	Winter	2	D	D9	20	0
05/02/2022	February	Winter	2	D	D10	30	0
05/02/2022	February	Winter	2	D	D11	30	0
05/02/2022	February	Winter	2	D	D12	30	0
05/02/2022	February	Winter	2	D	D13	40	0
05/02/2022	February	Winter	2	D	D14	40	0
05/02/2022	February	Winter	2	D	D15	40	0
05/02/2022	February	Winter	2	D	D16	50	0
05/02/2022	February	Winter	2	D	D17	50	0
05/02/2022	February	Winter	2	D	D18	50	0
05/02/2022	February	Winter	2	D	D19	60	0
05/02/2022	February	Winter	2	D	D20	60	0
05/02/2022	February	Winter	2	D	D21	60	0
05/02/2022	February	Winter	2	E	E1	0	0
05/02/2022	February	Winter	2	E	E2	0	0
05/02/2022	February	Winter	2	E	E3	0	0
05/02/2022	February	Winter	2	E	E4	10	0
05/02/2022	February	Winter	2	E	E5	10	0
05/02/2022	February	Winter	2	E	E6	10	0
05/02/2022	February	Winter	2	E	E7	20	0
05/02/2022	February	Winter	2	E	E8	20	0
05/02/2022	February	Winter	2	E	E9	20	0
05/02/2022	February	Winter	2	E	E10	30	0
05/02/2022	February	Winter	2	E	E11	30	0
05/02/2022	February	Winter	2	E	E12	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/02/2022	February	Winter	2	E	E13	40	0
05/02/2022	February	Winter	2	E	E14	40	0
05/02/2022	February	Winter	2	E	E15	40	0
05/02/2022	February	Winter	2	E	E16	50	0
05/02/2022	February	Winter	2	E	E17	50	0
05/02/2022	February	Winter	2	E	E18	50	0
05/02/2022	February	Winter	2	E	E19	60	0
05/02/2022	February	Winter	2	E	E20	60	0
05/02/2022	February	Winter	2	E	E21	60	0
20/02/2022	February	Winter	1	A	A1	0	0
20/02/2022	February	Winter	1	A	A2	0	0
20/02/2022	February	Winter	1	A	A3	0	0
20/02/2022	February	Winter	1	A	A4	10	0
20/02/2022	February	Winter	1	A	A5	10	0
20/02/2022	February	Winter	1	A	A6	10	0
20/02/2022	February	Winter	1	A	A7	20	0
20/02/2022	February	Winter	1	A	A8	20	0
20/02/2022	February	Winter	1	A	A9	20	0
20/02/2022	February	Winter	1	A	A10	30	0
20/02/2022	February	Winter	1	A	A11	30	0
20/02/2022	February	Winter	1	A	A12	30	0
20/02/2022	February	Winter	1	A	A13	40	0
20/02/2022	February	Winter	1	A	A14	40	0
20/02/2022	February	Winter	1	A	A15	40	0
20/02/2022	February	Winter	1	A	A16	50	0
20/02/2022	February	Winter	1	A	A17	50	0
20/02/2022	February	Winter	1	A	A18	50	0
20/02/2022	February	Winter	1	A	A19	60	0
20/02/2022	February	Winter	1	A	A20	60	0
20/02/2022	February	Winter	1	A	A21	60	0
20/02/2022	February	Winter	1	B	B1	0	0
20/02/2022	February	Winter	1	B	B2	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/02/2022	February	Winter	1	B	B3	0	0
20/02/2022	February	Winter	1	B	B4	10	0
20/02/2022	February	Winter	1	B	B5	10	0
20/02/2022	February	Winter	1	B	B6	10	0
20/02/2022	February	Winter	1	B	B7	20	0
20/02/2022	February	Winter	1	B	B8	20	0
20/02/2022	February	Winter	1	B	B9	20	0
20/02/2022	February	Winter	1	B	B10	30	0
20/02/2022	February	Winter	1	B	B11	30	0
20/02/2022	February	Winter	1	B	B12	30	0
20/02/2022	February	Winter	1	B	B13	40	0
20/02/2022	February	Winter	1	B	B14	40	0
20/02/2022	February	Winter	1	B	B15	40	0
20/02/2022	February	Winter	1	B	B16	50	0
20/02/2022	February	Winter	1	B	B17	50	0
20/02/2022	February	Winter	1	B	B18	50	0
20/02/2022	February	Winter	1	B	B19	60	0
20/02/2022	February	Winter	1	B	B20	60	0
20/02/2022	February	Winter	1	B	B21	60	0
20/02/2022	February	Winter	2	C	C1	0	0
20/02/2022	February	Winter	2	C	C2	0	0
20/02/2022	February	Winter	2	C	C3	0	0
20/02/2022	February	Winter	2	C	C4	10	0
20/02/2022	February	Winter	2	C	C5	10	0
20/02/2022	February	Winter	2	C	C6	10	0
20/02/2022	February	Winter	2	C	C7	20	0
20/02/2022	February	Winter	2	C	C8	20	0
20/02/2022	February	Winter	2	C	C9	20	0
20/02/2022	February	Winter	2	C	C10	30	0
20/02/2022	February	Winter	2	C	C11	30	0
20/02/2022	February	Winter	2	C	C12	30	0
20/02/2022	February	Winter	2	C	C13	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/02/2022	February	Winter	2	C	C14	40	0
20/02/2022	February	Winter	2	C	C15	40	0
20/02/2022	February	Winter	2	C	C16	50	0
20/02/2022	February	Winter	2	C	C17	50	0
20/02/2022	February	Winter	2	C	C18	50	0
20/02/2022	February	Winter	2	C	C19	60	0
20/02/2022	February	Winter	2	C	C20	60	0
20/02/2022	February	Winter	2	C	C21	60	0
20/02/2022	February	Winter	2	D	D1	0	0
20/02/2022	February	Winter	2	D	D2	0	0
20/02/2022	February	Winter	2	D	D3	0	0
20/02/2022	February	Winter	2	D	D4	10	0
20/02/2022	February	Winter	2	D	D5	10	0
20/02/2022	February	Winter	2	D	D6	10	0
20/02/2022	February	Winter	2	D	D7	20	0
20/02/2022	February	Winter	2	D	D8	20	0
20/02/2022	February	Winter	2	D	D9	20	0
20/02/2022	February	Winter	2	D	D10	30	0
20/02/2022	February	Winter	2	D	D11	30	0
20/02/2022	February	Winter	2	D	D12	30	0
20/02/2022	February	Winter	2	D	D13	40	0
20/02/2022	February	Winter	2	D	D14	40	0
20/02/2022	February	Winter	2	D	D15	40	0
20/02/2022	February	Winter	2	D	D16	50	0
20/02/2022	February	Winter	2	D	D17	50	0
20/02/2022	February	Winter	2	D	D18	50	0
20/02/2022	February	Winter	2	D	D19	60	0
20/02/2022	February	Winter	2	D	D20	60	0
20/02/2022	February	Winter	2	D	D21	60	0
20/02/2022	February	Winter	2	E	E1	0	0
20/02/2022	February	Winter	2	E	E2	0	0
20/02/2022	February	Winter	2	E	E3	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/02/2022	February	Winter	2	E	E4	10	0
20/02/2022	February	Winter	2	E	E5	10	0
20/02/2022	February	Winter	2	E	E6	10	0
20/02/2022	February	Winter	2	E	E7	20	0
20/02/2022	February	Winter	2	E	E8	20	0
20/02/2022	February	Winter	2	E	E9	20	0
20/02/2022	February	Winter	2	E	E10	30	0
20/02/2022	February	Winter	2	E	E11	30	0
20/02/2022	February	Winter	2	E	E12	30	0
20/02/2022	February	Winter	2	E	E13	40	0
20/02/2022	February	Winter	2	E	E14	40	0
20/02/2022	February	Winter	2	E	E15	40	0
20/02/2022	February	Winter	2	E	E16	50	0
20/02/2022	February	Winter	2	E	E17	50	0
20/02/2022	February	Winter	2	E	E18	50	0
20/02/2022	February	Winter	2	E	E19	60	0
20/02/2022	February	Winter	2	E	E20	60	0
20/02/2022	February	Winter	2	E	E21	60	0
06/03/2022	March	Spring	1	A	A1	0	0
06/03/2022	March	Spring	1	A	A2	0	0
06/03/2022	March	Spring	1	A	A3	0	0
06/03/2022	March	Spring	1	A	A4	10	0
06/03/2022	March	Spring	1	A	A5	10	0
06/03/2022	March	Spring	1	A	A6	10	0
06/03/2022	March	Spring	1	A	A7	20	0
06/03/2022	March	Spring	1	A	A8	20	0
06/03/2022	March	Spring	1	A	A9	20	0
06/03/2022	March	Spring	1	A	A10	30	0
06/03/2022	March	Spring	1	A	A11	30	0
06/03/2022	March	Spring	1	A	A12	30	0
06/03/2022	March	Spring	1	A	A13	40	0
06/03/2022	March	Spring	1	A	A14	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
06/03/2022	March	Spring	1	A	A15	40	0
06/03/2022	March	Spring	1	A	A16	50	0
06/03/2022	March	Spring	1	A	A17	50	0
06/03/2022	March	Spring	1	A	A18	50	0
06/03/2022	March	Spring	1	A	A19	60	0
06/03/2022	March	Spring	1	A	A20	60	0
06/03/2022	March	Spring	1	A	A21	60	0
06/03/2022	March	Spring	1	B	B1	0	0
06/03/2022	March	Spring	1	B	B2	0	0
06/03/2022	March	Spring	1	B	B3	0	0
06/03/2022	March	Spring	1	B	B4	10	0
06/03/2022	March	Spring	1	B	B5	10	0
06/03/2022	March	Spring	1	B	B6	10	0
06/03/2022	March	Spring	1	B	B7	20	0
06/03/2022	March	Spring	1	B	B8	20	0
06/03/2022	March	Spring	1	B	B9	20	0
06/03/2022	March	Spring	1	B	B10	30	0
06/03/2022	March	Spring	1	B	B11	30	0
06/03/2022	March	Spring	1	B	B12	30	0
06/03/2022	March	Spring	1	B	B13	40	0
06/03/2022	March	Spring	1	B	B14	40	0
06/03/2022	March	Spring	1	B	B15	40	0
06/03/2022	March	Spring	1	B	B16	50	0
06/03/2022	March	Spring	1	B	B17	50	0
06/03/2022	March	Spring	1	B	B18	50	0
06/03/2022	March	Spring	1	B	B19	60	0
06/03/2022	March	Spring	1	B	B20	60	0
06/03/2022	March	Spring	1	B	B21	60	0
06/03/2022	March	Spring	2	C	C1	0	0
06/03/2022	March	Spring	2	C	C2	0	0
06/03/2022	March	Spring	2	C	C3	0	0
06/03/2022	March	Spring	2	C	C4	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
06/03/2022	March	Spring	2	C	C5	10	0
06/03/2022	March	Spring	2	C	C6	10	0
06/03/2022	March	Spring	2	C	C7	20	0
06/03/2022	March	Spring	2	C	C8	20	0
06/03/2022	March	Spring	2	C	C9	20	0
06/03/2022	March	Spring	2	C	C10	30	0
06/03/2022	March	Spring	2	C	C11	30	0
06/03/2022	March	Spring	2	C	C12	30	0
06/03/2022	March	Spring	2	C	C13	40	0
06/03/2022	March	Spring	2	C	C14	40	0
06/03/2022	March	Spring	2	C	C15	40	0
06/03/2022	March	Spring	2	C	C16	50	0
06/03/2022	March	Spring	2	C	C17	50	0
06/03/2022	March	Spring	2	C	C18	50	0
06/03/2022	March	Spring	2	C	C19	60	0
06/03/2022	March	Spring	2	C	C20	60	0
06/03/2022	March	Spring	2	C	C21	60	0
06/03/2022	March	Spring	2	D	D1	0	0
06/03/2022	March	Spring	2	D	D2	0	0
06/03/2022	March	Spring	2	D	D3	0	0
06/03/2022	March	Spring	2	D	D4	10	0
06/03/2022	March	Spring	2	D	D5	10	0
06/03/2022	March	Spring	2	D	D6	10	0
06/03/2022	March	Spring	2	D	D7	20	0
06/03/2022	March	Spring	2	D	D8	20	0
06/03/2022	March	Spring	2	D	D9	20	0
06/03/2022	March	Spring	2	D	D10	30	0
06/03/2022	March	Spring	2	D	D11	30	0
06/03/2022	March	Spring	2	D	D12	30	0
06/03/2022	March	Spring	2	D	D13	40	0
06/03/2022	March	Spring	2	D	D14	40	0
06/03/2022	March	Spring	2	D	D15	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
06/03/2022	March	Spring	2	D	D16	50	0
06/03/2022	March	Spring	2	D	D17	50	0
06/03/2022	March	Spring	2	D	D18	50	0
06/03/2022	March	Spring	2	D	D19	60	0
06/03/2022	March	Spring	2	D	D20	60	0
06/03/2022	March	Spring	2	D	D21	60	0
06/03/2022	March	Spring	2	E	E1	0	0
06/03/2022	March	Spring	2	E	E2	0	0
06/03/2022	March	Spring	2	E	E3	0	0
06/03/2022	March	Spring	2	E	E4	10	0
06/03/2022	March	Spring	2	E	E5	10	0
06/03/2022	March	Spring	2	E	E6	10	0
06/03/2022	March	Spring	2	E	E7	20	0
06/03/2022	March	Spring	2	E	E8	20	0
06/03/2022	March	Spring	2	E	E9	20	0
06/03/2022	March	Spring	2	E	E10	30	0
06/03/2022	March	Spring	2	E	E11	30	0
06/03/2022	March	Spring	2	E	E12	30	0
06/03/2022	March	Spring	2	E	E13	40	0
06/03/2022	March	Spring	2	E	E14	40	0
06/03/2022	March	Spring	2	E	E15	40	0
06/03/2022	March	Spring	2	E	E16	50	0
06/03/2022	March	Spring	2	E	E17	50	0
06/03/2022	March	Spring	2	E	E18	50	0
06/03/2022	March	Spring	2	E	E19	60	0
06/03/2022	March	Spring	2	E	E20	60	0
06/03/2022	March	Spring	2	E	E21	60	0
20/03/2022	March	Spring	1	A	A1	0	0
20/03/2022	March	Spring	1	A	A2	0	0
20/03/2022	March	Spring	1	A	A3	0	0
20/03/2022	March	Spring	1	A	A4	10	0
20/03/2022	March	Spring	1	A	A5	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/03/2022	March	Spring	1	A	A6	10	0
20/03/2022	March	Spring	1	A	A7	20	0
20/03/2022	March	Spring	1	A	A8	20	0
20/03/2022	March	Spring	1	A	A9	20	0
