



John Muir Pollinator Way Report

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Saving the small things that run the planet

Summary

The John Muir Way, opened in 2014, stretches 134 miles through nine local authority areas from Helensburgh to Dunbar.

This B-lines project, the first in Scotland, has identified new opportunities for grassland habitat creation, enhancement and management along the entire route as well as 1.86 miles either side of this. Through this mapping exercise a number of sites have been identified including 287 schools and nurseries; 103 hospitals and care homes; 382 places of worship and cemeteries; 39 historic landmarks and buildings; and 28 train stations. Additionally, 54 golf courses (2,700.08 ha), 492 public parks and play spaces (2,820.63 ha) and five country parks (1,351.45 ha) were identified and mapped.

There are a number of sites within this project that have nature conservation designations, including 284 Sites of Importance for Nature Conservation (12,243.74 ha), 33 Sites of Special Scientific Interest (12,255.15 ha) and 15 Local Nature Reserves (1,045.18 ha). A further 10 sites are managed as Scottish Wildlife Trust reserves totalling 411.09 ha and 41 have previously been identified as having an Open Mosaic of Habitat on Previously Developed Land with a total of 169.79 ha.

By mapping new opportunities this will aid in the future development of projects that will provide real benefits to our declining populations of pollinating insects of bees, wasps, hoverflies and butterflies as well as other wildlife that these habitats support.

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1. Introduction

The route of the John Muir Way stretches 134 miles (215 kilometres (km)) from Helensburgh in the west to Dunbar on the east coast (Figure 1). This walking and cycling route was opened in 2014 to commemorate the 100th anniversary of John Muir's death.



Figure 1. Route of the John Muir Way from Helensburgh in the west to Dunbar on the east coast.

During its 134 miles stretch, the John Muir Way passes through nine different local authority areas and goes through and close to several towns, including Helensburgh, Balloch, Lennoxton, Kirkintilloch, Falkirk, Edinburgh and Dunbar (Table 1).

Table 1. The main towns and villages that the route of the John Muir Way passes through and close by through each of the nine local authority areas.

Local Authority Area	Main Town and Villages
Argyll and Bute	Helensburgh
West Dunbartonshire	Balloch and Alexandria
Stirlingshire	Killlearn and Strathblane
East Dunbartonshire	Lennoxton, Milton of Campsie and Kirkintilloch
North Lanarkshire	Kilsyth
Falkirk	Bonnybridge, Falkirk, Polmont and Bo'ness
West Lothian	Linlithgow
Edinburgh	South Queensferry, Dalmeny and Edinburgh
East Lothian	Musselburgh, Prestonpans, Gullane, North Berwick and Dunbar

The route reverses John Muir's steps from where he boarded a ship and set sail for America with his family from Helensburgh in 1849, to his birthplace in Dunbar which today is a designated museum. From Helensburgh, the walk goes over hills to reach the southern shores of Loch Lomond where it then follows old minor roads and disused railway lines through Stirlingshire to traverse the rural, farming landscapes in the shadow of the Campsie Fells. When passing through Kirkintilloch, the route joins the Forth and Clyde canal, following the towpath through the mix of industrial and urban landscapes with occasional diversions from the water to visit significant sites along the historic Antonine Wall built by the Romans about 2,000 years ago. From Falkirk, the route diverts into the ancient town of Linlithgow in West Lothian where it then turns north to reach the Firth of Forth at Bo'ness and then follows this along the coast beneath the Forth Bridge and on to Edinburgh. The John Muir Way then passes through the fringes of Scotland's capital before returning to the coastline as it heads into the more rural landscapes of East Lothian, before finally ending at Muir's birthplace in Dunbar.

As described above, the route passes through a varied landscape with a wide range of habitats including agriculture, parkland, housing as well as sites with various conservation designations. Many of these sites are important for a range of wildlife and plant species and allow the movement and mixing of species along and out with the route.

1.1 B-lines

Since the 1940's, Britain has lost over 97% of its species-rich grassland to agriculture, housing developments and industry. B-Lines are an imaginative solution to the problem of the loss in wildflower meadows and the subsequent decline of pollinating insects. The B-Lines are a series of 'insect pathways' along which Buglife aims to create and restore at least 150,000 hectares (ha) of wildflower-rich habitat stepping stones across the UK. They link existing wildlife areas together, creating a network that will weave across the British landscape. This will provide large areas of brand new habitat benefiting bees and butterflies as well as a host of other wildlife.

B-Lines bring a range of benefits to wildlife, people and agriculture, including helping to conserve our native pollinators and a range of other wildlife; contributing towards the 2020 Biodiversity targets; helping our wildlife respond to climate change by making it easier for them to move around; increasing the number of insect pollinators and the benefits these bring to our farming sector (pollination being an important 'ecosystem service'); bringing nature to people; and giving opportunities for everyone to play their part and help create the B-Lines network.

Making the B-lines happen will take time and will need farmers, land owners, wildlife organisations, businesses, local authorities and the general public to work together to create flower-rich grassland in the best locations.

'John Muir Pollinator Way' is the first B-lines project in Scotland. Through this study, this project has mapped opportunities for wildflower grassland creation, enhancement and management along the entire route of the John Muir Way and within surrounding areas. This B-lines map will include not only areas that are currently used as amenity grassland such as at public parks and in school grounds but also sites that have nature conservation designations and are currently managed for their important grassland habitats. By mapping these opportunities it identifies where current habitat is, how it can be better managed and where projects should focus to further benefit wildlife and communities in the future.

2. Method

Opportunities for the creation, enhancement and management of grassland meadows and other habitats important for pollinating insects and other invertebrates were mapped using an online Geographic Information System (QGIS) along the entire 134 mile route of the John Muir Way as well as 1.86 mile (3km) either side of this. This area covers a total 109,504.06 ha in size.

Potential opportunities on sites with no nature conservation designations were identified based on if they held grounds for habitat creation and enhancement, these sites were then marked by a round circle and included high schools, primary schools, nurseries, places of worship, cemeteries, historic landmarks, historic buildings, train stations, hospital and care homes.

Scotland's Greenspace Map, available from Scottish Natural Heritage (SNH) provides information about the type and extent of greenspace in urban Scotland in towns and cities with a population of over 3,000. This map was compiled in 2011 from greenspace data provided by the 32 Scottish local authorities and categorises greenspace into 23 different open space types (for example, public parks, private gardens, play areas, semi-natural, community gardens and allotments). Using

Scotland's Greenspace Map, public parks, play spaces and golf courses were identified and mapped on the B-lines using polygons to calculate the area of each site; further information on the location and names of public parks and play spaces was obtained from several of the local authority websites. Additional areas of amenity grassland identified on Scotland's Greenspace Map, including residential, business and transport were not mapped due to the number of sites and complexity in mapping them.

Polygons of designated country parks with information on the size of each site were also added to this opportunity map after being downloaded from the SNH website.

Sites designated for nature conservation within this project were downloaded from the SNH website and mapped using polygons so that the size of the area could be calculated for each site; this included Local Nature Reserves (LNR) and Sites of Special Scientific interest (SSSI). Information on Sites of Importance for Nature Conservation (SINC) (these are also described as Local Wildlife Sites, Local Biodiversity Sites and Local Nature Conservation Sites within the Appendix) were obtained by asking biodiversity officers from each local authority area for information, as well as looking on council websites and asking the Wildlife Information centre (TWIC) for advice (Table 2). Shapefiles for QGIS were obtained from East Dunbartonshire and East Lothian Council as well as TWIC for West Lothian and Edinburgh Council areas. For all other local authority areas, the boundaries for each site were drawn using information received from biodiversity sites and information found online.

Table 2. Location of where information was obtained for SINC's for each local authority area.

Local Authority	SINC information obtained from
Argyll and Bute	Local Biodiversity Officer, Scottish Wildlife Trust
West Dunbartonshire	Council website as there is no biodiversity officer
Stirlingshire	Local Biodiversity Officer, Scottish Wildlife Trust
East Dunbartonshire	Local Biodiversity Officer
North Lanarkshire	Local Biodiversity Officer
Falkirk	Local Biodiversity Officer, Scottish Wildlife Trust
West Lothian	TWIC
Edinburgh	TWIC, Local Biodiversity Officer and council website
East Lothian	Local Biodiversity Officer

As well as sites designated for nature conservation, all wildlife reserves were looked for within the project area. All sites identified belonged to the Scottish Wildlife Trust (SWT) and polygons of the reserves were added to show the location and size of each reserve within the project area.

In 2013, Buglife identified sites on Scotland's vacant and derelict land register with the UK Biodiversity Action Plan (UKBAP) priority habitat 'Open Mosaic of Habitat of Previously Developed Land' (OMHPDL) and the shapefile which included the polygons for these sites was uploaded onto this B-lines opportunity map (Macadam *et al.* 2013).

3. Results

3.1 Total number of sites identified

A full list of opportunities identified and further information for each local authority is in Appendix 1.

A total of 287 schools and nurseries were identified and this includes 169 primary schools, 49 high schools and 69 nurseries (Table 3); several of the high schools also operate as primary schools and for the purposes of this report and to prevent double counting they have been included within high school only. A further 103 care homes and hospitals along with 39 historic landmarks and buildings

were also identified (Table 3). There were a significant number of places of worship and cemeteries mapped with a total of 382 (Table 3). A total of 28 train stations, 10 of which were in Edinburgh, were identified as a number have some ground that could be enhanced for pollinating insects whether this is in pots or areas of amenity associated within the grounds (Table 3; Appendix 1).

At least 492 public parks and play space were identified and these covered at least 2,920.63 ha of ground and include a variety of habitats from woodland, ponds and amenity grassland (Table 3). One park in Kilsyth and 24 in Edinburgh have been awarded a green flag award that recognises good quality green spaces (Appendix 1). There are five parks designated as Country Parks with a combined area of 1,351.45 ha and 54 golf courses of 2,700.08 ha along the entire route and within the project area (Table 3).

In total there are 331 sites designated for nature conservation with a combined area of 18,108.59 ha and includes 284 SINC (12,243.74 ha), 32 SSSI (4819.67 ha) and 15 LNR (1,045.18 ha) (Table 3); in Edinburgh, seven sites designated as LNR are also recognised as being public parks (Appendix 1).

The only wildlife reserves within the project area that are managed by conservation charities belong to SWT of which there are 10 sites with a combined area of 411.09 ha (Table 3).

A further 41 sites with OMHPDL a total of 169.79 ha is within the project area (Table 3).

Table 3. Total number of opportunities identified for each category mapped including the size of the area in for sites designated for conservation along with public parks, country parks and golf courses.

Opportunity	Total number	Total Area (ha)
Primary Schools	169	-
High Schools	49	-
Nursery	69	-
Hospitals and Care Homes	103	-
Places of Worship and Cemeteries	382	-
Historic Landmarks and Buildings	39	-
Train Stations	28	-
Golf Courses	54	2,700.08
Public Parks and Play Spaces	492	2,820.63
Country Parks	5	1,351.45
SINC	284	12,243.74
SSSI	33	12,255.15
LNR	15	1,045.18
SWT Wildlife Reserves	10	411.09
OMHPDL	41	169.79

A total of 39 schools mapped (including 5 high schools and 34 primary schools) have been identified as having pupils who live in the 20% most deprived areas (Table 4). Of the total number the majority are within Falkirk and Edinburgh, 1 high school and 10 primary schools in Falkirk and 5 high schools and 14 primary schools in Edinburgh (Table 4).

