East Lammermuir River Catchment Regeneration Pilot

Findings from pressures and opportunities surveying along waterways in the East Lammermuirs

Sustaining Dunbar

Introduction

Sustaining Dunbar is a Community Development Trust for the Dunbar and East Linton Ward of East Lothian. We aim to provide a structure that can enable, support and incubate local projects that help to build a more resilient community that will be better placed to face up to the many challenges facing us in today's world. We believe that local, community-led action that values and taps into local knowledge and experience has a key role to play in building a future in which everyone in our community can thrive within a flourishing natural environment.

Summit to Sea - East Lammermuirs: A W...

East Lothian has always been a working landscape, but a show-garden nonetheless harbouring an...

https://summit-to-sea.uk/

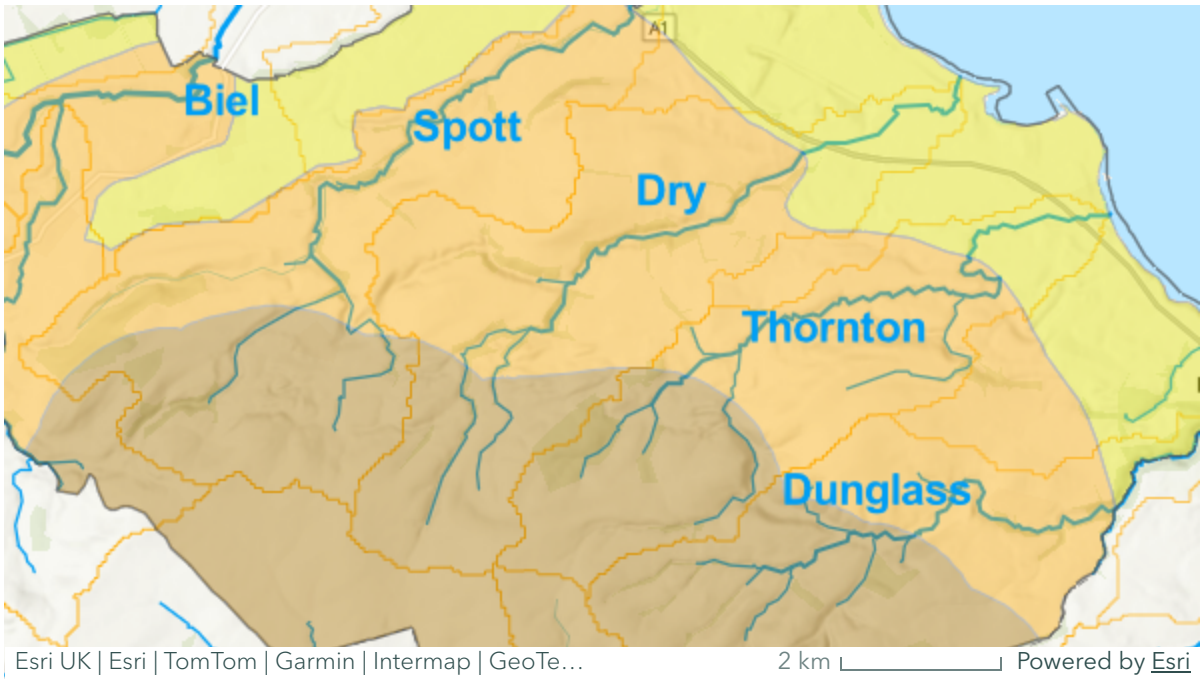
We have an ambitious vision of a landscape scale restoration of habitats and biodiversity across East Lammermuir. We want to see our uplands forming a dynamic mosaic of habitats including wetland and bog, heather moorland, scrub and woodland....clean rivers able to flow freely without barriers to

fish migration and able to meander and flood to form pools and marshy wetlands ... riparian woodland able to flourish and regenerate, shading and cooling watercourses and forming an active part of the river ecosystem ... large areas of actively regenerating native woodlands connected across the landscape by woodland and scrubby hedgerows to form wildlife corridors.....coastal dunes and salt marshes that are dynamic and resilient whilst offshore, seagrass meadows are regenerating and kelp forests are flourishing ...

This work was a pilot to plan and kickstart practical action and collaborative working between local landowners and community groups and volunteers. The intention was to develop a methodology that can then be replicated across the whole of the East Lammermuir Community Council area and potentially more widely across East Lothian. We explored how best to mobilise and coordinate volunteer effort, knowledge and enthusiasm whilst building relationships and understanding between landowners, farmers and the local community and perhaps bring new assets into community ownership and management.