20/03/2022	March	Spring	1	A	A10	30	0
20/03/2022	March	Spring	1	A	A11	30	0
20/03/2022	March	Spring	1	A	A12	30	0
20/03/2022	March	Spring	1	A	A13	40	0
20/03/2022	March	Spring	1	A	A14	40	0
20/03/2022	March	Spring	1	A	A15	40	0
20/03/2022	March	Spring	1	A	A16	50	0
20/03/2022	March	Spring	1	A	A17	50	0
20/03/2022	March	Spring	1	A	A18	50	0
20/03/2022	March	Spring	1	A	A19	60	0
20/03/2022	March	Spring	1	A	A20	60	0
20/03/2022	March	Spring	1	A	A21	60	0
20/03/2022	March	Spring	1	B	B1	0	0
20/03/2022	March	Spring	1	B	B2	0	0
20/03/2022	March	Spring	1	B	B3	0	0
20/03/2022	March	Spring	1	B	B4	10	0
20/03/2022	March	Spring	1	B	B5	10	0
20/03/2022	March	Spring	1	B	B6	10	0
20/03/2022	March	Spring	1	B	B7	20	0
20/03/2022	March	Spring	1	B	B8	20	0
20/03/2022	March	Spring	1	B	B9	20	0
20/03/2022	March	Spring	1	B	B10	30	0
20/03/2022	March	Spring	1	B	B11	30	0
20/03/2022	March	Spring	1	B	B12	30	0
20/03/2022	March	Spring	1	B	B13	40	0
20/03/2022	March	Spring	1	B	B14	40	0
20/03/2022	March	Spring	1	B	B15	40	0
20/03/2022	March	Spring	1	B	B16	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/03/2022	March	Spring	1	B	B17	50	0
20/03/2022	March	Spring	1	B	B18	50	0
20/03/2022	March	Spring	1	B	B19	60	0
20/03/2022	March	Spring	1	B	B20	60	0
20/03/2022	March	Spring	1	B	B21	60	0
20/03/2022	March	Spring	2	C	C1	0	0
20/03/2022	March	Spring	2	C	C2	0	0
20/03/2022	March	Spring	2	C	C3	0	0
20/03/2022	March	Spring	2	C	C4	10	0
20/03/2022	March	Spring	2	C	C5	10	0
20/03/2022	March	Spring	2	C	C6	10	0
20/03/2022	March	Spring	2	C	C7	20	0
20/03/2022	March	Spring	2	C	C8	20	0
20/03/2022	March	Spring	2	C	C9	20	0
20/03/2022	March	Spring	2	C	C10	30	0
20/03/2022	March	Spring	2	C	C11	30	0
20/03/2022	March	Spring	2	C	C12	30	0
20/03/2022	March	Spring	2	C	C13	40	0
20/03/2022	March	Spring	2	C	C14	40	0
20/03/2022	March	Spring	2	C	C15	40	0
20/03/2022	March	Spring	2	C	C16	50	0
20/03/2022	March	Spring	2	C	C17	50	0
20/03/2022	March	Spring	2	C	C18	50	0
20/03/2022	March	Spring	2	C	C19	60	0
20/03/2022	March	Spring	2	C	C20	60	0
20/03/2022	March	Spring	2	C	C21	60	0
20/03/2022	March	Spring	2	D	D1	0	0
20/03/2022	March	Spring	2	D	D2	0	0
20/03/2022	March	Spring	2	D	D3	0	0
20/03/2022	March	Spring	2	D	D4	10	0
20/03/2022	March	Spring	2	D	D5	10	0
20/03/2022	March	Spring	2	D	D6	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/03/2022	March	Spring	2	D	D7	20	0
20/03/2022	March	Spring	2	D	D8	20	0
20/03/2022	March	Spring	2	D	D9	20	0
20/03/2022	March	Spring	2	D	D10	30	0
20/03/2022	March	Spring	2	D	D11	30	0
20/03/2022	March	Spring	2	D	D12	30	0
20/03/2022	March	Spring	2	D	D13	40	0
20/03/2022	March	Spring	2	D	D14	40	0
20/03/2022	March	Spring	2	D	D15	40	0
20/03/2022	March	Spring	2	D	D16	50	0
20/03/2022	March	Spring	2	D	D17	50	0
20/03/2022	March	Spring	2	D	D18	50	0
20/03/2022	March	Spring	2	D	D19	60	0
20/03/2022	March	Spring	2	D	D20	60	0
20/03/2022	March	Spring	2	D	D21	60	0
20/03/2022	March	Spring	2	E	E1	0	0
20/03/2022	March	Spring	2	E	E2	0	0
20/03/2022	March	Spring	2	E	E3	0	0
20/03/2022	March	Spring	2	E	E4	10	0
20/03/2022	March	Spring	2	E	E5	10	0
20/03/2022	March	Spring	2	E	E6	10	0
20/03/2022	March	Spring	2	E	E7	20	0
20/03/2022	March	Spring	2	E	E8	20	0
20/03/2022	March	Spring	2	E	E9	20	0
20/03/2022	March	Spring	2	E	E10	30	0
20/03/2022	March	Spring	2	E	E11	30	0
20/03/2022	March	Spring	2	E	E12	30	0
20/03/2022	March	Spring	2	E	E13	40	0
20/03/2022	March	Spring	2	E	E14	40	0
20/03/2022	March	Spring	2	E	E15	40	0
20/03/2022	March	Spring	2	E	E16	50	0
20/03/2022	March	Spring	2	E	E17	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/03/2022	March	Spring	2	E	E18	50	0
20/03/2022	March	Spring	2	E	E19	60	0
20/03/2022	March	Spring	2	E	E20	60	0
20/03/2022	March	Spring	2	E	E21	60	0
02/04/2022	April	Spring	1	A	A1	0	0
02/04/2022	April	Spring	1	A	A2	0	0
02/04/2022	April	Spring	1	A	A3	0	0
02/04/2022	April	Spring	1	A	A4	10	0
02/04/2022	April	Spring	1	A	A5	10	0
02/04/2022	April	Spring	1	A	A6	10	0
02/04/2022	April	Spring	1	A	A7	20	0
02/04/2022	April	Spring	1	A	A8	20	0
02/04/2022	April	Spring	1	A	A9	20	0
02/04/2022	April	Spring	1	A	A10	30	0
02/04/2022	April	Spring	1	A	A11	30	0
02/04/2022	April	Spring	1	A	A12	30	0
02/04/2022	April	Spring	1	A	A13	40	0
02/04/2022	April	Spring	1	A	A14	40	0
02/04/2022	April	Spring	1	A	A15	40	0
02/04/2022	April	Spring	1	A	A16	50	0
02/04/2022	April	Spring	1	A	A17	50	0
02/04/2022	April	Spring	1	A	A18	50	0
02/04/2022	April	Spring	1	A	A19	60	0
02/04/2022	April	Spring	1	A	A20	60	0
02/04/2022	April	Spring	1	A	A21	60	0
02/04/2022	April	Spring	1	B	B1	0	0
02/04/2022	April	Spring	1	B	B2	0	0
02/04/2022	April	Spring	1	B	B3	0	0
02/04/2022	April	Spring	1	B	B4	10	0
02/04/2022	April	Spring	1	B	B5	10	0
02/04/2022	April	Spring	1	B	B6	10	0
02/04/2022	April	Spring	1	B	B7	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
02/04/2022	April	Spring	1	B	B8	20	0
02/04/2022	April	Spring	1	B	B9	20	0
02/04/2022	April	Spring	1	B	B10	30	0
02/04/2022	April	Spring	1	B	B11	30	0
02/04/2022	April	Spring	1	B	B12	30	0
02/04/2022	April	Spring	1	B	B13	40	0
02/04/2022	April	Spring	1	B	B14	40	0
02/04/2022	April	Spring	1	B	B15	40	0
02/04/2022	April	Spring	1	B	B16	50	0
02/04/2022	April	Spring	1	B	B17	50	0
02/04/2022	April	Spring	1	B	B18	50	0
02/04/2022	April	Spring	1	B	B19	60	0
02/04/2022	April	Spring	1	B	B20	60	0
02/04/2022	April	Spring	1	B	B21	60	0
02/04/2022	April	Spring	2	C	C1	0	0
02/04/2022	April	Spring	2	C	C2	0	0
02/04/2022	April	Spring	2	C	C3	0	0
02/04/2022	April	Spring	2	C	C4	10	0
02/04/2022	April	Spring	2	C	C5	10	0
02/04/2022	April	Spring	2	C	C6	10	0
02/04/2022	April	Spring	2	C	C7	20	0
02/04/2022	April	Spring	2	C	C8	20	0
02/04/2022	April	Spring	2	C	C9	20	0
02/04/2022	April	Spring	2	C	C10	30	0
02/04/2022	April	Spring	2	C	C11	30	0
02/04/2022	April	Spring	2	C	C12	30	0
02/04/2022	April	Spring	2	C	C13	40	0
02/04/2022	April	Spring	2	C	C14	40	0
02/04/2022	April	Spring	2	C	C15	40	0
02/04/2022	April	Spring	2	C	C16	50	0
02/04/2022	April	Spring	2	C	C17	50	0
02/04/2022	April	Spring	2	C	C18	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
02/04/2022	April	Spring	2	C	C19	60	0
02/04/2022	April	Spring	2	C	C20	60	0
02/04/2022	April	Spring	2	C	C21	60	0
02/04/2022	April	Spring	2	D	D1	0	0
02/04/2022	April	Spring	2	D	D2	0	0
02/04/2022	April	Spring	2	D	D3	0	0
02/04/2022	April	Spring	2	D	D4	10	0
02/04/2022	April	Spring	2	D	D5	10	0
02/04/2022	April	Spring	2	D	D6	10	0
02/04/2022	April	Spring	2	D	D7	20	0
02/04/2022	April	Spring	2	D	D8	20	0
02/04/2022	April	Spring	2	D	D9	20	0
02/04/2022	April	Spring	2	D	D10	30	0
02/04/2022	April	Spring	2	D	D11	30	0
02/04/2022	April	Spring	2	D	D12	30	0
02/04/2022	April	Spring	2	D	D13	40	0
02/04/2022	April	Spring	2	D	D14	40	0
02/04/2022	April	Spring	2	D	D15	40	0
02/04/2022	April	Spring	2	D	D16	50	0
02/04/2022	April	Spring	2	D	D17	50	0
02/04/2022	April	Spring	2	D	D18	50	0
02/04/2022	April	Spring	2	D	D19	60	0
02/04/2022	April	Spring	2	D	D20	60	0
02/04/2022	April	Spring	2	D	D21	60	0
02/04/2022	April	Spring	2	E	E1	0	0
02/04/2022	April	Spring	2	E	E2	0	0
02/04/2022	April	Spring	2	E	E3	0	0
02/04/2022	April	Spring	2	E	E4	10	0
02/04/2022	April	Spring	2	E	E5	10	0
02/04/2022	April	Spring	2	E	E6	10	0
02/04/2022	April	Spring	2	E	E7	20	0
02/04/2022	April	Spring	2	E	E8	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
02/04/2022	April	Spring	2	E	E9	20	0
02/04/2022	April	Spring	2	E	E10	30	0
02/04/2022	April	Spring	2	E	E11	30	0
02/04/2022	April	Spring	2	E	E12	30	0
02/04/2022	April	Spring	2	E	E13	40	0
02/04/2022	April	Spring	2	E	E14	40	0
02/04/2022	April	Spring	2	E	E15	40	0
02/04/2022	April	Spring	2	E	E16	50	0
02/04/2022	April	Spring	2	E	E17	50	0
02/04/2022	April	Spring	2	E	E18	50	0
02/04/2022	April	Spring	2	E	E19	60	0
02/04/2022	April	Spring	2	E	E20	60	0
02/04/2022	April	Spring	2	E	E21	60	0
17/04/2022	April	Spring	1	A	A1	0	0
17/04/2022	April	Spring	1	A	A2	0	0
17/04/2022	April	Spring	1	A	A3	0	0
17/04/2022	April	Spring	1	A	A4	10	0
17/04/2022	April	Spring	1	A	A5	10	0
17/04/2022	April	Spring	1	A	A6	10	0
17/04/2022	April	Spring	1	A	A7	20	0
17/04/2022	April	Spring	1	A	A8	20	0
17/04/2022	April	Spring	1	A	A9	20	0
17/04/2022	April	Spring	1	A	A10	30	0
17/04/2022	April	Spring	1	A	A11	30	0
17/04/2022	April	Spring	1	A	A12	30	0
17/04/2022	April	Spring	1	A	A13	40	0
17/04/2022	April	Spring	1	A	A14	40	0
17/04/2022	April	Spring	1	A	A15	40	0
17/04/2022	April	Spring	1	A	A16	50	0
17/04/2022	April	Spring	1	A	A17	50	0
17/04/2022	April	Spring	1	A	A18	50	0
17/04/2022	April	Spring	1	A	A19	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/04/2022	April	Spring	1	A	A20	60	0
17/04/2022	April	Spring	1	A	A21	60	0
17/04/2022	April	Spring	1	B	B1	0	0
17/04/2022	April	Spring	1	B	B2	0	0
17/04/2022	April	Spring	1	B	B3	0	0
17/04/2022	April	Spring	1	B	B4	10	0
17/04/2022	April	Spring	1	B	B5	10	0
17/04/2022	April	Spring	1	B	B6	10	0
17/04/2022	April	Spring	1	B	B7	20	0
17/04/2022	April	Spring	1	B	B8	20	0
17/04/2022	April	Spring	1	B	B9	20	0
17/04/2022	April	Spring	1	B	B10	30	0
17/04/2022	April	Spring	1	B	B11	30	0
17/04/2022	April	Spring	1	B	B12	30	0
17/04/2022	April	Spring	1	B	B13	40	0
17/04/2022	April	Spring	1	B	B14	40	0
17/04/2022	April	Spring	1	B	B15	40	0
17/04/2022	April	Spring	1	B	B16	50	0
17/04/2022	April	Spring	1	B	B17	50	0
17/04/2022	April	Spring	1	B	B18	50	0
17/04/2022	April	Spring	1	B	B19	60	0
17/04/2022	April	Spring	1	B	B20	60	0
17/04/2022	April	Spring	1	B	B21	60	0
17/04/2022	April	Spring	2	C	C1	0	0
17/04/2022	April	Spring	2	C	C2	0	0
17/04/2022	April	Spring	2	C	C3	0	0
17/04/2022	April	Spring	2	C	C4	10	0
17/04/2022	April	Spring	2	C	C5	10	0
17/04/2022	April	Spring	2	C	C6	10	0
17/04/2022	April	Spring	2	C	C7	20	0
17/04/2022	April	Spring	2	C	C8	20	0
17/04/2022	April	Spring	2	C	C9	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/04/2022	April	Spring	2	C	C10	30	0
17/04/2022	April	Spring	2	C	C11	30	0
17/04/2022	April	Spring	2	C	C12	30	0
17/04/2022	April	Spring	2	C	C13	40	0
17/04/2022	April	Spring	2	C	C14	40	0
17/04/2022	April	Spring	2	C	C15	40	0
17/04/2022	April	Spring	2	C	C16	50	0
17/04/2022	April	Spring	2	C	C17	50	0
17/04/2022	April	Spring	2	C	C18	50	0
17/04/2022	April	Spring	2	C	C19	60	0
17/04/2022	April	Spring	2	C	C20	60	0
17/04/2022	April	Spring	2	C	C21	60	0
