# ALIEN INVADER!

**NICK KLENSKE** REPORTS ON HOW PRECISE POSITIONING IS HELPING PROTECT A UNIQUE BIRD HABITAT IN NORTHERN IRELAND FROM AN INVASIVE SPECIES OF PLANT

Not only is Northern Ireland's Strangford Lough the largest inlet in the British Isles, it's also one of the most ecologically diverse. Home to an abundance of flora and fauna, the lough holds the distinction of being Northern Ireland's first Marine Conservation Zone, and tourists flock to the area for its outstanding fishing and scenery.

As one of the most richly biodiverse regions in Europe, the area is protected as a Special Area of Conservation by the European Union. It is also designated as an Area of Outstanding Natural Beauty, Area of Special Scientific Interest, and an Important Bird Area.

Unfortunately, the entire area is being threatened Common Cordgrass (Spartina anglica).

## Mapping alien invaders

Spartina is an invasive alien grass that is colonising Strangford's inter-tidal mud flats, resulting in a loss of feeding habitat for thousands of wildfowl and waders. As Spartina moves in, it colonisesthe mud flats that are rich in invertebrates. It can also displace other resources such as Zostera, commonlty known as Eel Grass. The Zostera is the main source of food for the Pale-bellied Brent Goose (Branta bernicla hrota), who fly in from Arctic Canada and stop off in Greenland and Iceland before landing on Strangford Lough's shores. The invertebrates in the mud flats serve as the food supply for most of the other waterfowl.

Any hope for controlling Spartina's spread and environmental impact starts with having a precise picture of how widespread the problem is – something the National Trust and the Northern Ireland Environment Agency (NIEA), key managers of the area, didn't have.

To remedy this, the National Trust, supported by the NIEA, contracted HeritageNI, a drone and mapping company based in Northern Ireland. "We provide comprehensive ground-based and aerial mapping solutions, right through to deliverables in various GIS formats," says company founder David Craig.

Together with Allen & Mellon Environmental, the company was charged with mapping the distribution of Spartina along the lough's more than 150-kilometer intertidal area.

*'Photo: Common Cord Grass - Spartina anglica, by Jürgen Howaldt (Reproduced under Creative Commons Attribution-Share Alike 2.0 Germany license.)*

Strangford Lough is the largest inlet in either Britain or Ireland, covering an area of 150 km². Although almost totally enclosed by the Ards Peninsula in County Down, it is linked to the Irish Sea by a narrow channel at its southeastern edge. *Satellite Image by the Copernicus Sentinel-2 satellite. Photo: ESA – Reproduced under Creative Commons Attribution-ShareAlike 3.0 IGO license*

Above left: Spartina anglica is a stout, rhizomatous salt marsh grass, with round, hollow stems five mm or more in diameter and grows in roundish clumps up to 130 cm in height. It was introduced to Strangford Lough in the 1940s to increase sediment accretion in coastal protection schemes. It subsequently colonised intertidal mudflat and sandflat locations beyond the lower limits of native saltmarsh vegetation, where it can reduce the availability of wildfowl and wader food resources. Tackling Spartina involves donning full protective overalls, respirator and face shield, strapping on a 20-litre knapsack full of water/herbicide mix, and trekking through the mud searching for areas of the grass that range in size from large beds to smaller clumps. Above right: Pale-bellied Brent Goose (Branta bernicla hrota) resting after migration. *Photo: Lonnie Bregman / Shutterstock.* Lower: four organisations have partnered to limit Spartina's spread and environmental impact

## Where drones fear to fly

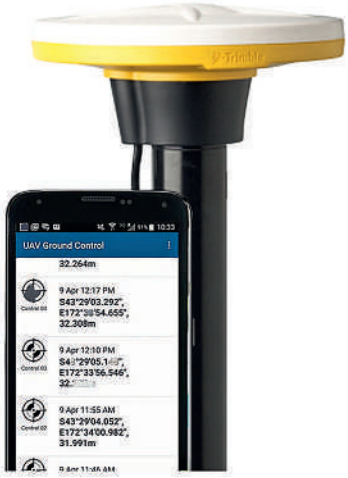
The original plan was to conduct the survey via drone. In fact, HeritageNI had already developed a technique specifically for recognising Spartina. "Equipped with a 20-mp Hasselblad camera, our drone had the necessary resolution to capture the spectral signature of Spartina's specific shade of green, along with its location," remarks David.