Commencing with a desktop study we collated available information to map habitats, land ownership and key problems/pressures (such as bank modification/realignment, poor riparian buffer zones, track erosion, non-native invasive species etc.) across East Lammermuir's five main (short) river catchments. Focusing in on the areas where current pressures seem to present key opportunities for enhancement projects and collaborative working between landowners and the wider community, we then carried out more detailed walking and (where necessary) drone surveys to start to map two of the catchments in more detail (see The Surveying), carry out baseline condition surveys and created action plans for taking forward practical projects. We identified potential for planning projects such as remeandering, wetland creation, leaky dams, woodland creation and riparian tree planting, removal of barriers to fish migration etc. as well as scope for planning programmes for control of any invasive species and

coordination of ongoing monitoring of river quality and the condition of surrounding habitats etc.. In parallel with this we ran a series of site visits and practical workshops involving local community groups, individuals and stakeholders, including farmers. These drew in local and external experts to share their knowledge and understanding of our local landscape and habitats and start building a shared vision of what is possible and of the benefits that catchment-scale restoration could bring. A number of volunteers were also supported to enhance their knowledge, understanding and practical skills by participating with surveying.



River catchments in the East Lammermuirs and the different identified zones they run through.

East Lammermuir is an ecologically degraded landscape, with fragmented habitats and declining biodiversity. Pressures arise from single uses of the landscape components, the uplands for grouse; woodlands for forestry and driven shooting; arable land for contract farming, which leaves little space for nature and no resilience in the face of climate change. The coastal burns provide the main seminatural links but are themselves constrained, with barriers to fish migration and limited room to function ecologically or hydrologically in a natural way. Much of the coastal strip has been reclaimed and the saltmarsh and sand dunes are now

single landuses like agriculture, golf, caravan-park and industry (quarrying, landfill and energy infrastructure). Today there is new pressure from vast energy development: energy storage, offshore wind, solar farms and the Eastern Green Link, stretching the landscape's capacity to absorb the cumulative impacts. On the plus side, there are three riparian woodland reserves managed by the Scottish Wildlife Trust and several isolated SSSIs. Some landowners are actively exploring regenerative approaches and keen to cooperate. Significantly, there is a palpable appetite for restoration of landscape and biodiversity amongst local communities, as demonstrated by East Lammermuir's 2024 Place Plan. The number of people involved with the East Lothian Climate Hub's biodiversity working group and workshops has outstripped expectations. Crucially, energy developers have signed up to the terms of reference of the East Lammermuir Biodiversity Liaison Group, committing to a more joined up approach to biodiversity gains relating to their developments and beyond.

The surveying

Opportunities* for alleviating pressures, or encouraging natural river processes were identified in the survey. These opportunities and pressures can be explored in the dashboard map with the interactive legend below, together with the Layer button adjacently displayed. Descriptions of the pressures and opportunities found during the survey are given below the dashboard map. Many of the pressures listed are addressed within the opportunities section as every pressure represents an opportunity to improve natural river processes. Some pressures represent larger challenges therefore, so the opportunities* mapping represents a 'sandbox' activity where new ideas and techniques can be explored and tested.

The above logo is the Layer button, which can be found at the bottom right corner of the map app below to activate and browse opportunities and their applicability scores, the pressures they arise from, and auxiliary datasets.

Auxiliary datasets were used during the walkover surveys to identify pressures and opportunities, which is why some more easily identifiable opportunities have been identified outwith the walkover boundary. Auxiliary datasets used consist of a combination of data layers from SEPA, NatureScot, Forestry Commission, OS Master, OpenStreetMap, and orthographic imagery provided by Bing, Google, and ESRI.

Each opportunity has been given an applicability score ranging from 1 to 3 where a grade of 1 represents projects that are more expensive, risky or more difficult to access in relation to their likelihood to improve natural river processes whereas a grade 3 represent the easiest wins, i.e. an opportunity to improve river processes at low cost, with relative ease or speed, or with major benefits. Scores are arbitrarily judged depending on a combination of the following factors:

- Seriousness of the pressure
- Ease/risk of project implementation
- Level of positive effect of implementation
- Costs of project implementation

***The during walkover identified habitat improvement opportunities are labelled as sandbox (i.e. without constraints typically present in real life setting) opportunities because further assessment of data (erodibility, LiDAR etc.) and context (land use and ownership, funding etc.) are required before planning any implementations. See more In Next steps.*

Esri UK | Esri | TomTom | Garmin | Ordnance Survey | NASA | NGA

Try the interactive legend

Discover and explore data by utilizing the interactive legend. By selecting values in the legend, you can focus on certain features in the dataset.

