Dŵr Cymru
Welsh Water

Draft Drought Plan 2020 – Annex 3 – Environmnetal assessment improvements

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1. Overview

As described in Chapter 5 of the main report, one of the main improvements made for the draft Drought Plan 2020 has been to try and minimise as far as possible, the environmental effects of the Drought Permits/Orders included in our Plan whilst at the same time ensuring we can maintain essential water supplies to our customers in drought conditions.

In particular, we have used updated environmental evidence to carefully review all of the Drought Permits/Orders included in our current (2015) Drought Plan in respect of the water supply benefits they provide and the currently predicted environmental effects. This review took account of our updated drought resilience assessments and resulted in the removal of the following Drought Permits/Orders from our draft Drought Plan:

- 8101-1: Exchange of spare Wye Regulation water to Severn Trent Water's Lydbrook abstraction point
- 8103-1: Increase the abstraction at Broomy Hill by 3 Ml/d
- 8103-2: Increase the abstraction at Leintwardine by 0.1 Ml/d
- 8108-1: Maintain the reduced Usk Compensation discharge of 5.7Ml/d and relax the requirement to ensure the average compensation discharge of 9Ml/d for the year.
- 8110-1: Removal of flow condition on the River Dore
- 8111-1: Removal of flow condition on the River Teme
- 8201-2: Reduce Ystradfellte compensation flow by 50%
- 8202-2: Increase the Teifi Pools annual abstraction licence to fully utilise the Emergency Storage volume
- 8206-6: Reduction in the statutory compensation release from Llys y Fran Reservoir to the Afon Syfynwy of 7.64 Ml/d from 13.64Ml/d to 6Ml/d
- 8001-7: Abstraction from Llyn Cwellyn below the pump intake level.
- 8012-1: Transfer water from Llyn Bran to Afon Aled
- 8012-3: Pump water from Llyn Aled 'dead' storage
- 8033-1: Pumped abstraction of Dead Storage from Llyn Bodlyn
- 8034-2: Reduce compensation flow releases from Llyn Cwmystradllyn
- 8034-3: Extension of the syphon arrangement to exploit the Dead Storage in Llyn Tecwyn
- 8035-1: Increase annual abstraction licences from Llyn Cowlyd
- 8036-1: Increased abstraction from Llyn Cynwch Penycefn WTW to support tankering to outlying source areas
- 8105-1: Increase the abstraction at Llyswen
- 8107-1: Increase the authorised Pilleth abstraction
- 8109-2: Unsupported abstractions from the River Usk at Prioress Mill
- 8109-3: Unsupported abstractions from the River Wye at Monmouth
- 8109-6: Use Grwyne Reservoir, as a regulating reservoir, to support abstraction at Prioress Mill or Llantrisant
- 8109-8: Reduce the compensation water releases from the Elan Reservoirs
- 8116-2: Reduction in the Cwmtillery Reservoir Compensation Water release
- 8119-2: Compensation Water Reduction of 50% at Lower Carno Reservoir
- 8203-1: Increase the annual abstraction quantity from Llyn Llygad Rheidol

- 8203-3: Reduce the compensation release from Llyn Craig Y Pistyll by 50%
- 8206-4: Reduce the Prescribed flow required at the Pont Hywel abstraction
- 8206-5: Abstraction from the Afon Taf

This significant reduction in the number of Drought Permits/Orders will materially reduce the overall environmental effect of our draft Drought Plan, including any effects on various environmentally-sensitive river systems within international and/or nationally important conservation areas.

For the remaining Drought Permits/Orders included in our current (2015) Drought Plan, we closely examined the environmental effects, taking account of the different life-cycle stages of relevant aquatic plants and animals through the calendar year, to see whether we could reduce the duration and/or period of the year during which each Drought Permit/Order may be required. Where feasible, we then sought to avoid those months where the environmental effects of each Drought Permit/Order would be greatest. We also considered what mitigation measures would be needed to address the identified environmental effects for the remaining months when each Drought Permit/Order may be required.

The same assessment approach has been adopted for the new Drought Permits/Orders that are included in the draft Drought Plan.

Using the results of our drought resilience assessment for each of our Water Resource Zones, we have been able to confirm where there is a low/negligible risk of requiring any Drought Permits/Orders. This has helped reduce the likelihood of any temporary adverse effects on the environment by removing a number of options that require a Drought Permit/Order.

By reducing the overall number, and the likely frequency and duration of Drought Permits/Orders, and optimising the time of year for their implementation as far as possible, we have been able to reduce the overall environmental effects of the draft Drought Plan.

