Natural Flood Management surgeries webinar series, 17 July 2019

Building capacity for communities, local authorities and catchment partnerships to achieve successful NFM

Chris Uttley, Dave Johnson and Dom Martyn

Next webinars: 9 September, 26 November

See CaBA Integrated Catchment Delivery programme here: https://www.therrc.co.uk/integrated-catchment-delivery-events-2019

Catchment Based Approach

Partnerships for action

Todays agenda

2pm Welcome, introductions and NFM capacity building

2.10pm Identified training needs to tackle today

2.10pm to 2.35pm Risk, liability and maintenance

2.35pm to 3pm Recording, reporting and evaluating the Defra £15million programme

3pm to 3.10pm BREAK

3.10pm to 4pm discussion

4pm to 4.15pm how did we do today, any actions?

Photo: Loddon, Arborfield bypass channel, weirs and wet woodland project

Capacity building events for NFM Integrated Catchment Delivery

Visits

- **London Climate Action Week – 2 July Coln, 3 July Evenlode Thames NFM pilot, 4 July Thame, 11 July Beane**
- **NFM in London** an urban approach
- **Yazor Brook,** Wye catchment, Herefordshire, NFM initiative complimenting Yazor Brook flood alleviation scheme
- **Derwent Villages** NFM project, Yorkshire aiming to reduce local flooding through entirely natural methods
- **Southwell and Loundhum**, Trent Rivers Trust, seeing NFM design and construction.
- **Dartmoor and Wiliton** natural flood management pilot project.
- **Wrye Rivers Trust, Lancashire -** Farmer led delivery day with leaky dams
- **Belford, Northumbria** – seeing one of the best practice NFM initiatives.

Workshops

- **11 September Visit and workshop: sustaining the benefits of NFM** - Yorkshire
- **Turning NFM evidence to action workshop**, South West.
- **NFM best practice community and catchment delivery workshop** - Severn and Wye and Thames.
- **NFM consenting workshop**, Severn and Wye location, Northumbria.
- **Soils, beavers and NFM,** Devon.

Webinars: 17 July, 9 September, 26 November – natural flood management surgeries – trouble shooting pain points and sharing top tips for embedding best practice and working with NERC NFM Programme.

Capacity building events for NFM
3 July Evenlode

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Partnerships for action

Risk, Liability and Maintenance

Taking a proportionate approach to reducing risk & liability and designing for minimum maintenance.

Chris Uttley, Senior Advisor, EA FCRM Integrated Outcomes Team

Catchment Based Approach

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Assessing the Risk

Assessing the Potential Hazards of using Leaky Woody Structures for Natural Flood Management

ADEPT

Environment Agency

Forestry Commission

Forest Research

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Partnerships for action

Working with Natural Processes on rivers & their tributaries

Grip blocking

Woodlands in wider catchment & as flow interception

Gulley Stuffing

Woody dams

River & floodplain woodlands

Flow interception

Land /soil management

Natural Flood Management

Environmental Engineering

River restoration

In-channel measures to restore river floodplain connection

River & floodplain reconnection

Floodplain & wetland restoration

Urban Flood storage areas

Green/blue infrastructure

Suds

Headwaters/steep slopes	In-channel	Floodplain	Urban

Catchment Based Approach

...ships for action

Who is going to build NFM?

Farmers and woodland owners? Crucial partners

Community groups and NGOs?

Contractors: Skills resource and valuable advocates?

The Basics of the Risk Assessment.

- **Part A:** Summarises the risks that need to be considered to ensure any LWS scheme will be safe and effective.
- In **Part B**, we consider the potential severity of impact or hazard and how to manage these through site selection right at the start of the process. This is intended to ensure that NFM schemes are only developed in suitable catchments where they can be most effective.
- **Part C** examines what mitigation measures can be applied to minimise the likelihood of loss of woody material from LWS and therefore reduce the risk of downstream blockage of structures. While LWS is not encouraged for sites that have a high blockage impact or hazard, if such sites are chosen, it will be essential that mitigation measures are put in place.

Key Risks:

- **There are four risks that need to be considered when installing LWS:**
- 1. Woody material breaking loose and flowing downstream resulting in a blockage of a bridge or culvert, increasing flooding of another person's property or land, or direct injury to people and damage to infrastructure.
- 2. Flood water damage to property downstream as a result of a surge of flood water due to the failure of multiple LWS.
- 3. Water levels rising upstream of a structure – the "backwater" effect, causing inadvertent flooding of land or property outside of the ownership boundary or onto rights of way.
- 4. People injuring themselves on LWS.

Basic Principles of Using Wood and LWS

- The main purpose of LWS is to increase hydraulic roughness, add channel diversity, divert flows out of channel and slow the flow by attenuation.
- The principle should be to establish many smaller, wider, low features rather than few, large, deeper ones.
- Permeability is key to stability The more permeable a structure, the less hydraulic pressure will be exerted on the upstream face during high flows
- Go big or go home. Larger, longer and more complex elements of wood are safer & less mobile in flood flows. Use large timbers, relative to the width of the channel (approx. 2.5 times channel width)
- (The influence of geomorphology on large wood dynamics in a low gradient headwater stream Dixon. S & Sear.D 2014)

Longevity and maintenance.

- Designed well, there is little need for maintenance of most Leaky Woody structures. They may need replacement in the longer term rather than specific maintenance. Where appropriate, natural replenishment is the preferred method, but re-construction may also be necessary. Desilting is not feasible. Observation and inspection is needed.
- Utilising naturally occurring materials enables structures to be constructed with minimal cost, maximum flexibility and to be added to or repaired with ease. In some locations live trees should be used.
- Structures should be allowed to rot and decay, changing ,evolving and influencing stream & floodplain morphology.

Risk is reduced with a good Governance structure

- It is good practice for projects involving LWS to have a governance structure that sets out who is responsible for the design, construction and ongoing maintenance. The responsibility for maintenance and repair will depend upon formal or informal agreements put in place between the landowner and the commissioning / constructing organisation. It is likely that LWS installed in locations where they pose little or no hazard will require no ongoing maintenance other than observation and potential replacement.
- Responsibility for any unintended damage caused by LWS, including inadvertent flooding, will be determined by a large range of project and site specific factors. Responsibility could rest with the landowner, commissioning body, designer or contractor unless there is a specific agreement in place that transfers liability to a particular organisation or person.

Part B

Assess and mitigate the potential severity of impact.

The potential severity of the hazard/Impact should be assessed first and where ranked as potentially moderate or high, action taken to mitigate this. In the case of potential impact on downstream property or infrastructure, consideration needs to be given to placement and design factors in **Part C** to minimise the likelihood of washout and risk posed. All the design factors should be interpreted in relation to each other, assessing the location, type of land use and the level of certainty required.

If the potential impacts identified in Part B are low, no further action need be taken.

If the potential impacts identified in Part B are moderate or high, mitigate these or reject site. See (Part C).

B1. Potential severity of impact on downstream property or infrastructure

NFM projects are designed to reduce the risk of flooding to people, property and infrastructure downstream. However, the washout of woody material could potentially block or damage downstream culverts and bridges in and around residential properties and infrastructure, increasing flooding. Increased flooding could also result from the failure of multiple LWS causing a surge/release of stored flood waters.

Potential severity of Impact	Negligible / Low	Moderate	High
Hazard Property or infrastructure downstream is at risk from inadvertent flooding	No vulnerable culverts or bridges downstream at risk of blockage that would cause flooding. The nature of the river system (presence of ponds, non-critical pinch-points or dense vegetation) and features (appropriately sited and managed trash screens or other trapping structures) prevent woody material reaching them. Total volume of water designed to be attenuated behind LWS is small in relation to flood peaks affecting downstream communities or property.	Mobile trees and timber would be able to reach vulnerable culverts and bridges, but no history of blockage or flooding. Blockage would only result in flooding of land and not property. Moderate volumes of water attenuated, the release of which would have a limited effect on downstream flood levels and potential flood damage.	Mobile trees and timber would be able to reach vulnerable culverts and bridges located directly downstream. This infra-structure has a history of blockage causing flooding. Total volume of water attenuated is large in relation to downstream flood peak and its release would have a significant effect on flood levels and damage to property.
Potential mitigation	N/A	Select appropriate placement and design to minimise the risk of LWS failure/washout. (Part C)	Avoid site or ensure placement and design will secure structures. (Part C)

Part C

Assess and mitigate the likelihood of impacts occurring.

The tables in part "C" focus on how the placement and some design elements of LWS can be used to minimise the likelihood of washout of woody material or sudden release of attenuated waters thereby reducing the risk of flood damage. These elements act as mitigation for each other and where the potential severity of impact is moderate to high.

C1. Landscape or habitat setting of the constructed LWS

Installing LWS within a woodland or riparian woodland setting will usually reduce the risk of failure. There is often scope for bracing structures against trees and for any released material to be trapped within the woodland or by existing natural woody structures. The presence of riparian trees and woodland will also act to slow down and mitigate the release of flood waters in the event of a structure(s) failing.

Likelihood	Low	Moderate	High
Hazard Timbers can travel further in a landscape without riparian trees	In woodland or riparian corridor where other trees will help secure structures and impede movement of loose material.	In water course flowing through open farmland.	In urban or public environment.

C2. Width of the watercourse and length of timbers

Wider watercourses present a greater risk of structure failure due to length of span and increased discharge. While the mobility of woody material in a watercourse is largely determined by the ratio of length of wood to channel width (at ratio's over 2.5: 1 timber lengths are functionally immobile, even without fixings), the risk of breakage/snap increases with width.

Likelihood	Low	Moderate	High
Hazard Energy is greater and risk of washout greater in wider watercourses. Shorter timbers are more mobile	**Less than 3m** Headwater streams providing high stability of structures due to ability for bracing or capture of woody material by close spacing of trees between opposite banks. Timbers are 2.5xs channel width.	**3 – 5m** Wider spacing between banks and longer structures at greater risk of breakage and washout. Timbers are >1.5xs channel width.	**5+m** Higher risk of breakage and washout due to width of span and greater discharge. Also less opportunity for trapping of released material. Timbers are the same or less than the width of the channel.