The problem, however, was that the technique could only be used during the summer growing season. That's because Spartina decays and becomes brown during the winter and spring. Although the drone could identify large clumps of decayed Spartina, this was not the case for small clumps.

Add to this the flight restrictions surrounding an airport located at the head of the Lough, where Spartina is particularly dense, and the idea to use a drone was simply impractical.

"Using drone imagery alone would have missed the very small, single outbreaks happening in the middle of this natural salt marsh," explains David. "We decided very early on that the trained eye was the best method for identifying all Spartina outbreaks."

More than 30,000 GNSS data points were collected along 150 km of shoreline




| | A | B | C | D | E | F | G | H | I | J | K | L |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Name | Latitude | Longitude | Height(m) | HeightAtGround(m) | AntennaHeight(m) | HPrecision(m) | VPrecision(m) | EPSGCode | Comment | MSLHeight(m) | MSLHeightAtGround(m) |
| 2 | 31 May Ctl 01 | 54.52029844 | -5.66636531 | 59.168 | 59.168 | 0 | 0.1 | 0.105 | 1165 | | 3.369 | 3.369 |
| 3 | 31 May Ctl 02 | 54.52038737 | -5.66638011 | 58.938 | 58.938 | 0 | 0.1 | 0.105 | 1165 | 1 | 3.138 | 3.138 |
| 4 | 31 May Ctl 03 | 54.52041381 | -5.66639768 | 58.96 | 58.96 | 0 | 0.1 | 0.105 | 1165 | 1 | 3.161 | 3.161 |
| 5 | 31 May Ctl 04 | 54.52044905 | -5.66644451 | 58.959 | 58.959 | 0 | 0.1 | 0.105 | 1165 | | 3.16 | 3.16 |
| 6 | 31 May Ctl 05 | 54.52048103 | -5.66645756 | 58.946 | 58.946 | 0 | 0.1 | 0.105 | 1165 | | 3.147 | 3.147 |
| 7 | 31 May Ctl 06 | 54.5205638 | -5.66644507 | 58.918 | 58.918 | 0 | 0.1 | 0.105 | 1165 | | 3.118 | 3.118 |
| 8 | 31 May Ctl 07 | 54.52058383 | -5.66644372 | 58.938 | 58.938 | 0 | 0.1 | 0.105 | 1165 | | 3.138 | 3.138 |
| 9 | 31 May Ctl 08 | 54.52062002 | -5.66647573 | 58.981 | 58.981 | 0 | 0.1 | 0.105 | 1165 | 1 | 3.182 | 3.182 |
| 10 | 31 May Ctl 09 | 54.52061591 | -5.66651175 | 59.045 | 59.045 | 0 | 0.1 | 0.105 | 1165 | 1 | 3.246 | 3.246 |
| 11 | 31 May Ctl 10 | 54.52060104 | -5.66662778 | 59.14 | 59.14 | 0 | 0.1 | 0.105 | 1165 | 5 | 3.341 | 3.341 |
| 12 | 31 May Ctl 11 | 54.5206321 | -5.66661778 | 59.044 | 59.044 | 0 | 0.1 | 0.105 | 1165 | 4 | 3.245 | 3.245 |
| 13 | 31 May Ctl 12 | 54.5206683 | -5.6666243 | 58.966 | 58.966 | 0 | 0.1 | 0.105 | 1165 | | 3.166 | 3.166 |
| 14 | 31 May Ctl 13 | 54.5206803 | -5.66664042 | 58.974 | 58.974 | 0 | 0.1 | 0.105 | 1165 | | 3.174 | 3.174 |
| 15 | 31 May Ctl 14 | 54.52067829 | -5.66659424 | 58.965 | 58.965 | 0 | 0.1 | 0.105 | 1165 | 1 | 3.166 | 3.166 |
| 16 | 31 May Ctl 15.1 | 54.52070652 | -5.66660709 | 58.92 | 58.92 | 0 | 0.1 | 0.105 | 1165 | | 3.121 | 3.121 |
| 17 | 31 May Ctl 15.2 | 54.52071848 | -5.66660239 | 58.877 | 58.877 | 0 | 0.1 | 0.105 | 1165 | | 3.078 | 3.078 |
| 18 | 31 May Ctl 15.3 | 54.52073033 | -5.66661544 | 58.906 | 58.906 | 0 | 0.1 | 0.105 | 1165 | | 3.107 | 3.107 |
| 19 | 31 May Ctl 15.4 | 54.5207259 | -5.66663425 | 58.918 | 58.918 | 0 | 0.1 | 0.105 | 1165 | | 3.119 | 3.119 |
| 20 | 31 May Ctl 15.5 | 54.52072841 | -5.66665076 | 58.921 | 58.921 | 0 | 0.1 | 0.105 | 1165 | | 3.122 | 3.122 |
| 21 | 31 May Ctl 15.6 | 54.52071183 | -5.66665343 | 58.924 | 58.924 | 0 | 0.1 | 0.105 | 1165 | | 3.124 | 3.124 |
| 22 | 31 May Ctl 15.7 | 54.52071073 | -5.66666717 | 58.956 | 58.956 | 0 | 0.1 | 0.105 | 1165 | | 3.157 | 3.157 |
| 23 | 31 May Ctl 15.8 | 54.52069247 | -5.66667382 | 58.974 | 58.974 | 0 | 0.1 | 0.105 | 1165 | | 3.175 | 3.175 |
| 24 | 31 May Ctl 15.9 | 54.52069301 | -5.66666063 | 58.926 | 58.926 | 0 | 0.1 | 0.105 | 1165 | | 3.126 | 3.126 |
| 25 | 31 May Ctl 15.10 | 54.52070411 | -5.66664446 | 58.931 | 58.931 | 0 | 0.1 | 0.105 | 1165 | | 3.131 | 3.131 |
| 26 | 31 May Ctl 16 | 54.5206814 | -5.66664251 | 58.891 | 58.891 | 0 | 0.1 | 0.105 | 1165 | | 3.091 | 3.091 |
| 27 | 31 May Ctl 17 | 54.52066807 | -5.66662639 | 58.885 | 58.885 | 0 | 0.1 | 0.105 | 1165 | | 3.085 | 3.085 |



