



Multi-Objective Floodplain Management (aka Natural Flood Management): Practitioner's Perspective Parsed by the Pond!

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Presentation Outline

1. Overview of Multi-Objective Floodplain Management in US

- Examples projects – Feather River, Bear River, Southport EIP (West Sacramento)

1. Overview of Natural Flood Management in UK

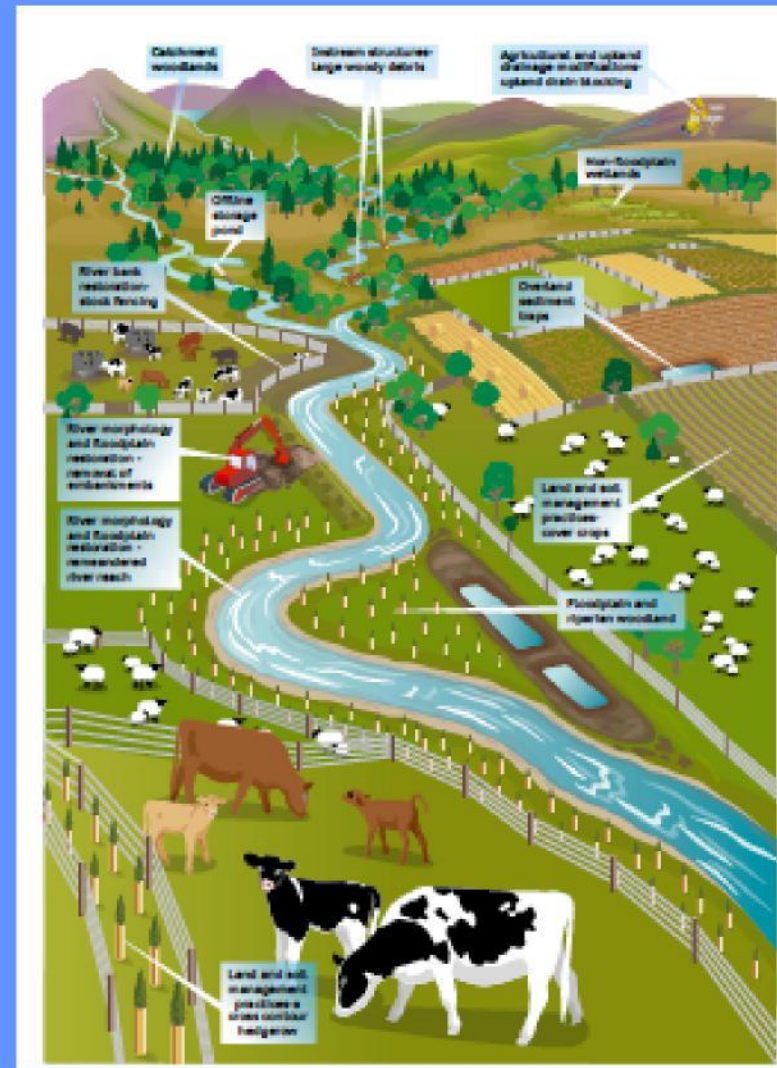
- Development of a holistic, SUDS-type approach
- Renaturalisation of land use and land cover (reforestation, upland drain blocking, etc.)
- Rehabilitation of river channels and floodplains
- Increasing interest in recent years (EFRA – Future Flood Prevention, etc.)

1. Recent NFM Achievements in UK

- Example projects (Eddleston, Pickering), SEPA NFM Handbook, EA NFM Handbook

1. Impediments to NFM – primarily funding

2. Key Take Home Message



SEPA 2015

Overview of Multi-Object Floodplain Management in US

1. Association of State Floodplain Management (ASFPM)
2. California Floodplain Management Association (FMA)
3. Project examples - Feather River, Bear River, Southport EIP.



www.floodplain.org



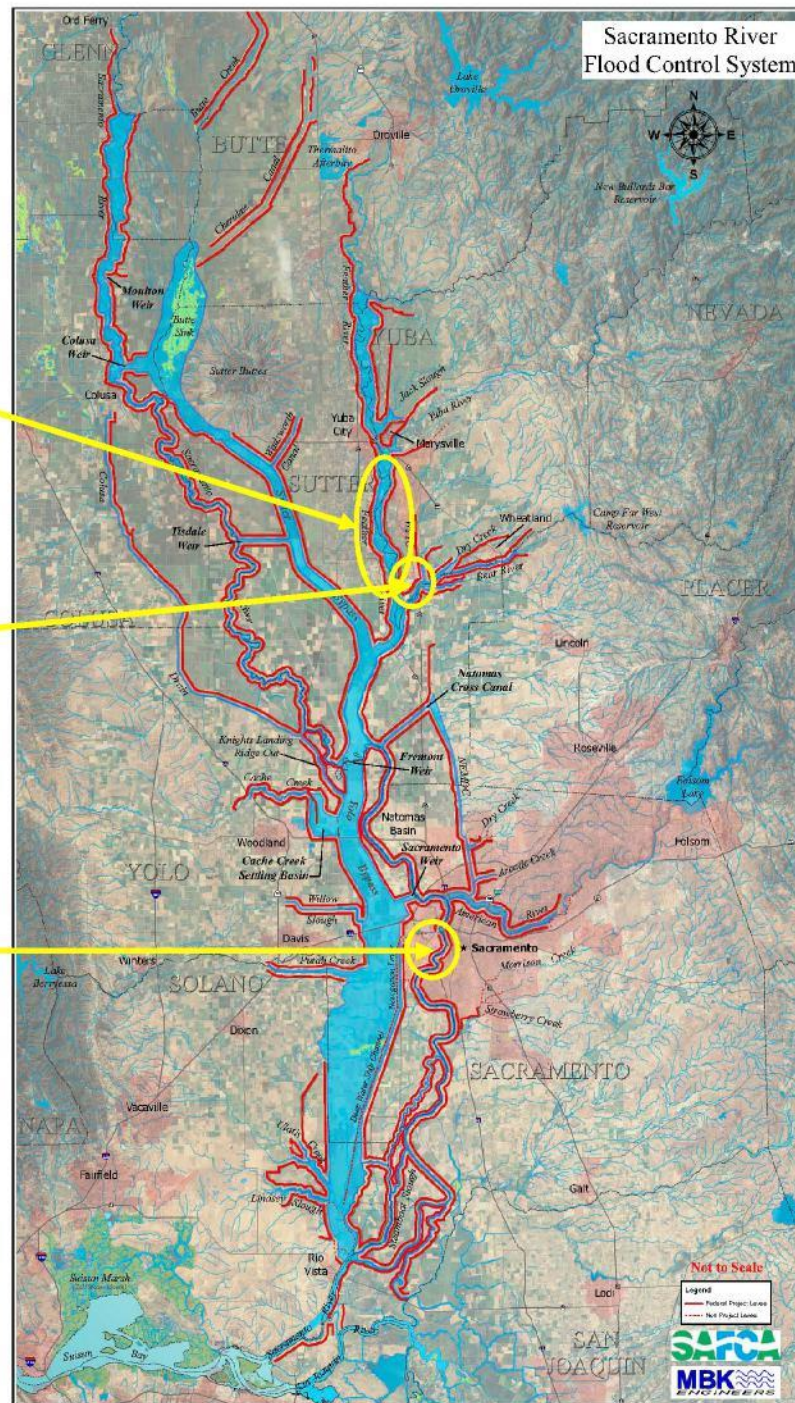
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Project Examples