C4. Height of LWS above bank

The higher the LWS above bank height, the greater the depth of water and therefore potential weight of water attenuated. This will add hydraulic pressure and can increase likelihood of structural failure. As a general guide, the higher the structure, the more frequent the need for inspection and potential for maintenance. Higher structures will need more fixings and other mitigation measures.

Likelihood	Low	Moderate	High
Hazard Increased depth is generally associated with an increased risk of failure	Height above bank <50 cm.	Height above bank between 50 cm – 1.0 m.	Height above bank >1 m.

C5. Permeability of the structures

There is a correlation between permeability and risk of LWS mobility and breakage. More permeable structures (letting normal flows pass unhindered) allow more water and sediment through which will reduce the force exerted on the face of the LWS structure. The desirable level of permeability will depend upon the project objectives, but higher permeability does not always reduce effectiveness and can increase longevity.

Likelihood	Low	Moderate	High
Hazard Less permeable structures may be more likely to fail in high flow events	Very permeable. Large gaps within or below the structure, allowing leaves and small branches to pass through.	Permeable. Smaller gaps that are more likely to become filled over time.	Low permeability. An increased risk of siltation/deposition causing infill and sealing.

Example: *Design of Leaky Woody Structures for use for a Natural Flood Management project in Forestdale*

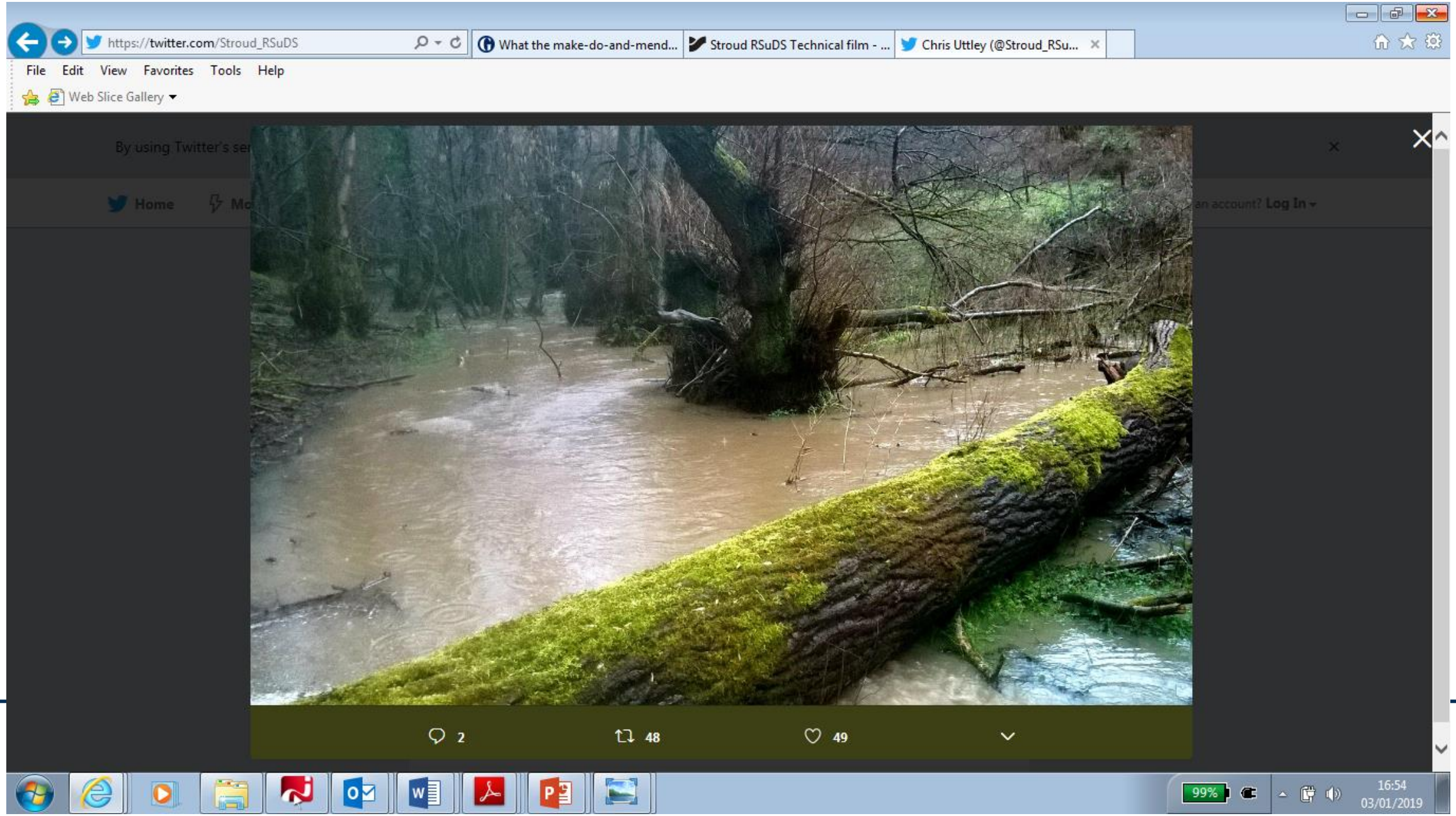
Potential severity of Impact to downstream infrastructure or property: Moderate
Potential impact to adjacent landowners – Low
Potential to harm people or rights of way – Low
Overall Risk Assessment after mitigation – LOW

Owner; Holly Woods | **Date of assessment** *15th January 2019*

Design Factors for Leaky Woody Structures	Characteristic	Initial risk level			Mitigation measures to reduce likelihood and risk	Residual risk level		
		Severity of impact of washout	Likelihood	Risk level		Severity of impact of washout	Likelihood	Risk level
Location & landscape	*Woodland setting*	M	L	L	***None required***	M	L	L
Water course width	*4m wide*	M	M	M	*Use timber lengths 1.5 x width. Increased frequency of monitoring.*	M	L	L
Tree species/materials used	*Alder*	M	L	L	*None required*	M	L	L
Height above bank	*75cm*	M	M	M	*Strengthen fixings, e.g. Using steel bar or reduce height of structure above bank. Increased frequency of monitoring.*	M	L	L
Permeability	*Permeable structure*	M	M	M	*Raise structure to allow base flows to pass unhindered. Increase permeability. More frequent maintenance.*	M	L	L
Fixings	*Non-degradable fixings*	M	L	L	*None required*	L	L	L

Catchment Based Approach

Partnerships for action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Chris Uttley @Stroud_RSuDS · 29 Mar 2017

More new LWD structures on the Upper Frome thanks to @Gloswildlife and volunteers.

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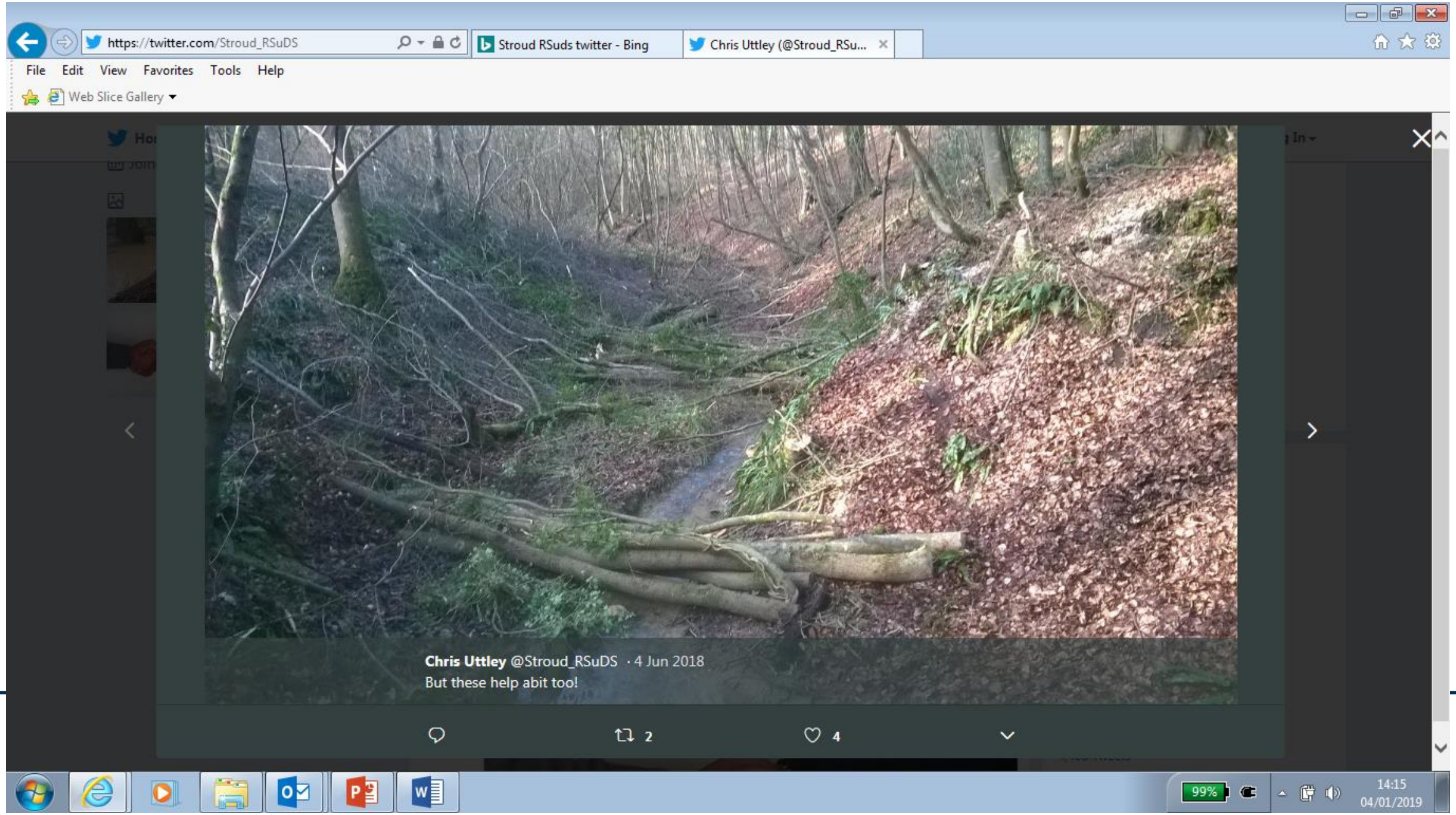
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NFM monitoring and evaluation for the Defra £15M….