Table 4. Number of high schools and primary schools that have pupils who live in the 20% most deprived areas within each local authority area.

Local Authority	Schools with proportion of pupils who live in 20% most deprived areas	
	High School	Primary School
West Dunbartonshire	0	3
East Dunbartonshire	0	4
North Lanarkshire	0	3
Falkirk	1	10
Edinburgh	4	14

A total of 78 schools and nurseries are registered with the RHS School gardening scheme, including 11 high schools, 56 primary schools and 11 nurseries (Table 5; Appendix 1). The majority of these are within Falkirk (1 high school, 13 primary schools and 2 nurseries), East Lothian (2 high school, 12 primary schools and 2 nurseries) and Edinburgh (6 high school, 17 primary schools and 2 nurseries) (Table 5).







Table 5. Number of high schools, primary schools and nurseries in each local authority area that are registered with the RHS School gardening scheme.

Local Authority	Registered with RHS School Gardening scheme		
	High School	Primary School	Nursery
Argyll and Bute	0	0	1
West Dunbartonshire	1	0	0
Stirlingshire	0	4	1
East Dunbartonshire	1	4	1
North Lanarkshire	0	2	2
Falkirk	1	13	2
West Lothian	0	4	0
Edinburgh	6	17	2
East Lothian	2	12	2

3.2 Individual local authority site details

Maps have been produced for each local authority area to show sites identified by circle marker (map 1, 3, 5, 7, 9, 11, 13, 15 and 17) and those identified through polygons (map 2, 4, 6, 8, 10, 12, 14, 16 and 18). Each colour represents the different opportunities (Table 6 for colour of the marker and Table 7 for colour of the polygon).

Table 6. Colour and shape of the marker for each opportunity relating to the maps below for each local authority area; map 1, 3, 5, 7, 9, 11, 13, 15 and 17.

Opportunity	Colour
High Schools	
Primary Schools	
Nursery	
Hospitals and Care Homes	
Places of Worship and Cemeteries	
Historic Landmarks and Buildings	











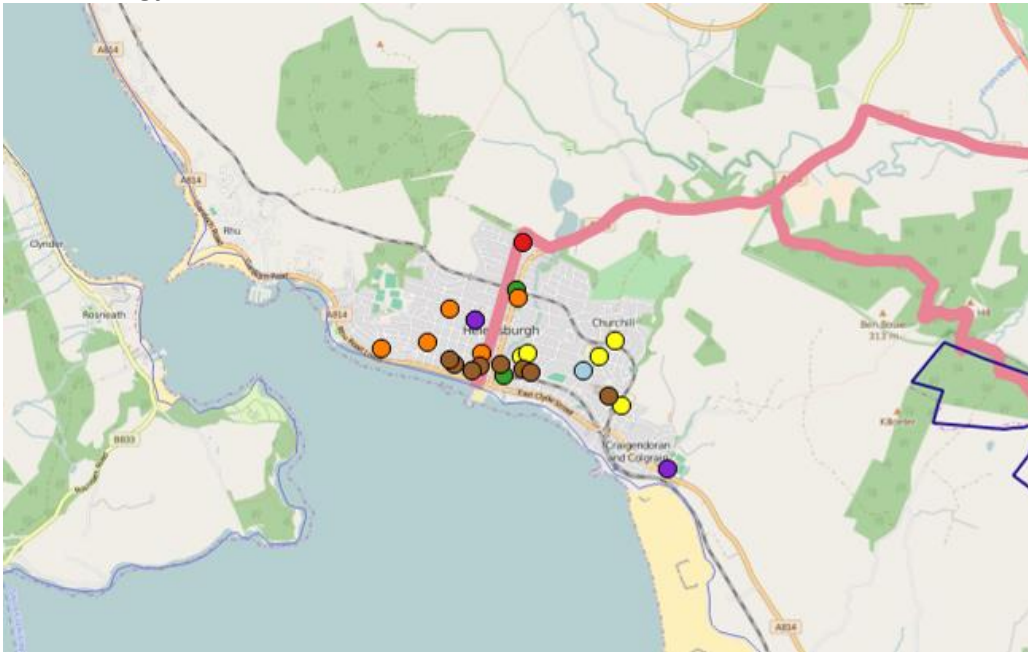
Train Stations	
Parks with Green Flag award	

Table 7. Colour of the polygon for each opportunity relating to the maps below for each local authority area; map 2, 4, 6, 8, 10, 12, 14, 16 and 18.

Opportunity	Colour
Public Parks and Play Space	
Country Parks	
Golf Courses	
SINC	
SSSI	
LNR	
SWT wildlife reserve	
OMHPDL	

3.2.1 Argyll and Bute



Map 1. Opportunities of non-designated sites identified in Argyll and Bute (see Table 6 for colour key).

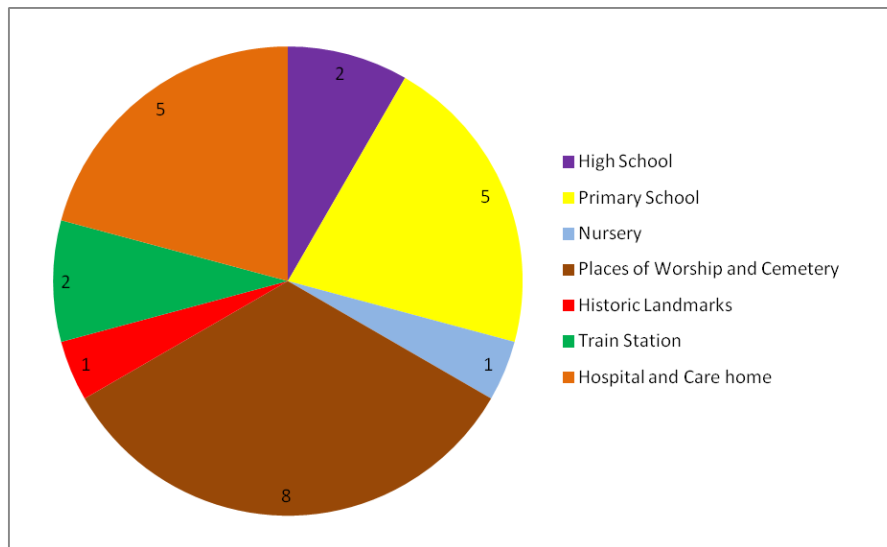


Figure 2. Numbers of identified opportunity for grassland creation on non-designated sites in Argyll and Bute that relates to map 1; colours match the key in Table 6.

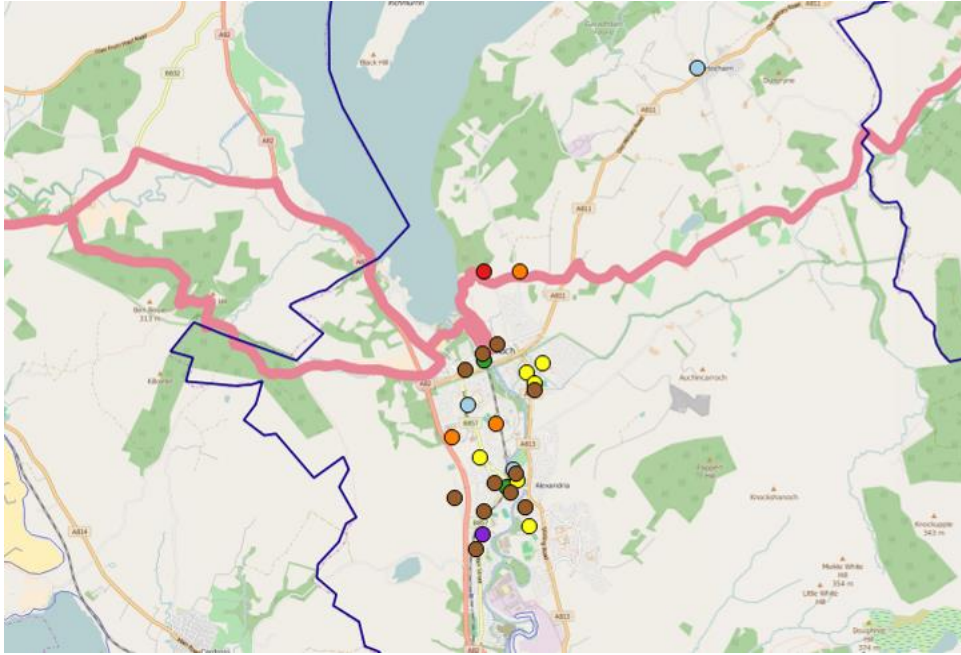


Map 2. Opportunities of sites designated for conservation along with public parks and golf courses identified in Argyll and Bute (see Table 7 for colour key).

Table 8. Number of site designated for conservation within Argyll and Bute and total area it covers.

Argyll and Bute	Number	Area (ha)
Public Park	5	7.54
Golf Course	1	38.98
SSSI	1	1825.29
LNR	1	23.05
SINC	10	533.85
OMHPDL	1	0.53

3.2.2 West Dunbartonshire



Map 3. Opportunities of non-designated sites identified in West Dunbartonshire (see Table 6 for colour key).

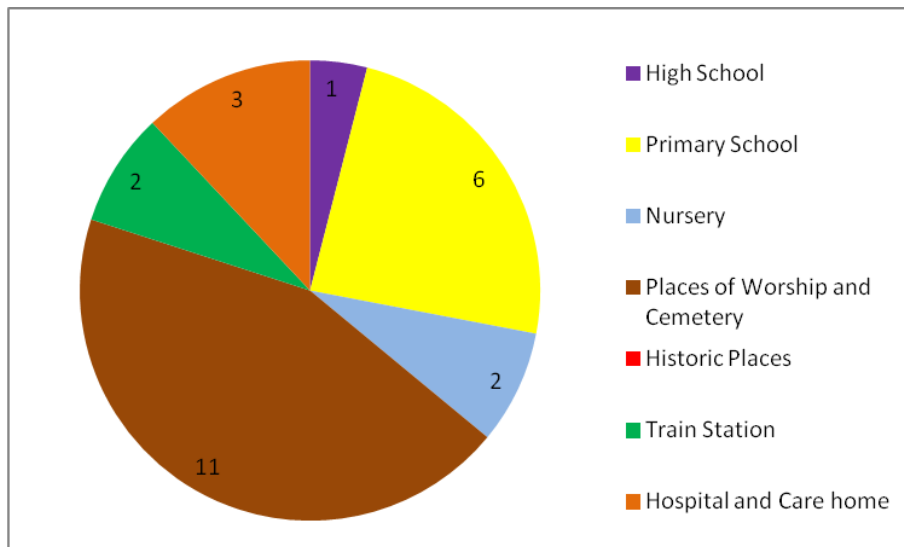
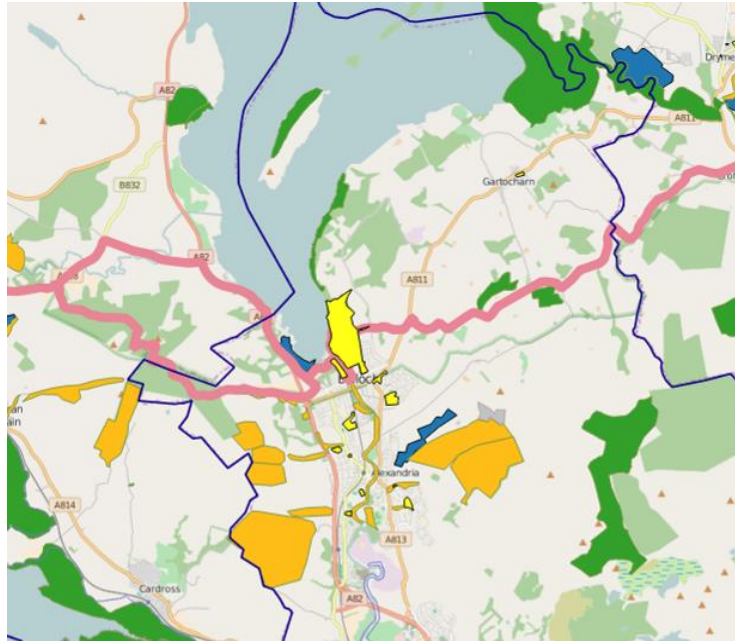


Figure 3. Numbers of identified opportunity for grassland creation on non-designated sites in West Dunbartonshire that relates to map 3; colours match the key in Table 6.

