



WOODLAND
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Wood Wise

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BRISTOL NATURAL HISTORY CONSORTIUM

OPAL Tree Health Survey

CITIZEN SCIENCE

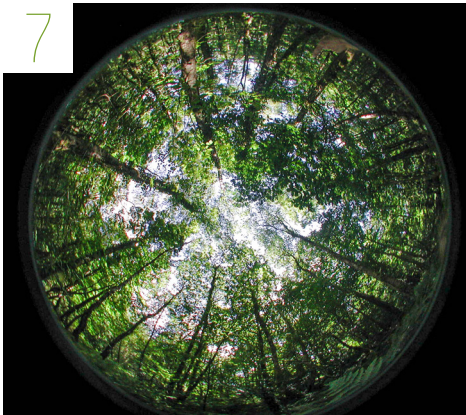
BIOBLOTT
RACING TO
RECORD
NATURE

INSPIRING
PEOPLE TO
SAVE OUR
WOODS

CHANGING
SEASONS AND
SPECIES
SURVIVAL

FIGHTING
TREE PESTS
AND
DISEASES

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Bristol Bioblitz event

Citizen Science

While 'citizen science' may be a fairly new concept for some, it's really one of the oldest forms of scientific knowledge-gathering.

Long before there were professional scientists, inquisitive citizens were collecting data, testing hypotheses and carrying out experiments. Many projects are now supported by citizen scientists, an approach which can be beneficial both to scientific progress and the general public.

Projects supported by volunteers and the public are becoming ever more popular, and can often gather much more data and cover far larger areas than using smaller numbers of

experts alone. This vast growth in resources and potential scope can offer huge benefits for furthering understanding of major issues, in a wider reaching and more cost-effective manner.

Accessible but robust

In modern times there have been many discussions around the credibility of data collected by citizen scientists. However, those projects able to carefully develop simple, accessible survey methods can ensure more robust data, which can be weighted as to its quality and verified by experts.

Citizen science can offer an accessible way for almost everyone to contribute to increasing our knowledge of the world. It can also inspire people to feel they can make a difference and increasing general awareness of issues and people's comprehension of specific subjects.

Read on...

From social media gaming to nature recording, the projects covered on the following pages focus on citizen science related to woods and trees. You may well be familiar or involved with some of them, or perhaps after reading about them you might like to get involved. The more the merrier and the better we may be able to protect the natural world we so depend on for life.



DAVID MCCLENAGHAN, CSIRO-WIKIMEDIA COMMONS

There are only a small number of experts about

BioBlitz

High-energy BioBlitz events are a nature recording race against time and offer a quick, inclusive gateway into citizen science for thousands of people.

The concept started in the United States in 1996, with the first BioBlitz organised in Florida by the U.S. Geological Survey. Its results were published online, offering up BioBlitz as a free, open source format anyone could use to run their own events. Several BioBlitz events now take place regularly in the U.S. with National Geographic promoting the concept widely.

Coming to the UK

In 2009 the Bristol Natural History Consortium (BNHC) ran one of the first BioBlitz events in the UK at Ashton Court. One thousand members of the public and 200 school children got involved in exploring this iconic green space on the edge of the city. The event identified over 800 species and collected many more individual wildlife records, including two species never previously recorded in the county.

To celebrate the International Year of Biodiversity in 2010, a national programme of activities took place. Organisations all over the country organised BioBlitz events and the national BioBlitz programme was established. In 2010 there were 37 events held across the UK. But the popularity of this recording bonanza has increased and today there are around 60 to 80 events held in the country each year. Since 2010, an impressive 267 events have inspired more than 100,000 participants and collected over 150,000 records.

High intensity recording

The basic idea of a BioBlitz event is a citizen science race against time. Participants generally have 24 hours to find and record as



Bioblitz is open to all

many species as they can. Although events can range from smaller, shorter ones, to the bigger 24 hour ones, to huge 30 hour events that get students involved by including part of the school day.

Rare or common, all species in the given area are recorded and a running count is kept. While anyone can take part, there are experts on hand to verify the findings. Naturalists will also collect specimens as some species are too difficult to identify in the field, so the count

can increase even after the event. All records are fed into the important stores of data held in Local Records Centres and the National Biodiversity Network Gateway.

There are often other activities for participants, such as arts and crafts, running alongside the main recording and wider public engagement. At Bristol's BioBlitz events, tree trails have been created by eminent local naturalist, Richard Bland to help tell the story of a site. These have been made available to



Bioblitz discovery



Ashton Court

local groups for use and publishing after the events, leaving a positive legacy that can be replicated around the country.