David Johnson National CaBA Technical Team

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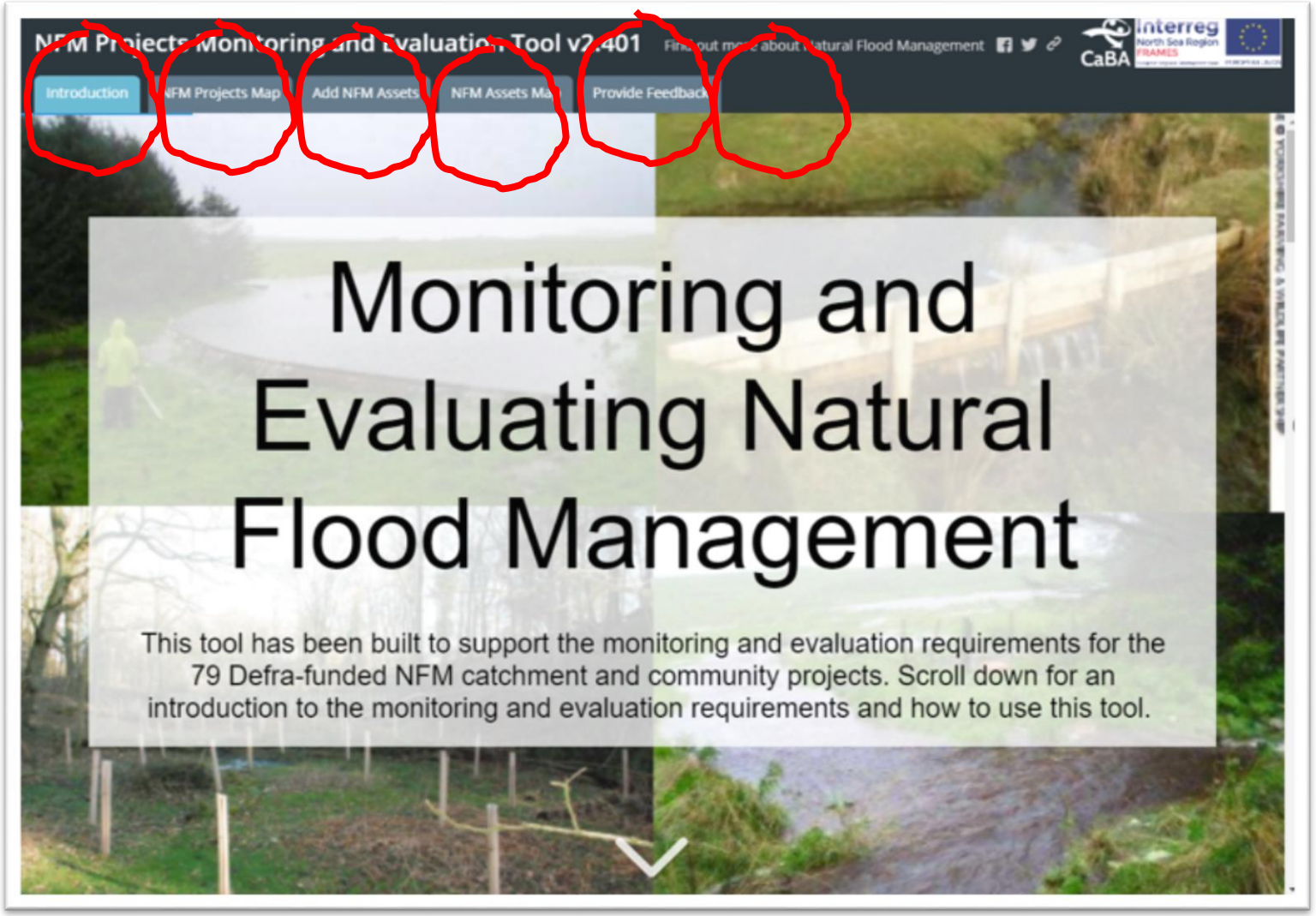
Introduction & user guide

PROJECT Map

Input an asset

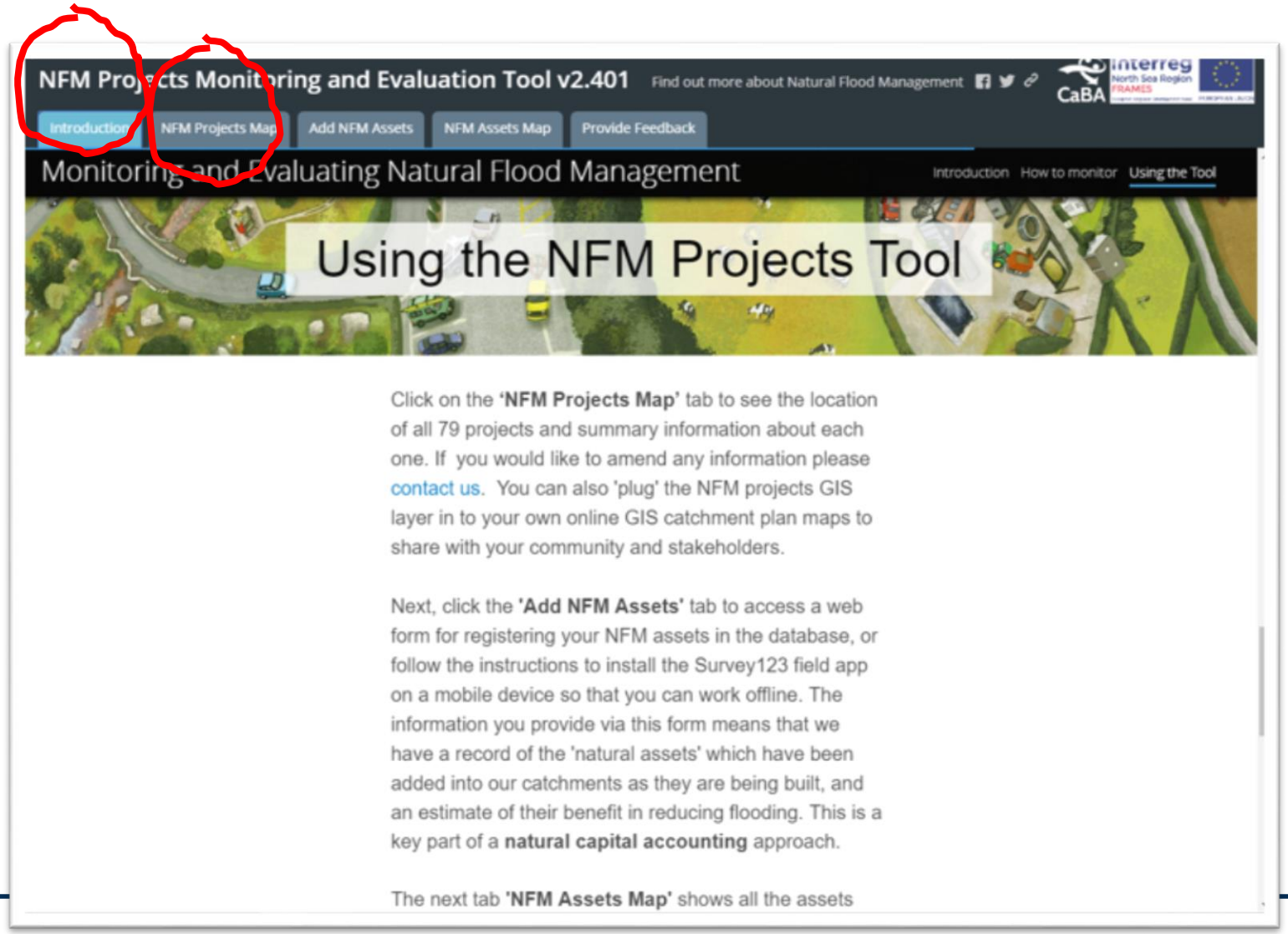


ASSET Map

Give us feedback

PROJECT evaluation

Scroll down to get the user guide



We will keep on updating this as people give us feedback

We will skip the next tab 'Project map' because we are republishing it based on feedback

