Twinflower Research & Conservation

The North Highland Twinflower Project

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North Highland Twinflower Project

Talk outline

- Twinflower: biology & Scottish status
- NHTP: area & population
- NHTP: action to date
- NHTP: protocols & methodologies
- Future Research

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Twinflower (*Linnaea borealis* L): biology

- A long-lived creeping, stoloniferous, evergreen dwarf shrub
- Flowering mid summer onwards tailing into August/October
- Insect pollinated by small flies and hoverflies, typically flying < 1 m between flowers (Scobie & Wilcock 2009)
- self-incompatible
- A Eurasian & North American plant of boreal forests

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The Plant: Scottish Status

- 400 separate patches [a continuous area of twinflower which may be more than 1 clone] have been recorded since 2000, as a result of concerted effort to re-visit old records, as well as new discoveries (A Scobie *pers com).*
- 80% of patches in Scotland are a single plant i.e. a unique, clone. The 20% contain only 2 or 3 clones, which are closely related. (Wiberg *et al.* 2016)
- This current precarious status is due to:
  - forest fragmentation
  - plantation management
  - heavy grazing
  - burning
  - lack of grazing/disturbance
- Current Scottish population is effectively a static collection of isolated clones, highly vulnerable to further loss

Kohn & Ennos 1999, Wilcock 2002, Scobie & Wilcock 2009, Wiberg *et al* 2016

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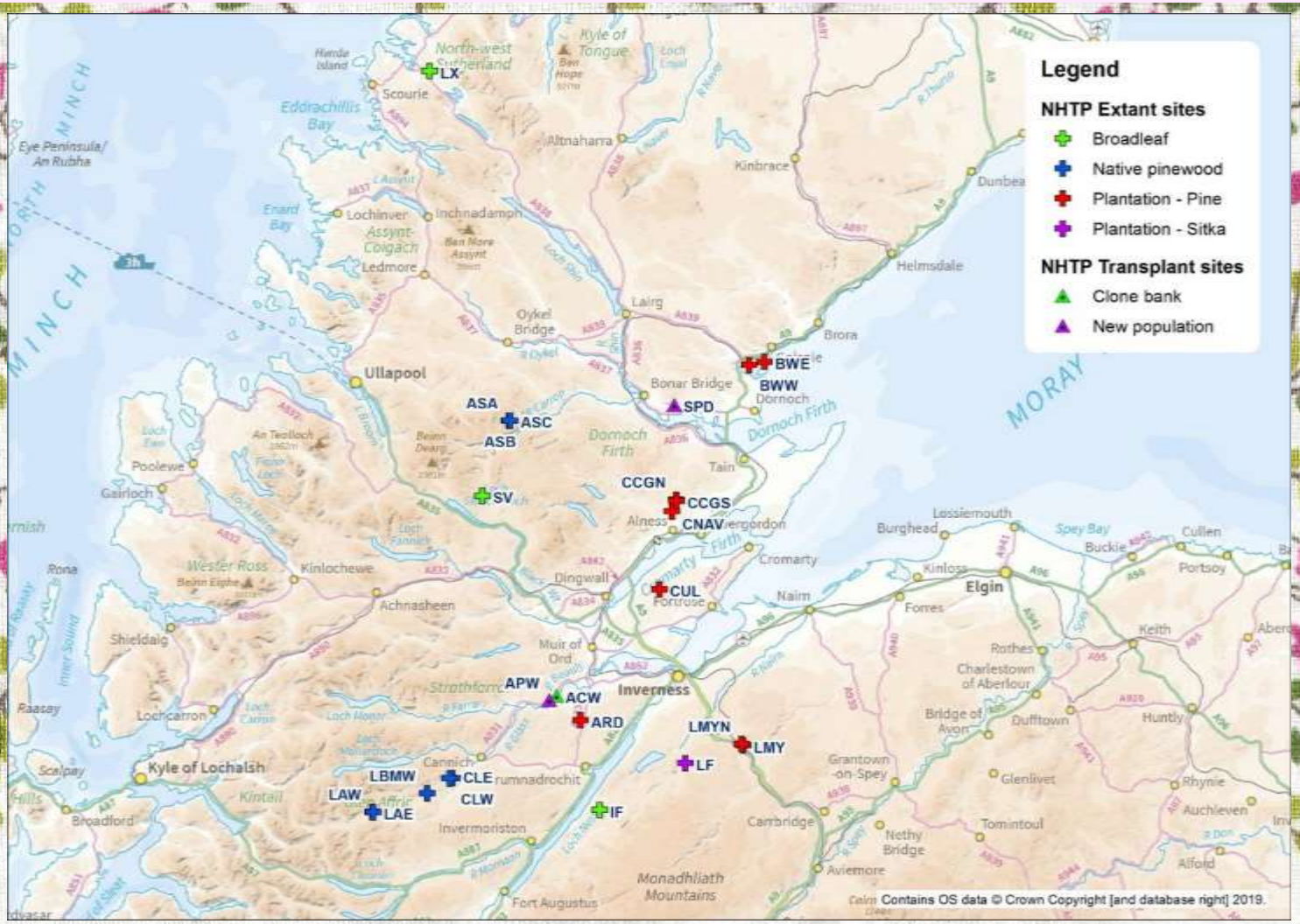
Action to date: 2019 Distribution