2. Optimising the time of year for Drought Permit/Order implementation

As summarised above, we closely examined the potential environmental effects of each Drought Permit/Order included in the draft Drought Plan, taking into account the different life-cycle stages of relevant aquatic plants and animals through the calendar year, to see whether we could reduce the duration and/or period of the year during which each Drought Permit/Order may be required. Figure 1 provides a generalised example of the life-cycle information we considered. This shows that different species have different sensitive periods of the year (e.g. for adult fish migration through river systems, for fish spawning, etc.). It should be noted that that the example in Figure 1 presents a generalised indication of key periods but where available, site specific information was used relevant to each Drought Permit/Order.

Feature	Feature Specifics	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Macrophytes	Communities												
Macrophytes	*Ranunculus* communities												
Lichen	Communities												
Bryophyte	Communities												
Macroinvertebrates	Communities												
Atlantic salmon	Upstream adult migration												
	Downstream smolt migration												
	Spawning												
	Juvenile life stage												
Brown/sea trout	Upstream adult migration												
	Downstream smolt migration												
	Spawning												
	Juvenile life stage												
European eel	Downstream adult migration												
	Upstream juvenile migration												
Bullhead	Spawning												
	Juvenile life stage												
River lamprey	Upstream adult migration												
	Downstream juvenile migration												
	Juvenile habitat												
	Spawning												
Brook lamprey	Juvenile habitat												
	Spawning												
Sea lamprey	Upstream adult migration												
	Downstream juvenile migration												
	Juvenile habitat												
	Spawning												

Figure 1 – Generalised sensitive period for key aquatic communities

Using this information, we assessed whether we could constrain the Drought Permit/Order implementation period to avoid or reduce the period of impact on key life-cycle stages.

As an example, a summary of potential environmental effects on the Afon Taf Fawr arising from implementation of the Llwynon Reservoir Drought Permit is included in Figure 2 and Figure 3. The assessment undertaken for our 2015 Drought Plan, which assumed a six month implementation period during any month of the year, is summarised in Figure 2. As Figure 2 illustrates, we identified potential adverse effects on aquatic species as indicated by the coloured boxes (where red indicates a major adverse effect; amber a moderate adverse effect; yellow a minor adverse effect; "N" a negligible adverse effect).

Having reviewed these effects, and taking account of our revised drought risk assessment, we have made a decision to restrict the implementation period for this Drought Permit in our draft Drought Plan to only the months of September to November inclusive. As illustrated in Figure 3, by substantially restricting the implementation period, we have been able to avoid impacts on certain fish life-cycle stages altogether (e.g. downstream migration of salmon smolts) and significantly reduce impacts on other communities (e.g. macrophytes and phytobenthos).

Month		J	F	M	A	M	J	J	A	S	O	N	D
Reach 1 – Afon Taf Fawr (Llwynon Reservoir outflow to the confluence with Afon Taf Fechan)													
Macrophytes													
Notable macrophyte species – *Fissidens rufulus*													
Phytobenthos													
Risk to WFD waterbody macrophyte/phytobenthos status													
Macroinvertebrates													
Notable macroinvertebrate species – *Metalype fragilis*													
Risk to WFD waterbody macroinvertebrate status													
Atlantic Salmon	Upstream migration and out-migrating smolts	N	N				N	N	N	N			
	Water quality	N	N										
	Spawning and juveniles (loss of habitat)	N	N	N									N
Brown / Sea trout	Spawning, egg survival, and juveniles	N	N										N
	Reduced water quality	N	N										N
	Upstream migration and out-migrating smolts	N	N				N						N
Bullhead		N	N								N	N	N
European eel		N	N	N	N	N	N	N	N				
Other fish species- Minnow, Stone loach and Three-spined stickleback		N	N	N							N	N	N
Risk to WFD waterbody fish status		N	N										
Landscape and Visual Amenity		N	N	N	N	N	N	N	N	N	N	N	N
Recreation	Angling	N	N	N	N	N	N	N	N	N	N	N	N
	Other recreational activities	N	N	N	N	N	N	N	N	N	N	N	N
Archaeology		N	N	N	N	N	N	N	N	N	N	N	N

Figure 2 – Summary of impacts on 8109-1 Llwynon Reservoir Reach 1- 2015 Drought Plan assessment

