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Devon and Cornwall Land Management Team Catchment Assessment of Ide, Exeter, Devon. 02.02.2024

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Contents

Introduction

This report presents the findings of a land management assessment of land South of Ide, Exeter, Devon.

The purpose of the assessment is to determine the cause of the flooding to property in the community of Ide on 2nd November 2023 and to provide solutions of how similar flooding incidents may be prevented in the future.

The investigation was requested in response to flooding incidents being reported therefore, a site visit was undertaken by the Environment Agency to determine whether there was any breach of regulations and to work with the landowners, providing options to prevent this issue occurring in the future.

A culvert (Figure 1) which collects the water from a tributary to the south of Ide and passes below houses and the road where it connects to the Fordland Brook. This culvert became blocked with debris and rubble during the storm event, overtopping and flooding the adjacent property.

Figure 1- Culvert south of Ide

Catchment Assessment

(i) Land use

A large proportion of the catchment is predominantly part of an arable rotation, with pockets of grassland, woodland and natural scrub. The fields inspected were part of an arable rotation system. The land is owned and managed by multiple parties.

(ii) Soil Type

The soil examined are mapped as the Crediton association. Crediton soils are well drained gritty reddish loamy soils over breccia, locally less stony and steep slopes in places. The Crediton series are permeable and well drained (Wetness Class I). Frequent ill-timed working reduces porosity and increases soil wetness. Excess winter rain readily passes through into the permeable substrata.

The loamy texture and good natural drainage of these soils allows them to be worked easily and trafficked at all but the wettest times. Heavy winter rain causes slaking and capping of cultivated soil, particularly where organic matter content is low on perennially arable land, and rill erosion occurs especially on slopes.

(iii) Geology

The underlying geology is mapped as the Alphington Breccia Formation described as, Breccia, reddish brown, clayey, silty, fine-grained. Clasts predominantly culm shale and sandstone, together with hornfels, chert, quartz-porphyry, and lava. Most clasts less than 4cm; some range up to 0.1m and large boulders of porphyry are locally present.

(iv) Soil assessments

Soil assessments were carried out in Field's 1,2 and 3. Field 4 was observed during a wet weather survey for overland runoff.

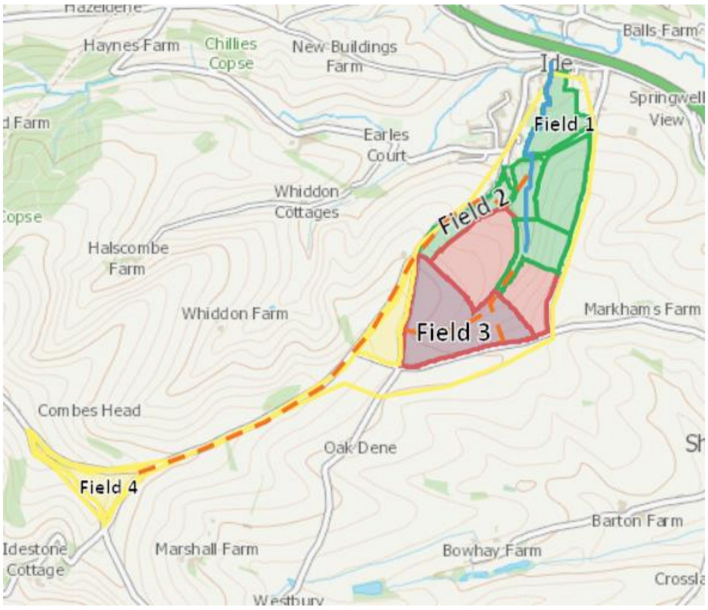

Figure 2- Annotated catchment map

Soil Structure Assessment

Field 1

Field 1 (Figure 4) Was a recently sown crop of winter wheat following maize. The established crop of winter wheat had good soil structure (Figure 3) and crop cover was emerging. There was no evidence of significant soil erosion and runoff, although the lower part of the field in the fluvial zone had been affected by fluvial flooding, where loosened maize stubble is at risk of being transported in flood waters. It was concluded that this field had good soil structure that would allow natural infiltration.

Figure 3- Soil sample field 1

Figure 4- Picture of field 1

Field 2

Following similar management to Field 1 the field had recently been sown to a crop of winter wheat following maize. Due to the nature of the recent cultivation this area had a loose friable structure with pore spaces to allow drainage and movement of air through the soil profile. This is likely to accept most winter rainfall. An area of erosion had been observed (Figures 5+6), where it is likely caused by the field accepting a significant flow of water from the drainage network from the local highway. Conversations with the land manager suggest there is drainage management required and formalisation of a suitable flow pathway through the field parcel.