17/04/2022	April	Spring	2	D	D1	0	0
17/04/2022	April	Spring	2	D	D2	0	0
17/04/2022	April	Spring	2	D	D3	0	0
17/04/2022	April	Spring	2	D	D4	10	0
17/04/2022	April	Spring	2	D	D5	10	0
17/04/2022	April	Spring	2	D	D6	10	0
17/04/2022	April	Spring	2	D	D7	20	0
17/04/2022	April	Spring	2	D	D8	20	0
17/04/2022	April	Spring	2	D	D9	20	0
17/04/2022	April	Spring	2	D	D10	30	0
17/04/2022	April	Spring	2	D	D11	30	0
17/04/2022	April	Spring	2	D	D12	30	0
17/04/2022	April	Spring	2	D	D13	40	0
17/04/2022	April	Spring	2	D	D14	40	0
17/04/2022	April	Spring	2	D	D15	40	0
17/04/2022	April	Spring	2	D	D16	50	0
17/04/2022	April	Spring	2	D	D17	50	0
17/04/2022	April	Spring	2	D	D18	50	0
17/04/2022	April	Spring	2	D	D19	60	0
17/04/2022	April	Spring	2	D	D20	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/04/2022	April	Spring	2	D	D21	60	0
17/04/2022	April	Spring	2	E	E1	0	0
17/04/2022	April	Spring	2	E	E2	0	0
17/04/2022	April	Spring	2	E	E3	0	0
17/04/2022	April	Spring	2	E	E4	10	0
17/04/2022	April	Spring	2	E	E5	10	0
17/04/2022	April	Spring	2	E	E6	10	0
17/04/2022	April	Spring	2	E	E7	20	0
17/04/2022	April	Spring	2	E	E8	20	0
17/04/2022	April	Spring	2	E	E9	20	0
17/04/2022	April	Spring	2	E	E10	30	0
17/04/2022	April	Spring	2	E	E11	30	0
17/04/2022	April	Spring	2	E	E12	30	0
17/04/2022	April	Spring	2	E	E13	40	0
17/04/2022	April	Spring	2	E	E14	40	0
17/04/2022	April	Spring	2	E	E15	40	0
17/04/2022	April	Spring	2	E	E16	50	0
17/04/2022	April	Spring	2	E	E17	50	0
17/04/2022	April	Spring	2	E	E18	50	0
17/04/2022	April	Spring	2	E	E19	60	0
17/04/2022	April	Spring	2	E	E20	60	0
17/04/2022	April	Spring	2	E	E21	60	0
30/04/2022	April	Spring	1	A	A1	0	0
30/04/2022	April	Spring	1	A	A2	0	0
30/04/2022	April	Spring	1	A	A3	0	0
30/04/2022	April	Spring	1	A	A4	10	0
30/04/2022	April	Spring	1	A	A5	10	0
30/04/2022	April	Spring	1	A	A6	10	0
30/04/2022	April	Spring	1	A	A7	20	0
30/04/2022	April	Spring	1	A	A8	20	0
30/04/2022	April	Spring	1	A	A9	20	0
30/04/2022	April	Spring	1	A	A10	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
30/04/2022	April	Spring	1	A	A11	30	0
30/04/2022	April	Spring	1	A	A12	30	0
30/04/2022	April	Spring	1	A	A13	40	0
30/04/2022	April	Spring	1	A	A14	40	0
30/04/2022	April	Spring	1	A	A15	40	0
30/04/2022	April	Spring	1	A	A16	50	0
30/04/2022	April	Spring	1	A	A17	50	0
30/04/2022	April	Spring	1	A	A18	50	0
30/04/2022	April	Spring	1	A	A19	60	0
30/04/2022	April	Spring	1	A	A20	60	0
30/04/2022	April	Spring	1	A	A21	60	0
30/04/2022	April	Spring	1	B	B1	0	0
30/04/2022	April	Spring	1	B	B2	0	0
30/04/2022	April	Spring	1	B	B3	0	0
30/04/2022	April	Spring	1	B	B4	10	0
30/04/2022	April	Spring	1	B	B5	10	0
30/04/2022	April	Spring	1	B	B6	10	0
30/04/2022	April	Spring	1	B	B7	20	0
30/04/2022	April	Spring	1	B	B8	20	0
30/04/2022	April	Spring	1	B	B9	20	0
30/04/2022	April	Spring	1	B	B10	30	0
30/04/2022	April	Spring	1	B	B11	30	0
30/04/2022	April	Spring	1	B	B12	30	0
30/04/2022	April	Spring	1	B	B13	40	0
30/04/2022	April	Spring	1	B	B14	40	0
30/04/2022	April	Spring	1	B	B15	40	0
30/04/2022	April	Spring	1	B	B16	50	0
30/04/2022	April	Spring	1	B	B17	50	0
30/04/2022	April	Spring	1	B	B18	50	0
30/04/2022	April	Spring	1	B	B19	60	0
30/04/2022	April	Spring	1	B	B20	60	0
30/04/2022	April	Spring	1	B	B21	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
30/04/2022	April	Spring	2	C	C1	0	0
30/04/2022	April	Spring	2	C	C2	0	0
30/04/2022	April	Spring	2	C	C3	0	0
30/04/2022	April	Spring	2	C	C4	10	0
30/04/2022	April	Spring	2	C	C5	10	0
30/04/2022	April	Spring	2	C	C6	10	0
30/04/2022	April	Spring	2	C	C7	20	0
30/04/2022	April	Spring	2	C	C8	20	0
30/04/2022	April	Spring	2	C	C9	20	0
30/04/2022	April	Spring	2	C	C10	30	0
30/04/2022	April	Spring	2	C	C11	30	0
30/04/2022	April	Spring	2	C	C12	30	0
30/04/2022	April	Spring	2	C	C13	40	0
30/04/2022	April	Spring	2	C	C14	40	0
30/04/2022	April	Spring	2	C	C15	40	0
30/04/2022	April	Spring	2	C	C16	50	0
30/04/2022	April	Spring	2	C	C17	50	0
30/04/2022	April	Spring	2	C	C18	50	0
30/04/2022	April	Spring	2	C	C19	60	0
30/04/2022	April	Spring	2	C	C20	60	0
30/04/2022	April	Spring	2	C	C21	60	0
30/04/2022	April	Spring	2	D	D1	0	0
30/04/2022	April	Spring	2	D	D2	0	0
30/04/2022	April	Spring	2	D	D3	0	0
30/04/2022	April	Spring	2	D	D4	10	0
30/04/2022	April	Spring	2	D	D5	10	0
30/04/2022	April	Spring	2	D	D6	10	0
30/04/2022	April	Spring	2	D	D7	20	0
30/04/2022	April	Spring	2	D	D8	20	0
30/04/2022	April	Spring	2	D	D9	20	0
30/04/2022	April	Spring	2	D	D10	30	0
30/04/2022	April	Spring	2	D	D11	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
30/04/2022	April	Spring	2	D	D12	30	0
30/04/2022	April	Spring	2	D	D13	40	0
30/04/2022	April	Spring	2	D	D14	40	0
30/04/2022	April	Spring	2	D	D15	40	0
30/04/2022	April	Spring	2	D	D16	50	0
30/04/2022	April	Spring	2	D	D17	50	0
30/04/2022	April	Spring	2	D	D18	50	0
30/04/2022	April	Spring	2	D	D19	60	0
30/04/2022	April	Spring	2	D	D20	60	0
30/04/2022	April	Spring	2	D	D21	60	0
30/04/2022	April	Spring	2	E	E1	0	0
30/04/2022	April	Spring	2	E	E2	0	0
30/04/2022	April	Spring	2	E	E3	0	0
30/04/2022	April	Spring	2	E	E4	10	0
30/04/2022	April	Spring	2	E	E5	10	0
30/04/2022	April	Spring	2	E	E6	10	0
30/04/2022	April	Spring	2	E	E7	20	0
30/04/2022	April	Spring	2	E	E8	20	0
30/04/2022	April	Spring	2	E	E9	20	0
30/04/2022	April	Spring	2	E	E10	30	0
30/04/2022	April	Spring	2	E	E11	30	0
30/04/2022	April	Spring	2	E	E12	30	0
30/04/2022	April	Spring	2	E	E13	40	0
30/04/2022	April	Spring	2	E	E14	40	0
30/04/2022	April	Spring	2	E	E15	40	0
30/04/2022	April	Spring	2	E	E16	50	0
30/04/2022	April	Spring	2	E	E17	50	0
30/04/2022	April	Spring	2	E	E18	50	0
30/04/2022	April	Spring	2	E	E19	60	0
30/04/2022	April	Spring	2	E	E20	60	0
30/04/2022	April	Spring	2	E	E21	60	0
15/05/2022	May	Spring	1	A	A1	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
15/05/2022	May	Spring	1	A	A2	0	0
15/05/2022	May	Spring	1	A	A3	0	0
15/05/2022	May	Spring	1	A	A4	10	0
15/05/2022	May	Spring	1	A	A5	10	0
15/05/2022	May	Spring	1	A	A6	10	0
15/05/2022	May	Spring	1	A	A7	20	0
15/05/2022	May	Spring	1	A	A8	20	0
15/05/2022	May	Spring	1	A	A9	20	0
15/05/2022	May	Spring	1	A	A10	30	0
15/05/2022	May	Spring	1	A	A11	30	0
15/05/2022	May	Spring	1	A	A12	30	0
15/05/2022	May	Spring	1	A	A13	40	0
15/05/2022	May	Spring	1	A	A14	40	0
15/05/2022	May	Spring	1	A	A15	40	0
15/05/2022	May	Spring	1	A	A16	50	0
15/05/2022	May	Spring	1	A	A17	50	0
15/05/2022	May	Spring	1	A	A18	50	0
15/05/2022	May	Spring	1	A	A19	60	0
15/05/2022	May	Spring	1	A	A20	60	0
15/05/2022	May	Spring	1	A	A21	60	0
15/05/2022	May	Spring	1	B	B1	0	0
15/05/2022	May	Spring	1	B	B2	0	0
15/05/2022	May	Spring	1	B	B3	0	0
15/05/2022	May	Spring	1	B	B4	10	0
15/05/2022	May	Spring	1	B	B5	10	0
15/05/2022	May	Spring	1	B	B6	10	0
15/05/2022	May	Spring	1	B	B7	20	0
15/05/2022	May	Spring	1	B	B8	20	0
15/05/2022	May	Spring	1	B	B9	20	0
15/05/2022	May	Spring	1	B	B10	30	0
15/05/2022	May	Spring	1	B	B11	30	0
15/05/2022	May	Spring	1	B	B12	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
15/05/2022	May	Spring	1	B	B13	40	0
15/05/2022	May	Spring	1	B	B14	40	0
15/05/2022	May	Spring	1	B	B15	40	0
15/05/2022	May	Spring	1	B	B16	50	0
15/05/2022	May	Spring	1	B	B17	50	0
15/05/2022	May	Spring	1	B	B18	50	0
15/05/2022	May	Spring	1	B	B19	60	0
15/05/2022	May	Spring	1	B	B20	60	0
15/05/2022	May	Spring	1	B	B21	60	0
15/05/2022	May	Spring	2	C	C1	0	0
15/05/2022	May	Spring	2	C	C2	0	0
15/05/2022	May	Spring	2	C	C3	0	0
15/05/2022	May	Spring	2	C	C4	10	0
15/05/2022	May	Spring	2	C	C5	10	0
15/05/2022	May	Spring	2	C	C6	10	0
15/05/2022	May	Spring	2	C	C7	20	0
15/05/2022	May	Spring	2	C	C8	20	0
15/05/2022	May	Spring	2	C	C9	20	0
15/05/2022	May	Spring	2	C	C10	30	0
15/05/2022	May	Spring	2	C	C11	30	0
15/05/2022	May	Spring	2	C	C12	30	0
15/05/2022	May	Spring	2	C	C13	40	0
15/05/2022	May	Spring	2	C	C14	40	0
15/05/2022	May	Spring	2	C	C15	40	0
15/05/2022	May	Spring	2	C	C16	50	0
15/05/2022	May	Spring	2	C	C17	50	0
15/05/2022	May	Spring	2	C	C18	50	0
15/05/2022	May	Spring	2	C	C19	60	0
15/05/2022	May	Spring	2	C	C20	60	0
15/05/2022	May	Spring	2	C	C21	60	0
15/05/2022	May	Spring	2	D	D1	0	0
15/05/2022	May	Spring	2	D	D2	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
15/05/2022	May	Spring	2	D	D3	0	0
15/05/2022	May	Spring	2	D	D4	10	0
15/05/2022	May	Spring	2	D	D5	10	0
15/05/2022	May	Spring	2	D	D6	10	0
15/05/2022	May	Spring	2	D	D7	20	0
15/05/2022	May	Spring	2	D	D8	20	0
15/05/2022	May	Spring	2	D	D9	20	0
15/05/2022	May	Spring	2	D	D10	30	0
15/05/2022	May	Spring	2	D	D11	30	0
15/05/2022	May	Spring	2	D	D12	30	0
15/05/2022	May	Spring	2	D	D13	40	0
15/05/2022	May	Spring	2	D	D14	40	0
15/05/2022	May	Spring	2	D	D15	40	0
15/05/2022	May	Spring	2	D	D16	50	0
15/05/2022	May	Spring	2	D	D17	50	0
15/05/2022	May	Spring	2	D	D18	50	0
15/05/2022	May	Spring	2	D	D19	60	0
15/05/2022	May	Spring	2	D	D20	60	0
15/05/2022	May	Spring	2	D	D21	60	0
15/05/2022	May	Spring	2	E	E1	0	0
15/05/2022	May	Spring	2	E	E2	0	0
15/05/2022	May	Spring	2	E	E3	0	0
15/05/2022	May	Spring	2	E	E4	10	0
15/05/2022	May	Spring	2	E	E5	10	0
15/05/2022	May	Spring	2	E	E6	10	0
15/05/2022	May	Spring	2	E	E7	20	0
15/05/2022	May	Spring	2	E	E8	20	0
15/05/2022	May	Spring	2	E	E9	20	0
15/05/2022	May	Spring	2	E	E10	30	0
15/05/2022	May	Spring	2	E	E11	30	0
15/05/2022	May	Spring	2	E	E12	30	0
15/05/2022	May	Spring	2	E	E13	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
15/05/2022	May	Spring	2	E	E14	40	0
15/05/2022	May	Spring	2	E	E15	40	0
15/05/2022	May	Spring	2	E	E16	50	0
15/05/2022	May	Spring	2	E	E17	50	0
15/05/2022	May	Spring	2	E	E18	50	0
15/05/2022	May	Spring	2	E	E19	60	0
15/05/2022	May	Spring	2	E	E20	60	0
15/05/2022	May	Spring	2	E	E21	60	0
29/05/2022	May	Spring	1	A	A1	0	0
29/05/2022	May	Spring	1	A	A2	0	0
29/05/2022	May	Spring	1	A	A3	0	0
29/05/2022	May	Spring	1	A	A4	10	0
29/05/2022	May	Spring	1	A	A5	10	0
29/05/2022	May	Spring	1	A	A6	10	0
29/05/2022	May	Spring	1	A	A7	20	0
29/05/2022	May	Spring	1	A	A8	20	0
29/05/2022	May	Spring	1	A	A9	20	0
29/05/2022	May	Spring	1	A	A10	30	0
29/05/2022	May	Spring	1	A	A11	30	0
29/05/2022	May	Spring	1	A	A12	30	0
29/05/2022	May	Spring	1	A	A13	40	0
29/05/2022	May	Spring	1	A	A14	40	0
29/05/2022	May	Spring	1	A	A15	40	0
29/05/2022	May	Spring	1	A	A16	50	0
29/05/2022	May	Spring	1	A	A17	50	0
29/05/2022	May	Spring	1	A	A18	50	0