Feather River Levee Setback

Bear River Levee Setback

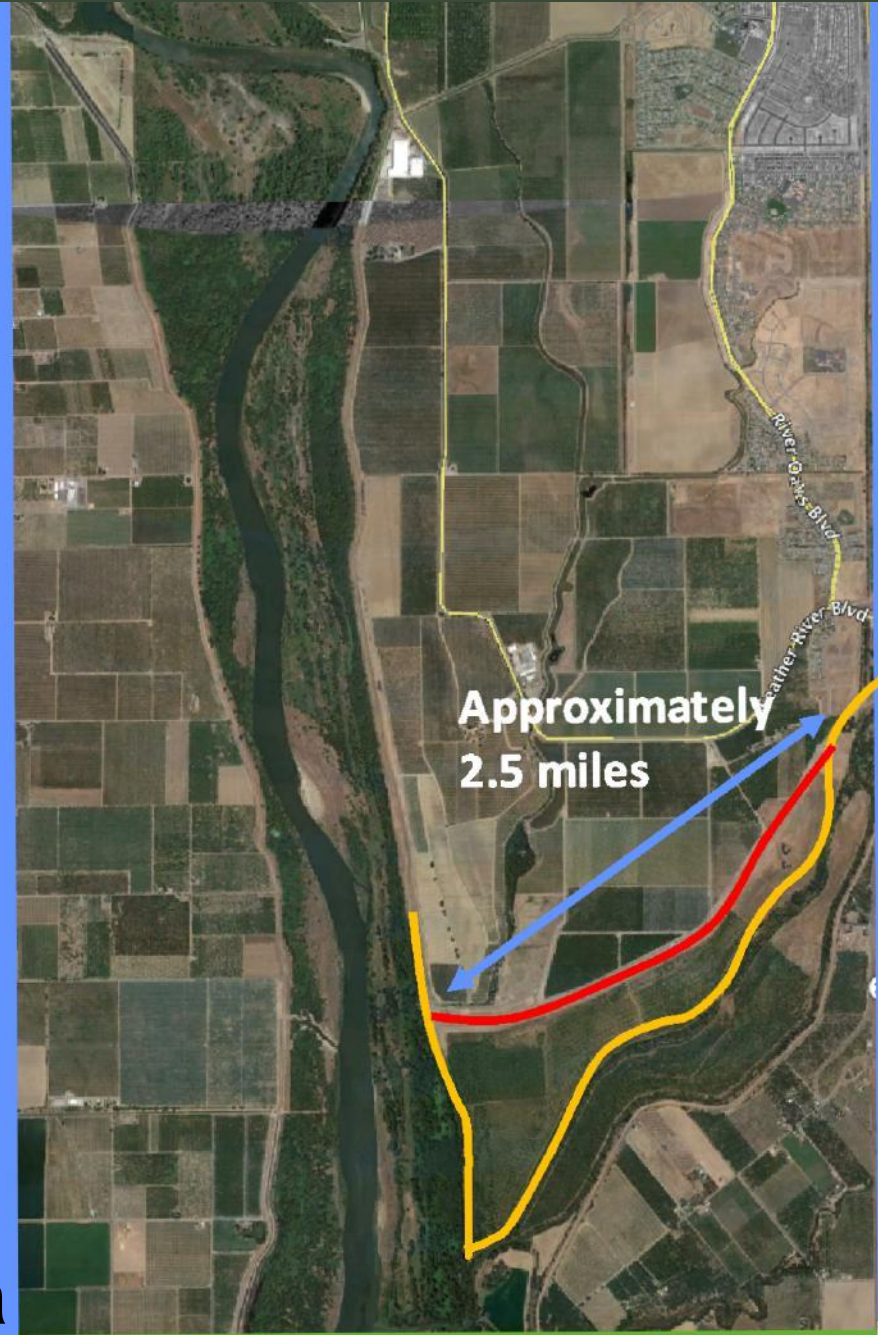
Southport (EIP) Levee Setback



Project Examples – Bear River Levee Setback



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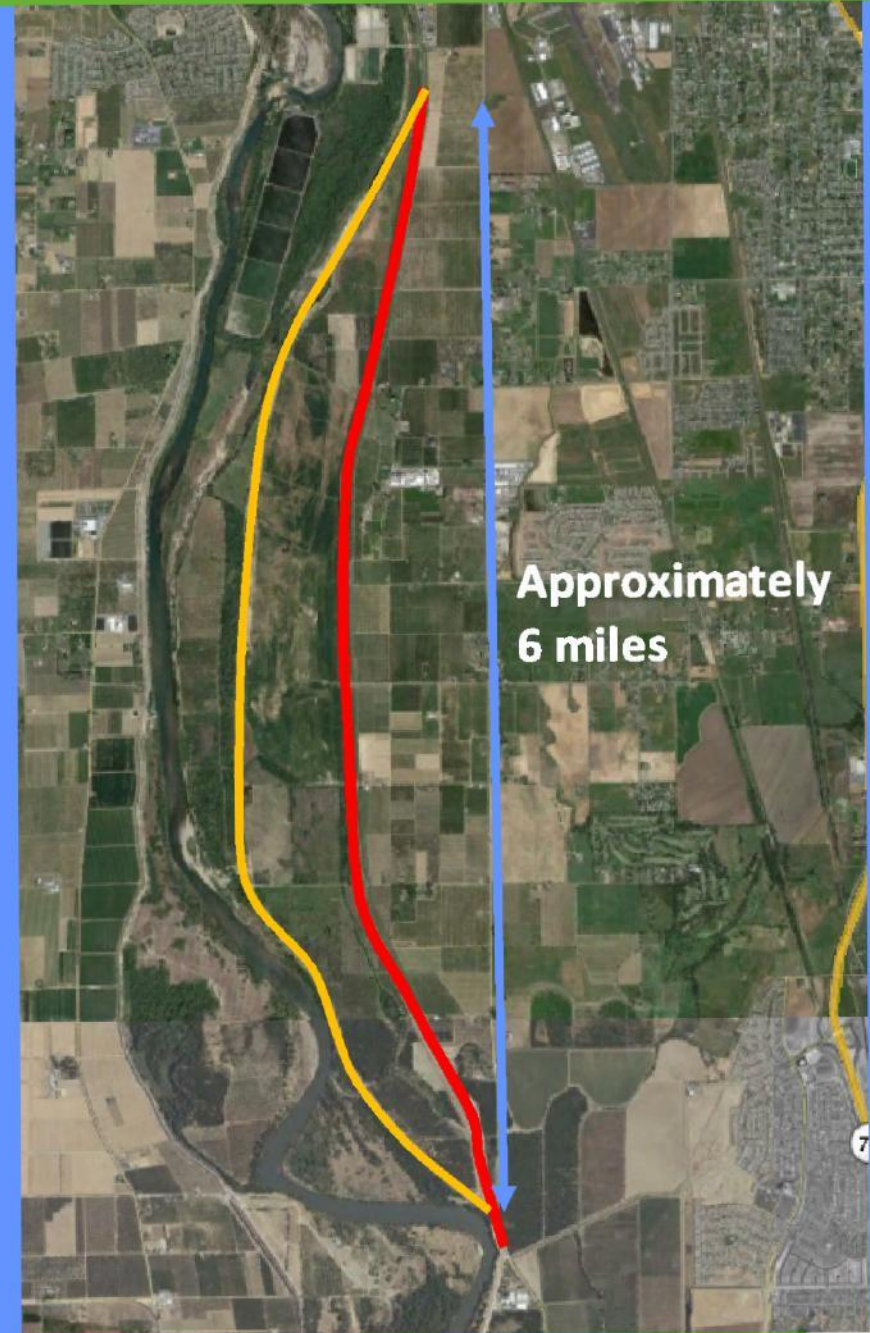


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Project Examples – Feather River Levee Setback



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Project Examples – Feather River Levee Setback

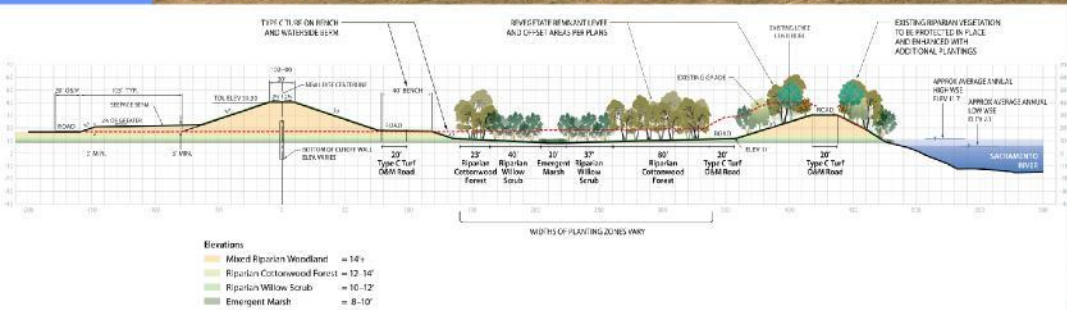


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Southern Offset Area - Existing



Southern Offset Area - Potential



Overview of Natural Flood Management in UK

1. Development of a SUDS-type approach
2. Legislative support - Scottish Flood Risk Management Act 2009 (FRM Act) – mandated NFM (Drumnadrochit Flood Protection Project– catchment approach/NFM)
 1. More holistic – restoration or reproduction of natural processes.
 1. Renaturalisation of land use and land cover (reforestation, upland drain blocking, etc.)
 1. Rehabilitation of river channels and floodplains
 2. Increasing interest in recent years (EFRA – Future Flood Prevention, etc.)
 1. EA’s Working with Natural Processes Research Framework – important.

