

# Thacka Beck Flood Alleviation Scheme

## Online Story Map of a flood risk management case study

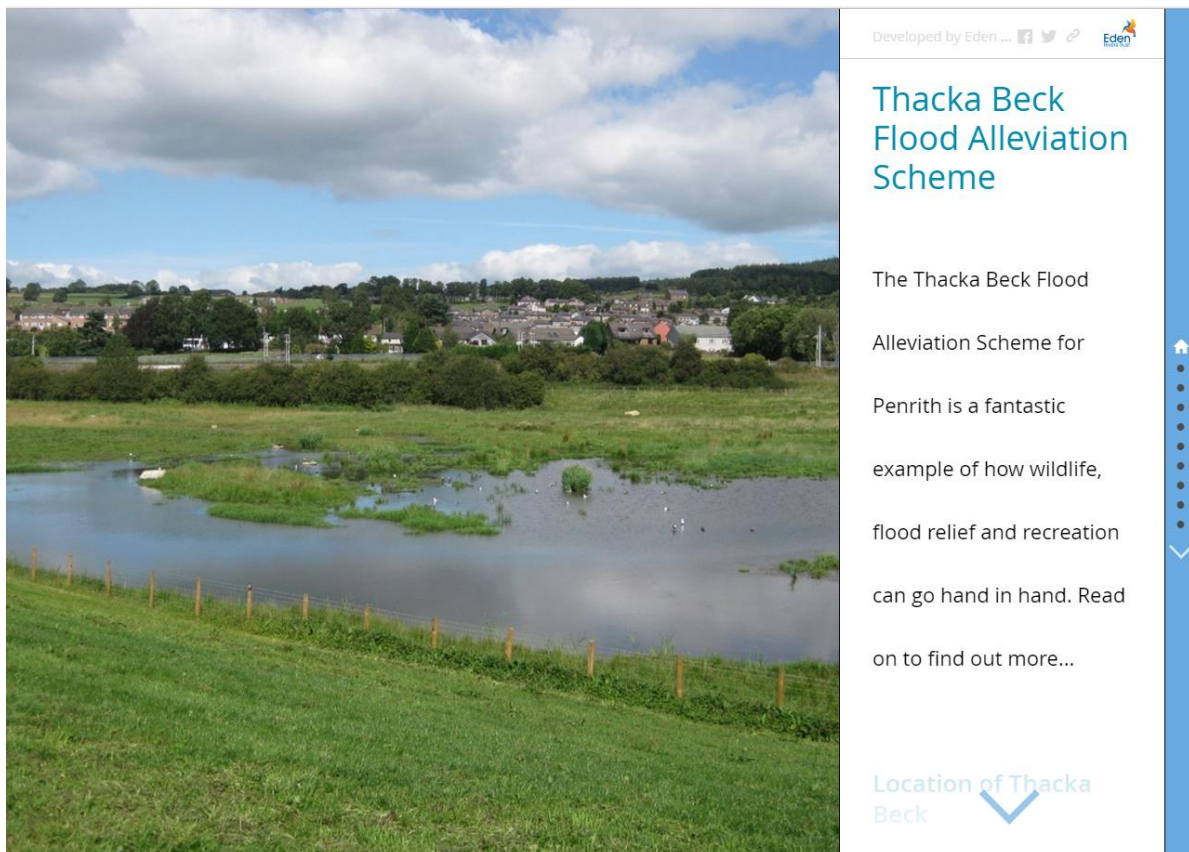
### Summary

Students can learn about flood risk in the town of Penrith and what has been done to reduce the risk.

The case study supports topics including: flood risk probabilities, causes of increased flood risk, the impact of flooding on people, upstream and downstream solutions to flood risk, and incorporating ecosystem service benefits within flood alleviation schemes.

The case study also features short video interviews with people whose homes were flooded in Eamont Bridge and Carlisle, and a film from the ALFA (Adaptive Land use for Flood Alleviation) Project which explores flood risk management throughout the upper, middle and lower reaches of a river catchment, providing examples of flood management solutions throughout Europe.

The Thacka Beck story map can be accessed at <http://arcg.is/1QrwwgA>



## Using the Story Map

The story map is split into a number of sections. A selection of questions and topics for further discussion are suggested below in orange for each section.

### 1. The Historic Beck

This section explains that the Thacka Beck has been artificially modified by humans for hundreds of years e.g. straightened and culverted.

Q1. How and why has Thacka Beck been altered by humans in the past? How might this have affected flood risk in the town, especially as Penrith has grown in size?

### 2. Flood Risk in Penrith

Includes historic photos and details of how many homes and businesses were at flood risk in Penrith.

Q1. Calculate Penrith's past flood risk (e.g. probability of a flood occurring in any one year) based on the information that the town has flooded 4 times in the last 20 years. The answer is given in the next section.

### 3. The Flood alleviation Scheme

This section explains how the flood alleviation scheme (constructed by the Environment Agency in 2010) reduces flood risk for Penrith. The scheme is a good example of flood risk management that incorporates both:

**Downstream** hard engineering within the town to improve conveyance by:  
Increasing the capacity of the culverts and  
Allowing more water to drain out of the town quickly and efficiently, plus

**Upstream** catchment storage to hold water back before it reaches the town.

Q1. How do both approaches work to reduce flood risk, and how are they different to each other? (e.g. one speeding water flow up and one slowing it down)

Q2. Discuss how the suitability of the flood risk management solution depends upon its location (upstream or downstream) within a catchment.