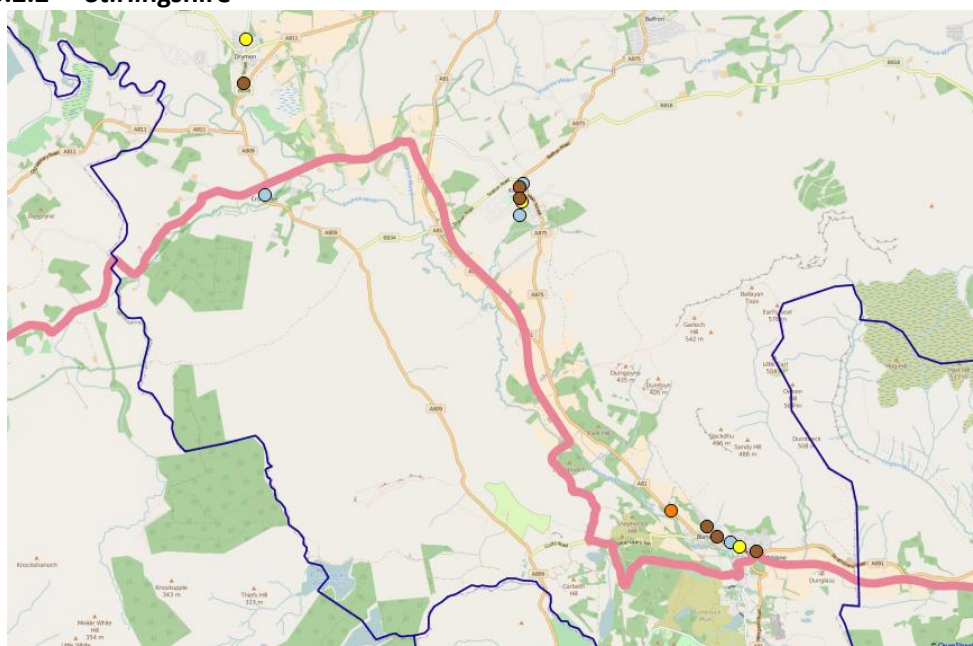


Map 5. Opportunities of sites designated for conservation along with public parks and golf courses identified in West Dunbartonshire (see Table 7 for colour key).

Table 9. Number of site designated for conservation within West Dunbartonshire and total area this covers.

West Dunbartonshire	Number	Area (ha)
Public Park	12	112
Country Park	1	82.82
Golf Course	2	51.1
SSSI	5	763.41
SINC	16	935.4
OMHPDL	1	2.19

3.2.2 Stirlingshire



Map 5. Opportunities of non-designated sites identified in Stirlingshire (see Table 6 for colour key).

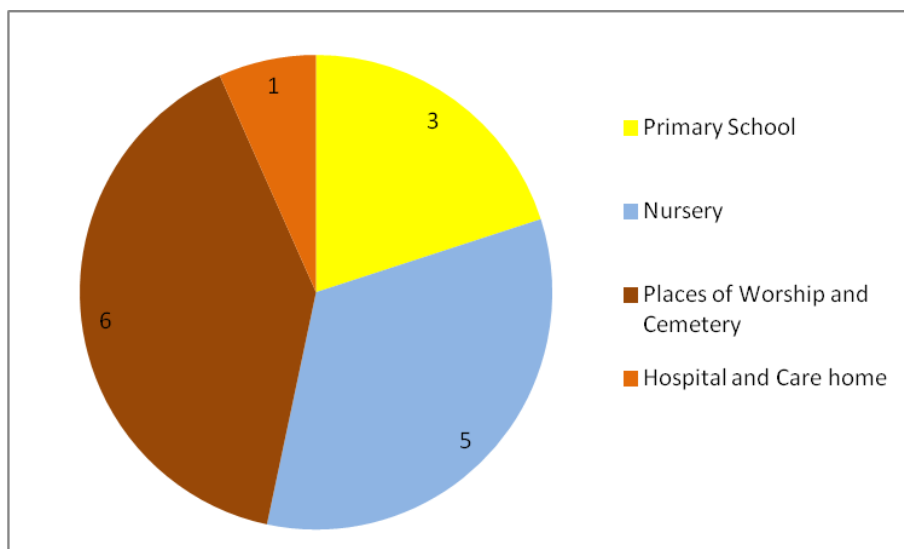
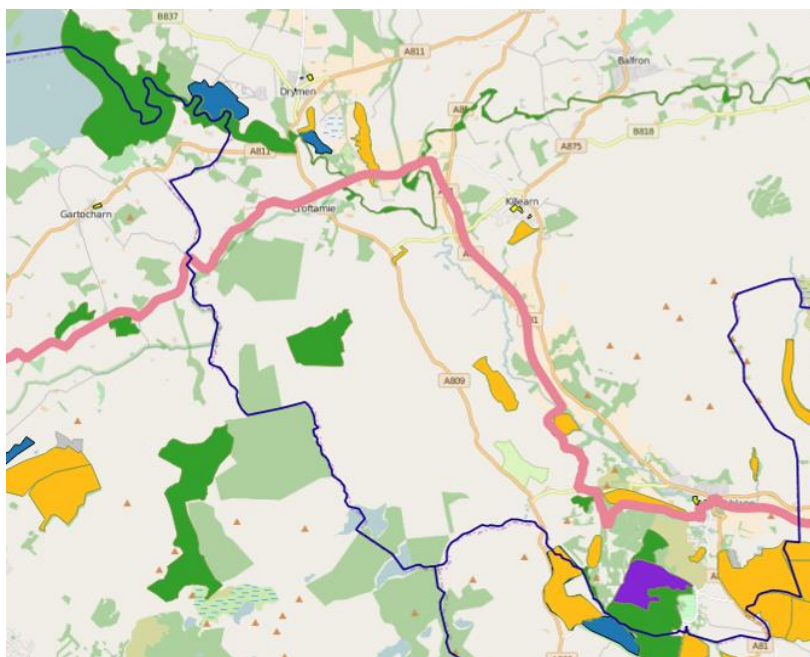


Figure 4. Numbers of identified opportunity for grassland creation on non-designated sites in Stirlingshire that relates to map 5; colours match the key in Table 6.

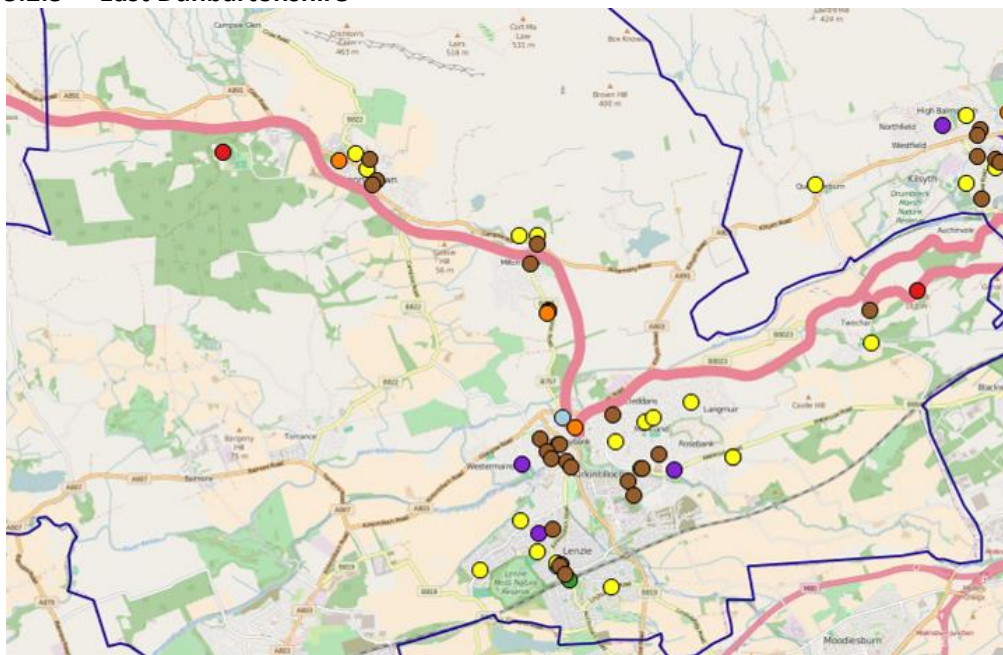


Map 6. Opportunities of sites designated for conservation along with public parks and golf courses identified in Stirlingshire (see Table 7 for colour key).

Table 10. Number of sites designated for conservation within Stirlingshire and total area this covers.

Stirlingshire	Number	Area (ha)
Public Park	6	5.8
Country Park	1	251.74
Golf Course	4	270.3
SSSI	7	998.86
SINC	13	529.04
SWT Reserve	2	152.45
OMHPDL	1	21.74

3.2.3 East Dunbartonshire



Map 7. Opportunities of non-designated sites identified in East Dunbartonshire (see Table 5 for colour key).