Bioblitz organising

On average a large scale event can cost between £3,000 and £5,000, including resources like hiring a marquee and catering for volunteers. Some events are funded internally by the organisations running them, others manage on volunteer goodwill. But most seek small-scale grants or event sponsorship to help pay for costs.

BNHC supports BioBlitz activity in the UK by hosting the National Network on its website and openly providing online resources to help people organise their own events. It also helps promote events going on around the UK, shares

best practice and gives support to organisers, hosting an annual BioBlitz Conference. The BNHC, Natural History Museum, Marine Biological Association and University of York have created a useful guide on how to run a BioBlitz.

BioBlitz is a high-energy way to get people interested in nature recording, but one event in itself is a short affair. Ongoing, long-term monitoring is needed to properly serve conservation of local wildlife and green spaces. The BNHC website also provides links to other citizen science projects for those that get hooked on recording and want to do more. These include the Woodland Trust's Nature's Calendar and the British Trust for Ornithology's BirdTrack projects. Find out more at www.bioblitzuk.org.uk.



BRISTOL NATURAL HISTORY CONSORTIUM

Careful species identification



Hemispherical image

Climate Change

Climate change is one of the biggest threats to wildlife and humans, but even the experts find it hard to predict what the effects will be.

There are worries around the impact climate change is having and will have on the natural environment. It is difficult to predict what will happen to the world's forests, as they are highly complex and variable ecosystems, and many of the methods used to monitor subtle changes in their growth and health are too costly, time consuming and labour intensive to be widely carried out. Yet such monitoring and increased understanding is needed if we are to safeguard their future.

Alison Smith, a scientist at Plymouth University, is currently testing methods to monitor the effects climate change will have on woodland in the UK. This includes testing citizen science accessible surveys against more rigorous scientific methodology.

Woodland research

For the last year Alison has carried out intensive monitoring of the plants in four very different woodlands in Devon – two in Plymouth and two in North Devon. Each wood had very different characteristics (e.g. north or south facing) and species compositions. This allowed the different methods used to be trialled and compared across a range of woodland types.

She has looked at a variety of techniques for assessing levels of canopy closure and understory light levels, as well as the growth rate and phenology of different tree, sapling and ground flora species. Techniques were trialled from February to December 2014 at the four sites, to test their effectiveness under different conditions. She is now at the stage of analysing the data to see which methods could be used as part of a wider monitoring programme.

For example, five techniques for measuring canopy closure and assessing the amount of light reaching the understorey were compared to each other. Light is a key factor determining the growth of forest understoreys. Climate change is likely to affect this by extending the length of time trees in temperate regions are in leaf. It is therefore important to find methods for assessing understorey light that can be used on a large scale.

The methods tested include sophisticated techniques such as the use of hemispherical photography, which requires expensive software, and cheaper methods, such as using a mobile phone camera with a fish-eye lens attachment, or making visual estimations.



Deadwood survey

By comparing the effectiveness of data from different methods, Alison hopes to identify cost effective methods for gathering data that are comparable to more expensive techniques.

Citizen science hopes

Citizen science makes it possible for projects to obtain much larger amounts of data. For woodland, this would enable us to get a better understanding of different ecosystems. The Plymouth Woodland Project is a citizen science collaboration between the School of Biological

Sciences at Plymouth University, the National Trust, the Woodland Trust and Plymouth City Council, using money from the Heritage Lottery Fund.

The project launched in September 2013 with the main aims over its two year lifespan of:

- Inspiring public interest in forests and their ecology, by facilitating investigative and hand-on learning in woodlands in the local area.
- Enhancing public and professional understanding of Plymouth's woodland ecosystems, in order to conserve local woodlands for future generations.



Making the survey accessible to all

A third evolving aim is creating a simple measurement toolkit that can be used by citizen scientists in their local woods – cheap and easy methods that can be used far and wide by volunteer groups, schools and local communities.

The project has already developed two citizen science surveys, aimed at assessing deadwood and plant life, to help inform woodland management.

Deadwood survey

The deadwood survey launched in January 2014, involving schools and the general public. Two training workshops have been delivered and over 100 surveys completed, covering a hectare of Plymouth's woods.

Participants set up a 10x10m quadrat in a wood and assess the amount of deadwood within it. The type of deadwood is also recorded (i.e. standing, fallen and stumps), along with its decay level and associated plants, fungi and invertebrates to broad group levels. A survey guide is available online, see the web link at the end of this article.