Catchment Based Approach

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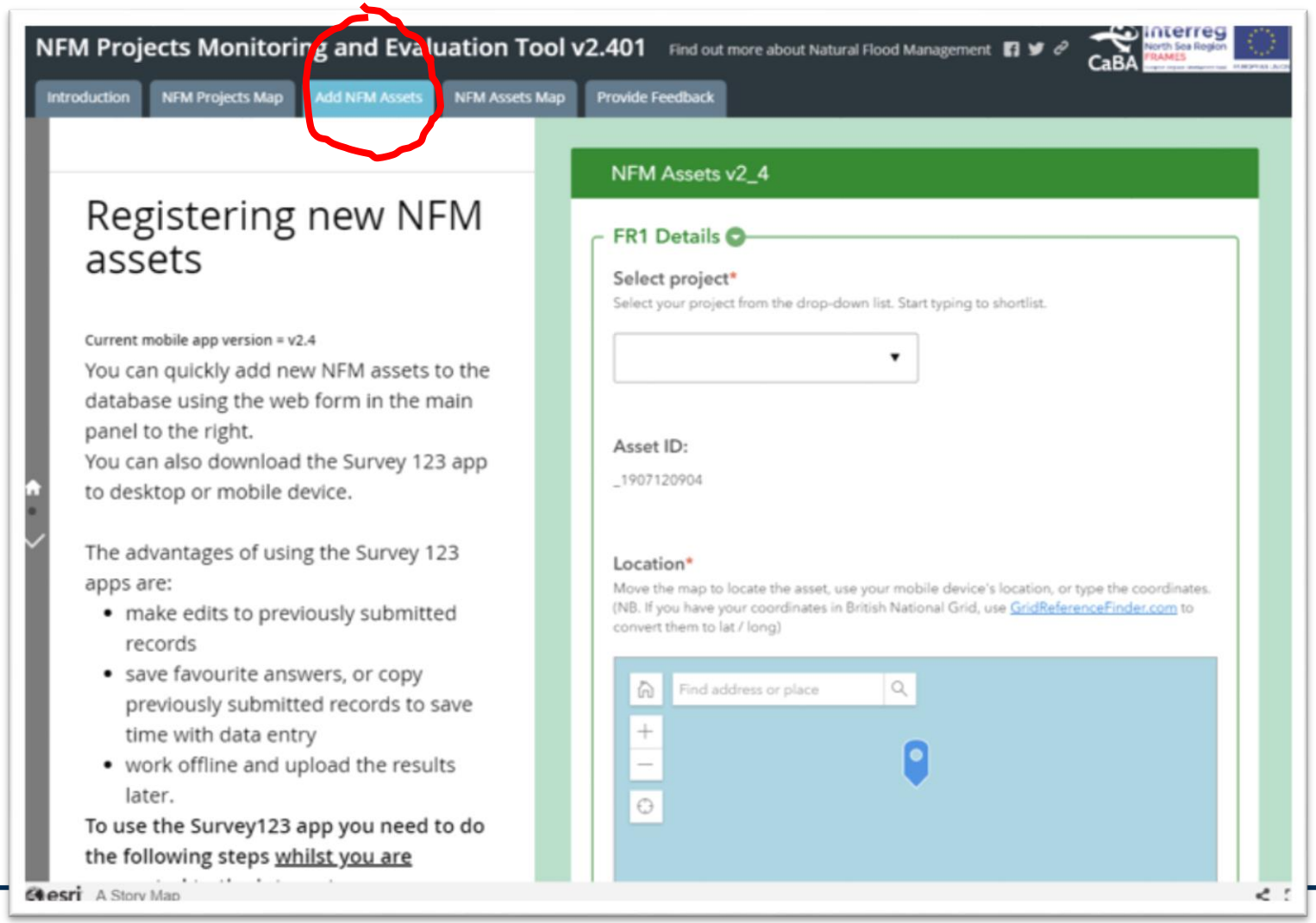
Now we are on the ‘Add Asset’ tab

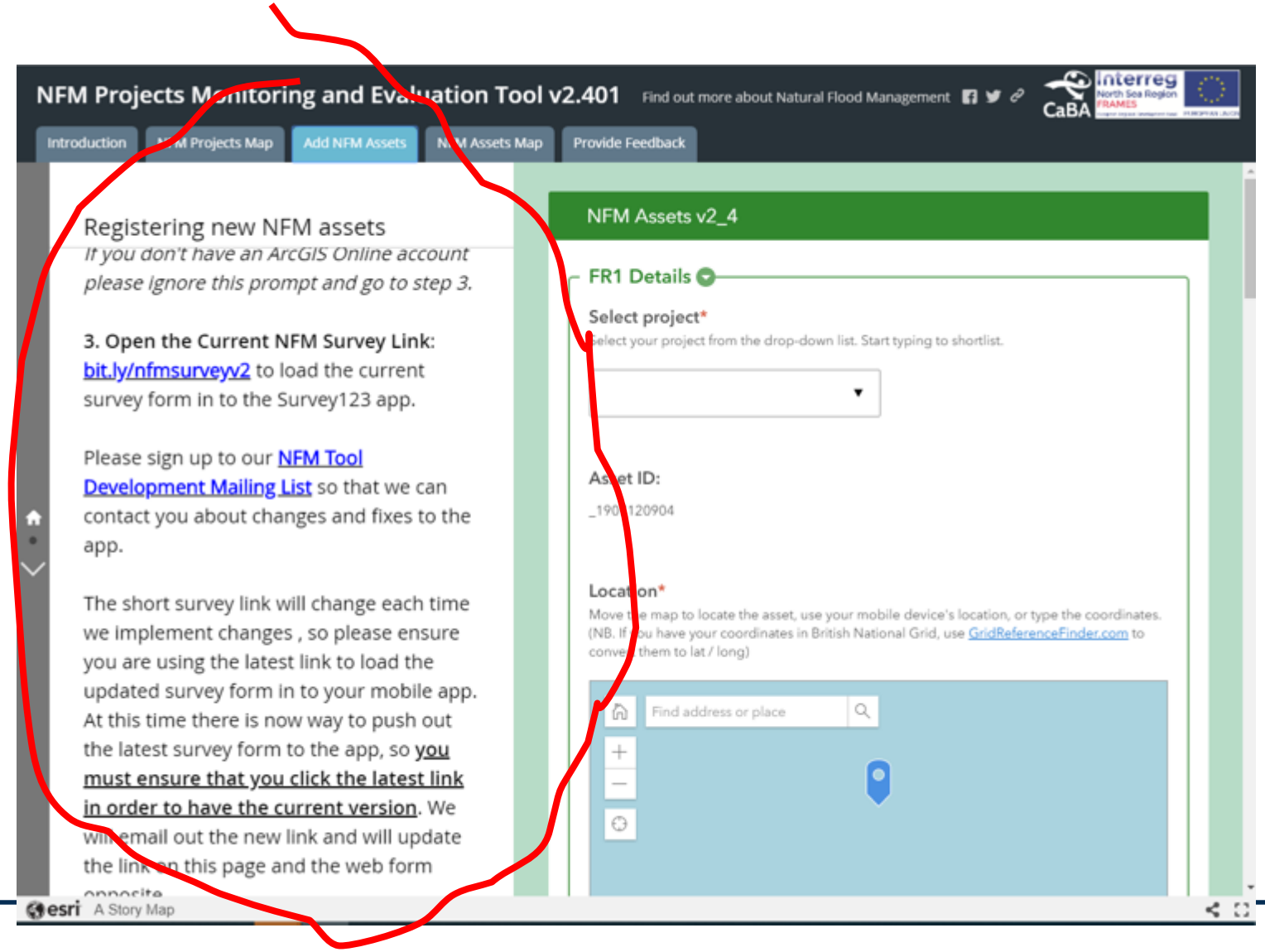
User guide on the LHS. Scroll down to see how to use this tab



Catchment Based Approach

Partnerships for action

User guide includes adding an asset from your mobile phone



Catchment Based Approach

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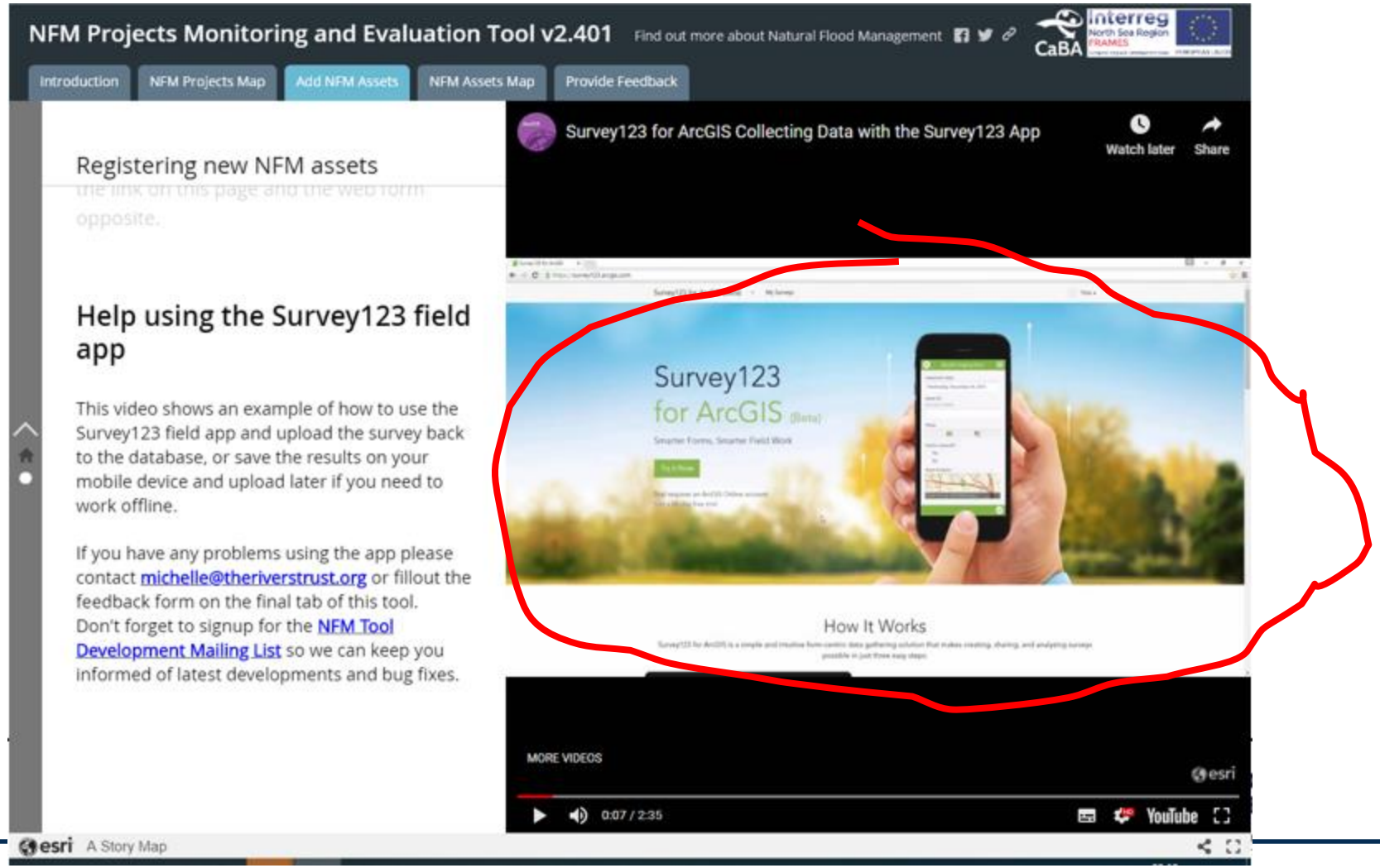
And a video clip on how to download Survey 123