In the legend, click an item. The map automatically updates to emphasize features that match your filter criteria.

▲	human poaching	2
▲	bank erosion	2

External layers

Pressures

Abstraction/drought - Induced by climate change, our river systems have to deal with drought more and more. Hand in hand with that comes a higher requirement for arable land to abstract water from the river courses. In the East Lammermuirs, this affects not only the upper channels, ditches and river tributaries but also the river main stems have dry sections in summer seasons.
Locations with pressures from abstraction and drought were found 9 times.

Bank erosion - Bank erosion is a natural process of a healthy river. This, however, can be exacerbated by surrounding land uses. This can then lead to an increased rate of habitat loss, increased sedimentation and a reduction in water quality.
The surveyors highlighted where bank erosion could be causing a loss of biodiversity and opportunities to improve these areas are shown in the section on natural bank protection below.
Only two locations with standalone (i.e. not related to bank poaching) bank erosion were observed.

Dumping - Rivers and their riparian zone are often used as a forgotten place to rid of trash ranging from macro-plastics to large plastic and metal objects but also of material ranging from as fine as dredging mounds to as course as quarried cobbles. Sometimes, dumping of material is done as an attempt to modify the river course, often leading to seeding the river bed with undesired material and undesired bank erosion on the long run after all.
Dumping was observed 12 times along the Spott and Dry burn catchments.

INNS - Invasive Non-native Species (INNS) cause harm to native wildlife through competition, predation, or disease, and can damage ecosystems by outcompeting native species for food and space. INNS can also alter river habitats, destabilize riverbanks, and disrupt fish populations, which can have long-term impacts on the health of the river ecosystem. Additionally, INNS can introduce diseases and alter habitats, further threatening the delicate balance of river ecosystems.
INNS were recorded at 15 locations.

Modification - All East Lammermuir catchments have river sections that have been historically straightened, embanked, and re-aligned. These modifications disrupt natural ecosystems by altering water flow, degrading natural habitat, and increase the risk of erosion, flooding, and loss of biodiversity. They were recorded where modifications form an obvious pressure to the river system.
At 17 locations such modifications were encountered, varying in type, size and severity.

Obstacles to fish migration - Obstacles to fish migration take many forms, such as culverts, redundant weirs, or bridge aprons. These barriers not only disrupt fish movement but can also impact natural river processes and increase flood risk upstream if they are large enough to influence them.
Many of the obstacles to fish migration recorded within the survey area would not limit adult fish passage during normal or high flows. Studies have shown that even the smallest of weirs can still impact resident fish populations and should be

considered for removal/easement on an individual basis.
As a start, SEPA's dataset on obstacles to fish migration was used. Additional obstacles found have been added and some obstacles not present in the field anymore have been removed.
In the Spott and Dry catchments, 44 obstacles to fish migration were identified.

Outfalls - Numerous pipes and outfalls from roads, fields, septic tanks, and combined sewer overflows (CSOs) were noted within the survey area.
A total of 12 outfalls were found, predominantly in the form of field drainage pipes.

Poaching (human and livestock) - Poaching in this context refers to the damage and degradation of riverbanks caused by the repeated trampling and compaction by livestock, wildlife, or human activity. This process can lead to the loss of vegetation, increased erosion, and a decline in water quality, ultimately destabilising riverbanks.
Livestock bank poaching was observed 13 times while human poaching was only found twice.

Poor buffer zone - By SEPA recommended width of a riparian buffer zone typically ranges from 10 to 30 meters on either side of a watercourse. Poor buffer zones typically lack vegetation and habitat features that protect the river from erosion, function as a wildlife corridor, or absorb and filter runoff water and contaminants. This can allow increased runoff from pollutants, compaction of the soil, and bare areas can allow INNS to spread.
14 river sections with poor buffer zones were identified.

Track erosion - Track erosion is where obvious evidence of topsoil erosion is visible, entering into the river system.
This was encountered at 14 locations.

Other - Some pressures on the river system were identified that cannot be easily categorised. These often have to do with unusual or unknown observations of runoff, land

management, wildlife, vegetation or algue.
Other pressures were observed 29 times.

Opportunities

Baffles - Baffles made from materials such as railway sleepers or stone can be installed in straightened or fast-flowing water to create varied flow patterns, improving fish passage and habitat by providing shelter, reducing turbulence, and reducing erosion. They can create a naturally looking and meandering artificial two stage channel within boundaries of bank modification, stimulating natural processes and faster flows to flush out silted riverbeds and exposing underlying gravel.
Four locations were identified with opportunities for baffles.

