

The background of the entire page is a high-quality landscape photograph. It shows a calm lake in the middle ground, surrounded by lush green hills and mountains. The sky is filled with soft, white clouds. In the foreground, there are rocky, moss-covered slopes. The overall tone is natural and serene.

BLUE newt

Spring/Summer 2022

The pulse of environmental innovation.



Welcome to the Spring / Summer 2022 edition of Blue Newt.

In this issue, we're exploring how technology is enhancing the way we do business. We continue to invest in new ideas and support innovation to further cement our position as a leading environmental consultancy.

Thomson's specialist GIS team has created the 'Total Digital Survey', a suite of revolutionary digital tools to give our ecologists in the field the most efficient and accurate way to carry out ecological surveys.

We've also been leading the way with the use of AI and Machine Learning to identify habitats and features from aerial mapping.

On page 10 we couldn't resist exploring NASA's Artemis project. Although not directly relevant to environmental solutions, it's certainly fascinating to understand more about the possibility of travelling to and staying on the moon for increasing lengths of time.

Finally, I'm delighted to introduce our new Associate Director of Climate Change & Sustainability, Andrew Frost. On page 14, he tells us all about his role at Thomson and the most common questions he's currently being asked by clients.

Nancy

Nancy Thomson
Founder and Chair,
Thomson environmental consultants

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TOTAL DIGITAL SURVEY

Ecologists have been using mobile GIS for a while to undertake various survey types, but Thomson has taken this approach several steps further by creating what we call our 'Total Digital Survey'.

The vast majority of our survey based projects now take this approach from the smallest phase 1 study through to our work on HS2.

Over the last two years of lockdown we have accelerated this approach to offer a Total Digital Survey from the start to the very end of the project by using state of the art GIS tools coupled with our own in-house developed, highly focussed digital processes. In doing so we have cut the time taken to do the mundane which has freed up ecologists time to focus on interpretation and analysis of data rather than its capture and processing.

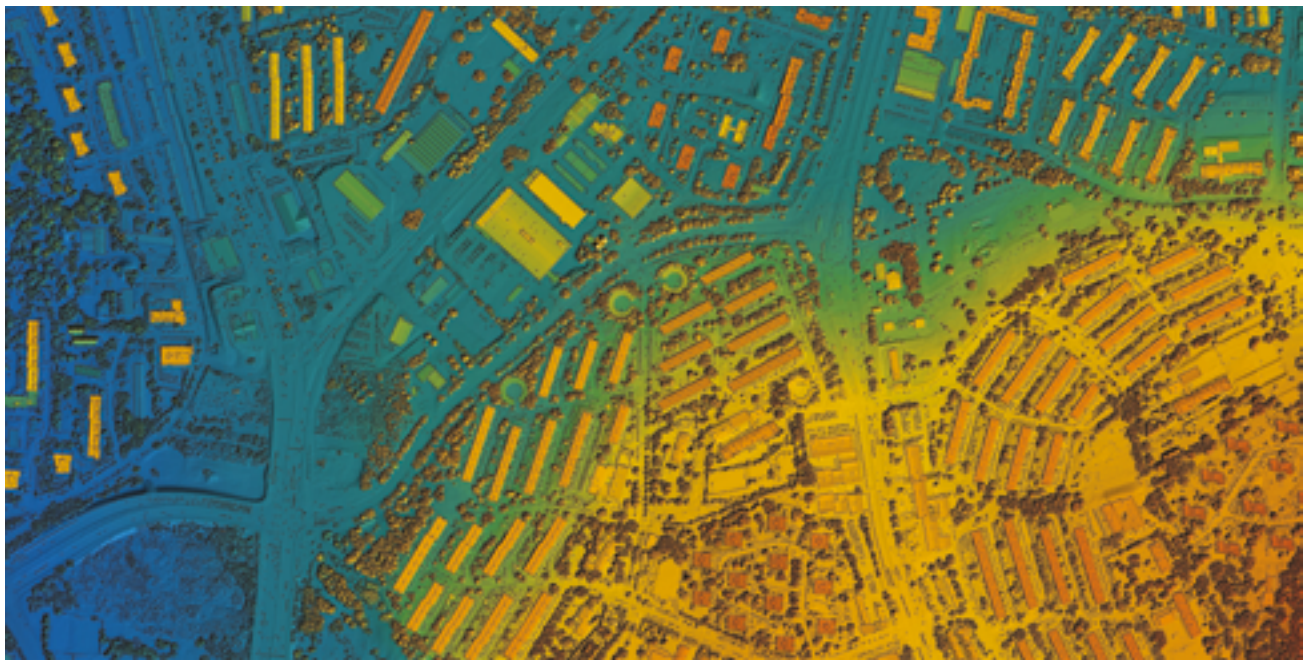
Thomson's specialist GIS team has created a suite of ready made data capture pro-formas using ESRI Collector (and now Field Maps) for all our standard survey types (e.g. GCN, UKHAB, Arb, Bats etc).