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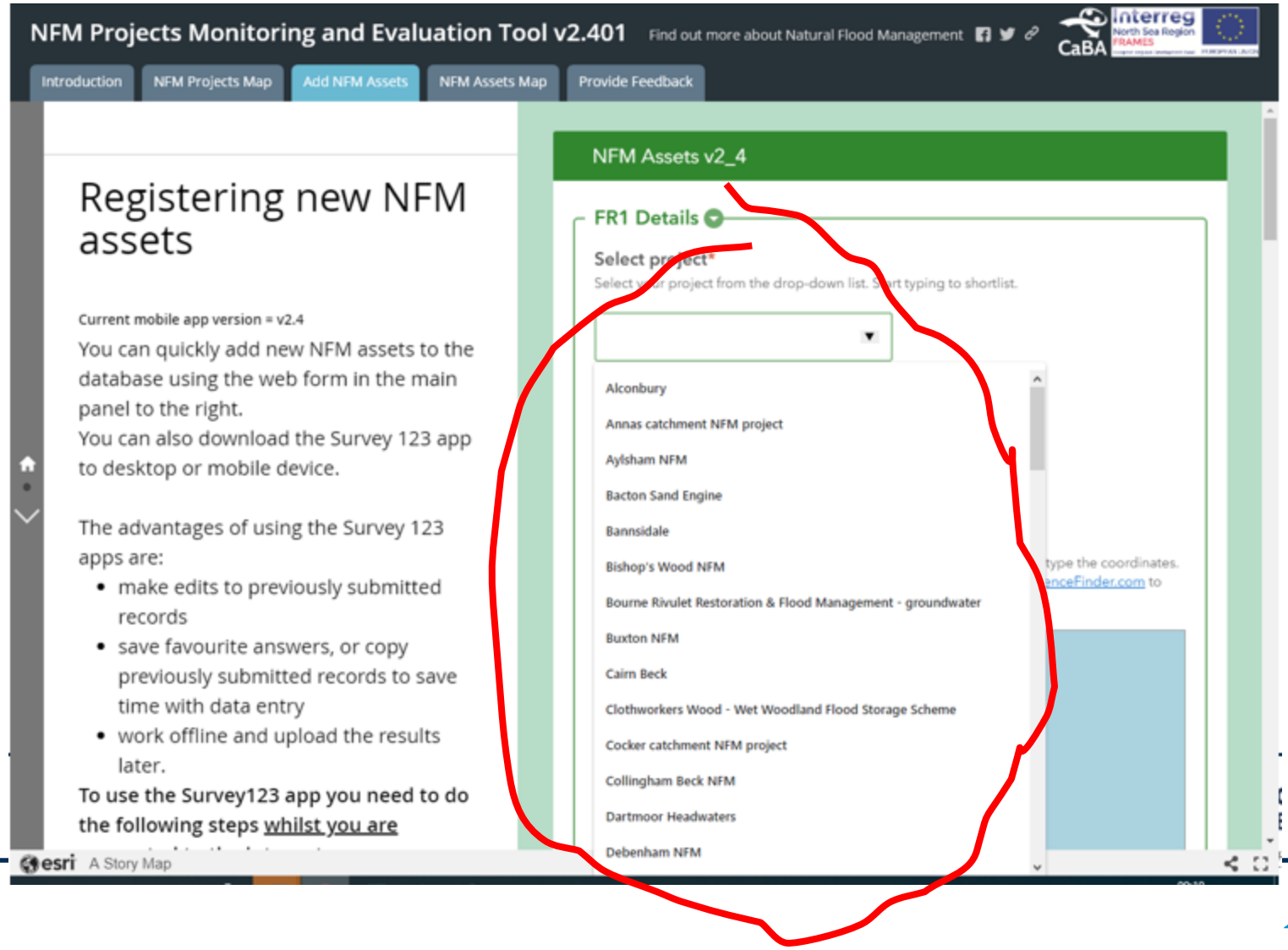
Now we are ready to input an asset

The first thing to do is to select your project from the drop down



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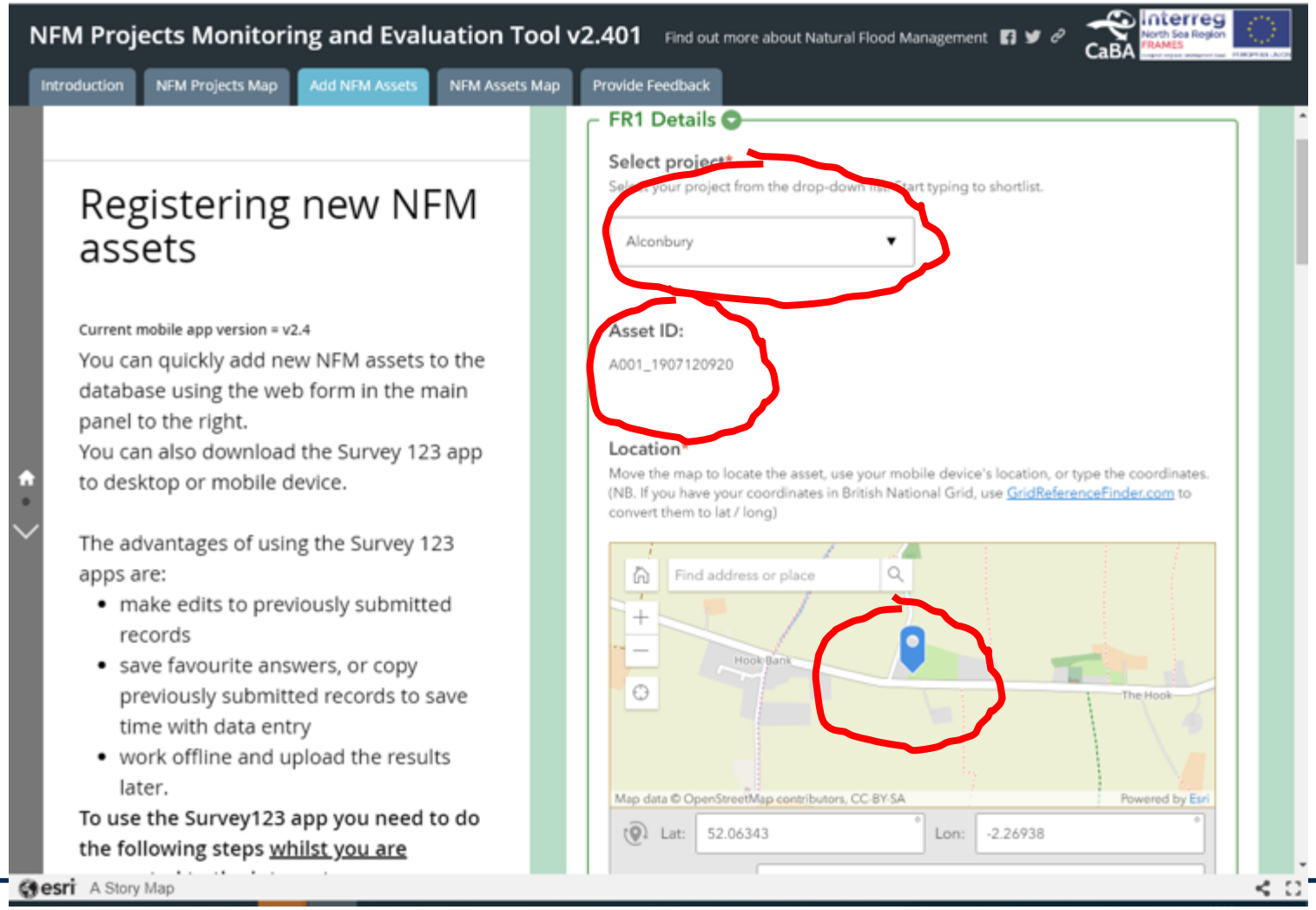
You have selected your project and the tool gives the asset a Unique ID



If you are doing this on the desktop you drop the pin on the exact location

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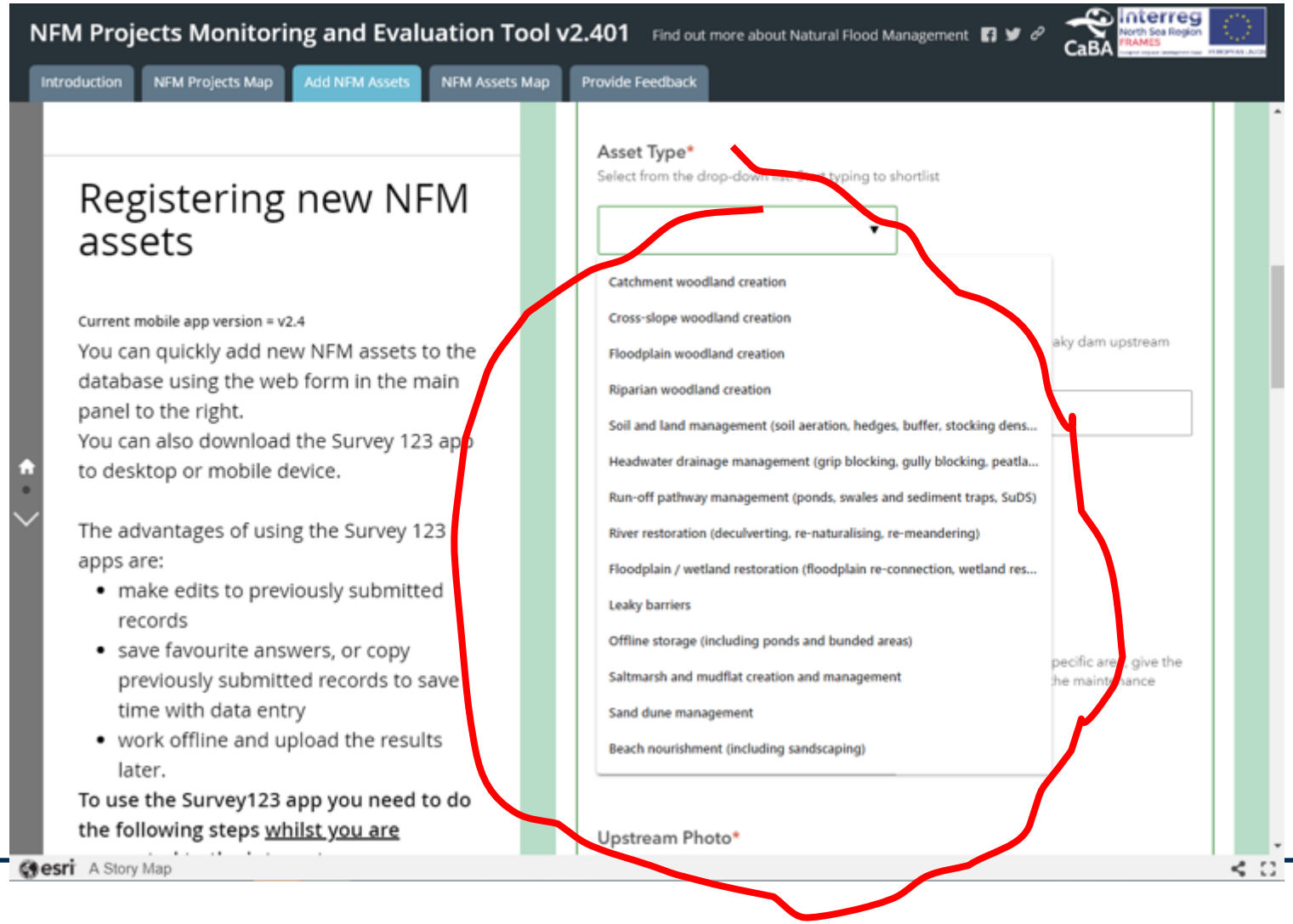
Now choose the ‘Asset type’ from the dropdown



