

Allow stream and river channels to change course naturally, or remove hard channel boundaries. Restore natural river processes.

## MANAGING ECOSYSTEM SERVICES

### FRESHWATER

REDUCE CANALISATION AND INCREASE CHANNEL DIVERSITY

## GOODS & SERVICES

Biodiversity



Recreation/Tourism



Climate Regulation



Water Quality



These pages represent a review of the available evidence linking management of habitats with the ecosystem services they provide. It is a review of the published peer-reviewed literature and does not include grey literature or expert opinion. There may be significant gaps in the data if no published work within the selection criteria or geographical range exists. These pages do not provide advice, only review the outcome of what has been studied.

Full data are available in electronic form from the [Evidence Spreadsheet](#).

Data are correct to March 2015.

### KEY

#### Quality of Evidence

Good



Medium



Poor

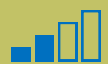


#### Quantity of Evidence

Number of sources showing direct evi-



Number of sources showing indirect evi-  
dence



#### Magnitude and Direction of Effect

Direction

Strong



Medium



Low



## MANAGING ECOSYSTEM SERVICES

### FRESHWATER

#### REDUCE CANALISATION AND INCREASE CHANNEL DIVERSITY

**Provisioning Services**—providing goods that people can use.

**Cultural Services**—contributing to health, wellbeing and happiness.

**Regulating Services**—maintaining a healthy, diverse and functioning environment.

## CULTURAL

**Biodiversity: Strong Evidence:**— The banks of old and diverse channels were found to have a larger seed bank than less vegetated eroding banks on the River Dove in the UK promoting natural regeneration<sup>1</sup>. The growth of floodplain trees benefits from natural river banks, rather than canalised ones, as flooding events need to occur periodically to recharge the water table for tree seedlings<sup>2</sup>. In Poland, temporary floodplain ponds support high levels of invertebrates of conservation concern<sup>3</sup>. This finding is supported by an additional study of temporary floodplain ponds in Japan that were shown to have a high plant diversity<sup>4</sup>. This result assumes a link between non-canalised river courses and increased connections with floodplains. In Scotland, there is strong evidence that natural channel movements create high vegetation diversity on riverine islands which are a natural feature of the area<sup>5</sup>. A modelling approach to look at the link between biodiversity and stream diversity found a strong link between temporary rivers and high diversity<sup>6</sup>. This is applicable only if natural river movements create temporary water courses. A study from Denmark on lowland streams found that those which have been managed sympathetically with wide and shallow banks have a higher macrophyte diversity than channelized streams<sup>7</sup>. A Swiss study presents strong evidence that while ‘river widenings’, to allow channel braiding, does increase plant diversity, it mainly benefits pioneer species<sup>8</sup>. A study from Norway found that adding gravel to canalised rivers could increase the spawning rates of Atlantic Salmon<sup>9</sup>. A study from the UK found that while canalised rivers were suitable for salmonid fry, they were unsuitable for parr<sup>10</sup>. **Moderate Evidence:**— An additional study also from Switzerland, suggests that fish diversity is largely unaffected by channel state<sup>11</sup>. One negative impact is that urban river walls in the UK provide a habitat for ‘urban-cliff’ species which would be lost if river canalisation were reduced<sup>12</sup>.

**Recreation/Tourism: Moderate Evidence:**— A study from Norway found that adding gravel to canalised rivers could increase the spawning rates of Atlantic Salmon<sup>9</sup>. A study from the UK found that while canalised rivers were suitable for salmonid fry, they were unsuitable for parr<sup>10</sup>. Both these studies imply a link between salmonid spawning success and the fishing tourism industry which is worth an estimated £56.7 million in 2003<sup>13</sup>.

**Climate Regulation: *Weak Evidence***:- There is mixed evidence from a study in Switzerland of the total carbon pool in restored (diversified) river channels and associated floodplains<sup>14</sup>. Restored sections have a higher diversity of stored carbon and carbon fluxes than canalised sections but the study does not indicate which offers the greater potential for carbon storage and there are many other additional factors that affect the extent of carbon storage.

**Water Quality: *Strong Evidence***:- A study of four different stream and wetland projects in Denmark<sup>15</sup> has shown that re-meandering rivers and streams led to increased Phosphorus retention of between 0.13 and 10 kg P ha<sup>-1</sup> year<sup>-1</sup> and increased removal of nitrogen of between 52-337 kg N ha<sup>-1</sup> year<sup>-1</sup>. ***Moderate Evidence***:- A review of seven international projects has shown that restoring natural river systems leads to a range of benefits including a 20%-70% reduction in Nitrogen transport via in-stream wetlands<sup>16</sup>. A Swiss study<sup>17</sup> found that higher nitrogen turn-overs were found in restored river sections and were associated with higher sedimentation rates and local inundation such as on gravel bars.

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