Recent NFM Achievement in UK

1. Projects – Eddleston, Pickering, River Dee Pilot, East Tullis Burn, Drumnadrochit/River Enrick Catchment Project

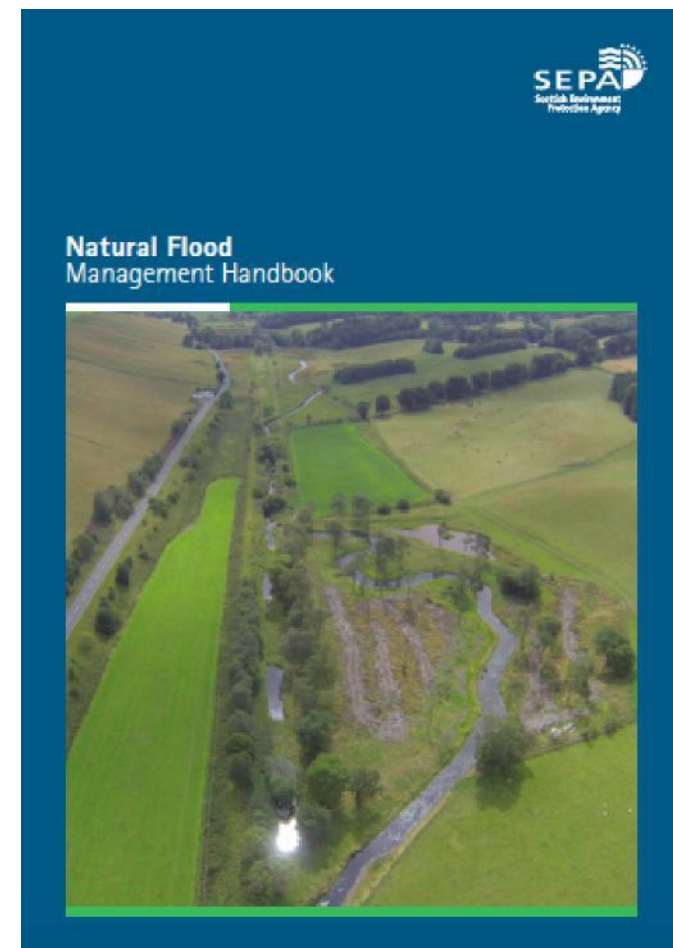