The ‘Asset type’ chosen then changes the data that is requested

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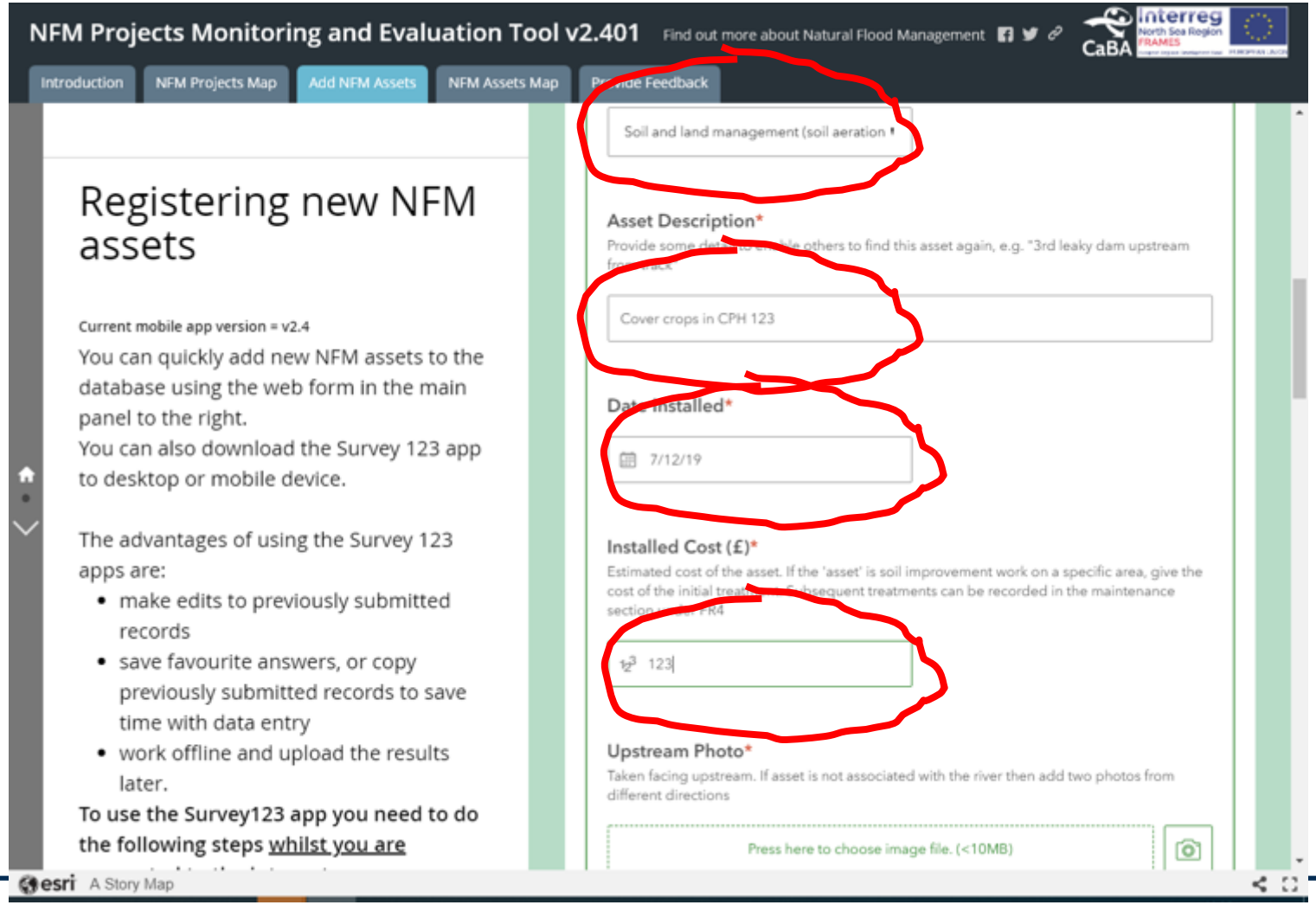
In this case we have chosen ‘Soil and land management’

A bit of free text to describe the asset

The date ‘installed’



The cost of the asset, in this case it is the cost for year one, subsequent costs will be recorded as maintenance

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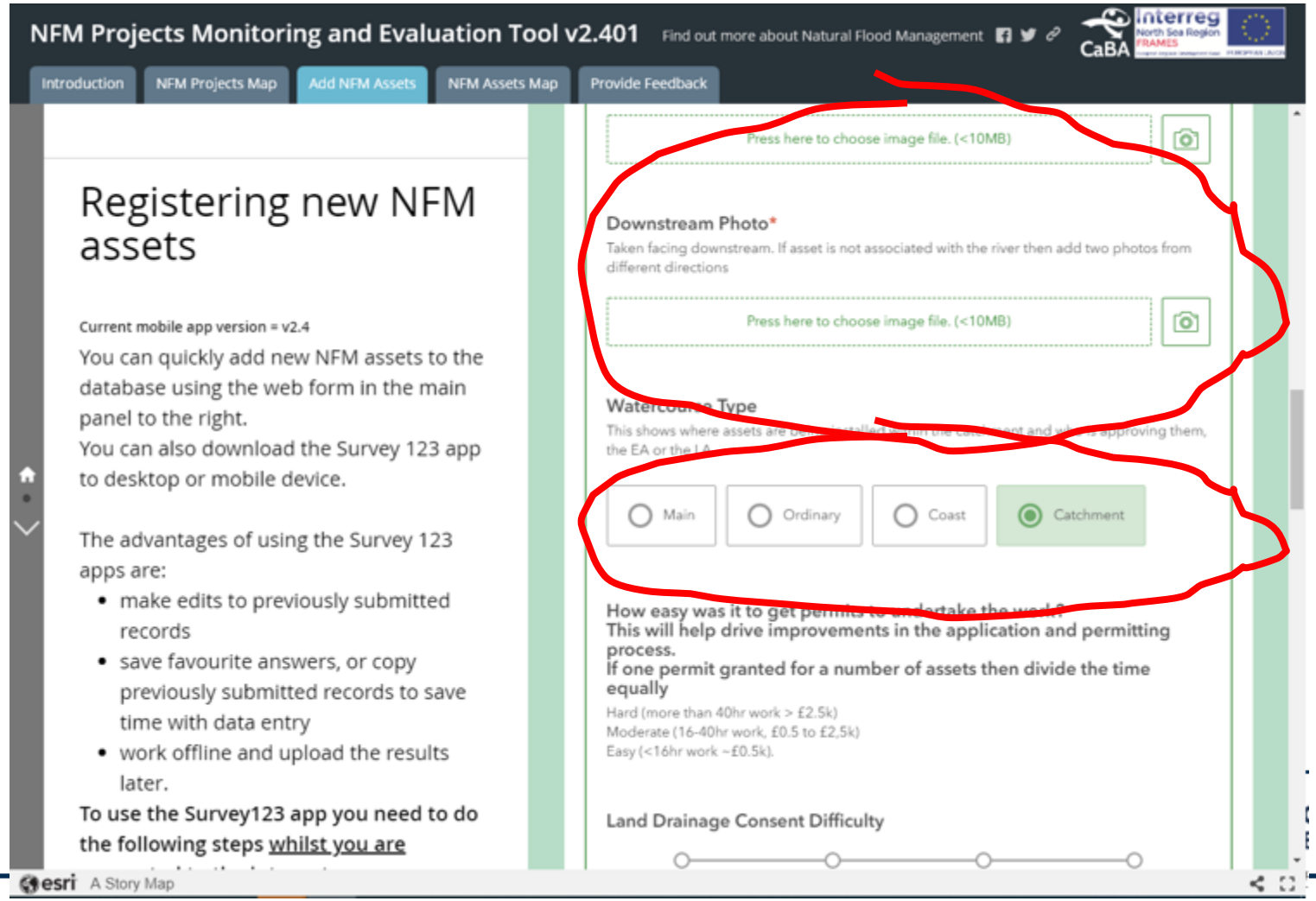
Insert a couple of photos as proof of delivery



What sort of waterbody are we affecting? In this case 'catchment'