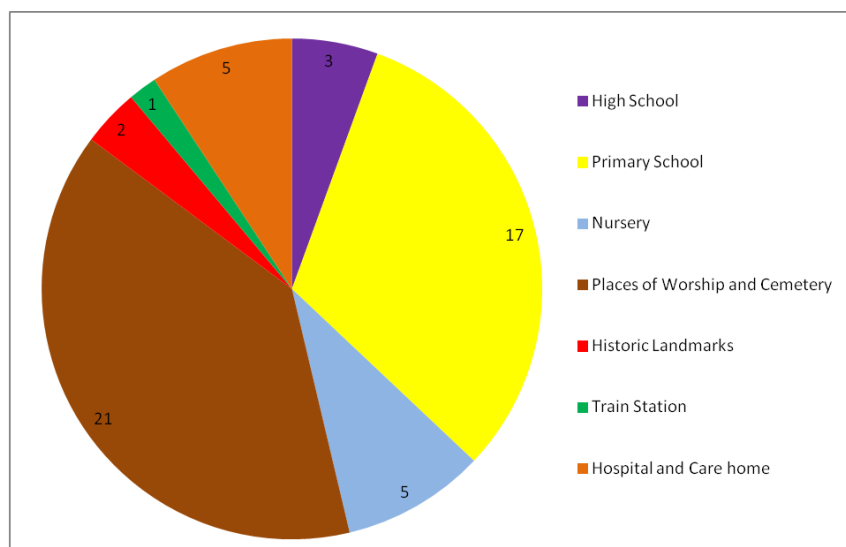
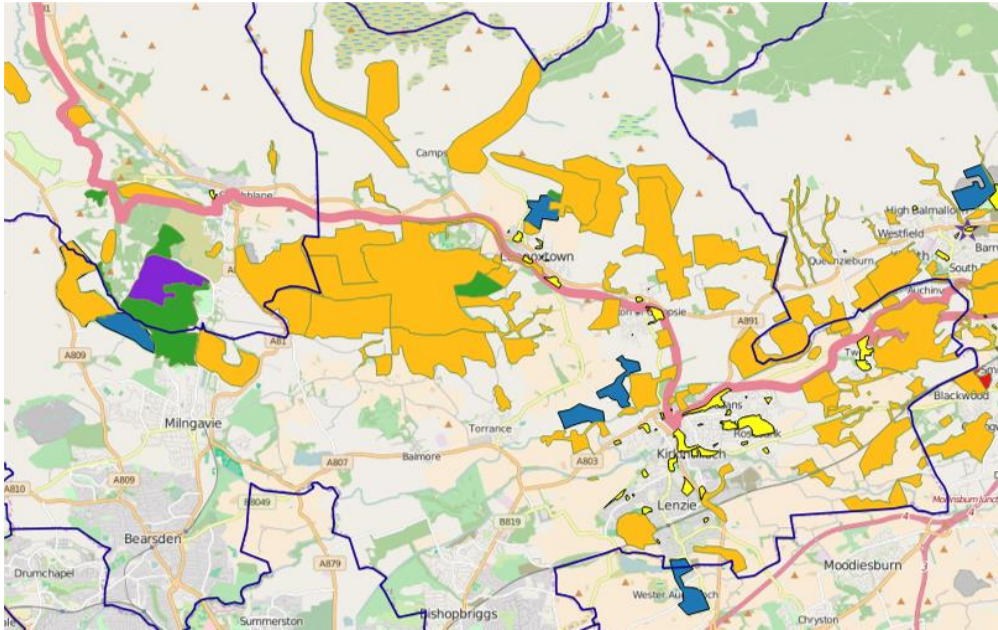


Figure 5. Numbers of identified opportunity for grassland creation on non-designated sites in East Dunbartonshire that relates to map 7; colours match the key in Table 6.

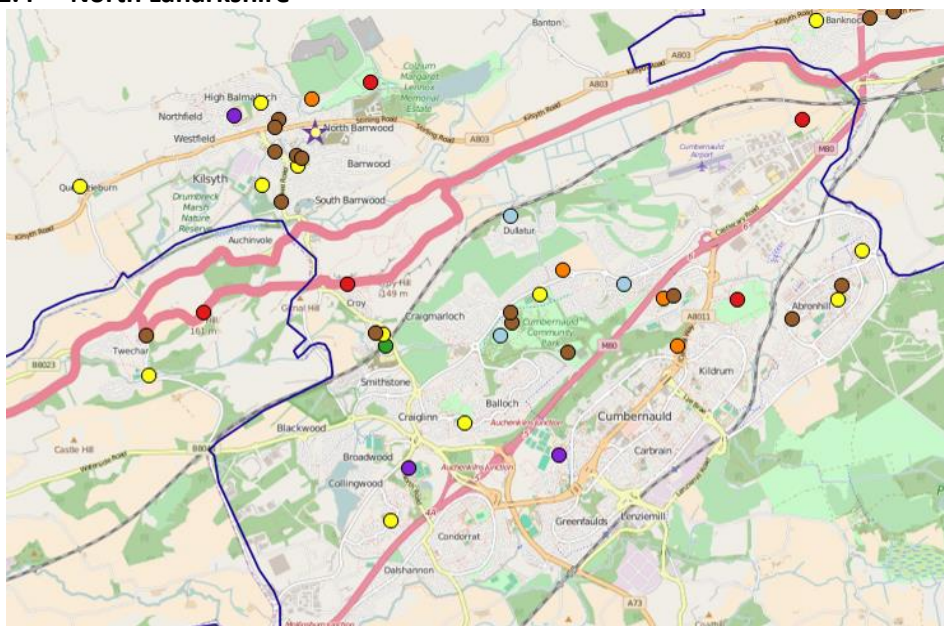


Map 8. Opportunities of sites designated for conservation along with public parks and golf courses identified in East Dunbartonshire (see Table 7 for colour key).

Table 11. Number of sites designated for conservation within East Dunbartonshire and the total area this covers.

East Dunbartonshire	Number	Area (ha)
Public Park	44	116.88
Golf Course	4	141.2
SSSI	2	36.57
LNR	2	60.97
SINC	45	2999.3
OMHPDL	5	13.71

3.2.4 North Lanarkshire



Map 9. Opportunities of non-designated sites identified in North Lanarkshire (see Table 7 for colour key).

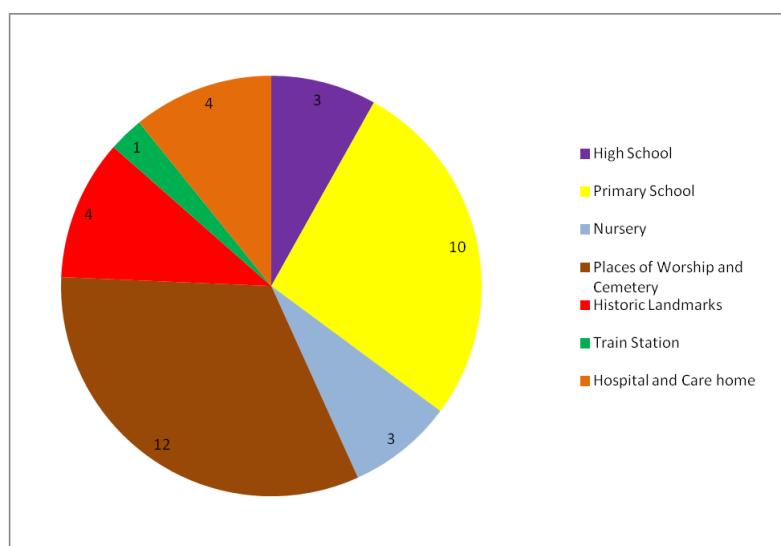
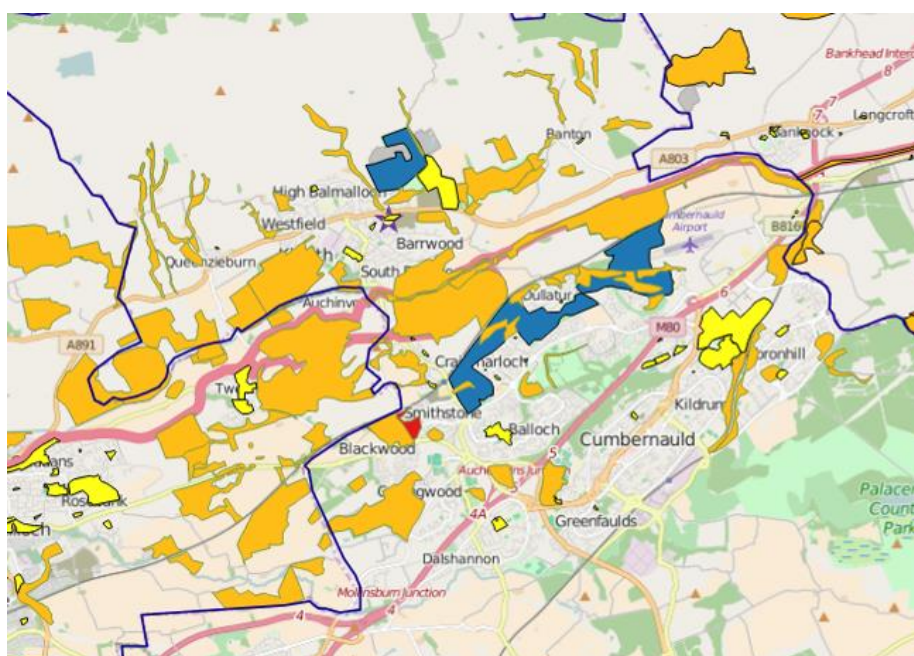


Figure 6. Numbers of identified opportunity for grassland creation on non-designated sites in North Lanarkshire that relates to map 9; colours match the key in Table 6.

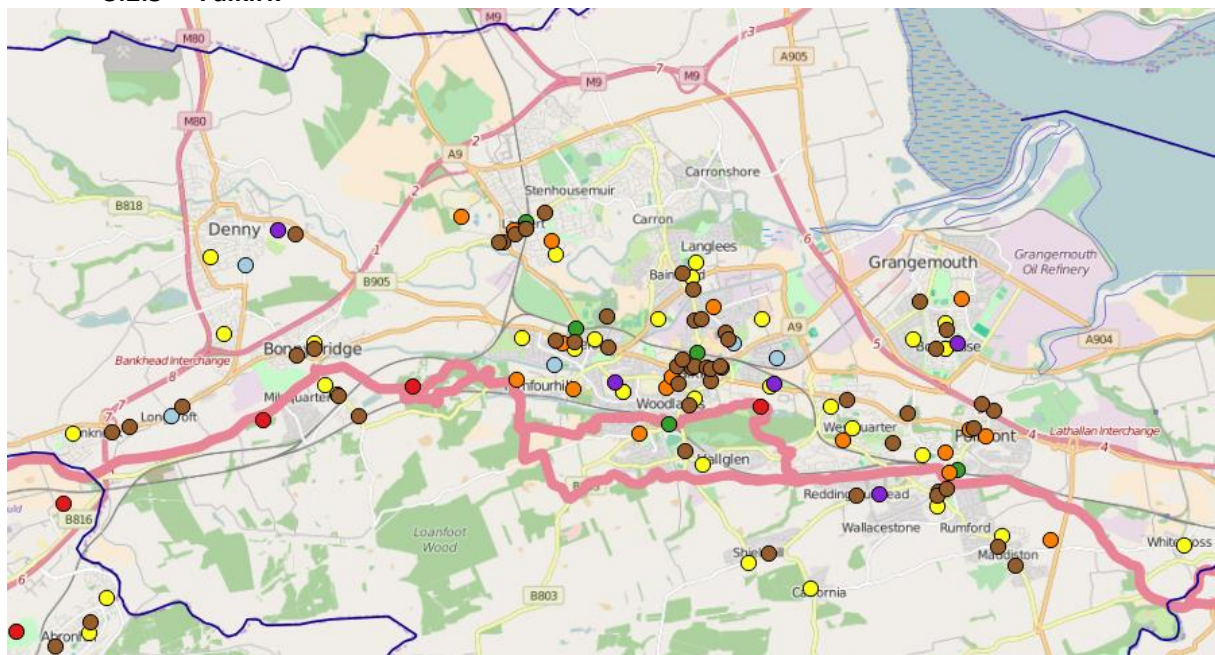


Map 10. Opportunities of sites designated for conservation along with public parks and golf courses identified in North Lanarkshire (see Table 7 for colour key).

Table 12. Number of sites designated for conservation within North Lanarkshire and the total area this covers.