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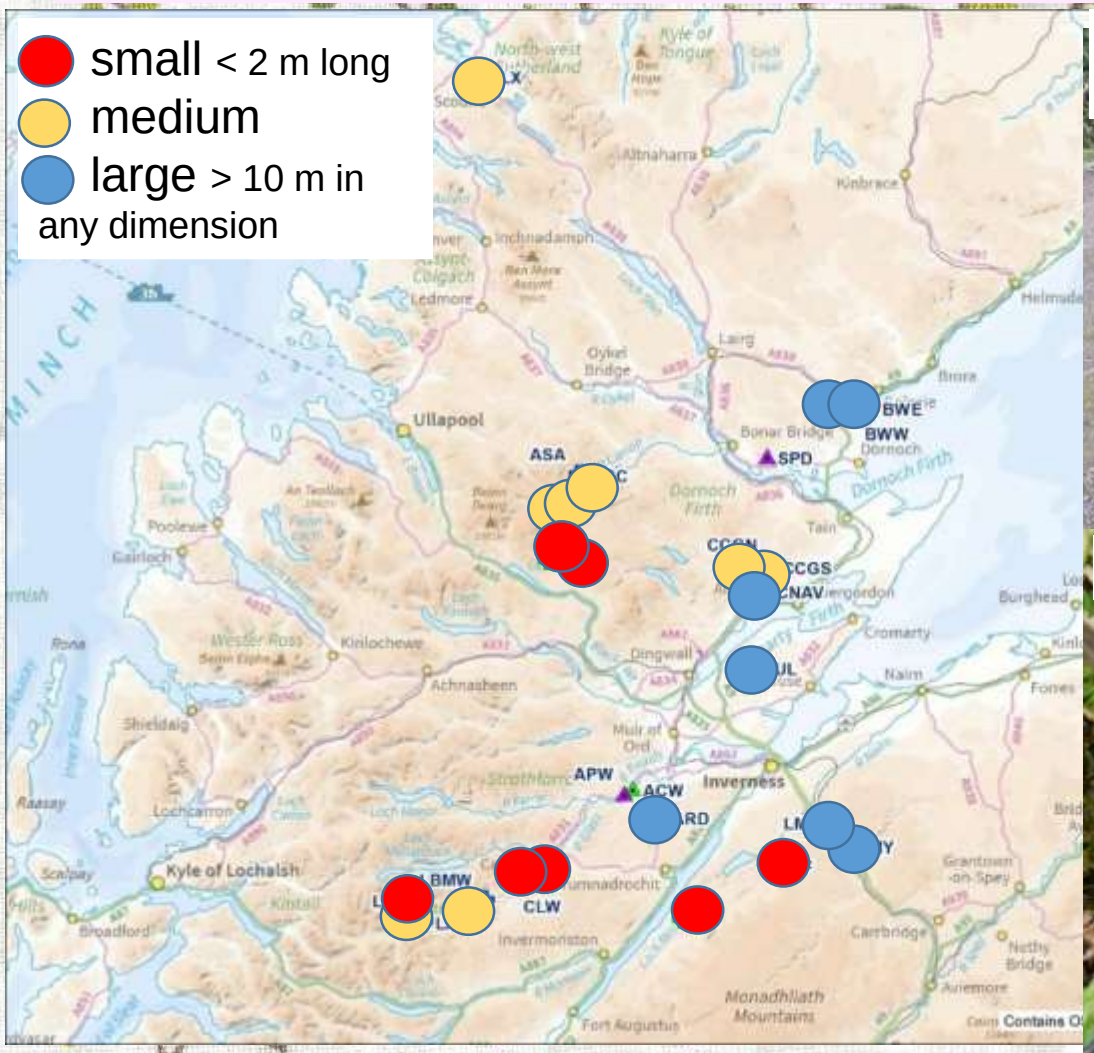
SIZE OF INDIVIDUAL PATCHES



Inverfarigaig – squeezed between track and sitka regen.