The survey aims to understand how woodland ground flora varies in the urban woodland environment, according to how much light reaches the understorey. This will help woodland managers understand how best to manage woodlands to promote native woodland plants, and restrict invasive non-native species.

Global future

In the long term, Alison hopes her PhD research will not only benefit the UK's woods, but that some of the methods chosen could be used around the world, in initiatives similar to the Plymouth Woodland Project. Once her research is complete she plans to trial the



Woodland plant trail

The second survey launched in May 2014, also involving volunteers and school groups. Three training sessions were provided and more than 50 surveys completed during the spring and summer of 2014. Surveying will begin again this spring. The survey booklet and plant identification guide are available online – see the web link below.

methods chosen in high-altitude forests in the Andes. Communities there rely heavily on the ecosystem services provided by the forests and are already being affected by the impacts of climate change.

If you live in Plymouth then get involved at this early stage, or watch this space for future developments. You can find out more, and access the resources used in the survey, via the following website:

www.plymouthwoodlandproject.org.uk.

Recording the seasons

Records of seasonal change make up one of the longest data sets in the UK. Nature's Calendar and Track a Tree are two projects asking volunteers to record the seasons.

Phenology is the fascinating study of the influence seasonal change has on the timing of plant and animal life cycles. It can tell us a great deal about the effects of weather and climate on fauna and flora, and is currently being used by researchers to show us what our changing climate is doing to natural cycles over time.

Citizen scientists have been recording phenological events for centuries. Britain's first phenologist, Robert Marsham, was recording his 'Indications of Spring' as early as 1736¹, and his family continued to keep records until 1947. A national network for volunteer phenological recorders was formed in 1875 by the Royal Meteorological Society, which published reports until 1947.

Nature's Calendar

In 1998, Tim Sparks at the Centre for Ecology and Hydrology (CEH) re-established a voluntary phenology network. The Woodland Trust then joined forces with CEH to promote this UK Phenology Network to a wider audience and the Nature's Calendar (NC) project was launched in 2000.

NC now has around 2000 volunteers eagerly recording up to 150 different seasonal events. These include the first snowdrops appearing in late winter, emergence of the earliest butterflies in spring, tree leaf tinting in autumn, and the flowering of ivy before winter kicks in again. The project is friendly to beginners, offering some easy species to identify as well as the more challenging ones.



Brimstone butterflies appearing earlier as temperatures rise



Ash flowering

Positive results

To date there are 2.5 million records, with around 80,000 new ones added each year. The data collected is incredibly valuable to researchers, with over 40 scientific articles published and many features in the media.

On average, spring records tell us that compared to 30 years ago insects are seen three weeks earlier, plant growth is two weeks earlier and bird activity a week earlier. This spring advance correlates with climate data showing increasing temperatures in the UK. Autumn changes are not as clear, but as the growing season extends, fruiting is generally happening earlier and leaf fall later.

One of the great things about the project is

the live online maps. These show up-to-date information about the sightings recorded, so you can actually see the seasons sweeping across the country. This is almost instant feedback for those involved. The NC team also keep volunteers regularly updated with what is going on through regular emails.

Become a recorder

While there are several thousand people registered, it is a few hundred dedicated volunteers who regularly record. NC is always looking for new recorders to help collect its important data, especially in the face of our changing climatic times. There are also a few areas that have less volunteer coverage, which is needed to help complete the whole UK picture. These tend to be the less populated regions of

the UK like upland areas of Wales and Scotland. Recorders in Northern Ireland are also scarce. If you fancy recording nature through the year, in your own garden or while on your favourite walks then register at www.naturescalendar.org.uk.

Committed Nature's Calendar recorder Michael Knaggs gets a lot from being involved in the project: "I enjoy recording because it helps me to make sense of what is happening in the natural world throughout the year. There are many different things to look for, but recording timings for Nature's Calendar puts everything into a convenient natural order. It shows me what to look for and when the right time is to do so."

Track a Tree

Track a Tree (TaT) is a sister project of NC. It too looks at phenology, but asks volunteers to choose an individual woodland tree and keep regular records of its seasonal activities, and the flowering plants growing beneath it. TaT was developed by PhD researcher Christine Tansey at the University of Edinburgh, whose PhD is supported by the Woodland Trust and funded by the Natural Environment Research Council.

The project aims to use the valuable data collected by volunteers to better understand the seasonal timing of UK woods and how climate change could affect them. It was necessary



First feeding of blackbird young is earlier than 30 years ago

to initiate TaT to answer questions around the interactions between species in woodland habitats, which the NC data could not address.