North Lanarkshire	Number	Area (ha)
Public Park	28	117.33
Golf Course	3	235.8
SSSI	1	85.93
LNR	3	119.01
SINC	62	1030.75
SWT Reserve	3	222.92
OMHPDL	8	37.45

3.2.5 Falkirk



Map 11. Opportunities of non-designated sites identified in Falkirk (see Table 6 for colour key).

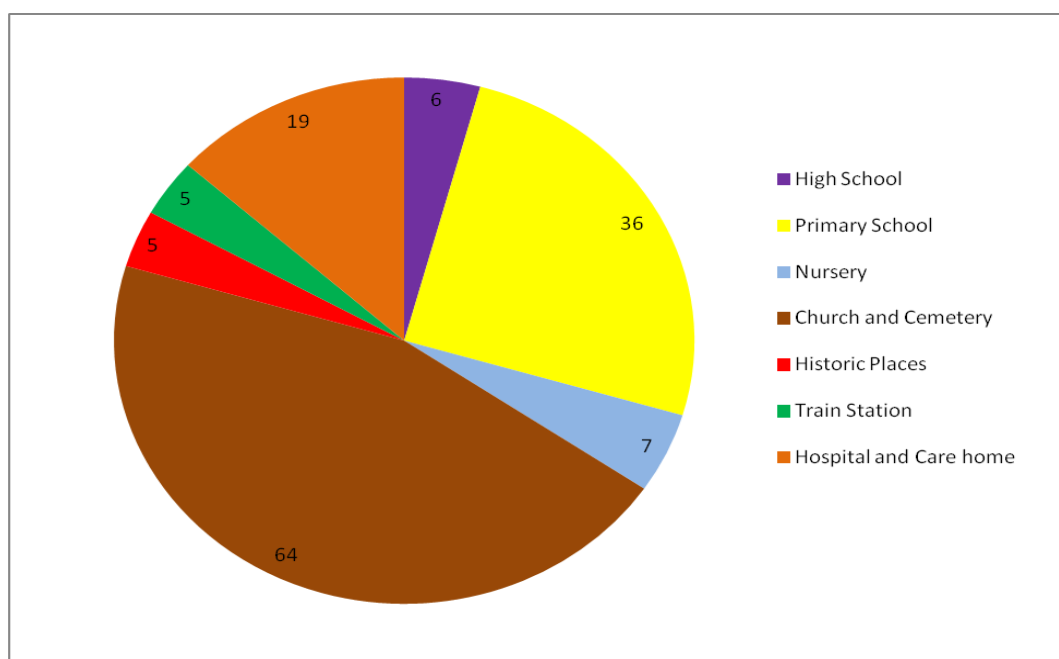
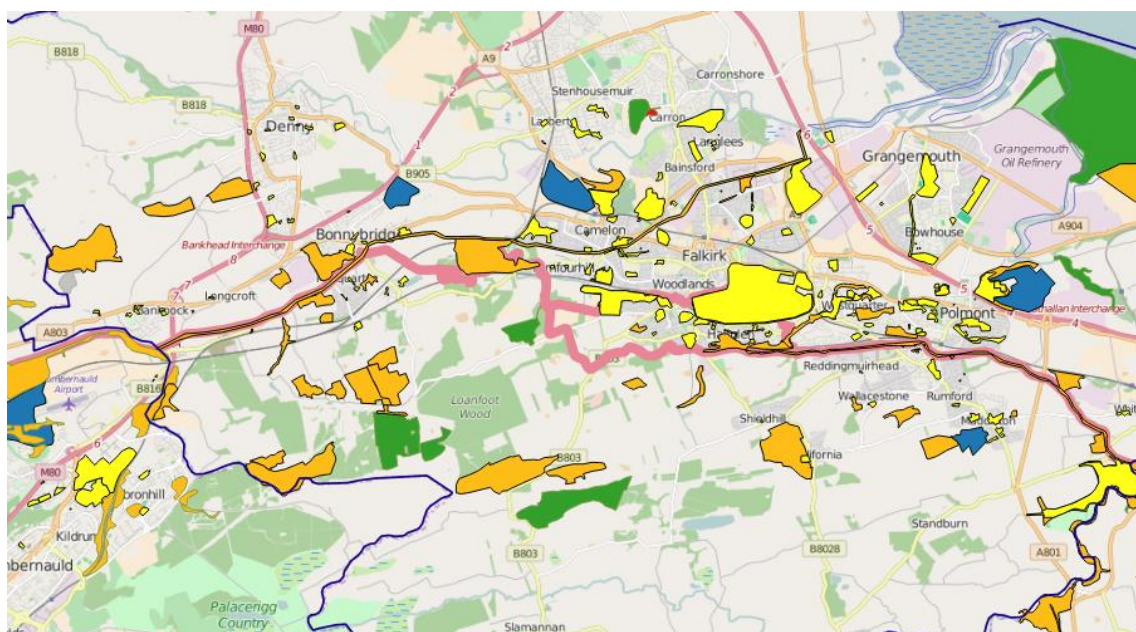


Figure 7. Numbers of identified opportunity for grassland creation on non-designated sites in Falkirk that relates to map 11; colours match the key in Table 6.

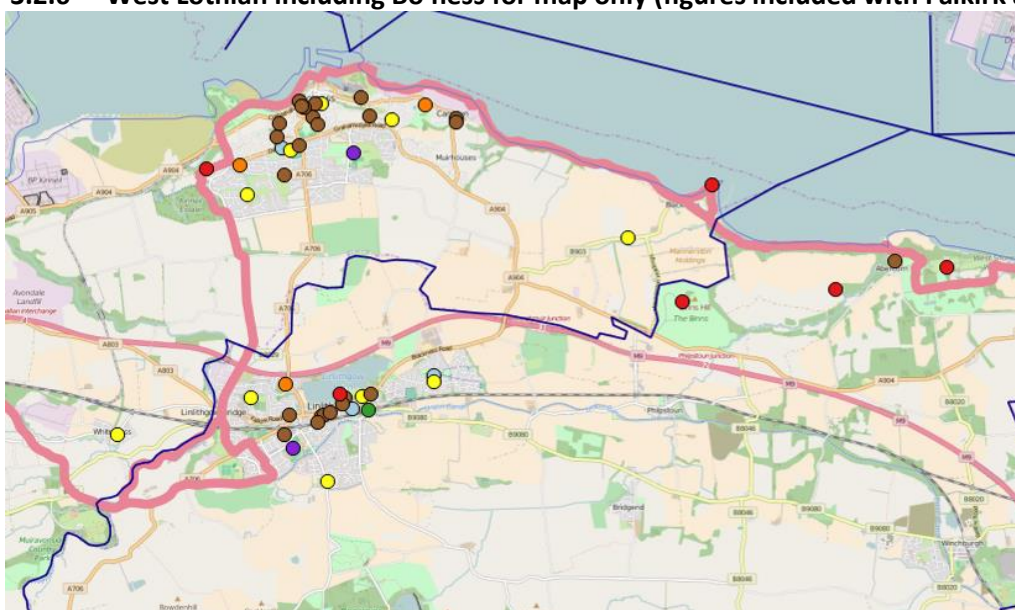


Map 12. Opportunities of sites designated for conservation along with public parks and golf courses identified in Falkirk (see Table 7 for colour key).

Table 13. Number of sites designated for conservation within Falkirk and the total area this covers.

Falkirk	Number	Area (ha)
Public Park	172	681.36
Country Park	1	64.83
Golf Course	4	215.84
SSSI	5	675.84
LNR	2	83.93
SINC	50	1089.17
SWT Reserve	2	7.59
OMHPDL	9	36.52

3.2.6 West Lothian including Bo'ness for map only (figures included with Falkirk above)



Map 13. Opportunities of non-designated sites in West Lothian (see Table 6 for colour key).

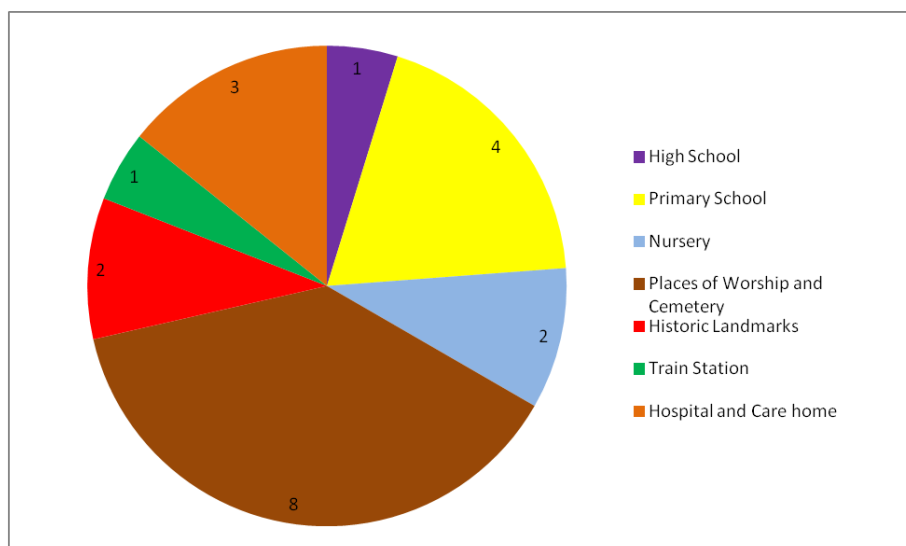
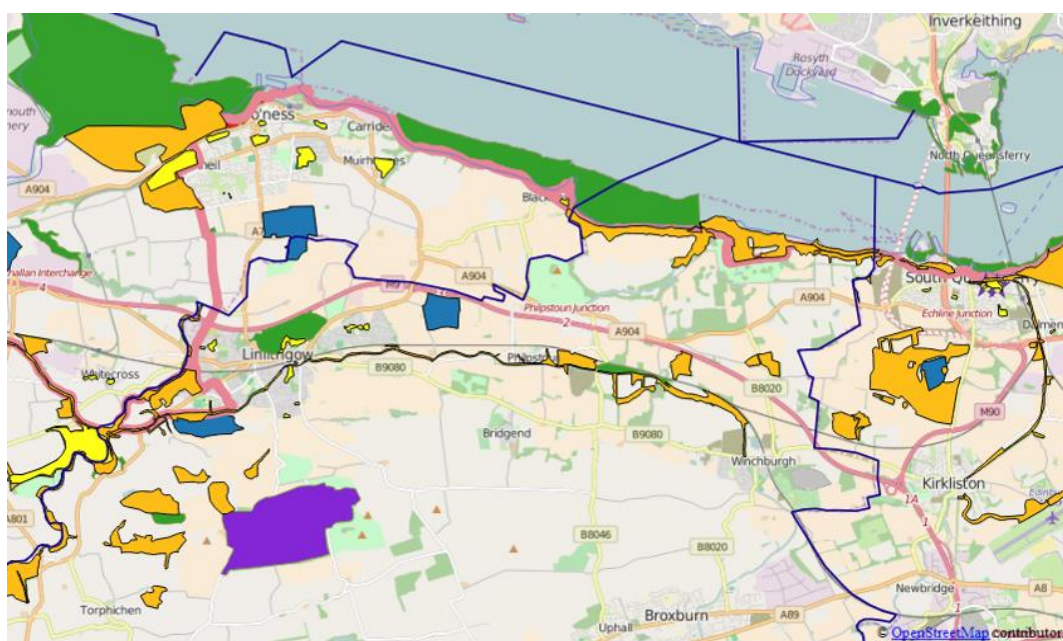


Figure 8. Numbers of identified opportunity for grassland creation on non-designated sites in West Lothian that relates to map 13; colours match the key in Table 6.