Coire Loch East 2 of 6 remaining shoots

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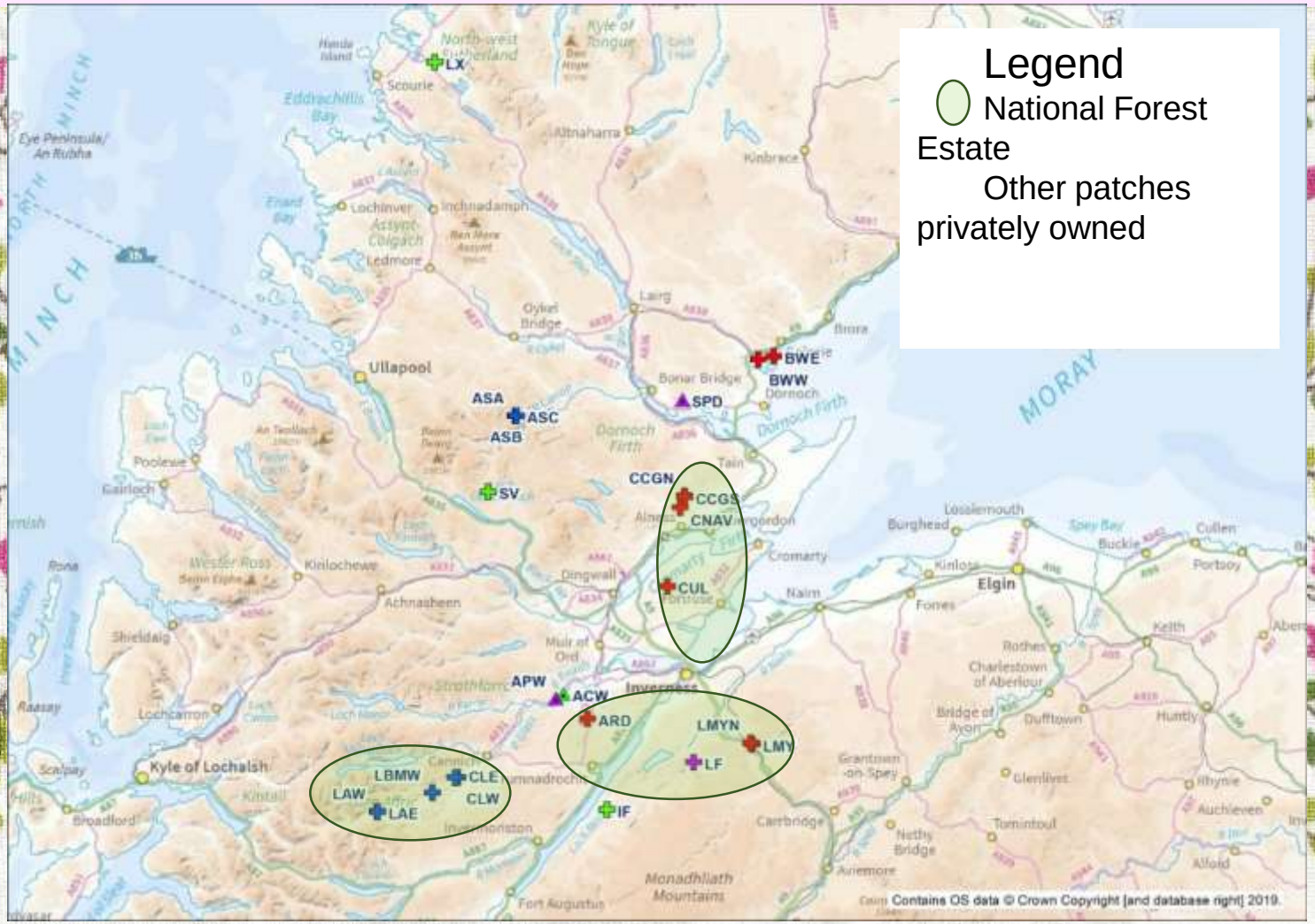
Ownership