1. SEPA Handbook

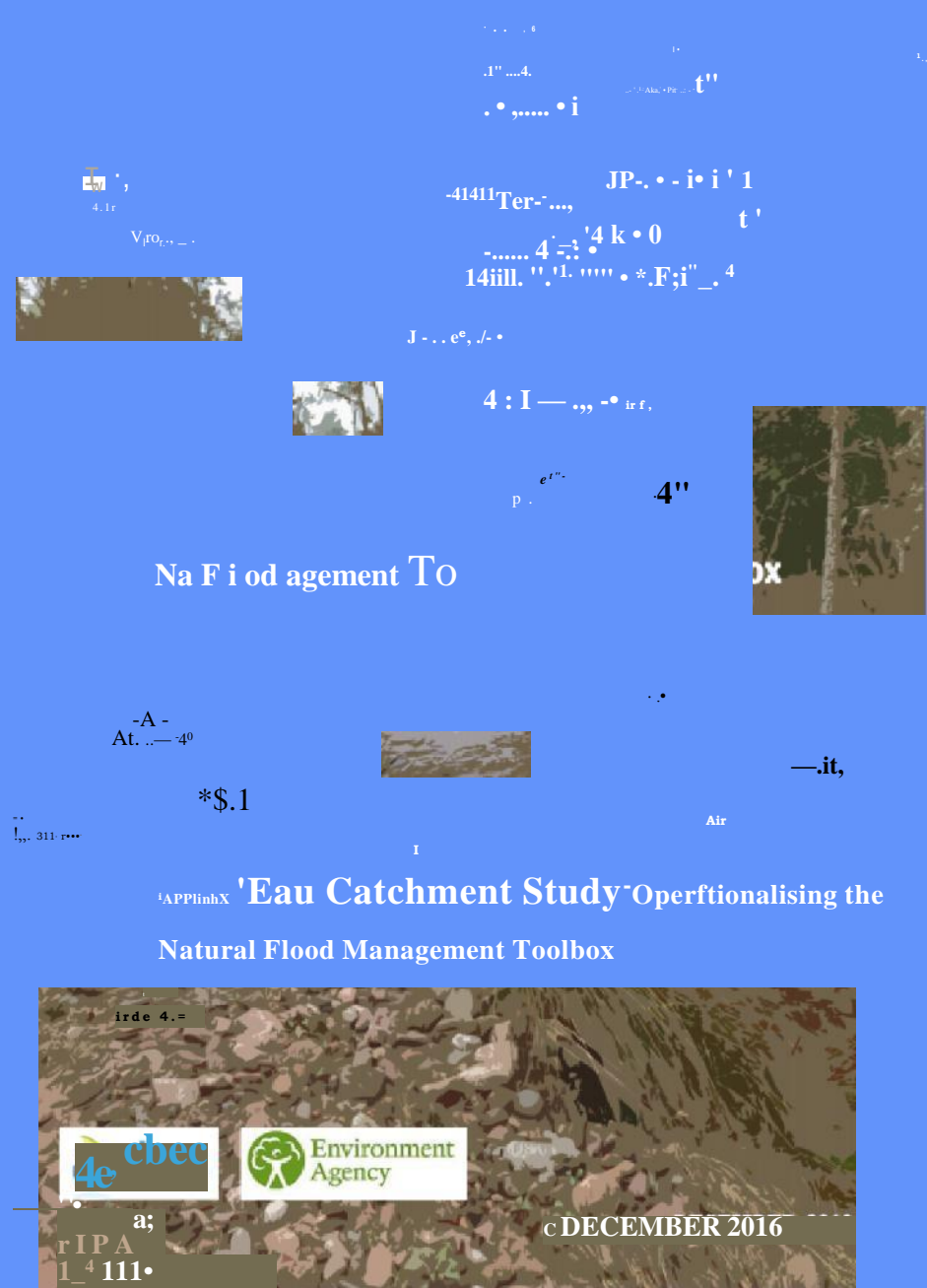
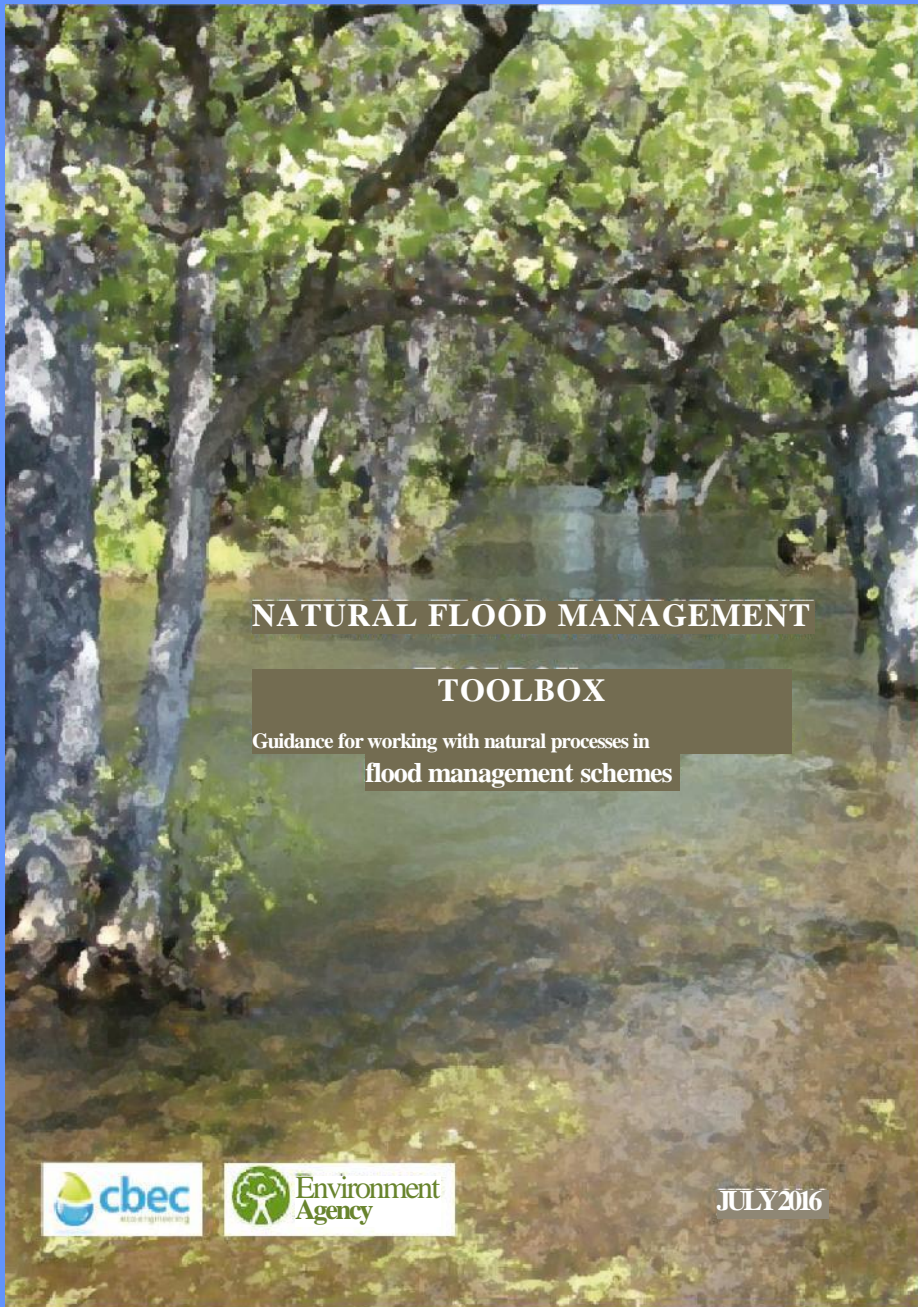
2. EA NFM Toolbox – Funding Mechanisms (Page 18, Table 2), Case Studies (Page 48).