Woodland species do not occur in isolation, so TaT looks at how spring timing affects woodland plant communities and the way species interact within them. A second focus for TaT is whether woodland species will adapt together with the changing climate, or if their timings will be thrown out of balance and threaten the long term survival of some species.

Flowers and trees

Species are always interacting with each other, but in woods this is particularly interesting during spring. To grow and bloom, flowers on the woodland floor rely on warmth and light reaching them from the sun. These species need to make the most of the time after the threat of frost has passed and before the leaves return, the tree canopy flourishes, and the lower levels are plunged into shade.

Woodland flowers and tree leaves are important food sources for many early insects, and they in turn for birds and their young. The spring timing of these species has an important impact for the whole food chain, therefore it is important to understand if the link between plant flowering and tree leafing will be altered through changes in our climate.

A TaT pilot took place in 2013 with enthusiastic volunteers from NC trialling it and the main project launched in spring 2014. In the first year over 250 trees in over 130 sites across the UK were observed by recorders. Volunteers register their wood and chosen tree, then visit their tree on a weekly basis until it has come fully into leaf. On every visit the spring development of the tree is recorded (such as budburst stage) and the number of flowers of selected woodland plants beneath it.

Some early analysis of geographical variation suggests early flowering woodland plants are good at tracking the timing of tree leafing across the UK, but much more data is needed to see how this varies over time.

Get involved

There is a reasonable spread of TaT volunteers but more are needed, particularly in Wales, Northern Ireland, east England and west Scotland. If you want to get involved then visit the TaT website www.trackatree.org.uk to register and download the recording guide.

¹Sparks T. H. & Carey P. D. (1995) *The Responses of Species to Climate Over Two Centuries: An Analysis of the Marham Phenological Record, 1736-1947*. *Journal of Ecology*, 83:2,321-329



Track a Tree surveying

Tree health

The introduction and spread of tree pests and diseases are major problems, but there are some important projects enlisting enthusiastic volunteers to help in the fight against them.

Awareness of the issues of pests and diseases has increased in recent years, but so too has the volume of new pests and diseases being spread around the world. Global trade and movement provides a pathway for pests and diseases to enter the UK, while climate change is thought to be altering conditions and enabling some species to survive and prosper here where they may not have previously.

Action stations

The Government's *Protecting Plant Health, A Plant Biosecurity Strategy for Great Britain (April 2014)*² highlights a need for "increased awareness and involvement of industry, NGOs and the public" and to "ensure all those with a role in plant health are more aware of risks to plants and plays their part to reduce the risk". The Government outlines a three-pronged strategy for tackling the issue:

- Keep pests and diseases out of the UK if we can.
- If they get in, eradicate them before they spread and take hold.
- If eradication is not possible, control and manage them.

In terms of tree health activity there is a pyramid of engagement. OPAL offers a broad base citizen science project for anyone to get involved, Observatree provides a narrower band of engagement for more experienced and trained volunteers, and then there are the experts and scientists sitting at the very top.

There are only a small number of dedicated inspectors and researchers tackling this huge and diverse issue. They need help and citizen science



OPAL Tree Health Survey

offers a way to do this and inspire the public. One of the biggest difficulties with solving any problem is feeling helpless. The following projects provide a way for us all to be involved in the solution.

OPAL

One of the biggest environmental people engagement projects in the UK is the Open Air Laboratories (OPAL) network launched in 2007 by Imperial College London through the Big Lottery Fund. Over the last eight years over 850,000 people have been involved, 270,000 survey packs been produced and 53,000 records saved in the database.

One of their surveys focuses specifically on tree health and was designed in collaboration with Forest Research and Fera. In 2012 the tree health

and plant biosecurity action plan increased the number of people focusing on tree pest and disease issues and raised its profile in the media. From this, OPAL began to devise a survey to enable the public to help.

Since its launch in May 2013, 1,500 OPAL tree health surveys have been completed. The survey has three elements: getting to know trees, identifying the health of a tree and a focus on the six most unwanted tree pests or diseases.

The tree identification guide has been a very popular resource and is helping increase public understanding of the most common trees found in the UK. Focusing on just six tree pests or diseases means the survey is within most people's capabilities and helps ensure wider engagement. OPAL enables people to start simply and provides a base for them to build on if they want to know more.



ANDREJ KUJICA, NATIONAL FOREST CENTRE - SLOVAKIA, BUGWOOD.ORG

Ash dieback symptoms

The best time to complete the survey is between May and September. If you want to get involved or view the useful resources go to www.opalexplornature.org/treesurvey.