29/05/2022	May	Spring	1	A	A19	60	0
29/05/2022	May	Spring	1	A	A20	60	0
29/05/2022	May	Spring	1	A	A21	60	0
29/05/2022	May	Spring	1	B	B1	0	0
29/05/2022	May	Spring	1	B	B2	0	0
29/05/2022	May	Spring	1	B	B3	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/05/2022	May	Spring	1	B	B4	10	0
29/05/2022	May	Spring	1	B	B5	10	0
29/05/2022	May	Spring	1	B	B6	10	0
29/05/2022	May	Spring	1	B	B7	20	0
29/05/2022	May	Spring	1	B	B8	20	0
29/05/2022	May	Spring	1	B	B9	20	0
29/05/2022	May	Spring	1	B	B10	30	0
29/05/2022	May	Spring	1	B	B11	30	0
29/05/2022	May	Spring	1	B	B12	30	0
29/05/2022	May	Spring	1	B	B13	40	0
29/05/2022	May	Spring	1	B	B14	40	0
29/05/2022	May	Spring	1	B	B15	40	0
29/05/2022	May	Spring	1	B	B16	50	0
29/05/2022	May	Spring	1	B	B17	50	0
29/05/2022	May	Spring	1	B	B18	50	0
29/05/2022	May	Spring	1	B	B19	60	0
29/05/2022	May	Spring	1	B	B20	60	0
29/05/2022	May	Spring	1	B	B21	60	0
29/05/2022	May	Spring	2	C	C1	0	0
29/05/2022	May	Spring	2	C	C2	0	0
29/05/2022	May	Spring	2	C	C3	0	0
29/05/2022	May	Spring	2	C	C4	10	0
29/05/2022	May	Spring	2	C	C5	10	0
29/05/2022	May	Spring	2	C	C6	10	0
29/05/2022	May	Spring	2	C	C7	20	0
29/05/2022	May	Spring	2	C	C8	20	0
29/05/2022	May	Spring	2	C	C9	20	0
29/05/2022	May	Spring	2	C	C10	30	0
29/05/2022	May	Spring	2	C	C11	30	0
29/05/2022	May	Spring	2	C	C12	30	0
29/05/2022	May	Spring	2	C	C13	40	0
29/05/2022	May	Spring	2	C	C14	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/05/2022	May	Spring	2	C	C15	40	0
29/05/2022	May	Spring	2	C	C16	50	0
29/05/2022	May	Spring	2	C	C17	50	0
29/05/2022	May	Spring	2	C	C18	50	0
29/05/2022	May	Spring	2	C	C19	60	0
29/05/2022	May	Spring	2	C	C20	60	0
29/05/2022	May	Spring	2	C	C21	60	0
29/05/2022	May	Spring	2	D	D1	0	0
29/05/2022	May	Spring	2	D	D2	0	0
29/05/2022	May	Spring	2	D	D3	0	0
29/05/2022	May	Spring	2	D	D4	10	0
29/05/2022	May	Spring	2	D	D5	10	0
29/05/2022	May	Spring	2	D	D6	10	0
29/05/2022	May	Spring	2	D	D7	20	0
29/05/2022	May	Spring	2	D	D8	20	0
29/05/2022	May	Spring	2	D	D9	20	0
29/05/2022	May	Spring	2	D	D10	30	0
29/05/2022	May	Spring	2	D	D11	30	0
29/05/2022	May	Spring	2	D	D12	30	0
29/05/2022	May	Spring	2	D	D13	40	0
29/05/2022	May	Spring	2	D	D14	40	0
29/05/2022	May	Spring	2	D	D15	40	0
29/05/2022	May	Spring	2	D	D16	50	0
29/05/2022	May	Spring	2	D	D17	50	0
29/05/2022	May	Spring	2	D	D18	50	0
29/05/2022	May	Spring	2	D	D19	60	0
29/05/2022	May	Spring	2	D	D20	60	0
29/05/2022	May	Spring	2	D	D21	60	0
29/05/2022	May	Spring	2	E	E1	0	0
29/05/2022	May	Spring	2	E	E2	0	0
29/05/2022	May	Spring	2	E	E3	0	0
29/05/2022	May	Spring	2	E	E4	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/05/2022	May	Spring	2	E	E5	10	0
29/05/2022	May	Spring	2	E	E6	10	0
29/05/2022	May	Spring	2	E	E7	20	0
29/05/2022	May	Spring	2	E	E8	20	0
29/05/2022	May	Spring	2	E	E9	20	0
29/05/2022	May	Spring	2	E	E10	30	0
29/05/2022	May	Spring	2	E	E11	30	0
29/05/2022	May	Spring	2	E	E12	30	0
29/05/2022	May	Spring	2	E	E13	40	0
29/05/2022	May	Spring	2	E	E14	40	0
29/05/2022	May	Spring	2	E	E15	40	0
29/05/2022	May	Spring	2	E	E16	50	0
29/05/2022	May	Spring	2	E	E17	50	0
29/05/2022	May	Spring	2	E	E18	50	0
29/05/2022	May	Spring	2	E	E19	60	0
29/05/2022	May	Spring	2	E	E20	60	0
29/05/2022	May	Spring	2	E	E21	60	0
12/06/2022	June	Summer	1	A	A1	0	0
12/06/2022	June	Summer	1	A	A2	0	0
12/06/2022	June	Summer	1	A	A3	0	0
12/06/2022	June	Summer	1	A	A4	10	0
12/06/2022	June	Summer	1	A	A5	10	0
12/06/2022	June	Summer	1	A	A6	10	0
12/06/2022	June	Summer	1	A	A7	20	0
12/06/2022	June	Summer	1	A	A8	20	0
12/06/2022	June	Summer	1	A	A9	20	0
12/06/2022	June	Summer	1	A	A10	30	0
12/06/2022	June	Summer	1	A	A11	30	0
12/06/2022	June	Summer	1	A	A12	30	0
12/06/2022	June	Summer	1	A	A13	40	0
12/06/2022	June	Summer	1	A	A14	40	0
12/06/2022	June	Summer	1	A	A15	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
12/06/2022	June	Summer	1	A	A16	50	0
12/06/2022	June	Summer	1	A	A17	50	0
12/06/2022	June	Summer	1	A	A18	50	0
12/06/2022	June	Summer	1	A	A19	60	0
12/06/2022	June	Summer	1	A	A20	60	0
12/06/2022	June	Summer	1	A	A21	60	0
12/06/2022	June	Summer	1	B	B1	0	0
12/06/2022	June	Summer	1	B	B2	0	0
12/06/2022	June	Summer	1	B	B3	0	0
12/06/2022	June	Summer	1	B	B4	10	0
12/06/2022	June	Summer	1	B	B5	10	0
12/06/2022	June	Summer	1	B	B6	10	0
12/06/2022	June	Summer	1	B	B7	20	0
12/06/2022	June	Summer	1	B	B8	20	0
12/06/2022	June	Summer	1	B	B9	20	0
12/06/2022	June	Summer	1	B	B10	30	0
12/06/2022	June	Summer	1	B	B11	30	0
12/06/2022	June	Summer	1	B	B12	30	0
12/06/2022	June	Summer	1	B	B13	40	0
12/06/2022	June	Summer	1	B	B14	40	0
12/06/2022	June	Summer	1	B	B15	40	0
12/06/2022	June	Summer	1	B	B16	50	0
12/06/2022	June	Summer	1	B	B17	50	0
12/06/2022	June	Summer	1	B	B18	50	0
12/06/2022	June	Summer	1	B	B19	60	0
12/06/2022	June	Summer	1	B	B20	60	0
12/06/2022	June	Summer	1	B	B21	60	0
12/06/2022	June	Summer	2	C	C1	0	0
12/06/2022	June	Summer	2	C	C2	0	0
12/06/2022	June	Summer	2	C	C3	0	0
12/06/2022	June	Summer	2	C	C4	10	0
12/06/2022	June	Summer	2	C	C5	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
12/06/2022	June	Summer	2	C	C6	10	0
12/06/2022	June	Summer	2	C	C7	20	0
12/06/2022	June	Summer	2	C	C8	20	0
12/06/2022	June	Summer	2	C	C9	20	0
12/06/2022	June	Summer	2	C	C10	30	0
12/06/2022	June	Summer	2	C	C11	30	0
12/06/2022	June	Summer	2	C	C12	30	0
12/06/2022	June	Summer	2	C	C13	40	0
12/06/2022	June	Summer	2	C	C14	40	0
12/06/2022	June	Summer	2	C	C15	40	0
12/06/2022	June	Summer	2	C	C16	50	0
12/06/2022	June	Summer	2	C	C17	50	0
12/06/2022	June	Summer	2	C	C18	50	0
12/06/2022	June	Summer	2	C	C19	60	0
12/06/2022	June	Summer	2	C	C20	60	0
12/06/2022	June	Summer	2	C	C21	60	0
12/06/2022	June	Summer	2	D	D1	0	0
12/06/2022	June	Summer	2	D	D2	0	0
12/06/2022	June	Summer	2	D	D3	0	0
12/06/2022	June	Summer	2	D	D4	10	0
12/06/2022	June	Summer	2	D	D5	10	0
12/06/2022	June	Summer	2	D	D6	10	0
12/06/2022	June	Summer	2	D	D7	20	0
12/06/2022	June	Summer	2	D	D8	20	0
12/06/2022	June	Summer	2	D	D9	20	0
12/06/2022	June	Summer	2	D	D10	30	0
12/06/2022	June	Summer	2	D	D11	30	0
12/06/2022	June	Summer	2	D	D12	30	0
12/06/2022	June	Summer	2	D	D13	40	0
12/06/2022	June	Summer	2	D	D14	40	0
12/06/2022	June	Summer	2	D	D15	40	0
12/06/2022	June	Summer	2	D	D16	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
12/06/2022	June	Summer	2	D	D17	50	0
12/06/2022	June	Summer	2	D	D18	50	0
12/06/2022	June	Summer	2	D	D19	60	0
12/06/2022	June	Summer	2	D	D20	60	0
12/06/2022	June	Summer	2	D	D21	60	0
12/06/2022	June	Summer	2	E	E1	0	0
12/06/2022	June	Summer	2	E	E2	0	0
12/06/2022	June	Summer	2	E	E3	0	0
12/06/2022	June	Summer	2	E	E4	10	0
12/06/2022	June	Summer	2	E	E5	10	0
12/06/2022	June	Summer	2	E	E6	10	0
12/06/2022	June	Summer	2	E	E7	20	0
12/06/2022	June	Summer	2	E	E8	20	0
12/06/2022	June	Summer	2	E	E9	20	0
12/06/2022	June	Summer	2	E	E10	30	0
12/06/2022	June	Summer	2	E	E11	30	0
12/06/2022	June	Summer	2	E	E12	30	0
12/06/2022	June	Summer	2	E	E13	40	0
12/06/2022	June	Summer	2	E	E14	40	0
12/06/2022	June	Summer	2	E	E15	40	0
12/06/2022	June	Summer	2	E	E16	50	0
12/06/2022	June	Summer	2	E	E17	50	0
12/06/2022	June	Summer	2	E	E18	50	0
12/06/2022	June	Summer	2	E	E19	60	0
12/06/2022	June	Summer	2	E	E20	60	0
12/06/2022	June	Summer	2	E	E21	60	0
29/06/2022	June	Summer	1	A	A1	0	0
29/06/2022	June	Summer	1	A	A2	0	0
29/06/2022	June	Summer	1	A	A3	0	0
29/06/2022	June	Summer	1	A	A4	10	0
29/06/2022	June	Summer	1	A	A5	10	0
29/06/2022	June	Summer	1	A	A6	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/06/2022	June	Summer	1	A	A7	20	0
29/06/2022	June	Summer	1	A	A8	20	0
29/06/2022	June	Summer	1	A	A9	20	0
29/06/2022	June	Summer	1	A	A10	30	0
29/06/2022	June	Summer	1	A	A11	30	0
29/06/2022	June	Summer	1	A	A12	30	0
29/06/2022	June	Summer	1	A	A13	40	0
29/06/2022	June	Summer	1	A	A14	40	0
29/06/2022	June	Summer	1	A	A15	40	0
29/06/2022	June	Summer	1	A	A16	50	0
29/06/2022	June	Summer	1	A	A17	50	0
29/06/2022	June	Summer	1	A	A18	50	0
29/06/2022	June	Summer	1	A	A19	60	0
29/06/2022	June	Summer	1	A	A20	60	0
29/06/2022	June	Summer	1	A	A21	60	0
29/06/2022	June	Summer	1	B	B1	0	0
29/06/2022	June	Summer	1	B	B2	0	0
29/06/2022	June	Summer	1	B	B3	0	0
29/06/2022	June	Summer	1	B	B4	10	0
29/06/2022	June	Summer	1	B	B5	10	0
29/06/2022	June	Summer	1	B	B6	10	0
29/06/2022	June	Summer	1	B	B7	20	0
29/06/2022	June	Summer	1	B	B8	20	0
29/06/2022	June	Summer	1	B	B9	20	0
29/06/2022	June	Summer	1	B	B10	30	0
29/06/2022	June	Summer	1	B	B11	30	0
29/06/2022	June	Summer	1	B	B12	30	0
29/06/2022	June	Summer	1	B	B13	40	0
29/06/2022	June	Summer	1	B	B14	40	0
29/06/2022	June	Summer	1	B	B15	40	0
29/06/2022	June	Summer	1	B	B16	50	0
29/06/2022	June	Summer	1	B	B17	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/06/2022	June	Summer	1	B	B18	50	0
29/06/2022	June	Summer	1	B	B19	60	0
29/06/2022	June	Summer	1	B	B20	60	0
29/06/2022	June	Summer	1	B	B21	60	0
29/06/2022	June	Summer	2	C	C1	0	0
29/06/2022	June	Summer	2	C	C2	0	0
29/06/2022	June	Summer	2	C	C3	0	0
29/06/2022	June	Summer	2	C	C4	10	0
29/06/2022	June	Summer	2	C	C5	10	0
29/06/2022	June	Summer	2	C	C6	10	0
29/06/2022	June	Summer	2	C	C7	20	0
29/06/2022	June	Summer	2	C	C8	20	0
29/06/2022	June	Summer	2	C	C9	20	0
29/06/2022	June	Summer	2	C	C10	30	0
29/06/2022	June	Summer	2	C	C11	30	0
29/06/2022	June	Summer	2	C	C12	30	0
29/06/2022	June	Summer	2	C	C13	40	0
29/06/2022	June	Summer	2	C	C14	40	0
29/06/2022	June	Summer	2	C	C15	40	0
29/06/2022	June	Summer	2	C	C16	50	0
29/06/2022	June	Summer	2	C	C17	50	0
29/06/2022	June	Summer	2	C	C18	50	0
29/06/2022	June	Summer	2	C	C19	60	0
29/06/2022	June	Summer	2	C	C20	60	0
29/06/2022	June	Summer	2	C	C21	60	0
29/06/2022	June	Summer	2	D	D1	0	0
29/06/2022	June	Summer	2	D	D2	0	0
29/06/2022	June	Summer	2	D	D3	0	0
29/06/2022	June	Summer	2	D	D4	10	0
29/06/2022	June	Summer	2	D	D5	10	0
29/06/2022	June	Summer	2	D	D6	10	0
29/06/2022	June	Summer	2	D	D7	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/06/2022	June	Summer	2	D	D8	20	0
29/06/2022	June	Summer	2	D	D9	20	0
29/06/2022	June	Summer	2	D	D10	30	0
29/06/2022	June	Summer	2	D	D11	30	0
29/06/2022	June	Summer	2	D	D12	30	0
29/06/2022	June	Summer	2	D	D13	40	0
29/06/2022	June	Summer	2	D	D14	40	0
29/06/2022	June	Summer	2	D	D15	40	0
29/06/2022	June	Summer	2	D	D16	50	0
29/06/2022	June	Summer	2	D	D17	50	0