*(Note: the ALFA project video in the final section gives more examples of methods for alleviating flood risk throughout the headwaters, middle reaches and lower reaches of a river – and how these might differ depending upon location within the catchment).*

## 4. Creation of the Nature Reserve

This section explains the other positive effects arising from the creation of the upstream flood storage reservoir (e.g. flood risk management combined with biodiversity, amenity and recreation, and improvements to water quality). In the video clip, Mike Harper from the Environment Agency discusses how the scheme helps to slow down water and hold it back before it reaches Penrith.

Q1. Compare the photo of the straight channel prior to construction of the scheme with the new meandering channel. What differences are there? What benefits does the meandering channel offer?

Q2. Land and space is at a premium in the UK. Discuss the different functions and services that might need to be balanced alongside flood risk in a catchment or floodplain.

## 5. The Thacka Beck flood storage reservoir & nature reserve in 2015

This section allows you to take a virtual tour of the flood storage reservoir as it is today and to learn about the ongoing management of the site. If the map in the main frame does not view particularly well on your screen, you can open it in a separate window using this link <http://arcg.is/1TjfvxM>.

Q1. Using the map tour, identify the different elements that contribute to managing flood risk at Thacka Beck (e.g. sluice, embankments, meandering channel, grazing management).

Q2. How many different land use functions can you identify in and around the site?

Q3. Why is it important to manage vegetation at the site (for both flood risk and wildlife)?

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#### Thacka Beck flood storage reservoir and nature reserve in 2015

Explore the map and take a tour of the Thacka Beck nature reserve and see how it has developed 5 years on in 2015. (Hint: If the map does not view correctly on your screen you can open it in a separate window [here](#)).

Today the area supports a diverse array of habitats and species. Hay meadows, wet grassland, scrub, hedges, ponds and the beck provide homes for a wealth of wildlife. Although small in size, the reserve has a remarkable number of birds.

The Thacka Beck nature reserve combines flood storage with wildlife habitat creation.

#### Conservation Grazing at Thacka

Created to provide flood relief for Penrith, Thacka Beck Nature Reserve supports an impressive diversity of habitats.

1 Thacka Beck Flood Alleviation Scheme  
2 Conservation grazing  
3 Recreation  
4 Hedgerows  
5 Wet grassland

## 6. How does flooding affect people's lives

This section includes a number of short videos and interviews looking at how flooding affects people's lives and how aware people are of flood risk.

The short news report by students at Ullswater Community College asks: What are local people's experiences of flooding? What is being done to reduce flooding? Is flooding happening more often? Are recent floods due to climate change? Watch the film featuring interviews with local people in Penrith and Eamont Bridge, the Environment Agency, and a flood scientist to find the answers.

Q1. Find out if your home or school is at flood risk via the [Environment Agency's website link](#).

Q2. How could we increase people's awareness of flood risk?

## 7. Adapting Land use to reduce flood risk throughout the catchment

The video in this section (produced as part of the ALFA (Adaptive Land use for Flood Alleviation) project) presents a range of flood risk management solutions that can be applied in different parts of a river catchment. This includes: techniques to improve infiltration into the soil and hold water back in the headwaters, measures to store water on floodplains in the middle reaches, and approaches to increase drainage capacity and conveyance in the lower reaches and deltas.

Case studies from Germany, France, Belgium, the Netherlands, and the UK (Eden Catchment) are included. The film also discusses the need to balance flood risk with the provision of other functions and services e.g. farming, forestry, wildlife, navigation, industrial gravel extraction and recreation.

Q1. Discuss how solutions to flood risk might vary throughout a river system.

## Field Trip Opportunities

### Flood risk:

There is a short circular walking route around the flood embankments which is fully accessible to the general public. From here you can see and discuss many of the key flood risk management features, e.g. the control sluice, embankments, overspill, meandered channel and wetland areas. A coach or mini bus could park in the lay-by on Bowerbank Way.

### Freshwater ecology:

The Thacka Beck Nature Reserve is an excellent location for finding a number of different freshwater habitats within one small, contained area, e.g. stream, pond, and wetland. A field trip could be undertaken to assess the water quality and biodiversity value of the different freshwater habitats at the site. Students could undertake water quality sampling, invertebrate sampling, vegetation surveys and river habitat surveys.

Note: Permission to access the wetland area would be required from Cumbria Wildlife Trust (who manage the site) as the wetland area is permanently locked.

## Additional resources

- The Geographical Association has some excellent resources to support a case study of managing flood risk in Carlisle: <http://www.geography.org.uk/resources/flooding/carlisle/>
- The Adaptive Land use for Flood Alleviation project website presents a range of flood alleviation schemes throughout Europe including schemes on the River Rhine and River Seine and schemes in delta areas such as The Netherlands: <http://alfa-project.eu/en>
- The Eddleston Natural Flood Management Project has a number of good videos and technical reports about a natural flood risk management project on a tributary of the River Tweed - showing how catchment management can help reduce flooding downstream in Peebles: <http://www.tweedforum.org/projects/current-projects/eddeleston>
- The National Flood Forum website provides information on preparing for a flood and what to do during a flood: <http://www.nationalfloodforum.org.uk/about-to-be-flooded/>
- The Met Office learning resources: Rainfall and what causes flash flooding: <http://www.metoffice.gov.uk/learning/rain>
- Environment Agency Flood Risk Maps: <https://flood-warning-information.service.gov.uk/long-term-flood-risk>  
<https://flood-warning-information.service.gov.uk/>

**You can download more free ArcGIS resources to use in the classroom  
from the Eden Rivers Trust website,**

**[www.edenrivertrust.org.uk/arcgis-resources-secondary-schools](http://www.edenrivertrust.org.uk/arcgis-resources-secondary-schools)**



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