Observatree

An ambitious venture using volunteers to support the work of tree health inspectors, Observatree is a four-year collaborative project between Forest Research, the Forestry Commission, Defra, Fera, APHA, the National Trust, Natural Resources Wales and the Woodland Trust, funded by the EU's Life programme. Observatree encourages everyone to act as tree health monitors and report sightings of pests and diseases, focusing on a list of the highest concern.

The project is also training up citizen scientists to act as a support network for verifying reports to Tree Alert. As there are only a small number of tree health inspectors but a growing number of problems, it means more sightings can be verified much quicker. This should enable action to be taken as quickly as possible.



LOUIS MICHEL NAGELISEN, DEPARTEMENT DE LA SANTÉ DES FORÊTS, BUGWOOD.ORG

Great spruce bark beetle larvae, an Observatree species



OPAL Tree Health Survey

A network of 200 specialist volunteers has been recruited to identify those pests and diseases of highest concern. Over four years they are being trained to help analyse data and undertake survey work across the UK.

The project is also researching tree health early warning systems currently used in other European countries. By learning from their experiences and sharing work in the UK, best practice protocols can be established. If you want to find out more go to www.observatree.org.uk.

Fraxinus

Social media is an increasingly useful tool, especially for engaging younger generations. Fraxinus, funded by the Biotechnology and Biological Sciences Research Council and Defra, is a Facebook game using players' pattern recognition skills to work out differences in genome sequences of DNA samples of the ash dieback fungal pathogen, *Hymenoscyphus fraxineus* (previously named *Chalara fraxinea*). This inputs into research around which fungal

strains are more virulent and which ash tree varieties are more resistant to the pathogen.

Fraxinus has been designed to be engaging to anyone that likes solving puzzles, turning an abstract problem into a fun and engaging game. Since starting in August 2013 it has had 60,000 plays by 25,600 unique players. Initial interest was very high (helped by the media spotlight on the disease), but this has now reduced down to a solid community of 50 dedicated players.

The project shows humans, although much slower, are better at finding variations than computers, especially with difficult genomic differences. Computers are good at identifying single changes, but humans are much better at picking up section changes, insertions or deletions.

They are always looking for new players, so if you love puzzles and are on Facebook take a look at www.facebook.com/fraxinusgame and help research into ash dieback.

AshTag

Another project focusing on ash dieback is AshTag, which launched in October 2012 very soon after the discovery of the pathogen in the UK hit the headlines. A smartphone application was designed to empower thousands of participants to spot and identify diseased trees, and upload images. The data was assessed by experts and enabled tracking of the disease as it spread.

Esmee Fairbairn Foundation funding allowed the project to evolve to provide people with physical tags to put on trees. These trees are being monitored over the long term to investigate the disease progress, assess the affect of it and look at characteristics of those disease resistant trees.

There are now thousands of trees recorded in the system. Many are clustered around those areas where the disease has already been recorded. But there are gaps that need plugging, such as Northern Ireland and northern Scotland.

Anyone interested in getting involved can sign up online via the project website: www.ashtag.org. Participants can buy tags to put on trees, geo-tag those trees, monitor them for disease and also look at adjacent individuals. This is important to find those individuals that are showing resistance even though they may be surrounded by diseased trees.

Living Ash

The Living Ash Project, funded by Defra, aims to identify ash trees tolerant to *Hymenoscyphus fraxineus*, the pathogen causing ash dieback. These individuals will then form the basis of a breeding programme to develop a new generation of tolerant ash trees, to ultimately ensure the UK does not lose ash from the landscape. The team is developing techniques to grow large numbers of tolerant trees to replace those being lost. They also hope to discover if isolated trees are less likely to be infected by the ash dieback pathogen

than trees in woods, which may be more so due to their close proximity to other trees.

The project was launched in spring 2014, in a joint venture between the Earth Trust, Forest Research, Future Trees and the Sylva Foundation, and is intrinsically linked to the AshTag project. Participants of AshTag can choose to answer five extra questions bolted onto the original survey and it is these that contribute to the Living Ash Project. Read more at: www.livingashproject.org.uk.

There is a plan to recruit more people this spring/summer, so if you want to get involved please sign up to AshTag and complete the extra survey. These positive projects empower people to find the trees that will help ensure ash survives into the future.

Your trees need you!

To borrow a phrase from the first world war image. This is our fight to save our native trees from the pests and diseases that threaten them. There are other projects out there, such as Conker Tree Science, and they all need caring people just like you.

²www.gov.uk/government/publications/plant-biosecurity-strategy-for-great-britain



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