29/06/2022	June	Summer	2	D	D18	50	0
29/06/2022	June	Summer	2	D	D19	60	0
29/06/2022	June	Summer	2	D	D20	60	0
29/06/2022	June	Summer	2	D	D21	60	0
29/06/2022	June	Summer	2	E	E1	0	1
29/06/2022	June	Summer	2	E	E2	0	2
29/06/2022	June	Summer	2	E	E3	0	0
29/06/2022	June	Summer	2	E	E4	10	0
29/06/2022	June	Summer	2	E	E5	10	0
29/06/2022	June	Summer	2	E	E6	10	0
29/06/2022	June	Summer	2	E	E7	20	0
29/06/2022	June	Summer	2	E	E8	20	0
29/06/2022	June	Summer	2	E	E9	20	0
29/06/2022	June	Summer	2	E	E10	30	0
29/06/2022	June	Summer	2	E	E11	30	0
29/06/2022	June	Summer	2	E	E12	30	0
29/06/2022	June	Summer	2	E	E13	40	0
29/06/2022	June	Summer	2	E	E14	40	0
29/06/2022	June	Summer	2	E	E15	40	0
29/06/2022	June	Summer	2	E	E16	50	0
29/06/2022	June	Summer	2	E	E17	50	0
29/06/2022	June	Summer	2	E	E18	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
29/06/2022	June	Summer	2	E	E19	60	0
29/06/2022	June	Summer	2	E	E20	60	0
29/06/2022	June	Summer	2	E	E21	60	0
10/07/2022	July	Summer	1	A	A1	0	0
10/07/2022	July	Summer	1	A	A2	0	0
10/07/2022	July	Summer	1	A	A3	0	0
10/07/2022	July	Summer	1	A	A4	10	0
10/07/2022	July	Summer	1	A	A5	10	0
10/07/2022	July	Summer	1	A	A6	10	0
10/07/2022	July	Summer	1	A	A7	20	0
10/07/2022	July	Summer	1	A	A8	20	0
10/07/2022	July	Summer	1	A	A9	20	0
10/07/2022	July	Summer	1	A	A10	30	0
10/07/2022	July	Summer	1	A	A11	30	0
10/07/2022	July	Summer	1	A	A12	30	0
10/07/2022	July	Summer	1	A	A13	40	0
10/07/2022	July	Summer	1	A	A14	40	0
10/07/2022	July	Summer	1	A	A15	40	0
10/07/2022	July	Summer	1	A	A16	50	0
10/07/2022	July	Summer	1	A	A17	50	0
10/07/2022	July	Summer	1	A	A18	50	0
10/07/2022	July	Summer	1	A	A19	60	0
10/07/2022	July	Summer	1	A	A20	60	0
10/07/2022	July	Summer	1	A	A21	60	0
10/07/2022	July	Summer	1	B	B1	0	0
10/07/2022	July	Summer	1	B	B2	0	0
10/07/2022	July	Summer	1	B	B3	0	0
10/07/2022	July	Summer	1	B	B4	10	0
10/07/2022	July	Summer	1	B	B5	10	0
10/07/2022	July	Summer	1	B	B6	10	0
10/07/2022	July	Summer	1	B	B7	20	0
10/07/2022	July	Summer	1	B	B8	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
10/07/2022	July	Summer	1	B	B9	20	0
10/07/2022	July	Summer	1	B	B10	30	0
10/07/2022	July	Summer	1	B	B11	30	0
10/07/2022	July	Summer	1	B	B12	30	0
10/07/2022	July	Summer	1	B	B13	40	0
10/07/2022	July	Summer	1	B	B14	40	0
10/07/2022	July	Summer	1	B	B15	40	0
10/07/2022	July	Summer	1	B	B16	50	0
10/07/2022	July	Summer	1	B	B17	50	0
10/07/2022	July	Summer	1	B	B18	50	0
10/07/2022	July	Summer	1	B	B19	60	0
10/07/2022	July	Summer	1	B	B20	60	0
10/07/2022	July	Summer	1	B	B21	60	0
10/07/2022	July	Summer	2	C	C1	0	0
10/07/2022	July	Summer	2	C	C2	0	0
10/07/2022	July	Summer	2	C	C3	0	0
10/07/2022	July	Summer	2	C	C4	10	0
10/07/2022	July	Summer	2	C	C5	10	0
10/07/2022	July	Summer	2	C	C6	10	0
10/07/2022	July	Summer	2	C	C7	20	0
10/07/2022	July	Summer	2	C	C8	20	0
10/07/2022	July	Summer	2	C	C9	20	0
10/07/2022	July	Summer	2	C	C10	30	0
10/07/2022	July	Summer	2	C	C11	30	0
10/07/2022	July	Summer	2	C	C12	30	0
10/07/2022	July	Summer	2	C	C13	40	0
10/07/2022	July	Summer	2	C	C14	40	0
10/07/2022	July	Summer	2	C	C15	40	0
10/07/2022	July	Summer	2	C	C16	50	0
10/07/2022	July	Summer	2	C	C17	50	0
10/07/2022	July	Summer	2	C	C18	50	0
10/07/2022	July	Summer	2	C	C19	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
10/07/2022	July	Summer	2	C	C20	60	0
10/07/2022	July	Summer	2	C	C21	60	0
10/07/2022	July	Summer	2	D	D1	0	0
10/07/2022	July	Summer	2	D	D2	0	0
10/07/2022	July	Summer	2	D	D3	0	0
10/07/2022	July	Summer	2	D	D4	10	0
10/07/2022	July	Summer	2	D	D5	10	0
10/07/2022	July	Summer	2	D	D6	10	0
10/07/2022	July	Summer	2	D	D7	20	0
10/07/2022	July	Summer	2	D	D8	20	0
10/07/2022	July	Summer	2	D	D9	20	0
10/07/2022	July	Summer	2	D	D10	30	0
10/07/2022	July	Summer	2	D	D11	30	0
10/07/2022	July	Summer	2	D	D12	30	0
10/07/2022	July	Summer	2	D	D13	40	0
10/07/2022	July	Summer	2	D	D14	40	0
10/07/2022	July	Summer	2	D	D15	40	0
10/07/2022	July	Summer	2	D	D16	50	0
10/07/2022	July	Summer	2	D	D17	50	0
10/07/2022	July	Summer	2	D	D18	50	0
10/07/2022	July	Summer	2	D	D19	60	0
10/07/2022	July	Summer	2	D	D20	60	0
10/07/2022	July	Summer	2	D	D21	60	0
10/07/2022	July	Summer	2	E	E1	0	0
10/07/2022	July	Summer	2	E	E2	0	1
10/07/2022	July	Summer	2	E	E3	0	1
10/07/2022	July	Summer	2	E	E4	10	0
10/07/2022	July	Summer	2	E	E5	10	0
10/07/2022	July	Summer	2	E	E6	10	0
10/07/2022	July	Summer	2	E	E7	20	0
10/07/2022	July	Summer	2	E	E8	20	0
10/07/2022	July	Summer	2	E	E9	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
10/07/2022	July	Summer	2	E	E10	30	0
10/07/2022	July	Summer	2	E	E11	30	0
10/07/2022	July	Summer	2	E	E12	30	0
10/07/2022	July	Summer	2	E	E13	40	0
10/07/2022	July	Summer	2	E	E14	40	0
10/07/2022	July	Summer	2	E	E15	40	0
10/07/2022	July	Summer	2	E	E16	50	0
10/07/2022	July	Summer	2	E	E17	50	0
10/07/2022	July	Summer	2	E	E18	50	0
10/07/2022	July	Summer	2	E	E19	60	0
10/07/2022	July	Summer	2	E	E20	60	0
10/07/2022	July	Summer	2	E	E21	60	0
24/07/2022	July	Summer	1	A	A1	0	0
24/07/2022	July	Summer	1	A	A2	0	0
24/07/2022	July	Summer	1	A	A3	0	0
24/07/2022	July	Summer	1	A	A4	10	0
24/07/2022	July	Summer	1	A	A5	10	0
24/07/2022	July	Summer	1	A	A6	10	0
24/07/2022	July	Summer	1	A	A7	20	0
24/07/2022	July	Summer	1	A	A8	20	0
24/07/2022	July	Summer	1	A	A9	20	0
24/07/2022	July	Summer	1	A	A10	30	0
24/07/2022	July	Summer	1	A	A11	30	0
24/07/2022	July	Summer	1	A	A12	30	0
24/07/2022	July	Summer	1	A	A13	40	0
24/07/2022	July	Summer	1	A	A14	40	0
24/07/2022	July	Summer	1	A	A15	40	0
24/07/2022	July	Summer	1	A	A16	50	0
24/07/2022	July	Summer	1	A	A17	50	0
24/07/2022	July	Summer	1	A	A18	50	0
24/07/2022	July	Summer	1	A	A19	60	0
24/07/2022	July	Summer	1	A	A20	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
24/07/2022	July	Summer	1	A	A21	60	0
24/07/2022	July	Summer	1	B	B1	0	0
24/07/2022	July	Summer	1	B	B2	0	0
24/07/2022	July	Summer	1	B	B3	0	0
24/07/2022	July	Summer	1	B	B4	10	0
24/07/2022	July	Summer	1	B	B5	10	0
24/07/2022	July	Summer	1	B	B6	10	0
24/07/2022	July	Summer	1	B	B7	20	0
24/07/2022	July	Summer	1	B	B8	20	0
24/07/2022	July	Summer	1	B	B9	20	0
24/07/2022	July	Summer	1	B	B10	30	0
24/07/2022	July	Summer	1	B	B11	30	0
24/07/2022	July	Summer	1	B	B12	30	0
24/07/2022	July	Summer	1	B	B13	40	0
24/07/2022	July	Summer	1	B	B14	40	0
24/07/2022	July	Summer	1	B	B15	40	0
24/07/2022	July	Summer	1	B	B16	50	0
24/07/2022	July	Summer	1	B	B17	50	0
24/07/2022	July	Summer	1	B	B18	50	0
24/07/2022	July	Summer	1	B	B19	60	0
24/07/2022	July	Summer	1	B	B20	60	0
24/07/2022	July	Summer	1	B	B21	60	0
24/07/2022	July	Summer	2	C	C1	0	0
24/07/2022	July	Summer	2	C	C2	0	0
24/07/2022	July	Summer	2	C	C3	0	0
24/07/2022	July	Summer	2	C	C4	10	0
24/07/2022	July	Summer	2	C	C5	10	0
24/07/2022	July	Summer	2	C	C6	10	0
24/07/2022	July	Summer	2	C	C7	20	0
24/07/2022	July	Summer	2	C	C8	20	0
24/07/2022	July	Summer	2	C	C9	20	0
24/07/2022	July	Summer	2	C	C10	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
24/07/2022	July	Summer	2	C	C11	30	0
24/07/2022	July	Summer	2	C	C12	30	0
24/07/2022	July	Summer	2	C	C13	40	0
24/07/2022	July	Summer	2	C	C14	40	0
24/07/2022	July	Summer	2	C	C15	40	0
24/07/2022	July	Summer	2	C	C16	50	0
24/07/2022	July	Summer	2	C	C17	50	0
24/07/2022	July	Summer	2	C	C18	50	0
24/07/2022	July	Summer	2	C	C19	60	0
24/07/2022	July	Summer	2	C	C20	60	0
24/07/2022	July	Summer	2	C	C21	60	0
24/07/2022	July	Summer	2	D	D1	0	0
24/07/2022	July	Summer	2	D	D2	0	4
24/07/2022	July	Summer	2	D	D3	0	0
24/07/2022	July	Summer	2	D	D4	10	0
24/07/2022	July	Summer	2	D	D5	10	0
24/07/2022	July	Summer	2	D	D6	10	0
24/07/2022	July	Summer	2	D	D7	20	0
24/07/2022	July	Summer	2	D	D8	20	0
24/07/2022	July	Summer	2	D	D9	20	0
24/07/2022	July	Summer	2	D	D10	30	0
24/07/2022	July	Summer	2	D	D11	30	0
24/07/2022	July	Summer	2	D	D12	30	0
24/07/2022	July	Summer	2	D	D13	40	0
24/07/2022	July	Summer	2	D	D14	40	0
24/07/2022	July	Summer	2	D	D15	40	0
24/07/2022	July	Summer	2	D	D16	50	0
24/07/2022	July	Summer	2	D	D17	50	0
24/07/2022	July	Summer	2	D	D18	50	0
24/07/2022	July	Summer	2	D	D19	60	0
24/07/2022	July	Summer	2	D	D20	60	0
24/07/2022	July	Summer	2	D	D21	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
24/07/2022	July	Summer	2	E	E1	0	0
24/07/2022	July	Summer	2	E	E2	0	0
24/07/2022	July	Summer	2	E	E3	0	1
24/07/2022	July	Summer	2	E	E4	10	0
24/07/2022	July	Summer	2	E	E5	10	0
24/07/2022	July	Summer	2	E	E6	10	0
24/07/2022	July	Summer	2	E	E7	20	0
24/07/2022	July	Summer	2	E	E8	20	0
24/07/2022	July	Summer	2	E	E9	20	0
24/07/2022	July	Summer	2	E	E10	30	0
24/07/2022	July	Summer	2	E	E11	30	0
24/07/2022	July	Summer	2	E	E12	30	0
24/07/2022	July	Summer	2	E	E13	40	0
24/07/2022	July	Summer	2	E	E14	40	0
24/07/2022	July	Summer	2	E	E15	40	0
24/07/2022	July	Summer	2	E	E16	50	0
24/07/2022	July	Summer	2	E	E17	50	0
24/07/2022	July	Summer	2	E	E18	50	0
24/07/2022	July	Summer	2	E	E19	60	0
24/07/2022	July	Summer	2	E	E20	60	0
24/07/2022	July	Summer	2	E	E21	60	0
07/08/2022	August	Summer	1	A	A1	0	0
07/08/2022	August	Summer	1	A	A2	0	0
07/08/2022	August	Summer	1	A	A3	0	0
07/08/2022	August	Summer	1	A	A4	10	0
07/08/2022	August	Summer	1	A	A5	10	0
07/08/2022	August	Summer	1	A	A6	10	0
07/08/2022	August	Summer	1	A	A7	20	0
07/08/2022	August	Summer	1	A	A8	20	0
07/08/2022	August	Summer	1	A	A9	20	0
07/08/2022	August	Summer	1	A	A10	30	0
07/08/2022	August	Summer	1	A	A11	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
07/08/2022	August	Summer	1	A	A12	30	0
07/08/2022	August	Summer	1	A	A13	40	0
07/08/2022	August	Summer	1	A	A14	40	0
07/08/2022	August	Summer	1	A	A15	40	0
07/08/2022	August	Summer	1	A	A16	50	0
07/08/2022	August	Summer	1	A	A17	50	0
07/08/2022	August	Summer	1	A	A18	50	0
07/08/2022	August	Summer	1	A	A19	60	0
07/08/2022	August	Summer	1	A	A20	60	0
07/08/2022	August	Summer	1	A	A21	60	0
07/08/2022	August	Summer	1	B	B1	0	0
07/08/2022	August	Summer	1	B	B2	0	0
07/08/2022	August	Summer	1	B	B3	0	0
07/08/2022	August	Summer	1	B	B4	10	0
07/08/2022	August	Summer	1	B	B5	10	0
07/08/2022	August	Summer	1	B	B6	10	0
07/08/2022	August	Summer	1	B	B7	20	0
07/08/2022	August	Summer	1	B	B8	20	0
07/08/2022	August	Summer	1	B	B9	20	0
07/08/2022	August	Summer	1	B	B10	30	0
07/08/2022	August	Summer	1	B	B11	30	0
07/08/2022	August	Summer	1	B	B12	30	0
07/08/2022	August	Summer	1	B	B13	40	0