1. Catchment Based Approach – great start but no specific flood management priorities in Mission Statement.

1. Natural England Stewardship Grants – benefit flood management indirectly but no specific reference.

1. Importance of land use management.





NFM Funding Mechanisms

Eligibility	Types of projects	Application procedure	Notes
Grant in Aid (GiA) (Defray)			
<p>Risk management authorities (lead local flood authorities, district councils, internal drainage boards, regional flood and coastal committees, water companies)</p> <p>Projects must cost £5,000+</p>	<ul style="list-style-type: none"> Funds all flood risk management, both traditional and NFM approaches Project implementation, strategies, and studies to investigate potential NFM options Funding based on public benefits, primarily, number of households protected, as well as habitats improved or created May fund all or part of costs with the remainder needing to be raised through 'partnership funding'; use Partnership Funding Calculator to determine how much funding a project is eligible to apply for. 	<ul style="list-style-type: none"> Environment Agency provides guidance and contacts for regional offices: Weblink See also CIWEM's <i>Breaking the Bank?</i> report (p17-21): Weblink 	<ul style="list-style-type: none"> Can support habitat restoration and conservation, surveys including citizen science, environmental education and regenerating public spaces Grants of €3,000 for community schemes, to £3 million for 'Landscape Partnerships' working with communities and landowners. <p>Big Lottery Fund</p> <p>Some schemes may support natural flood management projects where they can demonstrate additional benefits, for instance:</p> <ul style="list-style-type: none"> Awards for All: £300-E10,000 grants for community projects aiming to 'improve life for local people and neighbourhoods' Parks for People: regenerating historic parks to increase visitor and volunteer numbers, heritage value, improved skills and knowledge, management and maintenance, as well as wider public—European Union
Local Levy (Regional Flood and Coastal Committees, RFCCS)			
<p>Projects are selected by Committee</p> <p>Only projects not funded by GiA</p>	<ul style="list-style-type: none"> Funds all flood risk management, both traditional and natural approaches Funds are raised by a levy on local authorities Committee members are appointed from Lead Local Flood Authorities and the EA to plan and manage coastal erosion risk committees meet quarterly. 	<ul style="list-style-type: none"> Funds are allocated by RFOCs; no formal application programme Contact details for each RFCC can be found at: Weblink 	<p>Varies</p> <p>Includes funding relevant to Water Framework Directive a targets. NFM projects could be eligible under the following Articles:</p> <ul style="list-style-type: none"> Article 17_ Investments in physical assets Article 18. Restoring agricultural production damaged by natural disasters, and introduction of appropriate prevention actions Article 22. Afforestation and woodland creation Article 23. Agro-forestry system Article 28_ Agri-environment-climate Article 30_ Natura 2000 and Water Framework Directive payments. <p>Rural Development Programme (CAP — Pillar 2)</p> <p>UK Government advice: Weblink</p> <p>EU Natural Water Retention Measures project (summarises Articles listed above)</p> <p>European Commission (detailed technical paper on opportunities for water projects in the RDP)_</p>
Community Infrastructure Levy (Department for Communities and Local Government)			
<p>Projects are selected by local authorities</p>	<ul style="list-style-type: none"> Levy charged by local authorities on new developments Can be spent on a range of infrastructure including transport, flood defences, schools, hospitals, recreation and open spaces High demand for funds; local funding priorities will vary 	<p>Local Government</p> <p>Funds are allocated by local authorities; no formal application programme.</p> <p>Weblink Visit:</p>	<p>Public sector, private sector, voluntary sector</p> <p>Preference for large projects, typically €500,000+</p> <p>Public sector, private sector, voluntary sector</p> <p>Typically allocates at least £500,000 per project</p>
Countryside Stewardship (Natural England)			
<p>Farmers and land managers</p>	<p>Encourages land managers to deliver environmental benefits through activities including flood risk management, conservation and woodland creation</p> <p>The following elements of CS may be relevant to NFM: Higher and Mid Tier grants, Woodland Support, Capital Grants and Facilitation Fund</p> <p>Grant finder tool for selecting eligible projects including NFM measures and feasibility studies: Weblink</p> <p>Highly competitive; favours projects addressing local priorities and delivering multiple objectives.</p>	<ul style="list-style-type: none"> Annual window for applications Guidance available from the Natural England website Regional statements of priorities: Weblink 	<p>Supports projects that help implement EU policy and a legislation including water quality, biodiversity, flooding, nature and climate change.</p> <ul style="list-style-type: none"> Can fund demonstration/pilot projects Projects cannot be co-financed by certain other EU funds e.g. Horizon 2020, Structural and Cohesion Funds (see Orientation Document (PDF), for further guidance). <p>European Regional Development Fund (ERDF)</p> <ul style="list-style-type: none"> One of the Cohesion Policy funding streams, the a ERDF may offer support under two of its Thematic Objectives: <p>5. Promoting climate change adaptation, risk prevention and management</p> <ol style="list-style-type: none"> Preserving and protecting the environment and promoting resource efficiency <p>Annual call for proposals with September deadline; lengthy application process</p> <p>Guidance available from the joint Nature Conservation Committee</p> <p>UK Government website lists call for proposals in England and guidance and eligibility documents</p> <p>Cohesion Policy website (overview of ERDF and other funds).</p>