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Action to date: Genetics

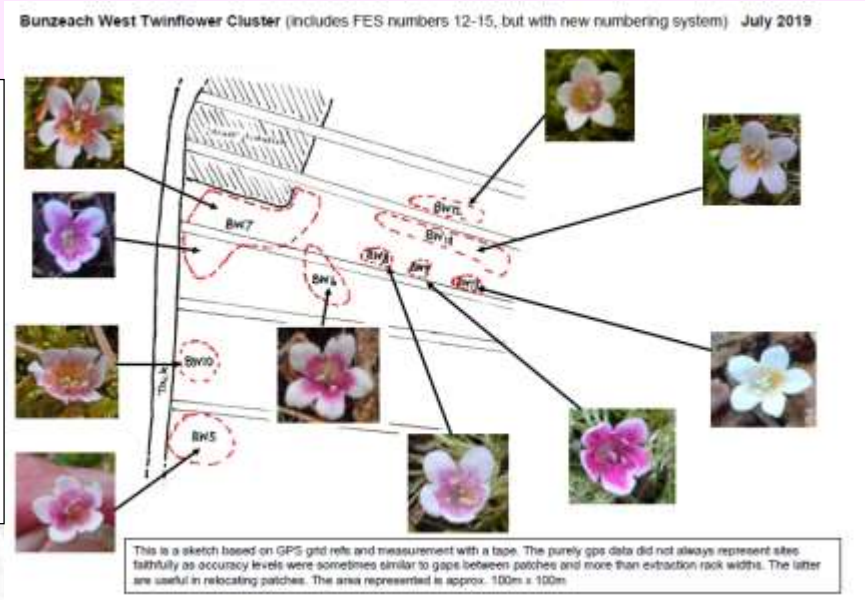
In 2018, 81 samples from 18 NH patches were genotyped:

- giving 19 unique clones
- Strathvaich has 2 clones
- All clones unique, as are those from the rest of Scotland showing there has been no historical movement of clones

2019: 12 further samples, from 4 patches are with Forest Research awaiting genotyping

It would be very useful to be able to identify different clones in the field.
During a recent survey of a group of clones on Deeside the following range of flower shapes and colours was recorded. These will be related to the genotypes currently being determined and may suggest a way forward.

(Drawn by Richard Marriott. The area represented is approx. 100m x 100m)



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Action: Genetic conservation

1st Aim - Safeguard genetic diversity

- All confirmed and potential genotypes are in cultivation

These stock plants can be used to produce further plants for new populations and clone banks

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Action: Genetic conservation

1st Aim – safeguard genetic diversity – clone banks to preserve each genotype & eventually to provide propagation material for further populations.

- 14 genotypes are in a pinewood-based clone bank hosted by Aigas Community Forest Trust
- 14 genotypes are in Forest Research clone bank with other Scottish genotypes
- remaining genotypes, primarily from the small vulnerable clones are still being grown on to produce enough material for new plants.

2nd Aim – achieve genetically diverse and viable populations, in order to facilitate seed production in the long term.

- two sites have now been planted with 4 or 5 new multi-clone populations

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Establishing New Populations

Translocation licence – needed for any proposed planting anywhere

Planting site selection criteria include (Scobie & Wilcock 2009)

- site type (maybe geographic are specific),
- ownership,
- management type,
- ease of access

Which donor patches to use? (Wiberg *et al* 2016)

- a minimum of 6 different clones is most important
- they must have a low chance of being related, that is at least 1.5 km apart
- if possible they should be growing within +/- 150 m altitude of each other & the planting site.

