PROJECT PROPOSAL FORM

Making the Most of Masters aims to improve collaboration between employers and universities by providing opportunities for postgraduate students to undertake work based projects as an alternative to a traditional university dissertation. Projects should address a real need within the host organisation and be beneficial to both host and student.

The Marine Alliance for Science and Technology for Scotland (MASTS), pools the majority of Scotland's marine research capacity. MASTS members provide Masters courses in a range of marine related disciplines and many of their students are keen to undertake applied projects outside of academia.

Notes on Topic Selection

A relevant academic will work with your organisation to refine your proposed topic and ensure it meets both your needs and the academic requirements of the student. Projects should typically be achievable within a 12–16 week timeframe (including writing the final report).

Your proposed project could be:

- A specific project title or topic for the student to deliver;
- A general idea of a business need which requires further development;
- A core research theme to be developed by the student into a bespoke project;
- An intended outcome for the organisation.

The level of detail you provide will determine the extent to which further discussion may be required with the relevant programme director to ensure suitability.

desk-based/data studies that will easily facilitate remote working and remote supervision are welcome, as well as in person and/or experimental based projects where appropriate.

What's Next?

Please send your completed form to the MASTS Programme Coordinator & Deputy Dean of Grad School, Dr Emma Defew (masts@st-andrews.ac.uk) before the deadline.

Following submission of the form, it will be channeled to the leaders of the various Masters programmes that operate within the MASTS community and a representative from the most relevant programme or department will get in touch to discuss the project scope, delivery and the selection of an appropriate student. If more than one student expresses an interest in your project, you will need to ensure discussions take place to enable the most suitable student to be matched with your project. The projects themselves usually won't start until May or June.

MASTS - Making the Most of Masters – Project Proposal Form

Name and address of Organisation:
NatureScot
Great Glen House, Leachkin Road, Inverness, IV3 8NW.

Name of the key contact in Organisation:
Chris Nall

Contact e-mail and phone number:
chris.nall@nature.scot; kelly.saunders@nature.scot

Title of proposed project:
Mapping the decline of subtidal seagrass beds in the Western Isles

Project outline and intended outcomes:

Seagrasses are marine flowering plants that grow on sandy and muddy sediments in sheltered coastal areas. They often form dense meadows, known as seagrass beds, which are critical marine habitats that provide a range of ecosystem services. These include sediment stabilisation, carbon storage, and shelter and food provision for a wide variety of animals (including species of conservation importance and juveniles of commercially important fish species). There are three seagrass species and biotopes in Scotland, the focus of this master's project will be subtidal beds of common eelgrass *Zostera marina* (biotope: SS.SMp.SSgr.Zmar).

The Western Isles are a particular stronghold for subtidal seagrass in Scotland with the Sound of Barra and the Sound of Harris containing 80% of the national total. This area is therefore hugely important for the conservation of this habitat. Unfortunately, in recent years the extent of Hebridean seagrass has reportedly declined in both sounds (NatureScot, 2025; Carstairs and Carstairs, 2026). This has led to conservation status of designated seagrass beds in the Sound of Barra Special Area of Conservation (SAC) being downgraded from "favourable maintained" to "unfavourable declining" (NatureScot, 2025). The declines observed in both sounds are hypothesised to be caused by hydrodynamic changes and increased sedimentation related to the construction of causeways in the 1990s (as discussed with regard to the Eriskey causeway by Carstairs and Carstairs (2026)).

Preliminary work by NatureScot analysing aerial photography indicates that extent changes are potentially more nuanced with some key beds experiencing consistent decline overtime but other beds showing some increases in extent since causeway construction. A comprehensive assessment quantifying how seagrass beds are changing in Western isles is therefore needed to inform effective conservation and management decisions.

This project aims to quantify and understand changes in extent of *Zostera marina* beds in the Western Isles over recent decades. Remote sensing mapping techniques will be applied to a range of aerial and satellite imagery using recently acquired data confirming seagrass and macroalgae habitats to ground truth and validate models.

This desk based project also has a couple of key priorities and several optional objectives that will depend on time available

1. Quantify changes to the extent of *Zostera marina* beds in Western Isles overtime (priority is the mapping change in Sound of Barra over the last 10 years with the addition of doing the same in Sound of Harris if time allows)
2. Compare application of high-resolution aerial imagery (12.5cm resolution - APGB photography) to more regularly available low-resolution Sentinel 2 satellite imagery (10m resolution) and provide recommendations for using one or the other for future work
3. Evaluate the accuracy of seagrass mapping using an independent validation dataset (as provided by NatureScot)
4. (optional) Use of Sentinel 2 imagery to map seasonal changes in the extent of subtidal seagrass beds to better understand how seagrass distribution changes throughout the year as well as between years

The outputs of this work will greatly help the understanding spatial and temporal change which is crucial to inform management decisions in areas of high conservation value.

References

Carstairs, M and Carstairs, S. 2026. Review of Scottish Seagrass Declines. NatureScot Research Report 1388.

NatureScot 2025. Sound of Barra SAC Conservation and Management Advice (https://www.nature.scot/sites/default/files/special-area-conservation/8602/conservation-and-management-advice.pdf)

Poursanidis, D.; Katsanevakis, S. Mapping Subtidal Marine Forests in the Mediterranean Sea Using Copernicus Contributing Mission. *Remote Sens.* **2025**, *17*, 2398. https://doi.org/10.3390/rs17142398

Any additional comments e.g. details of specific disciplines required, methods to be used, travel involved, where the work would take place (i.e. at the host site or at the University), whether you foresee any Intellectual Property or confidentiality issues (and if so, what form might these take?):

Desk based project so can be shaped to masters program timelines

The student should have knowledge of marine ecology and geospatial sciences and should be comfortable with carrying out a work using earth observation techniques to map shallow underwater habitats.

The student will be required to develop techniques for mapping seagrass beds using both high resolution imagery (12.5cm resolution - APGB photography) and Sentinel 2 satellite imagery (10m resolution). Access to GIS software and appropriate computational power is therefore required as are advanced GIS skills. Some GIS support from NatureScot may be available but it

is advised the student has a supervisor in their academic institute with geospatial expertise. It is anticipated that image classification methods such as pixel and/or object based classification and random forest or deep learning models will be used to predict seagrass habitats with use of ground truthed data to train and verify classification (e.g. Poursandis and Katsanvakis 2025).

The student will need to familiarise themselves with NatureScot's survey data from the Sound of Barra and Harris, NatureScot ABGB aerial imagery (going back to 2005 and potentially other historic imagery under NatureScot custodianship) and the Copernicus Sentinel-2 dataset. Previous work by NatureScot's GIS team initially scoping out the potential to map seagrass from aerial imagery in Sound of Barra SAC will also be available and may act as a good starting point for this project. We invite the student to visit a NatureScot office to meet with relevant colleagues and the student is encouraged to present their work at the annual student conference in Inverness (although on-line option is possible).