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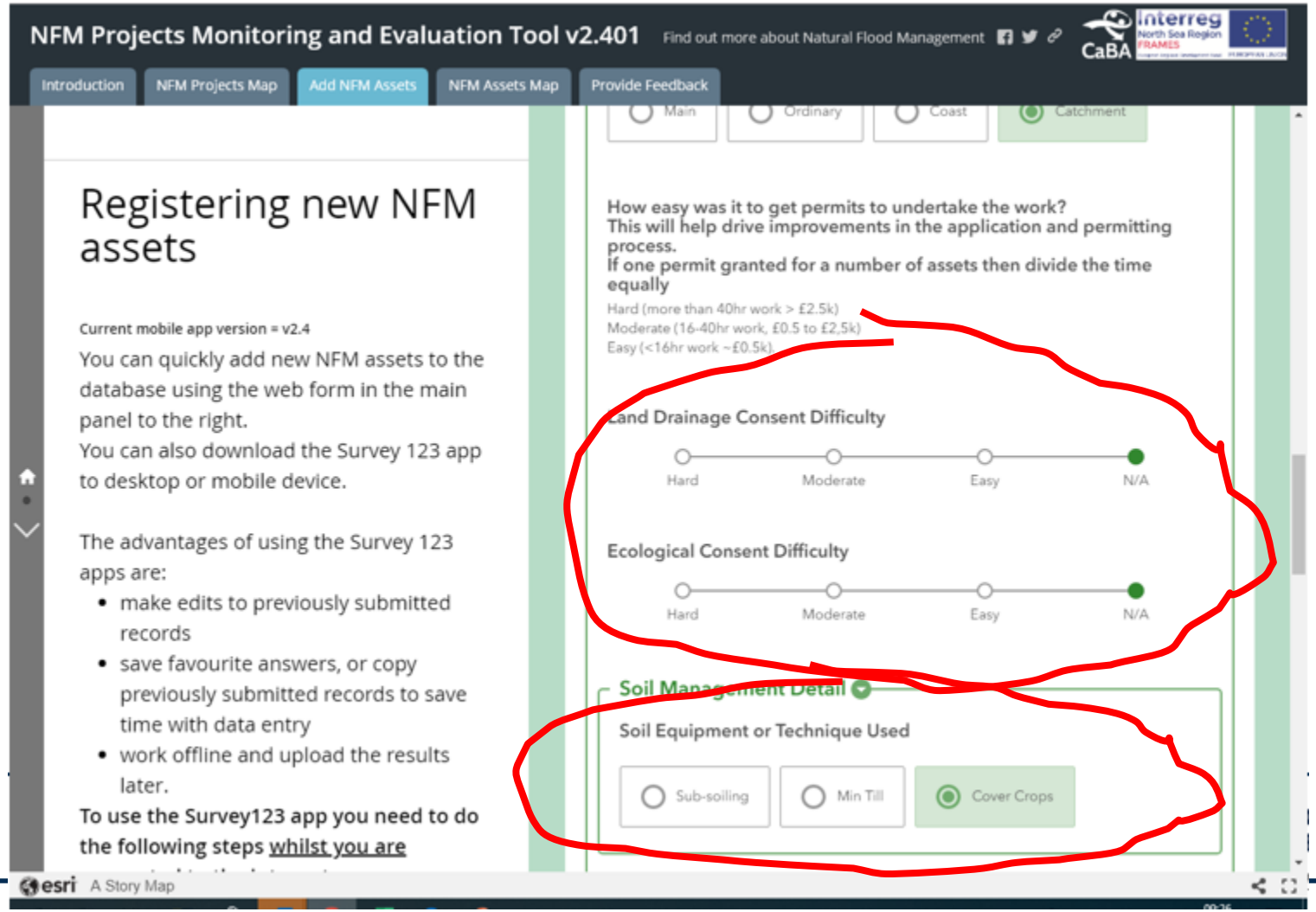
How easy is it to get a permit?



What type of soil management used, in this case 'Cover crops'

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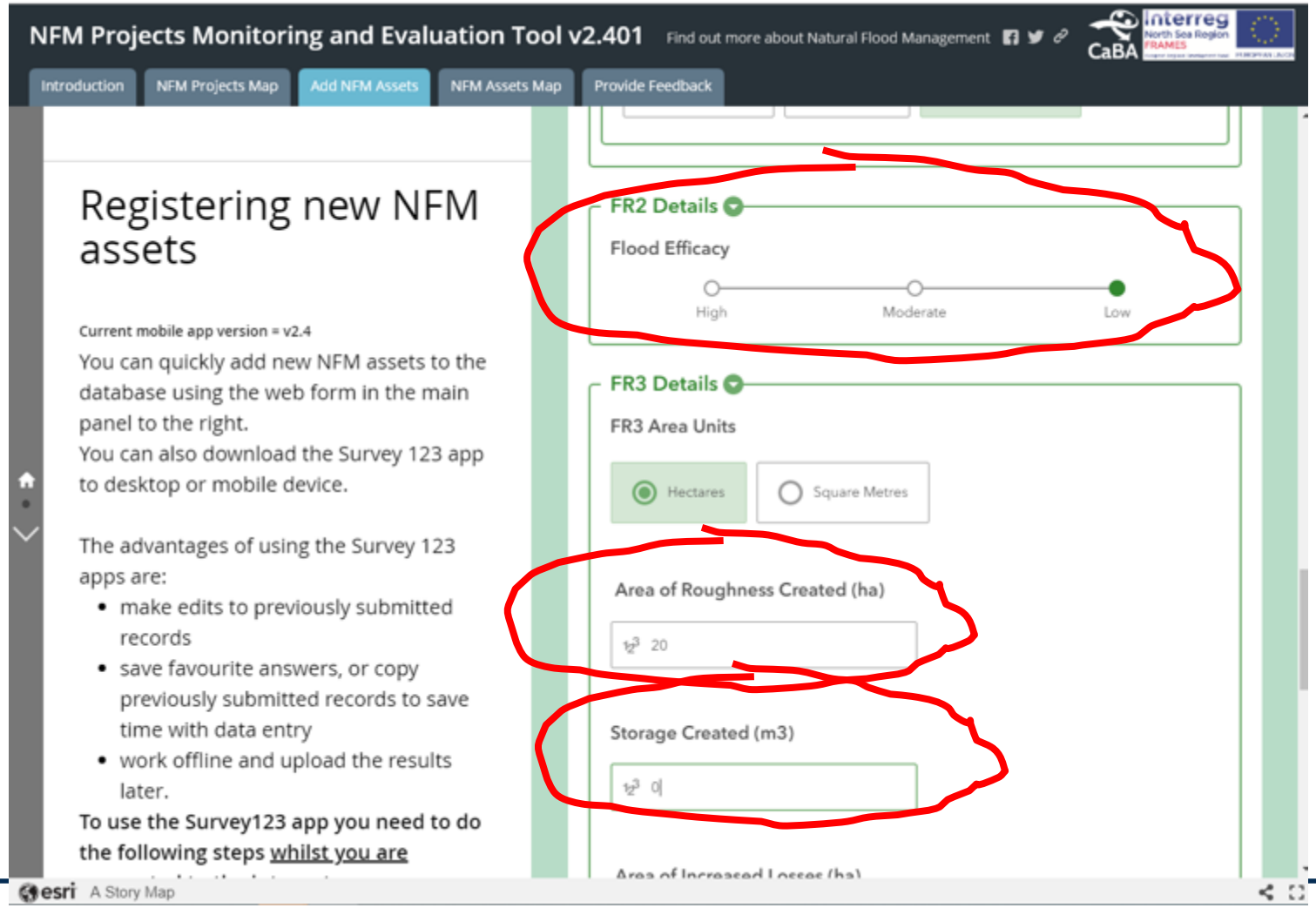
All assets are non optimal? How ‘effective’ is this particular asset?

In 10 years time we want to be maintaining the most valuable assets and not spending time on the least valuable?



Next the flood benefits of the asset

Area of roughness, in this case 20ha

Storage volume, in this case 0?

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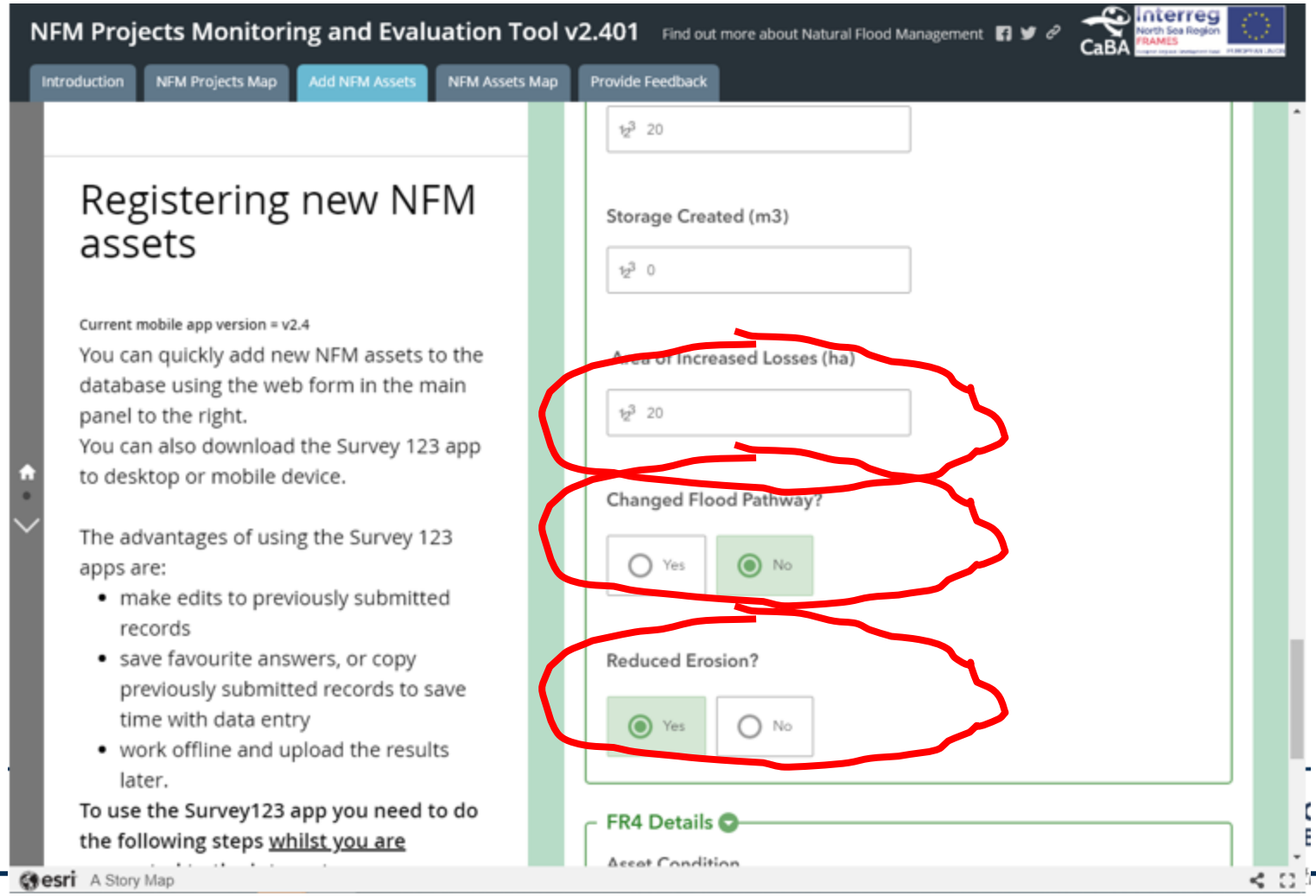
Area of increased losses, either ETa or percolation, in this case 20ha