Typical extant twinflower site

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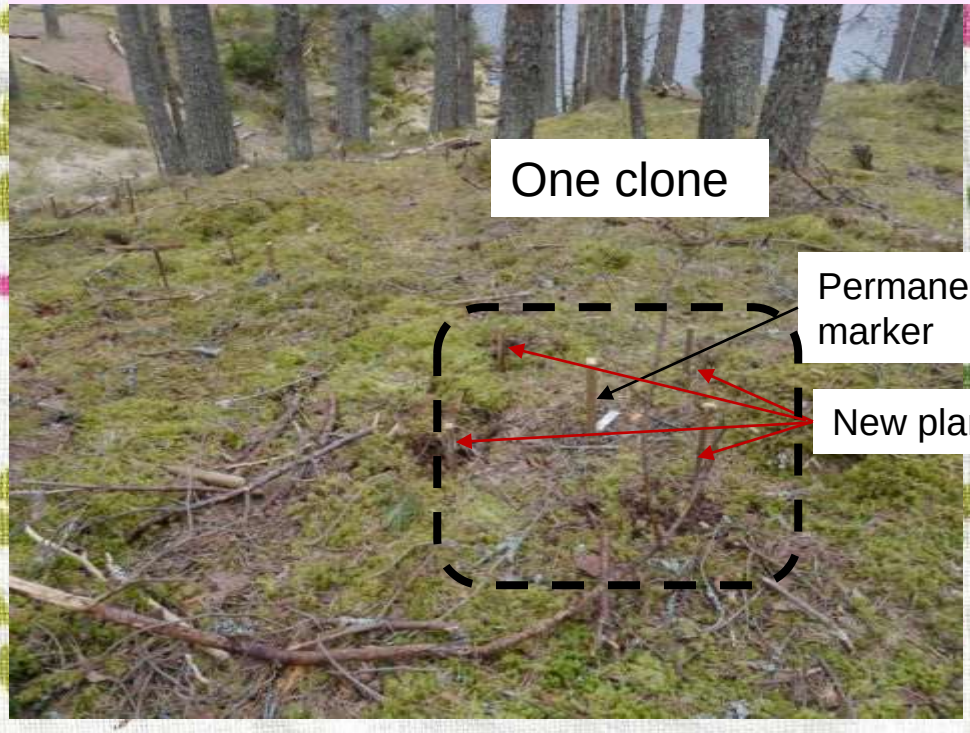
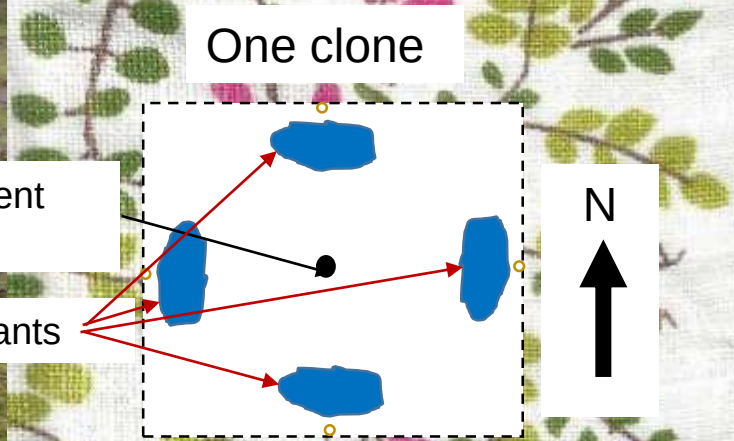
Establishing New Populations

Planting layout

- one site = 4 or 5 populations
- eventually at least 8 clones per population
- clones at least 1 m from each other.





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Ideas for Future Research

- Propagation methods for bulking up clonal material for planting out
- Extant sites
  - do we know why the plants have survived at them?
  - is there data still to be collected e.g. soil chemistry data or mycorrhizal associations?
  - given the above should we be planting in association with them to create multi-clone populations?
- New populations
  - What levels of competition occur between plants of the same genotype, and between different genotypes?
  - How long does it take a plant to establish and so be capable of “holding its own” in a multi-clone population?

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2020 Activities

Anticipated from partners:

- Final genotyping of 12 samples from 4 recently found patches
- Preparation of Best Practice Guidance:
  - Twinflower Restoration Handbook (R Ennos)
  - for integration with forest operations

NHTP work:

- A number of new populations planned for this winter on the National Forest Estate and potentially on Alladale Estate
- New sites for the most vulnerable clones
- Continue raising awareness
- Recruitment of further volunteers ….

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- **THANK YOU TO Jim MacIntosh/BSBI for inviting me to speak and to those who have helped with the project particularly:**
  - **Andy Scobie,**
  - **Iain MacDonald, & several SNH area staff,**
  - **Giles Brockman & Richard Thompson FLS**
  - **Innes McNeil, Alladale Estate,**
  - **Donald MacRae, Strathvaich Estate**
  - **Jill Hodge, Trees for Life….**
  - **Site Partners:**
  - **FLS, The Woodland Trust, Aigas Community Forest, Aigas Education Trust, Alladale Estate, Strathvaich Estate**

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