For any given project our ecologists in the field use hand held devices to accurately capture survey data – our best of breed GPS can give results at sub 50cm level. For other projects our GIS team will work closely with our ecologists to create bespoke pro-formas to meet clients' exact requirements. Examples of this have included our work for LMJV for HS2 where a very richly defined set of data was required to match HS2's ecology standards.

So far this is likely to be familiar but from here on the Total Digital Survey project really takes off! Our core aim was to make data work for our ecologists rather than the other way round.

All data is live uploaded into our central Data Warehouse (or on occasions where there is no signal the next time a signal is available). The Data Warehouse however is not just for storage. We have created our Thomson Data Engine to analyse and check this data and in many cases to automate tasks that were previously manually done by our GIS or ecology teams. Examples include adding a unique database wide ID, calculating OS grid references, cascading data down from the site information to individual features, calculating tree risk, formatting data correctly and many more. Overall there are over 200 actions that the Engine runs every day (and sometimes hourly) to ensure our data is as accurate as possible.





In addition we have now built our own tool TEQAT (Thomson Environmental Quality Assurance Tool) that allows the ecologists an early view of their data in a really simple to use way and lets them further QA using their expertise. Data can be easily amended where errors are spotted and a full log of all changes is automatically generated. This tool has seen huge time savings in our QA process and has been a key driver in ensuring we meet client deadlines. We can further use the audit trail to see where errors are common and subsequently adjust our forms in the field or offer advice/training to ecologists in the field to better improve quality.

Once survey data is QA'd, our GIS team use state-of-the-art desktop GIS to produce accurate survey maps and carry out sophisticated analysis of data. All our mapping requests use the same data from the Data Warehouse ensuring we are working in real time and with true synergy and the GIS team are now finding less errors in data enabling them to focus on the actual map production and analysis.

The TDS does not end there however. We have built a further custom tool (TARA – Thomson Automated Report Application) that allows the ecologists to extract their GIS mapping data into easy to present tables directly into MS Word – this used to be a manual process and very time consuming but now it's a matter of a few button presses

and our app opens Word and creates the tables in our standard format. Again this is freeing up ecologists to do the critical work of analysis and interpretation rather than spending time on mundane data tasks. TARA can also export site photos from the Data Warehouse – again this used to be a very slow manual process but is now almost instantaneous.

The final part of the TDS is TIM (Thomson Interactive Mapping) – this is our online mapping website where we can grant secure access to our clients so they can see their data. Again this data is all live, all current and all from the same data warehouse. For some projects we create a TIM site which allows the client to literally see our ecologists capture data live – this can be really important on some big projects where access is difficult and time pressing. For other clients we can provide a site for post-survey, allowing them to see the results of a survey in a really interactive way and even stream this data directly into their own GIS tools for use with their other data.

Overall the TDS has revolutionised the way we carry out ecological surveys and has led to increased efficiency, greater accuracy and more time to spend on the actual report and recommendations. All with a minimum cost as we are using core technology we already had – just developing our own add-ons and processes.

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ARTIFICIAL INTELLIGENCE IN ECOLOGICAL MAPPING

Artificial Intelligence (AI) and Machine Learning are current buzzwords in the IT sector but what impact will they have on the world of ecology? At Thomson we have been leading the way with the use of AI and Machine Learning to identify habitats and features from aerial mapping and to offer our clients new ways of understanding data.

Using our state of the art GIS tools the Thomson GIS Team has produced high quality mapping and data analysis for a number of years. In doing so we have built up a huge amount of data that has been captured on the ground. As humans we can look at a GIS map and identify features or habitat types using our own knowledge and experience. But now we can now use this data, coupled with our experience, to 'teach' our software too!

For example, a few years back we undertook a survey to identify Hottentot fig plants in the South West of England. This non-native species is a particular issue in coastal and dune areas as it outcompetes native species. This project was undertaken using traditional survey methods on the ground and led to identification of the species on a traditional GIS map. Recently we pushed this data through our AI tools overlaid with aerial imagery from the same era. The AI/ Machine Learning tools (after a lot of processing time!) 'learned' what a Hottentot fig looks like from the air based on the imagery and as identified from the survey.

