

Appendix B: Sub-catchment descriptions

Mawddach subcatchments

Alltlwyd

The Alltlwyd subcatchment contains the headwaters of the Mawddach, rising in the peat blanket bog of Waen y Griafofen in the east of the catchment. This bog, approximately 8km² in extent, is developed in a basin of glacial deposits on Ordovician shales, surrounded by mountain slopes of more resistant acid volcanic rocks. Waen y Griafofen forms the subject of a detailed hydrological study in Section 3.5.



Figure 1:
Outlet stream from the
Waen y Griafofen
blanket bog.

The outlet stream from the blanket bog (fig.1) descends in a cascade reach to the flat floor of the Alltlwyd glaciated valley, the presumed site of a post-glacial lake

Gwynfynydd

Continuing downstream into the Gwynfynydd sub-catchment, the Mawddach begins a descent into the deeply incised valley system of Coed y Brenin. Step-pool reaches and bedrock reaches characterise the river, with Cambrian sedimentary strata well exposed in the bed and banks over much of the section (fig.2). The downstream limit of the Gwynfynydd subcatchment is the waterfall of Rhaeadr Mawddach and the confluence of the Mawddach with its major tributary the Afon Gain.



Figure 2:
Step-pool reach of
the Mawddach
within the
Gwynfynydd sub-
catchment south of
Abergeirw.

Oernant

The Oernant subcatchment forms the headwaters of the Afon Gain in the north-east of the catchment. The river is a misfit stream within a broad valley floored by glacial till and extensive glacial outwash gravel deposits (fig.3). Plane-bed reaches characterise much of the section, with shorter bedrock reaches at points where the river descends over rock steps in the Cambrian sediments. River cliffs cut in glacial till are a prominent feature bordering the meander belt.



Figure 3:
Gravel floodplain
of the upper Gain,
Oernant sub-
catchment.



Pistyll Cain

The Pistyll Cain subcatchment is the downstream continuation of the Afon Gain. This is the steepest-graded section of the Mawddach river system, with a series of rapids and waterfalls culminating in the spectacular fall of Pistyll Cain. Much of the section is characterised by bedrock reaches, with rock steps produced by resistant bands of Cambrian sediments or Ordovician dolerite and diorite sill intrusions.

Figure 4:
Gorge section of the Afon Gain below Pistyll Cain.

A short distance downstream from Pistyll Cain is the confluence of the Afon Gain with the upper Mawddach, occurring within a boulder strewn gorge (fig.5).



Figure 5:
Confluence of the Mawddach and Gain. The Mawddach is seen descending the waterfall of Rhaeadr Mawddach. The Afon Gain flows into the gorge through a rock channel in the left foreground.

Ganllwyd

The Mawddach trunk stream continues southwards through Coed y Brenin as the Ganllwyd subcatchment. This section of the river course remains deeply incised into Cambrian sedimentary rocks, characterised by step-pool and bedrock reaches (fig.6). Channel sediment trapped within pools is dominantly of coarse gravel grade.

The lower limit of the Ganllwyd reach is the confluence of the Mawddach with the Afon Eden at Cefn Deuddwr.



Figure 6:
The Afon Mawddach at Cefn Deuddwr

Cefn Clawdd

The Afon Eden has its source in the Cefn Clawdd subcatchment on the flanks of the Rhinog mountain range, to the south of Trawsfynydd reservoir in the north-west of the catchment. This subcatchment is formed by a glacial basin, floored by Boulder Clay on which blanket peat is developed (fig.7). The basin is traversed by the Ardudwy leat, which intercepts the river to partially divert flow north into the reservoir.



Figure 7:
The glacial basin of Cefn Clawdd

Crawcwellt

Further headwaters of the Afon Eden have their sources in a series of glacial basins along the Rhinog mountain escarpment south of Cefn Clawdd on the west of the catchment. Prominent amongst these headwaters are the Crawcwellt streams, flowing from cols at the Roman Steps (fig.8) and Bwlch Drws Ardudwy. The streams occupy broad valleys within the Trawsfynydd plateau, floored by glacial till with extensive areas of peat development. These streams are intercepted by the Ardudwy leat system, and flow partially diverted northwards into Trawsfynydd reservoir.



Figure 8:
Source of the
Crawcwellt stream
below the Roman
Steps col.

Eden

The Eden subcatchment is the area of the Trawsfynydd plateau where the headwaters streams converge from the Rhinog escarpment. The Eden trunk stream flows initially across the open plateau (fig.9) before beginning its descent into the incised valley system of Coed y Brenin.



Figure 9: Afon Eden at Gelli-goch ford

Gelligemlyn

Downstream from its confluence with the Afon Eden, the Mawddach continues southwards within a deep wooded valley of Coed y Brenin. The river, now of considerable size, is floored by gravel interspersed with residual boulders eroded from glacial till. Plane-bed reaches are characteristic (fig.10).



Figure 10.
Afon Mawddach
at Ty'n y Groes.

Cefn Cam

A further tributary flowing from the Rhinog escarpment, the Afon Gamlan, joins the Mawddach within the Gelligemlyn reach. The Gamlan has its source in the glacial basin of Cefn Cam (fig.11), before descending over the Rhaeadr Du waterfalls to the Mawddach .



Figure 11:
Source of the Afon
Gamlan in blanket
peat within the glacial
basin of Cefn Cam

Afon Wen

The Afon Wen is a significant tributary in the south east of the Mawddach catchment which joins the trunk stream at the downstream limit of the Gelligemlyn subcatchment. The Afon Wen has its source on the slopes of Rhobell Fawr, a mountain composed of Ordovician basalts. The river has a steep gradient, following a deep and straight fault-guided valley for much of its lower course. Plane-bed reaches are characteristic (fig.12). Extensive glacial and periglacial deposits are present on the valley sides, and are readily eroded during flood events.