Figure 5- Picture of field 2

Figure 6- Picture showing overland flow in field 2

Field 3

The previous crop was an arable cereal where the stubble had been direct drilled to establish a grass crop, however this crop had failed to establish. There were two areas noted that where accepting significant highway water, this water was not accepted by the soil and travelled following the natural overland flow path through the catchment. The soil had a sealed soil surface where algal growth was developing, indicating poor water infiltration into the soil profile. This sealed soil surface also showed evidence of overland flow. From approximately 0-20 cm there was a poor dense, blocky soil structure, where evidence of smearing had been caused from the direct seed drill (Figure 7). There was limited evidence of biological activity. From 20-40cm (figure 9) there was also a dense blocky and angular structure that would not support good water infiltration. The soil was noticeably dryer at depth than the soil on the surface, showing the water on the soil surface was perched.

Figure 7- Soil profile

Figure 8- Soil assessment pit

Field 4

Overland flow was observed being generated from field 4 and entering the highway, where the flow travels down the highway towards the community of Ide. Although a soil examination had not been carried out for this field a crop of a winter cereal had been sown following maize, where winter crop cover had been established.

Flow Pathway

Overland flow is generated from field 4 (Figure 9) where it is mainly conveyed down the local highway, predominantly into field 2 although where not intercepted by the road drainage this excess water will make its way to the community of Ide via the road network (Figure 10). Where the flow pathway is conveyed through field 2 significant erosion occurs enabling significant levels of debris to be transported in high flows. Where overland flows travel through field 3 (Figure 11) significant surface water runoff occurs, when significant velocity develops soil erosion increases. Vegetation, floodplain connection and surface roughness will help to mitigate the impacts of high flows and sediment laden surface water. Between field 3 and field 1 there is a section of rough grassland where sediment deposition has occurred (Figure 12).

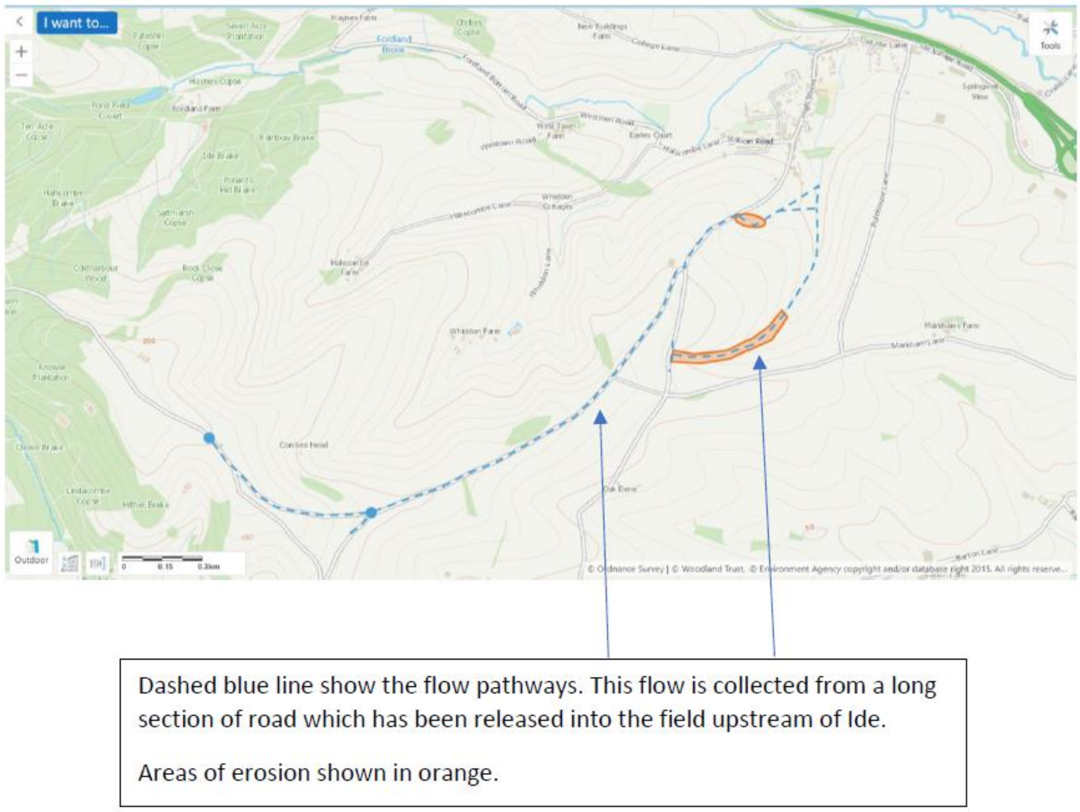

Figure 9- Annotated map showing observed flow pathways.