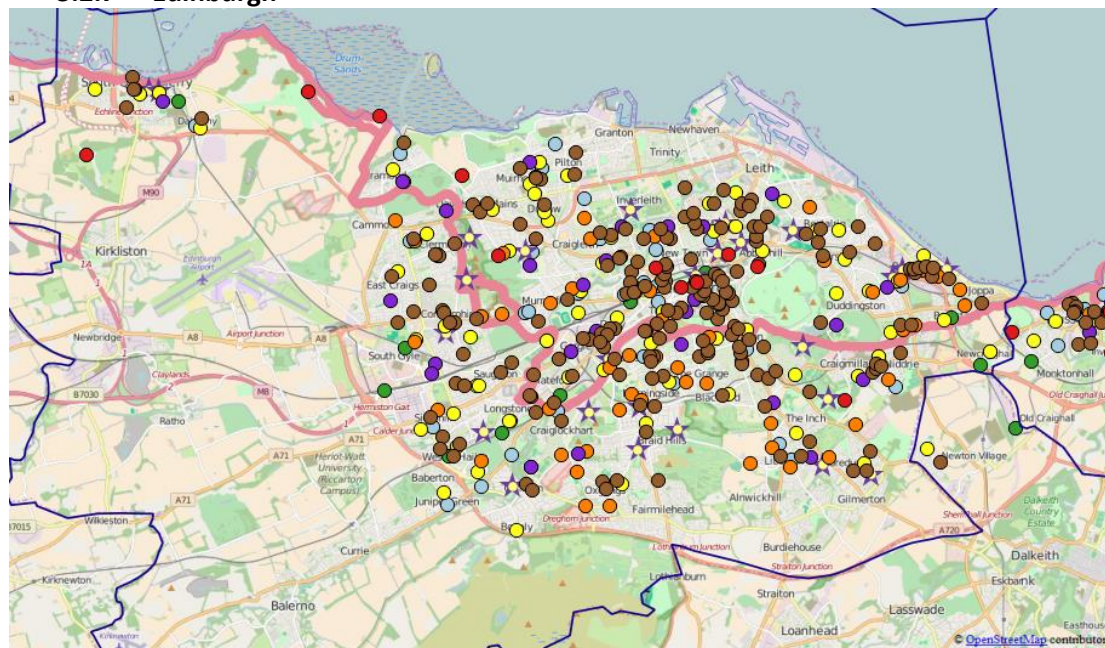


Map 14. Opportunities of sites designated for conservation along with public parks and golf courses identified in West Lothian (see Table 7 for colour key).

Table 14. Number of sites designated for conservation within West Lothian and the total area this covers.

West Lothian	Number	Area (ha)
Public Park	9	267.81
Country Park	1	267.81
Golf Course	3	73.8
SSSI	5	84.13
SINC	23	496.37
OMHPDL	2	34.7

3.2.7 Edinburgh



Map 15. Opportunities of non-designated sites identified in Edinburgh (see Table 6 for colour key).

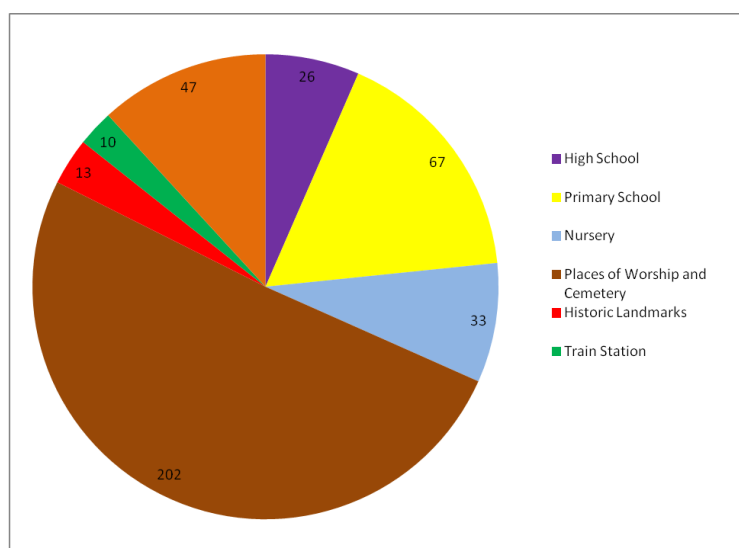
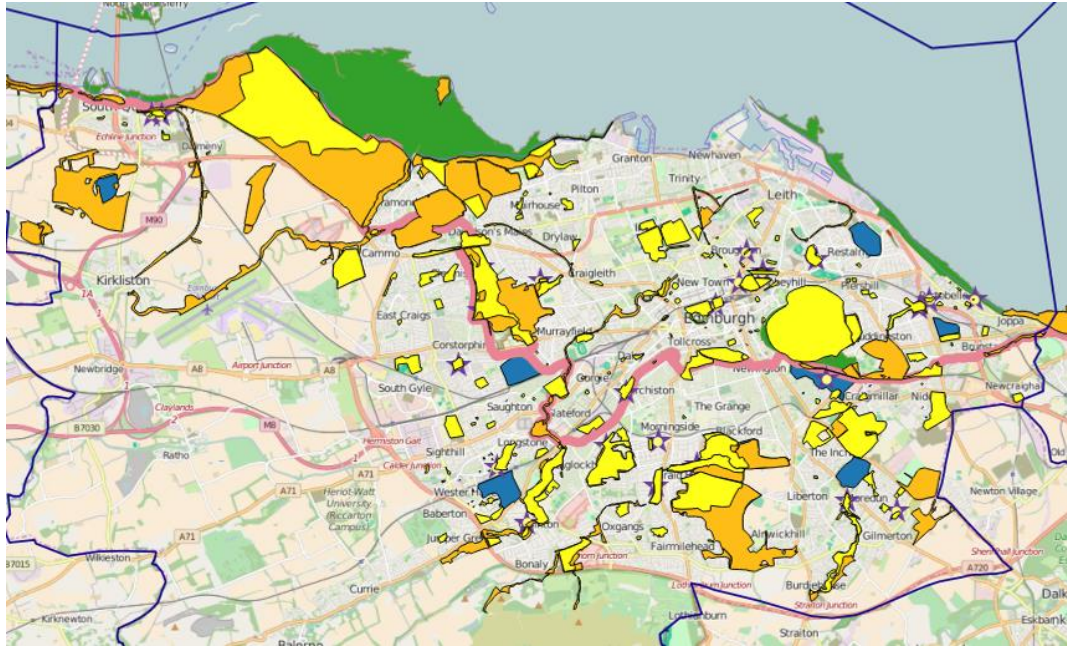


Figure 9. Numbers of identified opportunity for grassland creation on non-designated sites in Edinburgh that relates to map 15; colours match the key in Table 6.



Map 16. Opportunities of sites designated for conservation along with public parks and golf courses identified in Edinburgh (see Table 7 for colour key).

Table 15. Number of sites designated for conservation within Edinburgh and total area this covers.

Edinburgh	Number	Area (ha)
Public Park	189	1660.68
Golf Course	19	648.86
SSSI	2	253.22
LNR	6	182.99
SINC	48	2578
SWT Reserve	3	28.13
OMHPDL	5	20.52

3.2.8 East Lothian



Map 17. Opportunities of non-designated sites identified in East Lothian (see Table 6 for colour key).

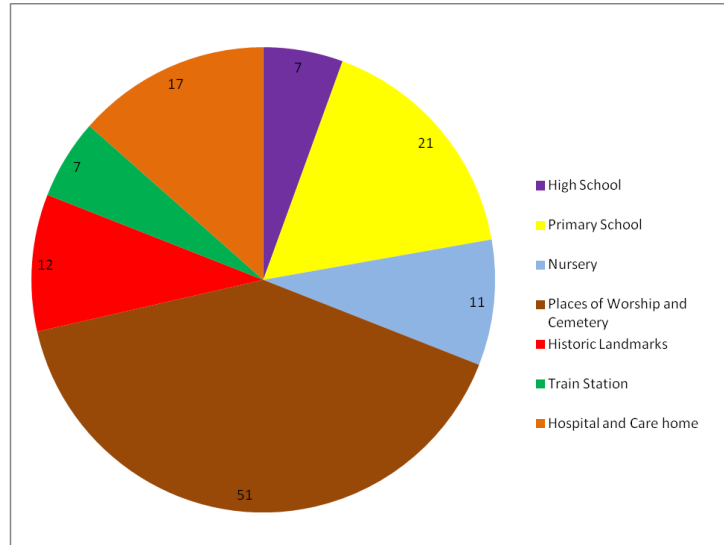
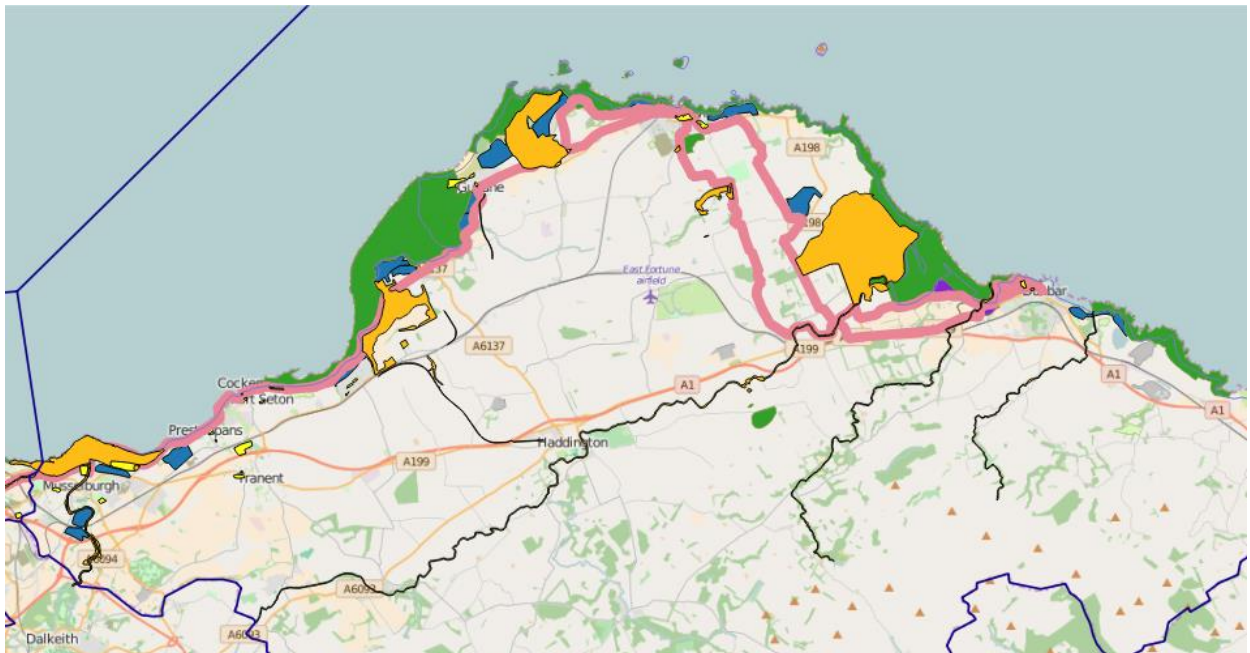


Figure 10. Numbers of identified opportunity for grassland creation on non-designated sites in East Lothian that relates to map 17; colours match the key in Table 6.