07/08/2022	August	Summer	1	B	B14	40	0
07/08/2022	August	Summer	1	B	B15	40	0
07/08/2022	August	Summer	1	B	B16	50	0
07/08/2022	August	Summer	1	B	B17	50	0
07/08/2022	August	Summer	1	B	B18	50	0
07/08/2022	August	Summer	1	B	B19	60	0
07/08/2022	August	Summer	1	B	B20	60	0
07/08/2022	August	Summer	1	B	B21	60	0
07/08/2022	August	Summer	2	C	C1	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
07/08/2022	August	Summer	2	C	C2	0	0
07/08/2022	August	Summer	2	C	C3	0	0
07/08/2022	August	Summer	2	C	C4	10	0
07/08/2022	August	Summer	2	C	C5	10	0
07/08/2022	August	Summer	2	C	C6	10	0
07/08/2022	August	Summer	2	C	C7	20	0
07/08/2022	August	Summer	2	C	C8	20	0
07/08/2022	August	Summer	2	C	C9	20	0
07/08/2022	August	Summer	2	C	C10	30	0
07/08/2022	August	Summer	2	C	C11	30	0
07/08/2022	August	Summer	2	C	C12	30	0
07/08/2022	August	Summer	2	C	C13	40	0
07/08/2022	August	Summer	2	C	C14	40	0
07/08/2022	August	Summer	2	C	C15	40	0
07/08/2022	August	Summer	2	C	C16	50	0
07/08/2022	August	Summer	2	C	C17	50	0
07/08/2022	August	Summer	2	C	C18	50	0
07/08/2022	August	Summer	2	C	C19	60	0
07/08/2022	August	Summer	2	C	C20	60	0
07/08/2022	August	Summer	2	C	C21	60	0
07/08/2022	August	Summer	2	D	D1	0	0
07/08/2022	August	Summer	2	D	D2	0	0
07/08/2022	August	Summer	2	D	D3	0	0
07/08/2022	August	Summer	2	D	D4	10	0
07/08/2022	August	Summer	2	D	D5	10	0
07/08/2022	August	Summer	2	D	D6	10	0
07/08/2022	August	Summer	2	D	D7	20	0
07/08/2022	August	Summer	2	D	D8	20	0
07/08/2022	August	Summer	2	D	D9	20	0
07/08/2022	August	Summer	2	D	D10	30	0
07/08/2022	August	Summer	2	D	D11	30	0
07/08/2022	August	Summer	2	D	D12	30	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
07/08/2022	August	Summer	2	D	D13	40	0
07/08/2022	August	Summer	2	D	D14	40	0
07/08/2022	August	Summer	2	D	D15	40	0
07/08/2022	August	Summer	2	D	D16	50	0
07/08/2022	August	Summer	2	D	D17	50	0
07/08/2022	August	Summer	2	D	D18	50	0
07/08/2022	August	Summer	2	D	D19	60	0
07/08/2022	August	Summer	2	D	D20	60	0
07/08/2022	August	Summer	2	D	D21	60	0
07/08/2022	August	Summer	2	E	E1	0	0
07/08/2022	August	Summer	2	E	E2	0	0
07/08/2022	August	Summer	2	E	E3	0	2
07/08/2022	August	Summer	2	E	E4	10	0
07/08/2022	August	Summer	2	E	E5	10	0
07/08/2022	August	Summer	2	E	E6	10	0
07/08/2022	August	Summer	2	E	E7	20	0
07/08/2022	August	Summer	2	E	E8	20	0
07/08/2022	August	Summer	2	E	E9	20	0
07/08/2022	August	Summer	2	E	E10	30	0
07/08/2022	August	Summer	2	E	E11	30	0
07/08/2022	August	Summer	2	E	E12	30	0
07/08/2022	August	Summer	2	E	E13	40	0
07/08/2022	August	Summer	2	E	E14	40	0
07/08/2022	August	Summer	2	E	E15	40	0
07/08/2022	August	Summer	2	E	E16	50	0
07/08/2022	August	Summer	2	E	E17	50	0
07/08/2022	August	Summer	2	E	E18	50	0
07/08/2022	August	Summer	2	E	E19	60	0
07/08/2022	August	Summer	2	E	E20	60	0
07/08/2022	August	Summer	2	E	E21	60	0
20/08/2022	August	Summer	1	A	A1	0	0
20/08/2022	August	Summer	1	A	A2	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/08/2022	August	Summer	1	A	A3	0	0
20/08/2022	August	Summer	1	A	A4	10	0
20/08/2022	August	Summer	1	A	A5	10	0
20/08/2022	August	Summer	1	A	A6	10	0
20/08/2022	August	Summer	1	A	A7	20	0
20/08/2022	August	Summer	1	A	A8	20	0
20/08/2022	August	Summer	1	A	A9	20	0
20/08/2022	August	Summer	1	A	A10	30	0
20/08/2022	August	Summer	1	A	A11	30	0
20/08/2022	August	Summer	1	A	A12	30	0
20/08/2022	August	Summer	1	A	A13	40	0
20/08/2022	August	Summer	1	A	A14	40	0
20/08/2022	August	Summer	1	A	A15	40	0
20/08/2022	August	Summer	1	A	A16	50	0
20/08/2022	August	Summer	1	A	A17	50	0
20/08/2022	August	Summer	1	A	A18	50	0
20/08/2022	August	Summer	1	A	A19	60	0
20/08/2022	August	Summer	1	A	A20	60	0
20/08/2022	August	Summer	1	A	A21	60	0
20/08/2022	August	Summer	1	B	B1	0	0
20/08/2022	August	Summer	1	B	B2	0	0
20/08/2022	August	Summer	1	B	B3	0	0
20/08/2022	August	Summer	1	B	B4	10	0
20/08/2022	August	Summer	1	B	B5	10	0
20/08/2022	August	Summer	1	B	B6	10	0
20/08/2022	August	Summer	1	B	B7	20	0
20/08/2022	August	Summer	1	B	B8	20	0
20/08/2022	August	Summer	1	B	B9	20	0
20/08/2022	August	Summer	1	B	B10	30	0
20/08/2022	August	Summer	1	B	B11	30	0
20/08/2022	August	Summer	1	B	B12	30	0
20/08/2022	August	Summer	1	B	B13	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/08/2022	August	Summer	1	B	B14	40	0
20/08/2022	August	Summer	1	B	B15	40	0
20/08/2022	August	Summer	1	B	B16	50	0
20/08/2022	August	Summer	1	B	B17	50	0
20/08/2022	August	Summer	1	B	B18	50	0
20/08/2022	August	Summer	1	B	B19	60	0
20/08/2022	August	Summer	1	B	B20	60	0
20/08/2022	August	Summer	1	B	B21	60	0
20/08/2022	August	Summer	2	C	C1	0	0
20/08/2022	August	Summer	2	C	C2	0	0
20/08/2022	August	Summer	2	C	C3	0	0
20/08/2022	August	Summer	2	C	C4	10	0
20/08/2022	August	Summer	2	C	C5	10	0
20/08/2022	August	Summer	2	C	C6	10	0
20/08/2022	August	Summer	2	C	C7	20	0
20/08/2022	August	Summer	2	C	C8	20	0
20/08/2022	August	Summer	2	C	C9	20	0
20/08/2022	August	Summer	2	C	C10	30	0
20/08/2022	August	Summer	2	C	C11	30	0
20/08/2022	August	Summer	2	C	C12	30	0
20/08/2022	August	Summer	2	C	C13	40	0
20/08/2022	August	Summer	2	C	C14	40	0
20/08/2022	August	Summer	2	C	C15	40	0
20/08/2022	August	Summer	2	C	C16	50	0
20/08/2022	August	Summer	2	C	C17	50	0
20/08/2022	August	Summer	2	C	C18	50	0
20/08/2022	August	Summer	2	C	C19	60	0
20/08/2022	August	Summer	2	C	C20	60	0
20/08/2022	August	Summer	2	C	C21	60	0
20/08/2022	August	Summer	2	D	D1	0	0
20/08/2022	August	Summer	2	D	D2	0	0
20/08/2022	August	Summer	2	D	D3	0	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/08/2022	August	Summer	2	D	D4	10	0
20/08/2022	August	Summer	2	D	D5	10	0
20/08/2022	August	Summer	2	D	D6	10	0
20/08/2022	August	Summer	2	D	D7	20	0
20/08/2022	August	Summer	2	D	D8	20	0
20/08/2022	August	Summer	2	D	D9	20	0
20/08/2022	August	Summer	2	D	D10	30	0
20/08/2022	August	Summer	2	D	D11	30	0
20/08/2022	August	Summer	2	D	D12	30	0
20/08/2022	August	Summer	2	D	D13	40	0
20/08/2022	August	Summer	2	D	D14	40	0
20/08/2022	August	Summer	2	D	D15	40	0
20/08/2022	August	Summer	2	D	D16	50	0
20/08/2022	August	Summer	2	D	D17	50	0
20/08/2022	August	Summer	2	D	D18	50	0
20/08/2022	August	Summer	2	D	D19	60	0
20/08/2022	August	Summer	2	D	D20	60	0
20/08/2022	August	Summer	2	D	D21	60	0
20/08/2022	August	Summer	2	E	E1	0	0
20/08/2022	August	Summer	2	E	E2	0	0
20/08/2022	August	Summer	2	E	E3	0	0
20/08/2022	August	Summer	2	E	E4	10	0
20/08/2022	August	Summer	2	E	E5	10	0
20/08/2022	August	Summer	2	E	E6	10	0
20/08/2022	August	Summer	2	E	E7	20	0
20/08/2022	August	Summer	2	E	E8	20	0
20/08/2022	August	Summer	2	E	E9	20	0
20/08/2022	August	Summer	2	E	E10	30	0
20/08/2022	August	Summer	2	E	E11	30	0
20/08/2022	August	Summer	2	E	E12	30	0
20/08/2022	August	Summer	2	E	E13	40	0
20/08/2022	August	Summer	2	E	E14	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
20/08/2022	August	Summer	2	E	E15	40	0
20/08/2022	August	Summer	2	E	E16	50	0
20/08/2022	August	Summer	2	E	E17	50	0
20/08/2022	August	Summer	2	E	E18	50	0
20/08/2022	August	Summer	2	E	E19	60	0
20/08/2022	August	Summer	2	E	E20	60	0
20/08/2022	August	Summer	2	E	E21	60	0
05/09/2022	September	Autumn	1	A	A1	0	0
05/09/2022	September	Autumn	1	A	A2	0	0
05/09/2022	September	Autumn	1	A	A3	0	0
05/09/2022	September	Autumn	1	A	A4	10	0
05/09/2022	September	Autumn	1	A	A5	10	0
05/09/2022	September	Autumn	1	A	A6	10	0
05/09/2022	September	Autumn	1	A	A7	20	0
05/09/2022	September	Autumn	1	A	A8	20	0
05/09/2022	September	Autumn	1	A	A9	20	0
05/09/2022	September	Autumn	1	A	A10	30	0
05/09/2022	September	Autumn	1	A	A11	30	0
05/09/2022	September	Autumn	1	A	A12	30	0
05/09/2022	September	Autumn	1	A	A13	40	0
05/09/2022	September	Autumn	1	A	A14	40	0
05/09/2022	September	Autumn	1	A	A15	40	0
05/09/2022	September	Autumn	1	A	A16	50	0
05/09/2022	September	Autumn	1	A	A17	50	0
05/09/2022	September	Autumn	1	A	A18	50	0
05/09/2022	September	Autumn	1	A	A19	60	0
05/09/2022	September	Autumn	1	A	A20	60	0
05/09/2022	September	Autumn	1	A	A21	60	0
05/09/2022	September	Autumn	1	B	B1	0	0
05/09/2022	September	Autumn	1	B	B2	0	0
05/09/2022	September	Autumn	1	B	B3	0	0
05/09/2022	September	Autumn	1	B	B4	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/09/2022	September	Autumn	1	B	B5	10	0
05/09/2022	September	Autumn	1	B	B6	10	0
05/09/2022	September	Autumn	1	B	B7	20	0
05/09/2022	September	Autumn	1	B	B8	20	0
05/09/2022	September	Autumn	1	B	B9	20	0
05/09/2022	September	Autumn	1	B	B10	30	0
05/09/2022	September	Autumn	1	B	B11	30	0
05/09/2022	September	Autumn	1	B	B12	30	0
05/09/2022	September	Autumn	1	B	B13	40	0
05/09/2022	September	Autumn	1	B	B14	40	0
05/09/2022	September	Autumn	1	B	B15	40	0
05/09/2022	September	Autumn	1	B	B16	50	0
05/09/2022	September	Autumn	1	B	B17	50	0
05/09/2022	September	Autumn	1	B	B18	50	0
05/09/2022	September	Autumn	1	B	B19	60	0
05/09/2022	September	Autumn	1	B	B20	60	0
05/09/2022	September	Autumn	1	B	B21	60	0
05/09/2022	September	Autumn	2	C	C1	0	0
05/09/2022	September	Autumn	2	C	C2	0	0
05/09/2022	September	Autumn	2	C	C3	0	0
05/09/2022	September	Autumn	2	C	C4	10	0
05/09/2022	September	Autumn	2	C	C5	10	0
05/09/2022	September	Autumn	2	C	C6	10	0
05/09/2022	September	Autumn	2	C	C7	20	0
05/09/2022	September	Autumn	2	C	C8	20	0
05/09/2022	September	Autumn	2	C	C9	20	0
05/09/2022	September	Autumn	2	C	C10	30	0
05/09/2022	September	Autumn	2	C	C11	30	0
05/09/2022	September	Autumn	2	C	C12	30	0
05/09/2022	September	Autumn	2	C	C13	40	0
05/09/2022	September	Autumn	2	C	C14	40	0
05/09/2022	September	Autumn	2	C	C15	40	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/09/2022	September	Autumn	2	C	C16	50	0
05/09/2022	September	Autumn	2	C	C17	50	0
05/09/2022	September	Autumn	2	C	C18	50	0
05/09/2022	September	Autumn	2	C	C19	60	0
05/09/2022	September	Autumn	2	C	C20	60	0
05/09/2022	September	Autumn	2	C	C21	60	0
05/09/2022	September	Autumn	2	D	D1	0	0
05/09/2022	September	Autumn	2	D	D2	0	0
05/09/2022	September	Autumn	2	D	D3	0	0
05/09/2022	September	Autumn	2	D	D4	10	0
05/09/2022	September	Autumn	2	D	D5	10	0
05/09/2022	September	Autumn	2	D	D6	10	0
05/09/2022	September	Autumn	2	D	D7	20	0
05/09/2022	September	Autumn	2	D	D8	20	0
05/09/2022	September	Autumn	2	D	D9	20	0
05/09/2022	September	Autumn	2	D	D10	30	0
05/09/2022	September	Autumn	2	D	D11	30	0
05/09/2022	September	Autumn	2	D	D12	30	0