We then ran the process against aerial imagery from another location and allowed the AI to attempt to identify the species. We compared the results to survey data we held for this area. It achieved a remarkably high success rate. We could then teach the learning model from this data set too to further improve accuracy – in fact the more it learns the better!

This offers up exciting potential of taking new aerial imagery (either commercial or flown by our own UAV pilots) to quickly identify invasive species over a far wider area than with traditional methods or where access may be limited with a very high degree of accuracy.

Our next step is to teach our software to identify other invasive species such as Japanese knotweed. We are also trialling its ability to learn what Ash dieback looks like, again from previous

ground surveys matched to UAV imagery of the same sites – this could be particularly useful when coupled with our innovative work using near infrared aerial imagery.

This though is just the start of our journey with AI and ecology data. We have many years' worth of detailed surveys across the UK and are looking to use AI in a number of areas. For example, to build a predictive model based on this data, coupled with imagery, and other data such as temperature, soils, aspect etc to potentially identify habitats, biodiversity and the likelihood of species being present on a site from a current aerial image. Don't worry - we're not suggesting this would replace boots on the ground - but it could potentially offer clients an 'early warning' system when they are considering sites or allow land owners to understand and manage their land holdings much better.

From our ecologists' point of view it could help them focus on the most likely places a particular species may be present or better still pre-capture habitat areas before they go on site, speeding up the habitat survey process as a whole.

It's still early days, but whatever happens it is clear AI is going to have a major impact on the way we work and there are some very exciting times ahead at Thomson as we develop this technology!



MAN KIND GOES BACK TO THE MOON

It's been 50 years since a man last set foot on the moon, but in as little as two more years that could be set to change. In 2024 NASA's Artemis project is set to land two more astronauts on the lunar surface – at least one of whom will be the first woman to touch down.

Not only is the intention to land people on the moon but this time to establish Artemis base camp from which further exploration can be carried out and further missions can be sent to. Coupled with an orbiting 'Gateway' space station it will allow for humans to travel to and from the moon and stay there for increasing lengths of time.

The Gateway is a spaceship in lunar orbit where astronauts will transfer between the Orion rocket (that will carry people from Earth) and the 'lander' on regular Artemis missions. Gateway will remain in orbit for more than a decade, providing a place to live and work, and supporting long-term science and human exploration on and around the Moon.

The Human Landing System is the final mode of transportation that will take astronauts to the lunar surface in the Artemis lunar exploration program from the Gateway. On early missions, the astronauts will live inside the pressurized crew cabin portion of the lander for up to a week.

With Artemis III mission, from lunar orbit, two astronauts will take the first new ride to the surface of the Moon, landing where no humans have ever been: the lunar South Pole. This is the ideal location for a future base camp given its potential access to ice and other mineral resources.

On the first few missions, the human landing system will double as lunar lodging, offering life support systems to support a short crew stay on the Moon. In the future, NASA envisions a fixed habitat at the Artemis Base Camp that can house up to four astronauts for a month-long stay.

Since 2016, NASA has worked with several companies on their habitation systems and designs, assessing internal layouts, environmental control and life support

systems, and outer structure options, including rigid shells, expandable designs, and hybrid concepts. The agency is currently working with industry to refine ideas for a combination home and office in orbit, recently testing full-size prototypes.

Furthermore NASA has proposed two lunar surface transportation systems: a lunar terrain vehicle (LTV) and a mobile home and office referred to as a habitable mobility platform. The LTV will be an un-pressurised, or open-top vehicle, that astronauts can drive in their spacesuits for more than 12 miles from a camp site.

The technology the early moon landings used is hugely eclipsed by the digital technology we now have and the new Artemis missions are bringing together a wide variety of this technology to make lunar exploration more viable than ever – from battery technology to AI robots and everything in between.

Recent satellite mapping exercises and analysis (sadly not undertaken by Thomson's GIS team!) have discovered pockets of ice and water on the moon – and this more than anything else offers a huge impetus to the Artemis project. If there is water then there is potential to support longer term living on the moon and who knows what else...

Phase 1 on the Dark Side anyone...?

You can find out more at NASA's Artemis website:
nasa.gov/specials/artemis



USE OF UAVS IN ECOLOGY

Thomson Environmental Consultants are the UK's leading ecology specialist. Through our drive for innovation we are leading the way with the use of UAV (Unmanned Aerial Vehicle – or drones) surveys in the ecological market place.

Thomson is licensed with the Civil Aviation Authority, insured for aerial photography work and we have a number of drones at our disposal. The use of drones for ecological mapping is opening up a host of exciting opportunities to undertake ecological surveys in different ways and with potential efficiency gains. Often larger areas can be covered at a lower cost than traditional survey methods.