Embankment removal - Parts of river banks in the East Lammermuir rivers have been historically embanked and straightened. This has separated the rivers from their natural floodplain. The removal of the embankment on one or both banks can be used to allow the river to spill into its natural floodplain during high flows, reducing flooding downstream, increasing water quality and creating habitat for a range of wetland species.
Embankment removal opportunities were identified 25 times.

Fencing - Where deer, livestock, people, or dogs have access to the river, appropriate fencing can be utilised to reduce their impact on the riverbank and riparian vegetation (see Poaching).
Fencing as a standalone opportunity (see tree planting, often comes with fencing too) was identified 13 times.

Hedgerow - Hedgerows provide habitat corridors in our fragmented landscape. Unfortunately the maintenance hedgerows require has often not taken place for various decades, leaving many hedgerows to die off. Some are in a state of needing restoration, whereas other locations have space for hedgerows but none are left or have ever been planted.

Hedgerow opportunities were identified 9 times, although they can often be encountered further away from the riparian zone where surveying did not take place. More thorough hedgerow surveying is required to sketch a full picture.

INNS control opportunity - INNS control is most effective when starting from the most upstream source and working in downstream direction. Control opportunities also depend on the type of INNS, as some require spraying with chemicals whereas others can be manually removed by for example volunteers. Only the latter were identified here.
As a result, only two river reaches were identified with INNS control opportunities. Other locations with INNS identified as a pressure require chemical control and/or land owner action to remove species.

Large woody structure - The insertion of large woody structures into rivers can significantly enhance the river by stabilising banks, reducing erosion, and introducing habitat where natural processes have been disrupted. These structures, such as fallen trees, logs, and branches, are often removed, but they create pools, riffles, and cover for fish and other aquatic species. They also slow water flow, which can help in sediment deposition, nutrient cycling, and reducing the impact of floods. If placed correctly, they can also help reduce bank erosion and foster renaturalising of the river course. Additionally, large woody structures provide organic matter that supports aquatic invertebrates, contributing to the overall health and resilience of the river system.
At 16 locations large woody structures were identified as an opportunity.

Leaky dams - Leaky dams work best further up the catchment in smaller tributaries with moderate flows. They promote natural water storage and slow down water flow, especially during high-flow events, which can result in reduced flooding downstream. As a result, all of the leaky dam locations identified are outside the study area in areas with gentle to moderate slopes in areas where water could temporarily accumulate upstream of the dam.

At 15 locations leaky dams were identified as an opportunity, ranging from a shorter reach to a near entire tributary.

Natural bank protection - Natural or green bank modification refers to environmentally friendly practices and techniques used to stabilise and restore riverbanks using methods such as willow spiling, willow stake planting, or root wads. These methods are useful in areas where the river is eroding, bare riverbank is exposed or to encourage natural river processes.
Natural bank protection was identified as an opportunity 7 times.

Ponds - The addition of ponds within the floodplain allows water to pool in times of high rainfall, reducing flooding and increasing the water quality by trapping sediments and nutrients, while creating habitat for a range of aquatic and wetland species. Scrapes or scrape ponds could also be considered in these areas. Scrapes are generally shallower and as such, form seasonal, temporary ponds that support species adapted to such conditions. As with ponds, scrapes help in managing water levels by capturing and holding rainwater, reducing surface runoff, and promoting groundwater recharge. Ponds are often identified as an opportunity where full wetland creation or reconnection to the floodplain is not viable due to existing land use, or where already present.
10 locations for ponds were identified.

Public access opportunity - Where human poaching or where existing land use close to the river provide pressures, enhancing public access through for example board walks can provide a solution.
This was identified at 3 locations.

Remeandering - Historically the East Lammermuir rivers have sections that have been straightened, realigned and embanked throughout their reach. Remeandering sections of the watercourse to its natural, winding course can have many benefits including flood mitigation, erosion control, habitat

creation, water quality improvements, and groundwater recharge. These would benefit wildlife and the local community during flood and drought events. These projects would require a large area of land, and few such areas were identified during the surveys.
Where no possibility for re-meandering, a number of sites were identified during the survey were identified where micro-meandering would be possible within the existing wet channel width. This process creates complex flow patterns within the channel and could help de-silt sections of river. During lower flows, habitat is created on one or both banks using boulders and stone. Looser material is placed behind the stone and can be seeded to create a berm.
The narrower channel increases water velocities and creates riffles which are excellent fish spawning and recruitment habitat whilst benefiting amphibians, newts, lamprey and other aquatic species.