Figure 10- Aerial imagery showing theoretical overland flow pathways.

Figure 11- Field 2 erosion channel

Figure 12- Sediment deposition

Conclusions

It is concluded that across a significant area of the catchment the soils are in poor condition, increasing the volume and velocity of surface water runoff. Where fields are accepting flows, high flow rates have caused significant erosion. Field 1 is enabling water infiltration and is in good condition although it is likely debris and soil was eroded from the field when the river breached onto the floodplain and over loosened soil. Creating an enhanced riparean corridor will reduce risk and improving floodplain roughness creating more oporunity for debris to be deposited and flows slowed.

Significant overland flows were observed in the upper reaches of the catchment suggesting a wide spread soil structure issue. Improving the soil structure across the catchment will improve the fields resiliance and reduce the risk of soil loss. Surface water flows will also be reduced reducing the volume of water traveling through the fluvial system due to higher levels of grounwater infiltration. This could be achieved by monitoring the soil structure and carrying out timely operations/ cultivations such as sub soil loosening with a subsoiler.

The overland flow generated from field 4 is conveyed through and alongside the highway network this increases the natural catchment area and water volume passing through field 2 and along the road into Ide. Manitenance of road drainage is required alongside seeking oportunities to desperce the water volume and encourage a more natural flow pathway for the landscape.

Where highway water enters farmland and area's off increased runoff there should be a significant intervention to reduce the risk of soil laiden runoff from leaving the field. Therefore, it is recommended thought is applied to identify what interventions can be implemented to reduce the risk of soil laiden runoff leaving the field and affecting other parties. This could involve techniques such as creating grass waterways.

Landmanagers should take care when choosing what crops to grow and consider the risks involved, especially when growing high risk crops such as maize. When there is a sensitive receptor such as a road, watercourse or properties at the bottom of a slope, any field work comes with excessive risk. This is particularly true when dealing with the ever increasing intense rainfall events we are seeing regularly here in the Westcountry. However, as stated before, the condition of the soil and the slope can increase the impact on the receptors below.

Recommendations

The following options should be considered as a catchment with a view of enhancing the environmental condition and reducing flood risk to properties, infrastructure and the community:

a) Highway drainage assessment.
b) Formalisation of drains, spill ways, drainage grips and gulleys to remove the water from the highway.
c) Management of existing highway drainage infrastructure to ensure its working effectively.
d) Natural flood management assessment.
   There appears to be opportunities for natural flood management interventions (Figure 13) such as: Grassed waterways, leaky dams, riparian tree planting, enhanced riparian buffers, floodplain reconnection, retention ponds etc. The effectiveness of these measures should be considered and routes for funding explored.
e) Catchment sensitive farming advice given to land managers. This presents opportunities for funding and implementing measures that may have benefits for flooding and water quality.
f) Assessment of the culvert near the community affected. Is it adequate can it be improved, what's the cost benefit assessment of this work?
g) Creation of an overflow/ spillways near houses and community affected. This will provide a safe exit route for excess water.
h) Assessment and management of downstream infrastructure and drainage network to ensure the is sufficient opportunity for surface water to get away.

The following options should be considered by the land owner/ managers:

a) Soil assessment

It is recommended that soil structure is assessed before cultivation and establishment of next crop in the rotaion. This can be done by digging soil assessment pits over a representation of the fields in question to see at what depth the problems are, so that cultivations can be adjusted to need.

b) Dealing with compaction

Cultivation to loosen the soil needs to be at a depth that will eliminate any compaction and allowing infiltration of the heavy rainfall that falls in this location.

C) Complying with the regulations.

This type of incident is covered by the Reduction and Prevention of Agricultural Diffuse Pollution (England) Regulations 2018, colloquially known as Farming Rules for Water. (FRfW)

Specifically, Regulation 10 (5) - Managing soil protection from cultivation, harvesting and livestock activity (Rule 6)

“A land manager must ensure that reasonable precautions are taken to prevent diffuse pollution from agriculture caused by land management and cultivation practices on agricultural land.”

Examples of reasonable precautions include, but are not limited to:

In relation to soil:

- Establishing crops early in the autumn months, and during dry conditions;
- Planting headland rows and beds across the base of any sloping land;
- Undersowing or sowing a cover crop to stabilise soil after harvest;
- Removing compacted soil;
- Establishing grass (buffer) strips in valleys, or along contours or slopes, or gateways.

d) Future use of the field’s and risk

Due to the nature of the steepness of the land and the sensitive receptors below the fields, it is suggested that the land manager reassesses how the fields in question are managed in the future taking into account timeliness of ground works, crop choice and rainfall risk.

Figure 13- Vegetated valley bottom