The use of UAVs is particularly useful when clients need to obtain data from locations where access or visibility is limited or when large areas need to be covered. The photographic imagery we capture is of very high quality, much better than traditional aerial photography and therefore can be used to better extract habitat and ecological data.

Using a mixture of automated and AI techniques we can create habitat mapping and ecological reporting. Use of our UAV surveys is particularly useful when monitoring habitats over the longer term. For example, our work at the world renowned re-wilding project at Knepp Estate, Sussex, has allowed for comparison of habitats digitised from our own UAV collected imagery and older aerial imagery. We have used this to monitor and quantify changes in habitat mosaics and the development of scrub patches within the re-wilding scheme.

Very excitingly our latest drone is equipped with a number of cameras allowing us to capture imagery in a range of spectrums.

This allows us to carry out NDVI (Normalised Difference Vegetation Index) analysis. Put simply NDVI is a well-documented methodology to calculate the visible and near-infrared light that is reflected by vegetation. Vegetation that is healthy absorbs most of the visible light that hits it, and reflects a large portion of near-infrared light. The opposite is true of sparse or unhealthy vegetation. This means we can effectively look at plant health over an area far more quickly than with manual surveys.

This technique has been used in the US and Australia for a number of years in agriculture to allow farmers to manage their crops and identify areas that may require additional intervention. However at Thomson we are starting to use this technology to analyse an area's overall vegetation health and potentially identify issues. In particular, trials are ongoing at Thomson with this technology to spot diseases such as Ash dieback and we are positive that this could be an essential tool in the fight against the loss of these trees in the UK.

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A COFFEE WITH:

Andrew Frost

We caught up with Associate Director of Climate Change & Sustainability, Andrew Frost, to find out more about life at Thomson.

TELL US ABOUT YOUR ROLE AS ASSOCIATE DIRECTOR OF CLIMATE CHANGE & SUSTAINABILITY

This is a new role to focus on developing and delivering the Climate Change and Sustainability service offering for Thomson environmental consultants and to support the internal ESG strategy work at Thomson. It is a broad ranging role that considers climate change mitigation, adaptation and resilience of our built and natural

environment. Carbon foot printing and reporting at product, project and company level and life cycle assessment. Impact reduction through renewables, demand side management and training. Sustainability strategy development, implementation and reporting and nature-based solutions that enhance biodiversity, sequester carbon, improve nutrient cycling, reduce flood risk and provide a valuable resource for local communities.

TELL US ABOUT YOUR CAREER. HAVE YOU ALWAYS WORKED IN THE ENVIRONMENTAL SECTOR?

On leaving school I started life in the Services. After suffering a back injury, I returned to education as a mature student, taking my A level equivalents at evening classes. I then attended Lancaster University where I read Environmental Science and graduated with a 1st class BSc (Hons).

I then found my way into sustainability, initially via the Concrete Centre as their Sustainability Manager, developing the cement, aggregates and concrete sustainability strategy and reporting framework. Since then, I have worked in sustainability at BRE,

Willmott Dixon Re-Thinking, HS2, TRL, Connected Places Catapult, DB Group (Holdings) Limited and now at Thomson environmental consultants. I have also set up and run a renewable energy business, Aqua Forte Limited. My roles have included Standards work at UK, European and international level, having written BES 6001 whilst at BRE, sat on several UK Standards committees, ASTM Standards committees and been involved in several working groups on CEN TS 350 Sustainability of Construction Works. My time in sustainability has covered the built environment, natural environment, and transportation.



WHAT ATTRACTED YOU TO THE ROLE AT THOMSON?

Thomson occupies an interesting space, creating maintaining and monitoring the natural environment at its interface with the built environment. It has a passion for 'joining the dots', innovating, and offering its services in the most sustainable way. They also have a great ethos and values that are important to me.

HOW DO YOU HELP MAKE INNOVATIVE IDEAS A REALITY?

Hard work! Innovation does not happen easily, though the concept is simple, take two (or more) things that exist and put them together in a new way. Innovation does not happen in an isotropic environment, it happens in a rugged environment, where the planets need to align e.g., the innovative idea, right environment,

right time, right cost, right demand, and right enablers need to exist at the same time for the innovation to gain traction. If they don't, it will fail. A classic example of this is the shipping container that failed several times before successful adoption.

WHAT IS THE MOST COMMON QUESTION YOU'RE CURRENTLY BEING ASKED BY CLIENTS?