Heritage Lottery Fund			
<p>(Public sector, private sector, voluntary sector)</p>	<p>Fund a range of 'Land and Natural Heritage' schemes which 'reconnect people with nature and the benefits it brings to our lives, health and wellbeing'</p>	<ul style="list-style-type: none"> Visit: Weblink Offer informal pre-application advice via email or online 	

NFM Funding Mechanisms

	<ul style="list-style-type: none"> Requires match funding (amount varies) Since these objectives apply to the new ERDF for 2014-2020, it is not known whether NFM projects have been supported to date. 	
	PrDs	
	Private investment	
Will vary	<ul style="list-style-type: none"> Voluntary investment by local beneficiaries of flood risk management or environmental improvements May include landowners, businesses, developers, landlords etc. 	Funding available on an ad hoc basis.
	Water companies	
Will vary	<p>Investment in flood risk management may be driven by a range of factors, including:</p> <ul style="list-style-type: none"> Protecting assets and customers from flooding Meeting targets for water quality or biodiversity (e.g. WFD) through funding river restoration works_ 	Contact water companies directly; no formal application programme.
	Non-governmental organisations (NGOs)	
Will vary	<ul style="list-style-type: none"> NGOs, trusts or community groups may support schemes where they deliver benefits like habitat improvements, recreation or public education For instance, Rivers Trusts fund river restoration which could be integrated into NFM projects. 	<ul style="list-style-type: none"> No formal application programme List of local Rivers Trusts: Weblink
	The Community Fund	
Better suited to smaller, community-led schemes	<ul style="list-style-type: none"> An online crowdfunding platform to raise donations from individuals and organisations for environmental projects, including flood risk and river restoration Can also be used to recruit volunteers and raise awareness Preference for smaller projects; likely to raise relatively small sums. 	Visit: Weblink
Will vary	<ul style="list-style-type: none"> Voluntary schemes which provide credits for greenhouse gas reduction or biodiversity increase generated by environmental projects Offset schemes have yet to be developed as a funding source for NFM projects. 	<p>Contact schemes directly. For example:</p> <p>UK Woodland Carbon Code: a voluntary standard for carbon sequestration from UK woodland creation. Must demonstrate afforestation would not otherwise take place without funding.</p> <p>Verified Carbon Standard (VCS) use various methodologies to quantify carbon reductions for land use changes, forestry and agriculture; includes one UK project.</p>

NFM Case Studies

Case Study 1- Stroud Rural SuDS Project

Summary Description	Over <u>250 small features</u> <u>Road alleviation</u> across <u>the catchment</u> . The Stroud valleys experience flooding every year. Following the devastating floods of 2007, community flood groups were established and the Environment Agency subsequently published a feasibility report on natural flood management for the River Frome Catchment in 2012. Acting on its findings, Stroud District Council has implemented a range of low cost features to slow flows and reduce flood peaks across the 235 km ² catchment. The project took an approach of implementing low risk solutions in a short period of time, rather than waiting for 'perfect' data.
Methods	Measures primarily focus on Ordinary Watercourses (i.e. small streams), using small features to deliver a large cumulative impact. The following were constructed between 2014-2016: <ul style="list-style-type: none"> • 157 'major' structures (130 leaky woody material dams, 12 field bonds, 8 culverts and soakaways, 7 erosion gulleyworks) • 50 'minor' woody material structures • 1.2 km riparian fencing and 10 drinking troughs/bays • Part-funded 50 swales and grips to divert runoff to woodland.
Outcomes	Whilst the project is relatively new, some data indicates the project may be attenuating flows. On 9 March 2016, 35-40 mm rainfall was recorded in 12 hours, a similar amount to a flood event in November 2012. A flow gauge in the Sled Valley recorded peak water levels of nearly 1.8 m in 2012, compared to under 0.4 m in 2016 (see hydrograph). Whilst the two events were not directly comparable partly due to preceding conditions, partners believe that NFM measures are likely to have contributed to the lower river levels in 2016. The existing network of gauging stations also provides an opportunity to compare future flows with historic data.
Multiple benefits	Biodiversity, water quality, public education, community engagement.
Cost	£220,000
Funding	£105,000 project costs (local levy, Stroud District Council), £115,000 capital works (Environment Agency, Gloucester County Council, Stroud District Council; plus £5,000 in kind from Gloucestershire Wildlife Trust and National Trust).
Partners	Gloucestershire County Council, Environment Agency, Severn and Wye Regional Hood and Coastal Committee, Stroud District Council, community groups, landowners, <u>farmers</u>
Further information	<u>Weblink</u>