Top left: The Trimble Catalyst subscription-based GNSS Service brings precise (1-2 cm) positioning and is complemented by a range of apps, including the UAV Ground Control app pictured here. Top right: Example of CSV file created by the UAV Ground Control app. Lower left: Immediately after CSV import. Lower right: After Polygon digitisation showing three small clumps remaining

## A versatile surveying solution

For David, this meant heading out on foot. And in a region notorious for short days, cold winters, lots of rain, varying tides, and hundreds of kilometers of challenging terrain – not to mention nearly 100 islands that can only be accessed by boat – this was no easy feat.

To succeed, the company needed a versatile surveying solution that was light to transport, easy to use, and capable of providing the precise level of accuracy the project required.

For HeritageNI, that solution was the Trimble Catalyst.

"We already used Catalyst when plotting ground control points to use in our originally-planned mapping by drone, so we were aware of the lightweight nature of the system and found it ideal for this new task," says David.

Trimble Catalyst is a subscription-based GNSS solution offering professional-grade positioning as an on- demand service. It's easy-to-use, lightweight, plug-and-play USB antenna – and the fact it leverages the computing power of the smartphone already in David's pocket – made the Catalyst particularly convenient for visually inspecting the entire shoreline on foot.

Over the past year David has registered more than 30,000 GNSS data points along the lough's 150 km of shoreline - using Catalyst for the clumps along the perimeter identified by eye and by drone for the larger swaths located in salt marsh areas.

"Location accuracy and data acquisition speed (within 15 seconds), as well as the ability to identify even a single plant, are the main advantages of using Catalyst," explains David.

Although David could identify individual small clumps using a single GPS location, because the changing shape of larger clumps, he recorded their perimeter using several GPS readings. He then entered this data into the previously installed Trimble UAV Ground Control app, which has two editable fields for inputting vegetation attributes.

## A very accurate picture

At the end of the day, this data is shared out of the app by email as a CSV attachment and then imported as a layer in Quantum GIS (QGIS). These points are hand digitised on a separate overlaid polygon shapefile layer. The polygon points in the CSV file are then removed and the remaining points merged into a global shapefile layer containing just single points.

The resulting dataset contained two shapefiles, one with points representing single plants or small clumps less than 0.5m2 and the other containing polygons of the larger clumps. The area of these clumps is automatically calculated and stored in the attribute layer of the shapefile.

"While it takes longer to map a given length of shore compared to drone mapping, the back-office data processing takes less time as the CSV data file loads straight into QGIS," adds David.

The data files were then turned over to the National Trust and the NIEA. "Having a very accurate picture of nearly every occurrence of Spartina in the entire Strangford Lough region means these organisations can prioritise their control and mitigation efforts and, hopefully, preserve this important habitat for generations to come," concludes David.

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