Map 18. Opportunities of sites designated for conservation along with public parks and golf courses identified in East Lothian (see Table 7 for colour key).

Table 16. Number of site designated for conservation within East Lothian and total area this covers.

East Lothian	Number	Area (ha)
Public Park	27	104.2
Country Park	1	684.25
Golf Course	16	1024.2
SSSI	4	96.42
LNR	1	575.23
SINC	17	2051.86
OMHPDL	3	2.43

4. Discussion

The John Muir Way is 134 miles long and has a varied landscape, passing through nine different local authority areas, various towns and cities as well as rural habitats. The 109,504.06 ha covered by this project identified various opportunities for grassland habitat creation, enhancement and management within the grounds of schools and hospitals as well as through LNR, golf courses and public parks. Each of these potential opportunities differ in the communities involved and the habitats present but all have the potential to significantly increase and improve habitat for pollinating insects and other wildlife across the heartland of Scotland.

4.1 Schools

A total of 287 schools and nurseries were identified within this projects area and includes 49 high schools, 169 primary schools and 69 nurseries. Most schools and a majority of the nurseries have outdoor grounds that may include areas of amenity grassland as playing fields that are used by school children during breaks and during physical education (PE) lessons. Alongside these large areas of amenity ground, schools often have other outdoor areas that are may be used as a school garden or are left as areas of additional amenity grassland. It is these areas that can be enhanced for wildlife by creating biodiverse school gardens or changing the management to reduce the cutting of the area. This would not only benefit pollinating insects and other wildlife but also the school children who could help create the habitats and use them for learning and play. Wildflower meadows within the school grounds could be created with the help of the school children and parents and be managed with the help of the local authority if required.

To further benefit pollinating insects such as solitary bees, school children could be encouraged to create homes for them in wood working class. These can be installed in south facing and warm areas around the school and will create homes for wood nesting solitary bees and other invertebrates.

Of the 287 schools identified in this survey, 78 (includes 11 high schools, 56 primary schools and 11 nurseries) are registered with the RHS School gardening scheme which aims to inspire and support schools to provide children with gardening opportunities to enhance their skills and boost their development. These 78 schools are located within each of the nine local authority areas that the John Muir Way passes through although the majority are located within Edinburgh (6 high schools, 17 primary schools and 2 nurseries), East Lothian (2 high schools, 12 primary schools and 2 nurseries) and Falkirk (1 high schools, 13 primary schools and 2 nurseries). These results highlight how many schools are keen to get their pupils involved in outdoor learning to encourage them to get outside, improve their health and develop new skills.

Almost all of the schools and many of the nurseries identified are registered as an Eco-school, many of which have various awards associated with this; only three schools are not registered including Danderhall Primary and Mannafields Christian School in Edinburgh and Regius Christian School in East Lothian. Eco-Schools are an international initiative designed to encourage whole-school community action on 'Learning for Sustainability'. This environmental management tool is a learning resource and a recognised award scheme which empowers children and young people to take action towards an economically, socially and environmentally just world. The Eco-Schools programme is managed in Scotland by Keep Scotland Beautiful.

Other school initiatives that aim to get children out of the classroom and either into their local community or developing their school grounds include Polli:nation a UK wide initiative supporting pupils from 260 schools to turn their school grounds and other areas within their local communities

into pollinator friendly habitats. Unfortunately, none of the schools selected in Scotland are within this project's area although they will still be able to get involved in this initiative.

Priority Project 6 through Scotland's Biodiversity- a route map to 2020, aims to increase secondary and primary schools access to greenspace and nature for outdoor learning as part of the wider 'Learning for Sustainability' agenda. Through this, it aims to work with 100 schools by 2020 that have pupils who live in the 20% most deprived areas. Of the schools identified, 39 (5 high schools and 34 primary schools) have pupils who live in the 20% most deprived areas within the local authority areas West and East Dunbartonshire, North Lanarkshire, Falkirk and Edinburgh. By focusing to work with several of these schools identified through this project will significantly increase the health and well-being of school pupils as well as people in the wider community.

There is a lot of scope for schools to get involved with enhancing their grounds for wildlife and for the pupils through the RHS School gardening scheme and Keep Scotland's Beautiful Eco-schools as well as other initiatives. It may be that further support is required to encourage more schools to actively get involved for the benefit of the school children and for declining insect pollinator populations.

4.2 Hospitals and Care Homes

Of the 103 hospitals and care homes identified within this project, 13 are hospitals that are well by hundreds of patients and visitors every day. It is well documented of the health and well-being benefits for people with local and easy access to wildlife as well as the increase in recovery time of patients in hospitals.

Surrounding several of the hospitals are large areas of amenity grassland that have very little benefits for biodiversity and people using and visiting the hospitals. Some hospitals do have designated areas for wildlife but many are limited with funding or with staff. By enhancing hospital grounds for nature through the creation of grassland meadows this will not only add colour and life to the area benefiting both people and wildlife but will also allow for the moving and mixing of species and individuals across the hospital grounds and surrounding landscape. Additionally, small wildlife gardens can be created closer to the hospital within areas that are well used by patients through the use of planters, green walls and/or insect homes (Figure 11).



Figure 11. Example of a green wall that holds a variety of plants, including wildflowers. This particular green wall also has a variety of homes for insects and other bugs.

All patients can be encouraged to get involved with these creation and enhancement projects as well as the management whilst in the hospital and when they finish their treatments, especially for those that live within the local surrounding area.

Due to health and well-being benefits it is also important to provide opportunities for people in care and nursing homes and hospices to get involved in similar projects in their grounds. Care homes often have grounds that residents can walk around either on their own or with visitors. By enhancing these areas for pollinating insects it will provide colour and life to the gardens that will make a happier and healthier place for the residents to live and enhance their experiences and quality of life.

4.3 Places of Worship and Cemeteries

There are at least 382 places of worship and cemeteries identified within this project. At least 48 of this total are described as just cemeteries whilst many of the places of worship also include burial grounds.

Many cemeteries and churchyards are well known to be important habitats for a range of wildlife including bats, birds and foxes as they are often less intensively managed as other urban green spaces. A range of habitats are often found at these sites including mature and veteran trees, old walls, wildflowers, bare ground and shrubs. By creating habitat and enhancing areas already present within the grounds this will add colour and life to the churchyards and cemeteries that will not only improve health and well-being of visitors but will provide important stepping stones for wildlife through an area.

Not all the churches identified have grounds that could be enhanced or managed but they can help to inspire local communities to actively get involved with community led projects that could benefit the local area away from the church. It is important to identify which of these churches have access to an outdoor space and what habitats are currently present within these that could be enhanced or better managed for wildlife. This in itself could be a project that engages with communities across Scotland with their local place of worship.

4.4 Historic Landmarks and Buildings

Of the 39 different historic landmarks and buildings identified during this project, seven are owned and managed by the National Trust of Scotland (NTS) and nine are owned and managed by Historic Scotland (HS). These landmarks include castles (such as Edinburgh Castle and Blackness Castle), houses with grounds (such as the Hill House and Callendar House) and the historic roman built Antonine Wall. Many of these sites are now tourist attractions which attract thousands of visitors a year.

Due to their historic value it is unlikely that many of these landmarks could be influenced with creating large wildflower meadow areas and other habitat, especially in sensitive areas (for example along the Antonine Wall), but it may be that small projects could influence management within small areas of a site for the benefit of pollinating insects and other wildlife, especially at sites that are known for their gardens. This could be through the installation of solitary bee homes for wood nesting species and the creation of small wildflower areas within the gardens themselves.

4.5 Train Stations

There are 28 train stations that have been identified in this project that are used by thousands of people every day. Ten of these stations are within Edinburgh itself and include Edinburgh Park, Haymarket and Waverley that are known for being particularly busy stations.

Some train stations, such as at Polmont, have some ground that they currently manage as gardens often with the help of a local community group. Many others have planters of varying size that are planted with seasonal garden plants. By planting wildflowers within the planters or surrounding grounds this will help reduce costs of buying seasonal garden plants and reduce maintenance time. Green walls shown in Figure 1 could be placed alongside walls that are outside to further enhance the station for pollinating insects that would also provide colour and life benefitting passengers using the stations.

4.6 Golf Courses

Of the 54 golf courses within this projects the vast majority are within Edinburgh (19 courses with total area of 648.85 ha) and East Lothian (17 courses with total area of 1024.19 ha). The total area of all 54 courses is 2,700.08 ha which is significantly higher than the area of LNR identified in this project.

Golf courses are well known to act as important areas for wildlife, especially in an urban area due to the various habitats present, such as woodland, hedgerows, rough grassland, ponds, ditches and heathland. Golf courses cover 1% of land in the United Kingdom. Generally between 40 – 60% of a golf course is out of play representing a significant land resource that can potentially be made available for wildlife protection and nature conservation. Many golf clubs are recognising that a naturalistic golf course environment which is attractive for wildlife is also generally more attractive to golfers.

Buglife's current meadow creation project 'Fife's Buzzing', a three year project funded by Heritage Lottery Fund and Fife Environment Trust, has enhanced Dunnikier golf course in Kirkcaldy for biodiversity by planting native and diverse wildflower species into areas that are not in play and around ponds. These have helped create a healthier place for wildlife and for the people using the course as well as getting the local community and schools involved with habitat creation events through volunteer activities.

The Golf Environment (GEO) was founded to support the golfing industry, helping it to deliver and be recognized for a positive impact for the people and nature that it touches, now and in the future. They are currently developing an awards system that encourages golf courses around the world to create areas within their grounds to further benefit wildlife. Through their system, individual golf courses will be able to identify what they are currently doing that is benefitting local wildlife but also other activities that would provide further benefits. This could positively benefit not only pollinating insects with the planting of native species of wildflower within meadow areas that are local to the golf course, but also aquatic invertebrates through the enhancement of ponds and wildlife such as Longhorn beetles that require dead wood for their lifecycle with the enhancement and creation of areas of dead wood.

4.7 Public Parks and Play Spaces

Scotland's Greenspace Map, available from SNH, was used to identify and map the location of public parks and play spaces across the project area. Scotland's Greenspace Map was compiled in 2011 from greenspace data provided by the 32 Scottish local authorities and categorises greenspace into 23 different open space types (for example, public parks, private gardens, play areas, semi-natural, community gardens and allotments). As some of this information is incomplete, such as the names of the parks, information was also obtained using local authority websites and other sources.

A total of 492 public parks and play spaces were identified covering a total of 2,820.63 ha. The majority of parks and play spaces were identified in Falkirk with 172 (total of 681.36 ha) and

Edinburgh with 189 (total of 1,660.68 ha). Many of these parks are well used by local communities and visitors every day for walking, cycling, running or playing.

Of the total number of parks, 25 have been awarded a green flag including Burngreen Park in Kilsyth, North Lanarkshire and 24 parks in Edinburgh. The green flag award scheme recognises and rewards parks that have been identified as having excellent green spaces for people and wildlife. Additionally, six parks in Edinburgh are designated as a LNR and will have management plans that they currently follow (five of the six have green flag awards).