05/09/2022	September	Autumn	2	D	D13	40	0
05/09/2022	September	Autumn	2	D	D14	40	0
05/09/2022	September	Autumn	2	D	D15	40	0
05/09/2022	September	Autumn	2	D	D16	50	0
05/09/2022	September	Autumn	2	D	D17	50	0
05/09/2022	September	Autumn	2	D	D18	50	0
05/09/2022	September	Autumn	2	D	D19	60	0
05/09/2022	September	Autumn	2	D	D20	60	0
05/09/2022	September	Autumn	2	D	D21	60	0
05/09/2022	September	Autumn	2	E	E1	0	0
05/09/2022	September	Autumn	2	E	E2	0	0
05/09/2022	September	Autumn	2	E	E3	0	0
05/09/2022	September	Autumn	2	E	E4	10	0
05/09/2022	September	Autumn	2	E	E5	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
05/09/2022	September	Autumn	2	E	E6	10	0
05/09/2022	September	Autumn	2	E	E7	20	0
05/09/2022	September	Autumn	2	E	E8	20	0
05/09/2022	September	Autumn	2	E	E9	20	0
05/09/2022	September	Autumn	2	E	E10	30	0
05/09/2022	September	Autumn	2	E	E11	30	0
05/09/2022	September	Autumn	2	E	E12	30	0
05/09/2022	September	Autumn	2	E	E13	40	0
05/09/2022	September	Autumn	2	E	E14	40	0
05/09/2022	September	Autumn	2	E	E15	40	0
05/09/2022	September	Autumn	2	E	E16	50	0
05/09/2022	September	Autumn	2	E	E17	50	0
05/09/2022	September	Autumn	2	E	E18	50	0
05/09/2022	September	Autumn	2	E	E19	60	0
05/09/2022	September	Autumn	2	E	E20	60	0
05/09/2022	September	Autumn	2	E	E21	60	0
16/09/2022	September	Autumn	1	A	A1	0	0
16/09/2022	September	Autumn	1	A	A2	0	0
16/09/2022	September	Autumn	1	A	A3	0	0
16/09/2022	September	Autumn	1	A	A4	10	0
16/09/2022	September	Autumn	1	A	A5	10	0
16/09/2022	September	Autumn	1	A	A6	10	0
16/09/2022	September	Autumn	1	A	A7	20	0
16/09/2022	September	Autumn	1	A	A8	20	0
16/09/2022	September	Autumn	1	A	A9	20	0
16/09/2022	September	Autumn	1	A	A10	30	0
16/09/2022	September	Autumn	1	A	A11	30	0
16/09/2022	September	Autumn	1	A	A12	30	0
16/09/2022	September	Autumn	1	A	A13	40	0
16/09/2022	September	Autumn	1	A	A14	40	0
16/09/2022	September	Autumn	1	A	A15	40	0
16/09/2022	September	Autumn	1	A	A16	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
16/09/2022	September	Autumn	1	A	A17	50	0
16/09/2022	September	Autumn	1	A	A18	50	0
16/09/2022	September	Autumn	1	A	A19	60	0
16/09/2022	September	Autumn	1	A	A20	60	0
16/09/2022	September	Autumn	1	A	A21	60	0
16/09/2022	September	Autumn	1	B	B1	0	0
16/09/2022	September	Autumn	1	B	B2	0	0
16/09/2022	September	Autumn	1	B	B3	0	0
16/09/2022	September	Autumn	1	B	B4	10	0
16/09/2022	September	Autumn	1	B	B5	10	0
16/09/2022	September	Autumn	1	B	B6	10	0
16/09/2022	September	Autumn	1	B	B7	20	0
16/09/2022	September	Autumn	1	B	B8	20	0
16/09/2022	September	Autumn	1	B	B9	20	0
16/09/2022	September	Autumn	1	B	B10	30	0
16/09/2022	September	Autumn	1	B	B11	30	0
16/09/2022	September	Autumn	1	B	B12	30	0
16/09/2022	September	Autumn	1	B	B13	40	0
16/09/2022	September	Autumn	1	B	B14	40	0
16/09/2022	September	Autumn	1	B	B15	40	0
16/09/2022	September	Autumn	1	B	B16	50	0
16/09/2022	September	Autumn	1	B	B17	50	0
16/09/2022	September	Autumn	1	B	B18	50	0
16/09/2022	September	Autumn	1	B	B19	60	0
16/09/2022	September	Autumn	1	B	B20	60	0
16/09/2022	September	Autumn	1	B	B21	60	0
16/09/2022	September	Autumn	2	C	C1	0	0
16/09/2022	September	Autumn	2	C	C2	0	0
16/09/2022	September	Autumn	2	C	C3	0	0
16/09/2022	September	Autumn	2	C	C4	10	0
16/09/2022	September	Autumn	2	C	C5	10	0
16/09/2022	September	Autumn	2	C	C6	10	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
16/09/2022	September	Autumn	2	C	C7	20	0
16/09/2022	September	Autumn	2	C	C8	20	0
16/09/2022	September	Autumn	2	C	C9	20	0
16/09/2022	September	Autumn	2	C	C10	30	0
16/09/2022	September	Autumn	2	C	C11	30	0
16/09/2022	September	Autumn	2	C	C12	30	0
16/09/2022	September	Autumn	2	C	C13	40	0
16/09/2022	September	Autumn	2	C	C14	40	0
16/09/2022	September	Autumn	2	C	C15	40	0
16/09/2022	September	Autumn	2	C	C16	50	0
16/09/2022	September	Autumn	2	C	C17	50	0
16/09/2022	September	Autumn	2	C	C18	50	0
16/09/2022	September	Autumn	2	C	C19	60	0
16/09/2022	September	Autumn	2	C	C20	60	0
16/09/2022	September	Autumn	2	C	C21	60	0
16/09/2022	September	Autumn	2	D	D1	0	0
16/09/2022	September	Autumn	2	D	D2	0	0
16/09/2022	September	Autumn	2	D	D3	0	0
16/09/2022	September	Autumn	2	D	D4	10	0
16/09/2022	September	Autumn	2	D	D5	10	0
16/09/2022	September	Autumn	2	D	D6	10	0
16/09/2022	September	Autumn	2	D	D7	20	0
16/09/2022	September	Autumn	2	D	D8	20	0
16/09/2022	September	Autumn	2	D	D9	20	0
16/09/2022	September	Autumn	2	D	D10	30	0
16/09/2022	September	Autumn	2	D	D11	30	0
16/09/2022	September	Autumn	2	D	D12	30	0
16/09/2022	September	Autumn	2	D	D13	40	0
16/09/2022	September	Autumn	2	D	D14	40	0
16/09/2022	September	Autumn	2	D	D15	40	0
16/09/2022	September	Autumn	2	D	D16	50	0
16/09/2022	September	Autumn	2	D	D17	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
16/09/2022	September	Autumn	2	D	D18	50	0
16/09/2022	September	Autumn	2	D	D19	60	0
16/09/2022	September	Autumn	2	D	D20	60	0
16/09/2022	September	Autumn	2	D	D21	60	0
16/09/2022	September	Autumn	2	E	E1	0	0
16/09/2022	September	Autumn	2	E	E2	0	0
16/09/2022	September	Autumn	2	E	E3	0	0
16/09/2022	September	Autumn	2	E	E4	10	0
16/09/2022	September	Autumn	2	E	E5	10	0
16/09/2022	September	Autumn	2	E	E6	10	0
16/09/2022	September	Autumn	2	E	E7	20	0
16/09/2022	September	Autumn	2	E	E8	20	0
16/09/2022	September	Autumn	2	E	E9	20	0
16/09/2022	September	Autumn	2	E	E10	30	0
16/09/2022	September	Autumn	2	E	E11	30	0
16/09/2022	September	Autumn	2	E	E12	30	0
16/09/2022	September	Autumn	2	E	E13	40	0
16/09/2022	September	Autumn	2	E	E14	40	0
16/09/2022	September	Autumn	2	E	E15	40	0
16/09/2022	September	Autumn	2	E	E16	50	0
16/09/2022	September	Autumn	2	E	E17	50	0
16/09/2022	September	Autumn	2	E	E18	50	0
16/09/2022	September	Autumn	2	E	E19	60	0
16/09/2022	September	Autumn	2	E	E20	60	0
16/09/2022	September	Autumn	2	E	E21	60	0
17/10/2022	October	Autumn	1	A	A1	0	0
17/10/2022	October	Autumn	1	A	A2	0	0
17/10/2022	October	Autumn	1	A	A3	0	0
17/10/2022	October	Autumn	1	A	A4	10	0
17/10/2022	October	Autumn	1	A	A5	10	0
17/10/2022	October	Autumn	1	A	A6	10	0
17/10/2022	October	Autumn	1	A	A7	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/10/2022	October	Autumn	1	A	A8	20	0
17/10/2022	October	Autumn	1	A	A9	20	0
17/10/2022	October	Autumn	1	A	A10	30	0
17/10/2022	October	Autumn	1	A	A11	30	0
17/10/2022	October	Autumn	1	A	A12	30	0
17/10/2022	October	Autumn	1	A	A13	40	0
17/10/2022	October	Autumn	1	A	A14	40	0
17/10/2022	October	Autumn	1	A	A15	40	0
17/10/2022	October	Autumn	1	A	A16	50	0
17/10/2022	October	Autumn	1	A	A17	50	0
17/10/2022	October	Autumn	1	A	A18	50	0
17/10/2022	October	Autumn	1	A	A19	60	0
17/10/2022	October	Autumn	1	A	A20	60	0
17/10/2022	October	Autumn	1	A	A21	60	0
17/10/2022	October	Autumn	1	B	B1	0	0
17/10/2022	October	Autumn	1	B	B2	0	0
17/10/2022	October	Autumn	1	B	B3	0	0
17/10/2022	October	Autumn	1	B	B4	10	0
17/10/2022	October	Autumn	1	B	B5	10	0
17/10/2022	October	Autumn	1	B	B6	10	0
17/10/2022	October	Autumn	1	B	B7	20	0
17/10/2022	October	Autumn	1	B	B8	20	0
17/10/2022	October	Autumn	1	B	B9	20	0
17/10/2022	October	Autumn	1	B	B10	30	0
17/10/2022	October	Autumn	1	B	B11	30	0
17/10/2022	October	Autumn	1	B	B12	30	0
17/10/2022	October	Autumn	1	B	B13	40	0
17/10/2022	October	Autumn	1	B	B14	40	0
17/10/2022	October	Autumn	1	B	B15	40	0
17/10/2022	October	Autumn	1	B	B16	50	0
17/10/2022	October	Autumn	1	B	B17	50	0
17/10/2022	October	Autumn	1	B	B18	50	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/10/2022	October	Autumn	1	B	B19	60	0
17/10/2022	October	Autumn	1	B	B20	60	0
17/10/2022	October	Autumn	1	B	B21	60	0
17/10/2022	October	Autumn	2	C	C1	0	0
17/10/2022	October	Autumn	2	C	C2	0	0
17/10/2022	October	Autumn	2	C	C3	0	0
17/10/2022	October	Autumn	2	C	C4	10	0
17/10/2022	October	Autumn	2	C	C5	10	0
17/10/2022	October	Autumn	2	C	C6	10	0
17/10/2022	October	Autumn	2	C	C7	20	0
17/10/2022	October	Autumn	2	C	C8	20	0
17/10/2022	October	Autumn	2	C	C9	20	0
17/10/2022	October	Autumn	2	C	C10	30	0
17/10/2022	October	Autumn	2	C	C11	30	0
17/10/2022	October	Autumn	2	C	C12	30	0
17/10/2022	October	Autumn	2	C	C13	40	0
17/10/2022	October	Autumn	2	C	C14	40	0
17/10/2022	October	Autumn	2	C	C15	40	0
17/10/2022	October	Autumn	2	C	C16	50	0
17/10/2022	October	Autumn	2	C	C17	50	0
17/10/2022	October	Autumn	2	C	C18	50	0
17/10/2022	October	Autumn	2	C	C19	60	0
17/10/2022	October	Autumn	2	C	C20	60	0
17/10/2022	October	Autumn	2	C	C21	60	0
17/10/2022	October	Autumn	2	D	D1	0	0
17/10/2022	October	Autumn	2	D	D2	0	0
17/10/2022	October	Autumn	2	D	D3	0	0
17/10/2022	October	Autumn	2	D	D4	10	0
17/10/2022	October	Autumn	2	D	D5	10	0
17/10/2022	October	Autumn	2	D	D6	10	0
17/10/2022	October	Autumn	2	D	D7	20	0
17/10/2022	October	Autumn	2	D	D8	20	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/10/2022	October	Autumn	2	D	D9	20	0
17/10/2022	October	Autumn	2	D	D10	30	0
17/10/2022	October	Autumn	2	D	D11	30	0
17/10/2022	October	Autumn	2	D	D12	30	0
17/10/2022	October	Autumn	2	D	D13	40	0
17/10/2022	October	Autumn	2	D	D14	40	0
17/10/2022	October	Autumn	2	D	D15	40	0
17/10/2022	October	Autumn	2	D	D16	50	0
17/10/2022	October	Autumn	2	D	D17	50	0
17/10/2022	October	Autumn	2	D	D18	50	0
17/10/2022	October	Autumn	2	D	D19	60	0
17/10/2022	October	Autumn	2	D	D20	60	0
17/10/2022	October	Autumn	2	D	D21	60	0
17/10/2022	October	Autumn	2	E	E1	0	0
17/10/2022	October	Autumn	2	E	E2	0	0
17/10/2022	October	Autumn	2	E	E3	0	1
17/10/2022	October	Autumn	2	E	E4	10	0
17/10/2022	October	Autumn	2	E	E5	10	0
17/10/2022	October	Autumn	2	E	E6	10	0
17/10/2022	October	Autumn	2	E	E7	20	0
17/10/2022	October	Autumn	2	E	E8	20	0
17/10/2022	October	Autumn	2	E	E9	20	0
17/10/2022	October	Autumn	2	E	E10	30	0
17/10/2022	October	Autumn	2	E	E11	30	0
17/10/2022	October	Autumn	2	E	E12	30	0
17/10/2022	October	Autumn	2	E	E13	40	0
17/10/2022	October	Autumn	2	E	E14	40	0
17/10/2022	October	Autumn	2	E	E15	40	0
17/10/2022	October	Autumn	2	E	E16	50	0
17/10/2022	October	Autumn	2	E	E17	50	0
17/10/2022	October	Autumn	2	E	E18	50	0
17/10/2022	October	Autumn	2	E	E19	60	0

Date	Month	Season	Site	Survey Area	Seed Trap ID	Distance (m)	No. of Seeds
17/10/2022	October	Autumn	2	E	E20	60	0
17/10/2022	October	Autumn	2	E	E21	60	0

Table 4: Raw data of the lodgepole pine count data collection.