A curious feature of the Afon Wen, from which it may derive its name in Welsh, is the milky white colour of the waters during periods of high flow. This appears due to kaolinite clay in suspension, derived from the outcrop of the Coed y Brenin porphyry copper deposit which the river crosses around the village of Hermon.



Figure 12:
Plane-bed reach with
residual boulders
from glacial till,
Afon Wen south of
Hermon.

Llanelltyd

After being joined by the Afon Wen, the Mawddach flows south through the final subcatchment before the tidal limit is reached at Llanelltyd. This section of the course is within a wide and straight glaciated valley, developed along a line of faulting. The river exhibits gentle meandering within the broad floodplain of water meadows, and characteristically exhibits pool-riffle reaches (fig.13).



Figure 13:
Afon Mawddach,
north of Llanelltyd.

photo: Lydia Yates

Flood embankments have been constructed along sections of the river to protect agricultural land used for animal grazing and silage production. Flooding of the fields bordering the river is, however, a common annual occurrence.

Wnion sub-catchments, described successively downstream from the north-east of the catchment:

Drws y Nant

The sources of the Afon Wnion are streams flowing into the head of the fault-guided glaciated Wnion valley near the Drws y Nant col. This col marks the watershed between westward drainage into the Mawddach estuary and Cardigan Bay, and eastward drainage into Bala lake and the River Dee.

The upper Wnion appears as a misfit stream on a flat valley floor of glacial till (fig.14). Gradients within the valley trough are relatively gentle, and plane-bed reaches are characteristic.



Figure 14:
Afon Wnion at
Pont Fronwydd

Pared yr Ychain

The Pared yr Ychain subcatchment contains a significant headwater tributary of the Wnion, the Afon Ty Cerrig, which originates on the flanks of Aran Fawddwy (fig.15). This mountain forms part of the southern volcanic outcrop around the Harlech Dome.

The Afon Ty Cerrig descends steeply through a torrent reach to the main Wnion valley. This stream is currently being utilised for small scale hydro-electric power generation.



Figure 15:
Peat pool on the slopes
of Aran Fawddwy,
supplying water to the
Afon Ty Cerrig at
Pared yr Ychain.

Craig y Benglog

The subcatchment encompassing the Ordovician volcanic outcrop of Craig y Benglog is the source of the Afon Eiddon which joins the Wnion at the village of Rhydymain. As with other tributaries of the Wnion, the stream falls steeply into the main valley by a torrent reach. This follows a ravine at the base of the cliff face and screes of Craig y Benglog (fig.16), then a rocky channel descending through oak woods.



Figure 16:
Afon Eiddon, below
Craig y Benglog

Rhobell Fawr

The Afon Melau drains the Rhobell Fawr subcatchment, joining the Wnion at Hengwrt Hall, Rhydymain. Rhobell Fawr is a mountain composed of Ordovician basalts, with a cover of glacial deposits on the lower slopes providing a ready source of mixed sediment during flood events. Gravel and cobble accumulations are found at points of reduced gradient along the stream (fig.17).



Figure 17:
Accumulation of
coarse sediment
by the Afon
Melau above
Hengwrt Hall

Craig y Ffynnon

The Craig y Ffynnon subcatchment comprises a series of streams draining north-west into the Wnion valley from the slopes of the Aran mountain range. This is an area of acid igneous rocks overlain by glacial deposits which provide generally damp soil conditions. Predominant land uses are rough grazing and commercial coniferous forestry (fig.18).

Streams occupy broad valleys on the upper slopes, becoming increasingly incised into glacial deposits as they descend steeply to the main trough of the Wnion valley. Torrent reaches are common on steep sections (fig.19).



Figure 18 (above)
View across the Craig
y Ffynnon
subcatchment from
Brithdir, showing the
gentler upper slopes
below the Aran range.



Figure 19 (left)
Deeply incised
valley of the Afon
Harnog, descending
towards its
confluence with the
Wnion at
Rhydymain.

Bontnewydd

The Bontnewydd subcatchment forms the next downstream section of the Afon Wnion, as it continues its course along the broad floor of the glacial trough. River sediment is dominated by gravel and cobbles, and plane-bed reaches are characteristic (fig.20).



Figure 20:
Afon Wnion at
Bont Newydd

Clyweddog

The Afon Clyweddog drains the eastern slopes of Cader Idris, the col to Dinas Mawddwy, and the plateau area around Cross Foxes. Streams converge to a gorge section descending to the Afon Wnion near Dolserau. This gorge forms the picturesque tourist attraction of Torrent Walk (fig.21).



Figure 21:
Footbridge over the Afon
Clyweddog at Torrent
Walk

Lower Wnion

The lower Wnion catchment comprises the trunk stream of the Afon Wnion flowing westwards through the town of Dolgellau, along with the Afon Aran tributary which joins the Wnion near the centre of the town. The Wnion at Dolgellau is a broad gravel-bed river with gentle gradient and pool-riffle reaches (fig.22). It is gently meandering, but has had its course modified by engineering works to allow for construction of a main road by-passing the town centre. For about 2km in the vicinity of the town, the southern bank of the Wnion is raised by masonry walls or earth flood defence embankments. Flooding in the area of Dolgellau is the subject of modelling in Section 3.4.

The Wnion reaches its tidal limit and confluence with the Afon Mawddach at Llanelltyd, 2km west of Dolgellau.



Figure 22: Afon Wnion near Coleg Meirion-Dwyfor, Dolgellau