Most parks have large areas of amenity grassland that is cut several times over a year and has very little benefits to biodiversity because of this. Through Buglife's Get Britain Buzzing campaign, we have been transforming mown grassland in parks into colourful wildflower areas for both people and wildlife to use and enjoy. In Scotland these projects have so far occurred out with the project area of the John Muir Pollinator Way in Glasgow, Perth and currently in Fife and North Lanarkshire. For example, just over half way through the three year 'Fife's Buzzing' project, Buglife has engaged with 1,057 people in the creation and enhancement of over 5 ha of wildflower meadow at 13 parks across Fife.

Through these projects we have recognised that it is important that if changing the management at parks and/or creating wildflower areas for wildlife that local communities are consulted before hand so they can decide on the best areas within their local park and the size of the area to be created and managed. It may be that all of a park is well used over the year by dog walkers and picnickers so only small edge areas could be enhanced. It is these small areas that could encourage the creation of larger areas once the public understand the change being undertaken in their local area.

Local authorities across Scotland and the rest of the UK are facing major cutbacks and are looking at ways to reduce spending. Several are known to be looking at reducing their grass cutting regime within certain areas of amenity grassland. This is great news for pollinating insects that will be able to find forage and nesting habitat within areas that are cut less regularly but not if these aren't properly managed by being cut and lift once a year. It is important that wildflower meadow areas are managed appropriately to prevent grasses becoming dominant and turning into rank grassland. Management of grasslands is site dependent and could involve grazing or cutting once a year and removing the cuttings. With a reduction in grass cutting, councils are realising that they don't have equipment to cut and lift once a year and so hire a contractor to do this, which can be an expense they can't afford within the current climate.

Several parks identified in this project, especially in Edinburgh, have designated Friends of Groups that may be able to help get involved with habitat creation and management projects so as to enhance their area. Friends of groups could apply for funding to enhance their local park for biodiversity through the creation and management of grassland.

4.8 Country Parks

Of the 36 country parks across Scotland, only 5 are located within this project, including Balloch Castle in Balloch, Mugdock near Milngavie, Muiravonside in Whitecross, Beecraigs in Linlithgow and John Muir in Dunbar. This amounts to 1,351.45 ha of land which includes a variety of habitats such as woodland, grassland, heathland and ponds.

All of these parks have their own dedicated Countryside Ranger service that help to manage the parks as well as engaging with the local community and school children through events run all year round. Due to the location of these country parks and the services and events available they attract huge numbers of visitors every year.

It is important that these country parks follow management plans to ensure that they remain viable for wildlife and that the habitat is managed appropriately so that both people and animals can continue to use and visit the parks in the future.

4.9 Sites of Importance for Nature Conservation

A significant number of SINC were identified in this project with a total of 284 sites totalling over 12,000 ha. Each local authority had a different name for a SINC including Local Biodiversity Sites, Local Nature Conservation Sites and Local Wildlife Sites; for the purposes of this report they have been described and included altogether as SINC.

The highest number of SINC were found in North Lanarkshire with 62 sites (an estimated total of 1,030.75 ha in size) and in Falkirk with 50 sites (includes 15 SINC at 120.98 ha and 35 Local Wildlife Sites at 968.19 ha with a total of 1,089.17 ha altogether).

Information about SINC was obtained from a variety of sources including websites, local authorities themselves and local wildlife centres. For some local authority areas it was difficult to find information online and without asking local biodiversity officers for information and advice, as well as TWIC, it would have been difficult to get the information together. West Dunbartonshire and West Lothian don't have dedicated biodiversity officers within the council and information for West Dunbartonshire was found on the local authority website and for West Lothian from TWIC.

SINC are sites that have been designated as being important for nature conservation due to the habitats and wildlife that are present. For sites identified through this project a range of habitats are present, including woodland, heathland, reservoirs, ponds, ditches and grassland meadows. It is important that management plans are written for each site and that the correct regime is in place to ensure long-term survival of the site and its habitats for the future protection of wildlife. As it was very difficult to find information about individual sites it is assumed that management plans, if there are any are not accessible to the public or have yet to be completed.

4.10 Site of Special Scientific Interest

SSSI are those areas of land and water (to the seaward limits of local authority areas) that are considered to best represent our natural heritage, due to their species diversity and habitats, rocks and landforms present as well as a combinations of these features. SSSIs are protected by law and it is an offence for any person to intentionally or recklessly damage them. SSSI are designated by SNH under the Nature Conservation (Scotland) Act 2004.

There are over 1,425 SSSIs across Scotland, of which only 33 are within this project and this covers 12,255.15 ha; this includes the SSSI along the Firth of Forth which is shared amongst the local authority areas of Fife, Clackmannanshire, Stirling, Falkirk, West Lothian, City of Edinburgh and East Lothian and is a total of 7,435.48 ha in size and have not been included within Tables 13, 14, 15 and 16.

Most SSSIs are in private ownership and SNH works closely with their owners and managers to ensure appropriate management of the sites natural features and to ensure that decision-makers, land managers, their agents and advisors, as well as local authorities and other public bodies, are aware of SSSIs when considering changes in land-use or other activities which might affect them.

Any Scottish public body proposing to carry out an operation that may affect an SSSI must notify SNH before starting. SNH provides each SSSI owner and occupier with a site management statement that describes the interest of the site and explains the management needed to conserve its protected

natural features. For those sites which are known for their grasslands it is important that these management plans are stuck to and that the meadows are appropriately managed to ensure long-term survival of the site for their biological features.

4.11 Local Nature Reserves

There are 72 designated LNRs across Scotland that provides wild spaces where some of our rare species as well as our common species can thrive. LNRs offer a more natural environment than parks and gardens, but are still readily accessible to, and for a wide range of people.

There are 15 LNRs within this projects that cover an area of 1,045.18 ha. Most of these LNRs have been designated due to their important grassland habitat that includes wetland, floodplain and wildflower meadows. All LNRs should have management plans that are strictly followed to protect the site for the habitats that it supports along with the wildlife that depends on this.

Please note that Carron Dams LNR has not been included as only the very southern edge of this site touches the outer part of the projects area.

4.12 SWT Wildlife Reserves

SWT have over 120 reserves in Scotland which is more than any other conservation organisation in Scotland. There are 10 reserves within this project that total 411.09 ha of land. The largest is Loch Ardinning, south of Strathblane, that is 147.66 ha and the smallest is Johnson Terrace Garden near Edinburgh Castle at only 0.07 ha.

Several of the reserves are known for having important grassland and wildflower meadows, particularly Bo'mains meadow near Bo'ness and parts of loch Ardinning. Through the SWT website, there is information on each of its reserve that includes site maps as well as details on how to get there. As SWT is a membership charity, people who join help to conserve their reserves for wildlife. Management plans will be available for each of their reserves that they will follow in order to conserve the important habitats and features present.

As most of their reserves are appropriately fenced, when managing grasslands at their reserves, SWT realised that the best method was to use grazing livestock. Grazing, if not too heavy, produces structural mosaics in the vegetation associated with the palatability of individual species. Trampling, dunging and defoliation all contribute to the small scale pattern of variation. Plants and animals benefit from the variety of structural features present in lightly or moderately grazed pastures but heavy grazing eliminates structural diversity.

Through funding from Heritage Lottery Fund, SWT were able to buy some sheep that they use to help manage their reserves and other sites including several SSSI across Scotland; they are known as the 'flying flock'. Sites which use the flying flock are known to be improving each year through this management.

4.13 Open Mosaic Habitat on Previously Developed Land

OMHPDL is a UKBAP priority habitat as its mosaic of habitats provides homes for a number of wildlife species and allows a natural process of succession to occur which is often limited in the over-managed countryside. Derelict sites often have areas of bare ground, early successional communities, grasslands, wetland, scrub depending on how long the site has been abandoned, soil conditions and local climate.

In 2013, a report by Macadam *et al.* remotely assessed sites on Scotland's vacant and derelict land register for OMHPDL using Google Earth maps. Of the 4,118 sites on the 2011 register, 586 were

selected as potentially having OMHPDL and should be ground truthed and this amounted to over 5,600 ha of land. Of this total, 41 lie within this project area and are only 169.79 ha in total. Most of the sites with OMHPDL appear to have areas of bare ground and grassland on site. Ground truthing these sites would help to identify if the site has the UKBAP priority habitat OMHPDL and whether management is required to ensure long-term viability of the site.

Brownfields with OMHPDL are known to be important for wildlife due to a lack of management and low nutrients in the soil that often creates a mosaic of habitats. Many rare and scarce species have been recorded at brownfield sites, often as many that are associated with ancient woodlands. Due to natural succession, many of these sites have a limited lifespan but as sites are lost to development, new sites are added that allow succession to start again.

4.14 Other Opportunities

During the mapping of opportunities for this B-lines project, other areas were recognised as being possibilities but were not mapped due to a lack of information, the number of these sites as well as the complexity of mapping them. This includes areas of amenity grassland identified on Scotland's Greenspace Map, including amenity sites recognised as residential, business and for transport. These areas of amenity grassland include road verges through our urban areas as well as regularly mown areas of amenity that are not classified as parks or play spaces but can often be large in size. All of these areas of amenity are opportunities for creating habitat for pollinators across an urban area that will allow the moving and mixing of individuals and species across these areas with more natural areas of habitat.

As well as passing through urban areas, the John Muir Way also passes through agricultural areas which were not mapped due to a lack of information on the location and use of fields. By creating wildflower strips and planting hedges along field edges this will create habitat corridors for pollinating insects and other wildlife allowing them to pass through agricultural areas safely to other areas and this will also help with the mixing of individuals and species. Wildflower strips provides additional benefits by increasing free pollination services of crops and attracting insects such as hoverflies, soldier beetles and lacewings who's larvae feed on pests such as aphids.

5. Conclusion

The 134 mile route of the John Muir Way passes through villages and towns in nine different local authority areas. Various organisations are currently involved with a variety of different projects along and around the route of the John Muir Way. This includes Sustrans who are heavily involved with the cycle path network, Inner Forth Landscape Initiative which has a range of projects for biodiversity and people in Grangemouth and Bo'ness, Edinburgh Living Landscapes that are creating and managing grassland habitats within the City of Edinburgh as well as a number of community groups within the villages and towns will manage local community gardens for both people and wildlife.

This project has identified a number of opportunities for creating important grassland habitat within parks, golf courses, school grounds and others for pollinating insects that will allow the movement and mixing of individuals and species across Scotland. This will also benefit other wildlife, particularly other invertebrates, and plants.

The villages and towns where habitat can be created within the opportunities identified include Helensburgh, Balloch, Lennoxton, Kilsyth, Bonnybridge, Falkirk, South Queensferry, Edinburgh, Musselburgh and North Berwick as well as all other villages and towns identified in this project. Not only will these new habitats benefit wildlife but also local communities by getting people actively

involved in projects and through the addition of colour and life to their areas that will benefit people's health and well-being.

This project has additionally highlighted a number of sites that have been designated for nature conservation that should be managed for the habitats present at their site. By being appropriately managed this will ensure long-term survival of these sites and habitats for wildlife and people to use and enjoy.

By mapping the opportunities at new identified sites and within currently managed sites through this project, this will aid in the future development of projects that will provide real benefits to our declining populations of pollinating insects of bees, wasps, hoverflies and butterflies as well as other wildlife that these habitats support.

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