The surveyors identified 14 locations with potential for re-meandering.

Tree planting - Riparian trees shade the watercourse, reducing water temperatures in summer months or during low flows. They also introduce organic matter into the watercourse, sustaining the aquatic food web. Riparian trees also provide excellent habitats for a range of species.
Parts of the East Lammermuir river catchments lack trees along the river bank. Other reaches do have tree coverage but are homogenous and often overgrazed by deer and rabbit, preventing natural regeneration. This means trees are all of the same age and the woodland would not survive without restoration, leaving only gorse left to grow. This is why at many locations, inter-gorse planting was identified as an opportunity. On top of that, a high number of valley side tree planting opportunities were identified.
This leads to a total of 102 tree planting opportunities identified. Tree planting usually requires additional material in the form of tree tubes, stakes, and fencing.

Wetland creation- Wetland creation, intentionally establishing a wetland area in a previously dry or degraded landscape to restore ecological functions, improve environmental quality, and support biodiversity is also beneficial on areas of low-quality farmland. Wetland habitat often forms where scrapes or ponds are introduced making it a low-cost opportunity on land connected to the floodplain. Native wetland plants can also be introduced to more quickly establish a diverse plant community.

Wetland creation can often be integrated with other identified opportunities that aim to reconnect rivers to their natural floodplains and/or restore habitats. A good example is the creation or re-introduction of wet woodlands, a habitat that has become rare due to land use changes.

The surveyors identified 19 locations with potential for wetland creation or restoration.

Next steps

The surveyors mapped any possible opportunity for river restoration as well as any pressures which were limiting natural river processes. This approach does not rule out any landowner or likely project cost which are more likely to be a limiting factor when designing a river restoration project, therefore identified opportunities should be seen as sandbox opportunities.

Before taking any of our opportunity recommendations forward, these would need to be fully independently evaluated / scoped before implementation, and both landowner and regulatory approvals would be needed prior to initiation.

Next steps would involve creating an action plan for taking forward a range of projects in at least two of the river catchments in East Lammermuir. Having identified the issues each project will include a blend of measures to support the

naturalisation of river functions by way new riverine wetlands, more natural river flows and flooding, e.g. by allowing woody debris in watercourses, the creation of leaky dams, riparian planting, fencing, hedgerow rejuvenation as well as working with neighbouring landowners to find ways to mitigate runoff problems to and from their land etc.. Some of these projects are likely to be easy wins that can be implemented through unilateral community action, but most of them will require careful coordination and collaboration with landowners - hence the need for an initiative that creates the right environment for cooperation. Others still, such as removal of certain barriers to fish migration, exposing culverts etc. may well require longer term planning and engagement in some cases with the managers of national infrastructure. A key element will be to design an ongoing monitoring programme, to include assessing changes in river health through citizen science approaches such as riverfly monitoring.

Sustaining Dunbar has convened a steering group to take forward this project. Alongside Forth Rivers Trust, this will involve local people with professional expertise in ecology and nature based solutions as well as other community members who are involved with the East Lammermuir Community Council and their Biodiversity Liaison Group, the East Lothian Climate Hub's biodiversity working group and emerging groups such as Wild About West Barns.

As a result of this work, there now is a lasting legacy of increased knowledge, skills and understanding amongst those involved as well as from the new relationships that are developed. An overview of field-level detail identified pressures and opportunities, including an indication of their feasibility, will enable all future planning for restoration activities. Depending on land ownership engagement, decisions can be made on which restoration opportunities should take place and where. These restoration opportunities can then be developed further to required project detail for delivery. Once the first restoration activities have been

delivered, these can be extrapolated to similar opportunities identified, enabling a ripple effect of restoration activities within the area surveyed. Through having an action plan, combined with a shared vision for landscape scale restoration, a much more coordinated and joined up approach will become possible leading to better collaboration between farmers and others in our community and to more efficient use of the 'biodiversity net-gain' investments required by new energy infrastructure proposed for East Lammermuir. The project is also about piloting an approach and developing a methodology that can be further developed and replicated to lead to long-term action over a wider area. We plan to work closely with the biodiversity working group of the East Lothian Climate Hub and our hope is that this project can kickstart similar approaches that make use of the learning from this project to take forward the development of similar work in other river catchments across the whole of East Lothian.

The initial river focus has been a first crucial step towards devising an integrated approach to restoring the ecological and hydrological functions of the coastal burns cooperatively. We want to develop an approach that gives local people a strong stake in the protection and enhancement of their immediate local environment.