Have you changed a flood pathway? In this case no?



Have you reduced errosion? In this case yes?

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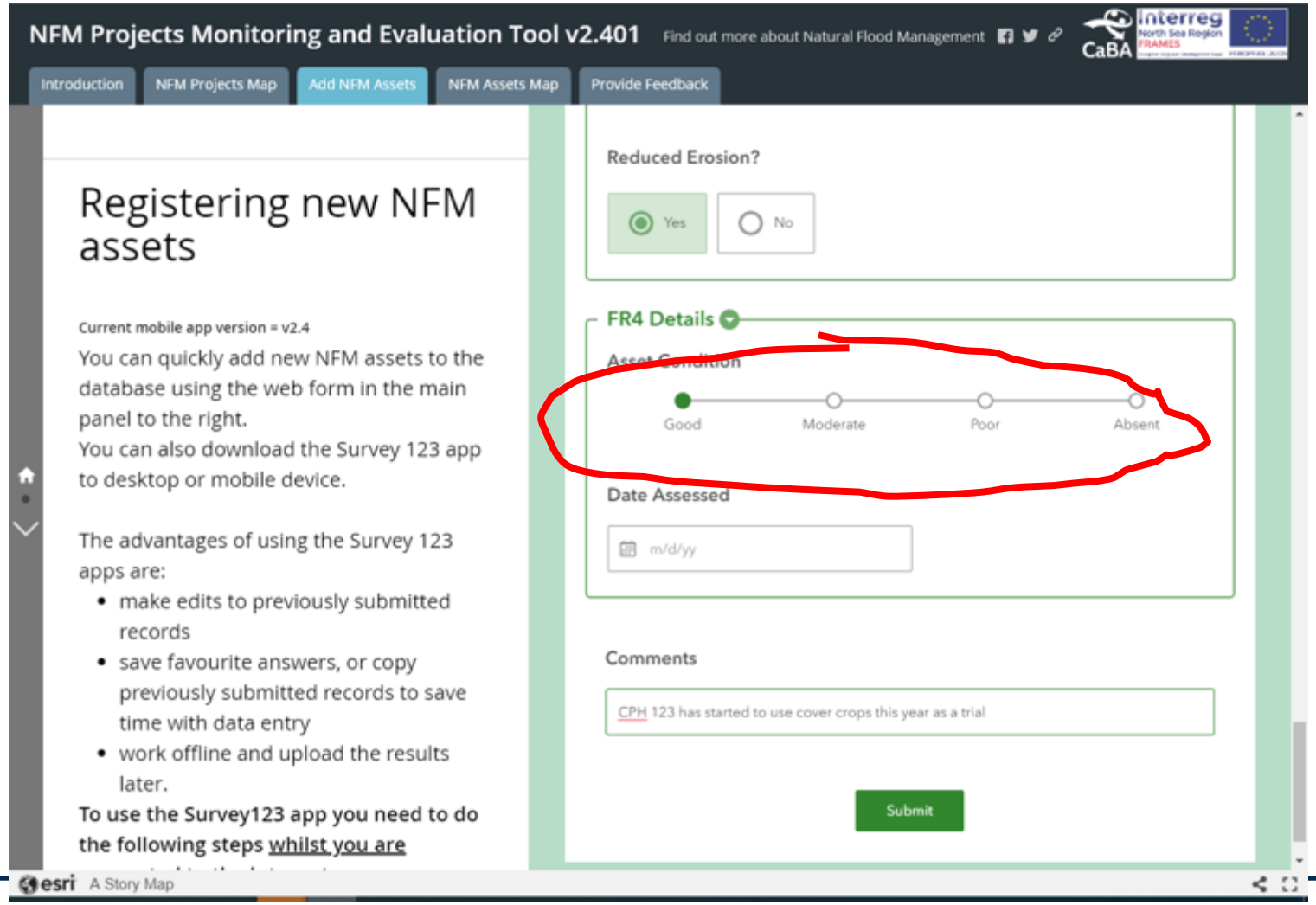
What is the condition of the asset? In this case it has just gone in so 'good'



If land manager goes back to bare soil in winter in the future, change to 'absent'

Make a comment and submit….

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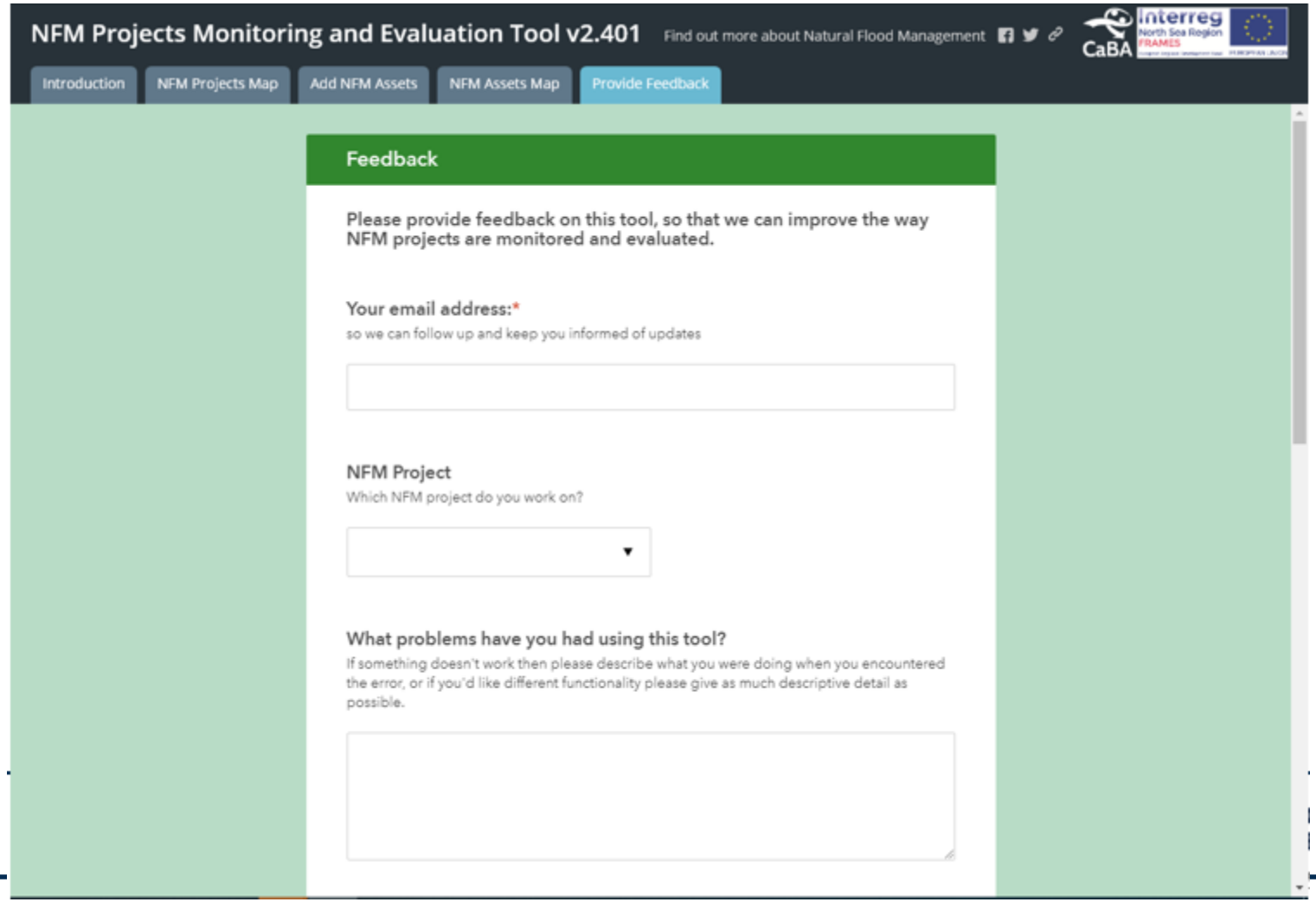
Asset then appears on Asset map. We are currently re-publishing this..



Give us some feedback

Later this month you can will see the 'Project evaluation' tab to be filled in at the end of the project

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Shorter

Easier to read?

Explains detail of each item of data required

Department for Environment Food & Rural Affairs

Environment Agency

Monitoring and evaluating the DEFRA funded Natural Flood Management projects

Version 1
Date July 2019

Will be linked to the tool

Catchment Based Approach

Partnerships for action

Questions and answers on the 2 presentations

The surgery…

Questions and answers on other NFM topics.

Here are the popular ones you voted for…

1) Multiple benefits
2) Construction techniques
3) EA and Local Authority - consenting
4) Funding