Site	Transect	Plant ID	Root Collar Diameter (mm)	Height (cm)	Distance (m)	Age Class	Topography
2	T1	T1.1	0.95	36.50	1.20	Seedling	Flat
2	T1	T1.2	0.95	33.00	1.30	Seedling	Flat
2	T1	T1.3	1.08	32.50	1.40	Seedling	Flat
2	T1	T1.4	1.27	38.50	1.65	Seedling	Flat
2	T1	T1.5	0.32	10.25	1.75	Seedling	Flat
2	T1	T1.6	1.40	37.25	2.25	Seedling	Flat
2	T1	T1.7	0.51	20.50	2.60	Seedling	Flat
2	T1	T1.8	0.57	14.50	2.70	Seedling	Flat
2	T1	T1.9	0.83	31.50	2.75	Seedling	Flat
2	T1	T1.10	0.19	5.50	2.80	Seedling	Flat
2	T1	T1.11	0.57	13.75	2.80	Seedling	Flat
2	T1	T1.12	0.95	34.00	3.20	Seedling	Flat
2	T1	T1.13	1.78	59.00	3.35	Sapling	Flat
2	T1	T1.14	1.40	65.50	3.50	Sapling	Flat
2	T1	T1.15	0.32	7.00	3.55	Seedling	Flat
2	T1	T1.16	0.25	4.50	3.80	Seedling	Flat
2	T1	T1.17	1.02	35.50	3.90	Seedling	Flat
2	T1	T1.18	0.76	46.50	4.05	Seedling	Flat
2	T1	T1.19	0.57	23.00	4.10	Seedling	Flat
2	T1	T1.20	0.89	56.00	4.20	Seedling	Flat
2	T1	T1.21	1.34	74.75	4.20	Seedling	Flat
2	T1	T1.22	1.34	45.00	4.30	Seedling	Flat
2	T1	T1.23	1.02	55.75	4.35	Seedling	Flat
2	T1	T1.24	0.38	6.75	4.60	Seedling	Flat
2	T1	T1.25	0.70	24.50	4.75	Seedling	Flat
2	T1	T1.26	1.21	25.00	4.80	Seedling	Flat
2	T1	T1.27	1.15	44.00	4.85	Seedling	Flat
2	T1	T1.28	1.46	36.25	5.00	Seedling	Flat
2	T1	T1.29	0.99	23.00	5.10	Seedling	Flat
2	T1	T1.30	0.76	20.75	5.25	Seedling	Flat
2	T1	T1.31	0.95	26.25	5.25	Seedling	Flat
2	T1	T1.32	1.97	51.50	5.35	Seedling	Flat

Site	Transect	Plant ID	Root Collar Diameter (mm)	Height (cm)	Distance (m)	Age Class	Topography
2	T1	T1.33	0.70	15.00	5.50	Seedling	Flat
2	T1	T1.34	1.08	29.50	5.65	Seedling	Flat
2	T1	T1.35	0.89	32.50	5.70	Seedling	Flat
2	T1	T1.36	1.27	38.00	5.70	Seedling	Flat
2	T1	T1.37	0.76	27.00	5.85	Seedling	Flat
2	T1	T1.38	0.64	16.50	5.90	Seedling	Flat
2	T1	T1.39	1.15	51.50	5.90	Seedling	Flat
2	T1	T1.40	1.34	38.50	5.90	Seedling	Flat
2	T1	T1.41	0.25	7.00	6.00	Seedling	Flat
2	T1	T1.42	0.45	17.00	6.00	Seedling	Flat
2	T1	T1.43	1.53	71.50	6.10	Seedling	Flat
2	T1	T1.44	0.38	15.50	6.15	Seedling	Flat
2	T1	T1.45	0.38	18.00	6.15	Seedling	Flat
2	T1	T1.46	0.45	17.25	6.15	Seedling	Flat
2	T1	T1.47	1.46	53.75	6.30	Seedling	Flat
2	T1	T1.48	0.57	15.75	6.35	Seedling	Flat
2	T1	T1.49	0.45	14.50	6.55	Seedling	Flat
2	T1	T1.50	0.45	10.50	6.60	Seedling	Flat
2	T1	T1.51	0.51	13.50	6.70	Seedling	Flat
2	T1	T1.52	1.78	66.75	6.70	Seedling	Flat
2	T1	T1.53	0.57	27.75	6.75	Seedling	Flat
2	T1	T1.54	0.51	15.50	6.80	Seedling	Flat
2	T1	T1.55	0.64	33.25	6.80	Seedling	Flat
2	T1	T1.56	0.38	10.25	6.85	Seedling	Flat
2	T1	T1.57	0.45	16.00	7.00	Seedling	Flat
2	T1	T1.58	0.38	16.50	7.05	Seedling	Flat
2	T1	T1.59	0.70	26.50	7.05	Seedling	Flat
2	T1	T1.60	0.70	10.75	7.10	Seedling	Flat
2	T1	T1.61	0.51	10.50	7.15	Seedling	Flat
2	T1	T1.62	0.57	13.50	7.25	Seedling	Flat
2	T1	T1.63	0.83	13.75	7.25	Seedling	Flat
2	T1	T1.64	0.76	18.50	7.30	Seedling	Flat

Site	Transect	Plant ID	Root Collar Diameter (mm)	Height (cm)	Distance (m)	Age Class	Topography
2	T1	T1.65	0.45	10.25	7.35	Seedling	Flat
2	T1	T1.66	0.51	1.00	10.10	Seedling	Flat
2	T1	T1.67	1.34	42.25	14.25	Seedling	Flat
2	T1	T1.68	0.95	39.25	14.65	Seedling	Flat
2	T1	T1.69	3.57	156.50	53.75	Sapling	Flat
2	T1	T1.70	2.48	75.00	75.10	Sapling	Flat
2	T2	T2.1	0.51	26.00	3.80	Seedling	Flat
2	T2	T2.2	0.64	11.00	16.65	Seedling	Flat
2	T2	T2.3	1.08	21.75	40.00	Seedling	Flat
2	T2	T2.4	0.83	27.00	41.30	Seedling	Flat
2	T2	T2.5	0.70	17.00	41.95	Seedling	Flat
2	T2	T2.6	1.85	60.50	42.40	Sapling	Flat
2	T2	T2.7	0.95	24.50	42.75	Seedling	Flat
2	T2	T2.8	0.45	15.75	43.30	Seedling	Flat
2	T3	T3.1	0.35	6.50	1.45	Seedling	Ridge
2	T3	T3.2	1.53	55.50	7.15	Sapling	Ridge
2	T3	T3.3	0.64	24.50	8.35	Seedling	Ridge
2	T3	T3.4	1.11	42.50	8.45	Seedling	Ridge
2	T3	T3.5	1.15	65.75	8.45	Sapling	Ridge
2	T3	T3.6	1.59	54.75	8.45	Sapling	Ridge
2	T3	T3.7	0.45	21.50	8.90	Seedling	Ridge
2	T3	T3.8	0.32	12.00	9.60	Seedling	Ridge
2	T3	T3.9	0.57	19.75	9.65	Seedling	Ridge
2	T3	T3.10	0.48	23.00	14.10	Seedling	Furrow
2	T3	T3.11	0.48	18.25	14.15	Seedling	Furrow
2	T3	T3.12	0.57	19.75	14.50	Seedling	Furrow
2	T3	T3.13	1.46	65.75	15.00	Sapling	Ridge
2	T3	T3.14	0.57	15.50	15.10	Seedling	Ridge
2	T3	T3.15	0.70	25.75	15.15	Seedling	Ridge
2	T3	T3.16	0.76	16.50	15.25	Seedling	Ridge
2	T3	T3.17	0.45	13.75	15.40	Seedling	Ridge
2	T3	T3.18	0.51	14.50	15.60	Seedling	Ridge

Site	Transect	Plant ID	Root Collar Diameter (mm)	Height (cm)	Distance (m)	Age Class	Topography
2	T3	T3.19	0.83	33.50	16.25	Seedling	Furrow
2	T3	T3.20	0.76	21.75	16.50	Seedling	Ridge
2	T3	T3.21	0.70	20.50	16.60	Seedling	Ridge
2	T3	T3.22	0.38	19.75	17.05	Seedling	Furrow
2	T3	T3.23	0.80	40.00	17.80	Seedling	Ridge
2	T3	T3.24	0.32	5.00	18.20	Seedling	Furrow
2	T3	T3.25	0.38	8.50	18.50	Seedling	Furrow
2	T3	T3.26	0.32	7.00	18.55	Seedling	Furrow
2	T3	T3.27	0.32	4.50	21.00	Seedling	Ridge
2	T3	T3.28	0.32	4.50	21.05	Seedling	Ridge
2	T3	T3.29	1.11	27.50	22.60	Seedling	Ridge
2	T3	T3.30	0.64	17.75	23.85	Seedling	Ridge
2	T3	T3.31	1.91	43.00	24.05	Seedling	Ridge
2	T3	T3.32	0.32	13.75	24.15	Seedling	Ridge
2	T3	T3.33	0.64	16.50	24.50	Seedling	Ridge
2	T3	T3.34	1.02	27.50	24.85	Seedling	Ridge
2	T3	T3.35	0.80	34.00	26.00	Seedling	Ridge
2	T3	T3.36	0.32	13.50	27.45	Seedling	Ridge
2	T3	T3.37	0.70	19.75	28.15	Seedling	Ridge
2	T3	T3.38	0.80	20.00	28.20	Seedling	Ridge
2	T3	T3.39	1.11	23.00	28.25	Seedling	Ridge
2	T3	T3.40	0.32	16.50	29.70	Seedling	Ridge
2	T3	T3.41	0.95	37.00	29.90	Seedling	Ridge
2	T3	T3.42	0.32	14.50	33.30	Seedling	Furrow
2	T3	T3.43	0.89	37.00	33.30	Seedling	Furrow
2	T3	T3.44	0.76	34.00	33.85	Seedling	Ridge
2	T3	T3.45	1.15	29.75	33.90	Seedling	Ridge
2	T3	T3.46	0.95	20.75	39.00	Seedling	Ridge
2	T3	T3.47	0.80	20.50	39.10	Seedling	Ridge
2	T3	T3.48	0.32	21.50	40.10	Seedling	Furrow
2	T3	T3.49	0.32	16.50	41.30	Seedling	Furrow
2	T4	T4.1	12.16	53.00	3.10	Sapling	Ridge

Site	Transect	Plant ID	Root Collar Diameter (mm)	Height (cm)	Distance (m)	Age Class	Topography
2	T4	T4.2	1.95	6.50	4.20	Seedling	Ridge
2	T4	T4.3	2.92	17.00	5.20	Seedling	Ridge
2	T4	T4.4	4.86	27.00	11.85	Seedling	Ridge
2	T4	T4.5	5.74	42.00	11.85	Seedling	Ridge
2	T4	T4.6	3.35	19.00	15.30	Seedling	Ridge
2	T4	T4.7	19.20	17.50	25.40	Seedling	Furrow
2	T4	T4.8	24.61	105.00	26.00	Sapling	Ridge
2	T4	T4.9	11.29	40.00	36.60	Seedling	Furrow
2	T4	T4.10	11.07	47.00	38.45	Seedling	Furrow
2	T4	T4.11	12.28	35.00	40.30	Seedling	Ridge
2	T4	T4.12	0.94	11.00	49.90	Seedling	Ridge
2	T4	T4.13	4.14	19.00	49.90	Seedling	Ridge
2	T4	T4.14	13.34	71.00	49.90	Sapling	Ridge
2	T5	T5.1	2.37	14.00	2.35	Seedling	Ridge
2	T5	T5.2	21.75	73.00	3.80	Sapling	Ridge
2	T5	T5.3	9.26	32.00	30.35	Seedling	Ridge
2	T5	T5.4	4.94	30.00	39.80	Seedling	Ridge
2	T5	T5.5	6.02	21.00	39.85	Seedling	Ridge
2	T5	T5.6	4.99	32.00	55.35	Seedling	Ridge
2	T5	T5.7	29.76	88.00	68.10	Sapling	Ridge
2	T5	T5.8	8.30	43.00	72.80	Seedling	Ridge
2	T5	T5.9	2.21	21.00	75.90	Seedling	Ridge
2	T5	T5.10	10.08	39.50	85.55	Seedling	Ridge
2	T5	T5.11	9.88	33.00	85.60	Seedling	Ridge
2	T5	T5.12	11.50	42.00	90.70	Seedling	Ridge
2	T5	T5.13	3.10	31.00	92.45	Seedling	Ridge
2	T5	T5.14	3.36	19.00	95.30	Seedling	Ridge
2	T5	T5.15	4.27	22.00	96.75	Seedling	Ridge
2	T6	T6.1	6.63	22.00	2.80	Seedling	Furrow
2	T6	T6.2	9.69	27.00	10.80	Seedling	Ridge
2	T6	T6.3	9.20	52.00	13.50	Sapling	Ridge
2	T6	T6.4	13.30	60.00	13.50	Sapling	Ridge

Site	Transect	Plant ID	Root Collar Diameter (mm)	Height (cm)	Distance (m)	Age Class	Topography
2	T6	T6.5	4.38	24.00	14.20	Seedling	Ridge
2	T6	T6.6	3.18	23.00	14.30	Seedling	Ridge
2	T6	T6.7	5.12	24.00	14.30	Seedling	Ridge
2	T6	T6.8	17.57	81.00	14.35	Sapling	Ridge
2	T6	T6.9	3.15	14.50	14.45	Seedling	Ridge
2	T6	T6.10	7.28	37.00	14.45	Seedling	Ridge
2	T6	T6.11	2.93	10.50	18.05	Seedling	Ridge
2	T6	T6.12	14.48	37.00	24.15	Seedling	Ridge
2	T6	T6.13	18.75	56.00	24.15	Sapling	Ridge
2	T6	T6.14	12.93	66.00	31.65	Sapling	Flat
2	T6	T6.15	2.17	14.00	78.45	Seedling	Flat
2	T7	T7.1	2.59	14.00	0.05	Seedling	Ridge
2	T7	T7.2	3.02	18.00	0.05	Seedling	Ridge
2	T7	T7.3	2.73	17.00	0.20	Seedling	Ridge
2	T7	T7.4	4.43	22.00	0.45	Seedling	Flat
2	T7	T7.5	2.15	12.00	0.50	Seedling	Flat
2	T7	T7.6	4.38	24.00	0.50	Seedling	Flat
2	T7	T7.7	2.05	13.00	0.85	Seedling	Flat
2	T7	T7.8	1.87	13.50	0.90	Seedling	Flat
2	T7	T7.9	3.61	20.00	1.00	Seedling	Flat
2	T7	T7.10	25.15	98.00	1.50	Sapling	Flat
2	T7	T7.11	2.67	10.00	4.80	Seedling	Flat
2	T7	T7.12	9.75	49.50	9.95	Seedling	Ridge
2	T7	T7.13	3.01	27.00	13.20	Seedling	Furrow
2	T7	T7.14	2.09	18.00	16.90	Seedling	Ridge
2	T7	T7.15	4.10	21.00	22.05	Seedling	Flat
2	T7	T7.16	35.28	119.00	22.75	Sapling	Ridge
2	T7	T7.17	10.07	36.50	23.30	Seedling	Ridge
2	T7	T7.18	9.22	43.00	23.60	Seedling	Ridge
2	T7	T7.19	3.28	11.00	24.35	Seedling	Ridge
2	T7	T7.20	4.37	28.00	24.45	Seedling	Ridge
2	T7	T7.21	8.36	37.00	24.65	Seedling	Ridge

Site	Transect	Plant ID	Root Collar Diameter (mm)	Height (cm)	Distance (m)	Age Class	Topography
2	T7	T7.22	12.01	46.00	25.40	Seedling	Flat
2	T7	T7.23	4.21	30.00	27.85	Seedling	Flat
2	T7	T7.24	7.27	27.50	36.10	Seedling	Flat
2	T8	T8.1	20.63	105.00	2.20	Sapling	Furrow
2	T8	T8.2	21.23	101.00	2.30	Sapling	Furrow
2	T8	T8.3	7.63	48.00	4.50	Seedling	Ridge
2	T8	T8.4	6.94	38.50	5.85	Seedling	Ridge
2	T8	T8.5	11.21	56.00	5.85	Sapling	Ridge
2	T8	T8.6	9.39	49.00	6.20	Seedling	Ridge
2	T8	T8.7	10.40	45.00	6.20	Seedling	Ridge
2	T8	T8.8	2.40	13.50	6.95	Seedling	Ridge
2	T8	T8.9	3.48	29.00	6.95	Seedling	Ridge
2	T8	T8.10	15.52	47.00	7.80	Seedling	Ridge
2	T8	T8.11	4.55	33.00	7.90	Seedling	Ridge
2	T8	T8.12	2.25	14.00	8.00	Seedling	Furrow
2	T8	T8.13	22.09	90.00	8.00	Sapling	Ridge
2	T8	T8.14	4.36	24.00	8.10	Seedling	Furrow
2	T8	T8.15	13.21	45.00	9.05	Seedling	Ridge
2	T9	T9.1	45.68	251.00	2.00	Sapling	Ridge
2	T9	T9.2	4.85	29.00	3.95	Seedling	Ridge
2	T9	T9.3	7.53	41.50	4.05	Seedling	Ridge
2	T9	T9.4	9.12	40.50	4.05	Seedling	Ridge
2	T9	T9.5	4.45	31.00	4.10	Seedling	Ridge
2	T9	T9.6	1.81	23.00	4.15	Seedling	Ridge
2	T9	T9.7	6.79	31.00	4.20	Seedling	Ridge
2	T9	T9.8	1.83	7.00	4.30	Seedling	Ridge
2	T9	T9.9	2.79	8.50	4.30	Seedling	Ridge
2	T9	T9.10	3.37	10.00	4.40	Seedling	Ridge
2	T9	T9.11	6.81	28.00	10.05	Seedling	Ridge
2	T9	T9.12	2.58	19.00	15.80	Seedling	Ridge
2	T9	T9.13	4.18	28.00	15.80	Seedling	Ridge
2	T9	T9.14	5.11	34.00	16.05	Seedling	Ridge

Site	Transect	Plant ID	Root Collar Diameter (mm)	Height (cm)	Distance (m)	Age Class	Topography
2	T9	T9.15	3.94	29.50	16.20	Seedling	Ridge
2	T9	T9.16	4.74	29.00	18.65	Seedling	Ridge
2	T9	T9.17	9.91	45.00	18.80	Seedling	Ridge
2	T9	T9.18	5.03	21.00	20.10	Seedling	Ridge
2	T9	T9.19	5.64	19.00	20.20	Seedling	Ridge
2	T9	T9.20	12.43	38.00	20.30	Seedling	Ridge
2	T9	T9.21	2.90	15.00	21.05	Seedling	Ridge
2	T9	T9.22	8.69	22.50	21.55	Seedling	Furrow
2	T9	T9.23	13.09	32.00	25.40	Seedling	Ridge
2	T9	T9.24	12.32	25.00	27.85	Seedling	Ridge
2	T9	T9.25	6.61	27.00	28.00	Seedling	Ridge
2	T9	T9.26	6.86	37.50	61.65	Seedling	Flat
2	T10	T10.1	10.46	33.00	23.45	Seedling	Ridge
2	T10	T10.2	10.62	30.00	27.15	Seedling	Furrow
2	T10	T10.3	5.95	21.00	27.20	Seedling	Furrow
2	T10	T10.4	2.50	13.50	31.35	Seedling	Ridge
2	T10	T10.5	3.17	27.00	38.20	Seedling	Ridge
2	T10	T10.6	15.51	53.00	68.60	Sapling	Ridge
2	T10	T10.7	4.79	20.50	70.90	Seedling	Furrow
2	T10	T10.8	13.56	43.50	81.90	Seedling	Ridge
2	T10	T10.9	7.54	22.00	85.15	Seedling	Ridge
2	T10	T10.10	33.30	60.00	85.30	Sapling	Ridge
2	T10	T10.11	75.85	131.00	87.50	Tree	Ridge
2	T10	T10.12	6.14	34.50	89.80	Seedling	Furrow
2	T10	T10.13	6.39	64.00	91.00	Seedling	Ridge
2	T10	T10.14	15.89	46.50	92.30	Seedling	Ridge
2	T10	T10.15	8.84	39.50	104.65	Seedling	Ridge
2	T10	T10.16	8.62	42.00	111.15	Seedling	Ridge
2	T10	T10.17	9.82	23.00	115.60	Seedling	Flat
2	T10	T10.18	5.43	26.00	115.85	Seedling	Flat
2	T10	T10.19	3.47	16.00	119.10	Seedling	Flat
2	T10	T10.20	21.30	71.00	120.90	Sapling	Flat