It depends on the clients and where they are on their journey. Climate change and sustainability are complex areas, with intrinsically linked themes. How can they address climate change mitigation and adaptation and how do they ensure their business and assets are climate change resilient can be a conundrum, especially when trying to balance other impacts and issues. Scope 3 emissions are a complex area, especially when delving into the supply chain and the materials they use.



"Innovation does not happen in an isotropic environment, it happens in a rugged environment."

Meaningful methods of reducing energy requirements and reducing carbon also emerge, especially around demand side management. Circularity is a growing area, as people begin to realise the benefits in resource depletion, waste, and carbon emissions from applying circularity principles to products and projects. There is also a growing interest in nature-based solutions and natural capital, from the carbon sequestration benefits biodiversity net gain can bring to valorising the climate change resilience and sustainability benefits a scheme can bring.

TELL US ABOUT A RECENT PROJECT

Recent work has focussed on supporting the development of innovative circular economy, low carbon construction products, addressing the barriers to their adoption (test data, Standards and Specifications) and brining them to market. This has included carbon foot printing, life cycle assessment (LCA) and the production of environmental product declarations (EPDs).



"I love being outdoors. When I am not supporting my children at their sporting endeavours, I run, cycle, kayak, climb, hill walk and open water swim."



WHAT DO YOUR CLIENTS REALLY VALUE FROM YOU?

Broad knowledge base, ability to join the dots, hard work, pragmatism, energy, enthusiasm, honesty, transparency, and quality of outcomes.

WHAT OTHER INTERESTS DO YOU HAVE OUTSIDE WORK?

I love being outdoors. When I am not supporting my children at their sporting endeavours, I run, cycle, kayak, climb, hill walk and open water swim. We have a smallholding on the outskirts of Farnham, Surrey and

spend the rest of my time looking after that and, out in my workshop, where I turn wood and make electric guitars (for my son). That's if the dogs aren't demanding another walk! I also love rocks and fossils...

WHAT'S ONE THING THAT PEOPLE WOULD FIND SURPRISING ABOUT YOU?

Like many others, cancer has had a massive impact on my life so I do what I can to raise money for Cancer Research and other cancer related charities. So far, I have run 52 full marathons and 30 half marathons.

HOW MUCH FLOODING DOES THE UK FACE?

Last September, the UN Intergovernmental Panel on Climate Change (IPCC) released a bumper assessment of how and why the climate is changing, including projections for how everything from rainfall to arctic sea ice is likely to change in the coming decades.

Scientists expect a warming world to lead to more extreme rainfall. The forecast shows the UK receiving about 10 per cent more rainfall on average per year by 2100 compared to 1986-2005.

Source: IPCC 5th Assessment Report

It's not just the total amount of rainfall that scientists expect to increase. The IPCC report also predicts Europe and the UK is "very likely" to see more heavy rainfall events by the end of the century. A lot of rain falling in a short space of time raises flood risk, and there's already evidence heavy rainfall events are getting more frequent in the UK due to climate change, as a report released last week from the Met Office explains.

Heavier rainfall plus sea level rise – which make storm surges bigger and more likely to breach coastal defences – has scientists warning of a greater flood risk in the UK as the climate warms. As professor Richard Allan from Reading University told us recently:

"Whenever we have heavy (and prolonged) rainfall events in the future, we can expect them to be more intense – along with the risk of flooding."

WOULD YOU RECOGNISE ASH DIEBACK?

WHAT DOES ASH DIEBACK LOOK LIKE?

Ash dieback can affect ash trees of all ages. Younger trees succumb to the disease quicker but in general, all affected trees will have these symptoms:

- Leaves develop dark patches in the summer.
- They then wilt and discolour to black. Leaves might shed early.
- Dieback of the shoots and leaves is visible in the summer.
- Lesions develop where branches meet the trunk. These are often diamond-shaped and dark brown.
- Inner bark looks brownish grey under the lesions.
- New growth from previously dormant buds further down the trunk. This is known as epicormic growth and is a common response to stress in trees.

Woodland trust

QUICK FACTS

Common names:

Ash dieback, chalara

Scientific name:

Hymenoscyphus fraxineus

What does it affect?

Ash

Areas affected so far:

The whole of the UK

Origin:

Originally from Asia, arrived in the UK via Europe



What will you discover from a PEA?

Peak ecology season is underway

A Preliminary Ecological Appraisal (PEA) is normally the first stage in any ecology site assessment. This will support the planning and design in the early stages of a project and indicate any likely ecological impacts from the proposed development.

As many of you know, the optimum time for undertaking detailed ecological assessments occurs between April and September so it's important to book your PEA as early as possible.

Email enquiries@thomsonec.com or call **01483 466000** to book now

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