Field blind in normal conditions (left) and attenuating runoff during flooding (right). images, Stroud District Council

Case Study 3 - Eddleston Water, Scottish Borders

summary	A partnership approach to catchment restoration
Description	Eddleston Water, a small (69 km ²), upland tributary of the 5,000 km ² River Tweed Catchment, has been historically modified, including extensive channel straightening and land management changes, which have contributed to increased flood risk at the villages of Eddleston and Peebles. Restoration of some natural features has been undertaken to reduced flooding and reverse habitat loss, incorporating installation of NFM measures and land management changes across 17 farms from 2009-2013. Co-ordinated by the Tweed Forum, the project has benefited from a strong partnership structure encompassing public sector agencies, landowners, academia and voluntary groups, contributing to leveraging funding and monitoring. The Tweed Forum was awarded <u>the 2015 UK River Prize for its work in the Tweed Catchment</u> .
Methods	Remeandering 1.8 km of river, creation of 66 ha of riparian woodland, 89 flow restrictors (e.g. large woody material dams), 19 leaky ponds (7,000 m ³), 16 km of fencing erected.
Outcomes	A network of rain gauges, groundwater and river level gauges were installed to monitor how the measures impact river flows and flood frequencies, in addition to biological monitoring. Hydraulic modelling has indicated remeandering and increasing the wetland and woodland areas may result in smaller urban areas being inundated, as well as delaying flood peaks by up to 4 hours. The river's EU Water Framework Directive status has improved from 'bad' to 'moderate' during the project lifetime.
Multiple benefits	Water quality, biodiversity.
Cost	£400,000
Funding	Public (Scottish Government, Water Environment Fund, Scottish Rural Development Programme, Scottish Borders Council), Private/Voluntary Sector (Forest Carbon, CEMEX, Woodland Trust, Scottish Power, landowners).
Partners	Led by the Tweed Forum with the Scottish Government, Scottish Environment Protection Agency and University of Dundee. Other partners include British Geological Survey, Scottish Borders Council, Scottish Natural Heritage, Forestry Commission, National Farmers' Union of Scotland, Tweed Foundation, Forest Carbon, Woodland Trust, landowners and community groups.
Further information	<u>Weblink</u>

Aerial view of restored habitat and renaturalised channels at Eddleston Water. Image: Tweed Forum.

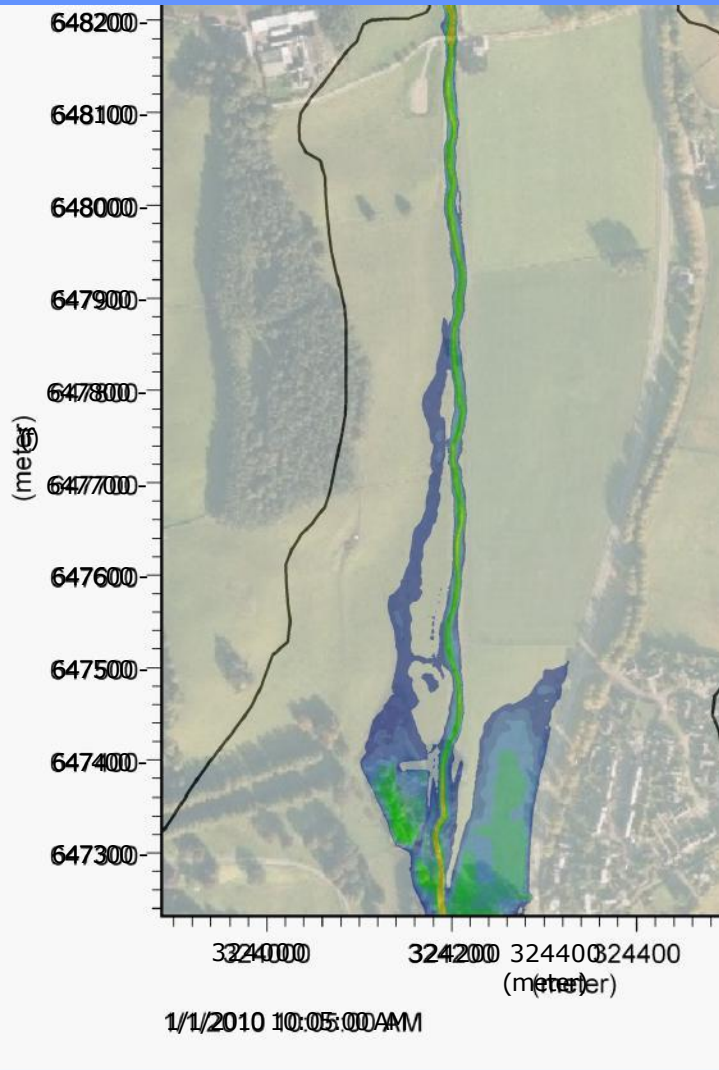
NFM – Bad Examples



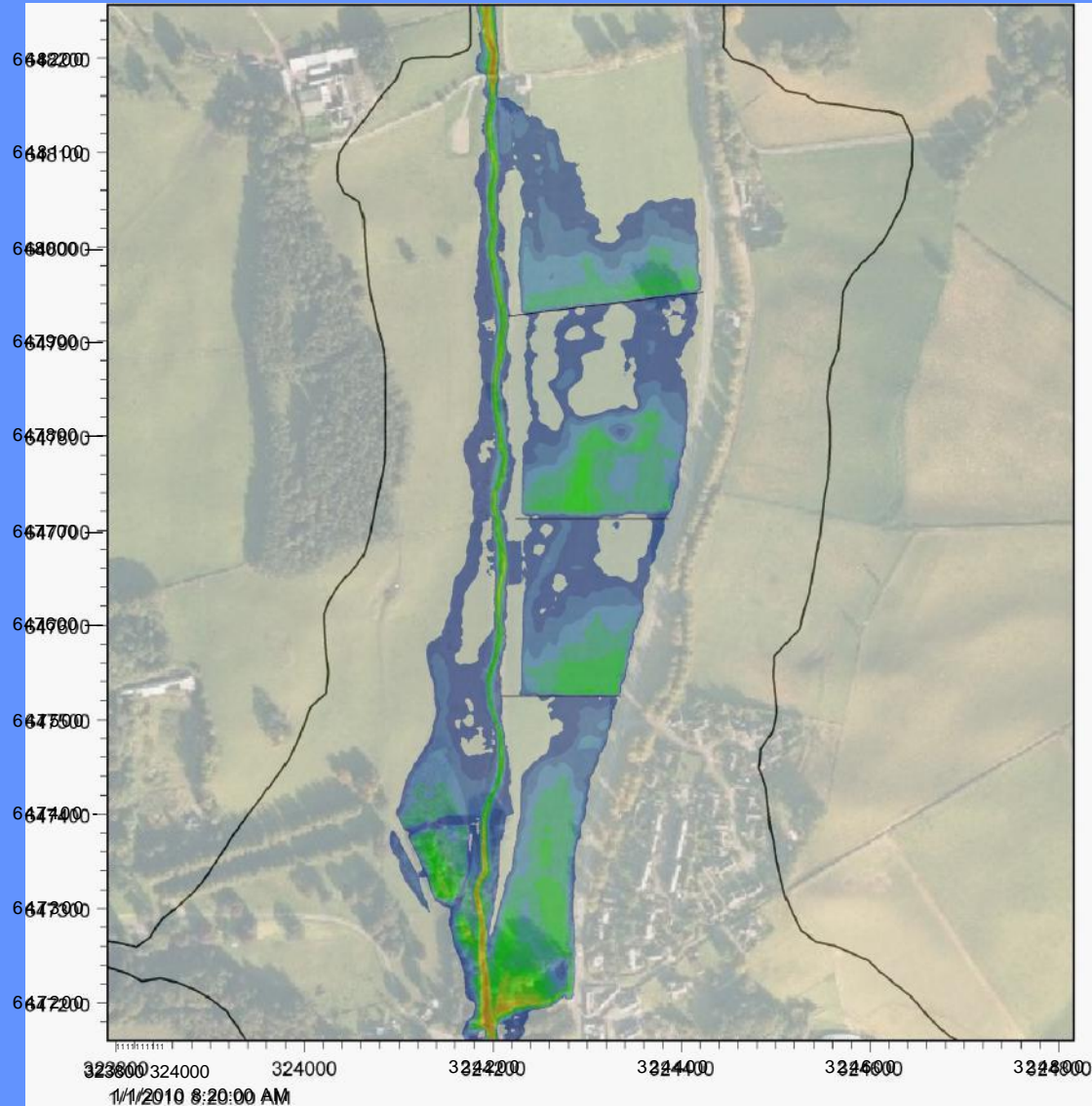
cbec, 2016

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NFM – Examples – Floodplain Attenuation



**Eddleston Water,
Peebles, Dec, 2012**



NFM – Examples – Offline Ponds



© Chris Bowles, cbec eco-engineering

**East Tullos Burn,
Aberdeen, cbec, 2015**



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Impediments to NFM - Funding Floodways in US

1. Easements

- The right to use land for a particular purpose
- Affirmative (permits something to be done) or negative (prohibits the landowner from doing something)
- Perpetual (forever) or Term (number of years)
- Usually non-Federal responsibility for land
- *Flowage Easement:*
 - Land can be used as normal when land not flooded, seasonal.
 - Less flexibility
- *Conservation Easement:*
 - Not usually via eminent domain
 - Involves negotiation
 - Affirmative = Permanent requirement to use land for identified wildlife/restoration purpose(s).
 - Negative = Permanent requirement to avoid uses that would be inconsistent with wildlife/restoration purpose(s).
 - Desirable but not necessary

Funding Floodways

2. Flowage Easement Purchase through eminent domain/condemnation

- Compulsory purchase (UK)
- Typically 90% value of land
- Must prove for 'greater good' – public safety, etc., necessity, no viable alternative
- Appraisal for the cost of flooding - need hydrology – period and frequency of inundation - duration and timing - temporary or permanent.
- Impacts to farmers – loss of productivity, etc.

1. Conservation Easement Maintenance

- Endowment established for management of land
- Management of land by landowner, conservancy (TNC), Land Trust, USFWS, CDFW
- Guidelines – Federal and State

Funding Floodways

4. Mitigation Banking

- Reproduce impacted areas in floodplain area
- Developers pay one-time fee in lieu of providing mitigation land (Development Impact Fee – to preserve lands in floodplain (fee covers cost of land acquisition and long term management)).
- Stream mitigation banking
- Funding floodplain for other uses - “farming fish” in winter.

Key Messages

1. Catchment scale is extremely important – NFM should include multiple elements – cumulative benefits. More holistic in UK than US.
1. Be careful of over-selling the flood benefits of floodplain attenuation/storage. Cumulative benefits are critical.
1. Effective landowner compensation schemes must be developed - in perpetuity – fixed term is less than ideal.
1. Need effective landowner engagement, incentives, new techniques.

Acknowledgements

1. **Tim Washburn – Sacramento Area Flood Control Agency (SAFCA)**
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