Month		J	F	M	A	M	J	J	A	S	O	N	D
Reach 1 –Taf Fawr (Llwynon Reservoir outflow to the confluence with Taf Fechan)													
Macrophytes		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N	N	N/A
Notable macrophyte species –*Fissidens rufulus*		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N	N	N/A
Phytobenthos		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N	N	N	N/A
Risk to WFD waterbody macrophyte/phytobenthos status		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N	N	N/A
Macroinvertebrates		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				N/A
Notable macroinvertebrate species –*Metalype fragilis*		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				N/A
Risk to WFD waterbody macroinvertebrate status		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N	N	N	N/A
Atlantic Salmon	Upstream migration and out-migrating smolts	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N			N/A
	Water quality	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				N/A
	Spawning and juveniles (loss of habitat)	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				N/A
Brown / Sea trout	Spawning, egg survival, and juveniles	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				N/A
	Reduced water quality	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				N/A
	Upstream migration and out-migrating smolts	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				N/A
Bullhead		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				N/A
European eel		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				N/A
Other fish species- Minnow, Stone loach and Three-spined stickleback		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A		N	N	N/A
Risk to WFD waterbody fish status		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A				N/A
Landscape and Visual Amenity		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N	N	N	N/A
Recreation	Angling	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N	N	N	N/A
	Other recreational activities	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N	N	N	N/A
Archaeology		N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N	N	N	N/A

Figure 3 – Summary of impacts on 8109-1 Llwynon Reservoir Reach 1- 2020 Draft Drought Plan assessment

3. Summary of changes made to Drought Permit/Orders and environmental benefits

Table 1 (below) summarises the environmental benefits arising from the changes made to each Drought Permit/Order included in the draft Drought Plan to reduce the predicted environmental effects. In particular, by making these changes we have:

- Significantly reduced the number of Drought Permit/Order options that may have adverse effects on European conservation sites to just three options; Crai Reservoir (Option no. 8201-1), Crowhill intake (Option no. 8206-1) and Canaston intake (Option no. 8206-8),
- Reduced the overall extent of aquatic features for which major adverse effects have been identified.

Option name	DP Option	DP 2015 timing	DP 2020 timing	Environmental Benefits arising from changes made
Aled Isaf	8012-2	All year	September to January	The change to the implementation period would result in any impacts on the macrophyte community being limited to the month of September only, the end of the macrophyte growing season, and not the full season. Impacts on macroinvertebrate egg deposition and early instar development during spring and summer will also be avoided due to the changes in timing. The majority of out-migrating Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta*) smolt would be likely to migrate between mid-March and mid-May and the changes in the timing will avoid this migration period. The changes would also result in avoidance of the upstream and downstream migration of sea lamprey (*Petromyzon marinus*) and avoidance of the downstream migration period of river lamprey (*Lampetra fluviatilis*).
Afon Aled	8012-4	June-December	November-March	Changes to the implementation period would ensure that the macrophyte growing season is avoided. Impacts on macroinvertebrate egg deposition and early instar development during spring and summer will also be avoided.
Llannerch Boreholes	8012-5	All year	November-March	Changes to the implementation period would ensure that the macrophyte growing season is avoided. Impacts on macroinvertebrate egg deposition and early instar development during spring and summer will also be avoided. The majority of out-migrating Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta*) smolt would be likely to migrate between mid-March and mid-May so the changed timing will avoid this migration period.
Aled Isaf to Llyn Aled	8012-6	All year	November-February	Changes to the implementation period would ensure that the macrophyte growing season is avoided whilst impacts on macroinvertebrate egg deposition and early instar development during spring and summer will also be avoided. The majority of out-migrating Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta*) smolt would be likely to migrate between mid-March and mid-May so the changed timing will avoid this migration period. The changes in the implementation period would also result in only part of the upstream migration of river lamprey (*Lampetra fluviatilis*) being affected.
Crai Reservoir	8201-1	All year	August to November	The drought order will now not be implemented during the downstream migration period of Atlantic salmon (*Salmo salar*) smolt or the spring run of adult salmon. The autumn run associated with the River Usk could still be affected. While the drought order will not be implemented during the downstream migration period for sea/brown trout

Option name	DP Option	DP 2015 timing	DP 2020 timing	Environmental Benefits arising from changes made
				smolt, the September to November implementation period could still coincide with the period when sea/brown trout undertake upstream migration. Similarly, the drought order implementation could coincide with the migration period of mature (silver) eel, although the full migration window will now not be affected. The drought order impacts will be limited to the start of the downstream and upstream migration period of river lamprey (*Lampetra fluviatilis*) and will not affect the full migration window. The drought order will not be implemented during the spawning or incubation period for either bullhead (*Cottus gobio*) or river and brook lamprey (*Lampetra planeri*). Hydrological impacts associated with the macrophyte community will also be limited to the latter parts of the growing season when macrophyte communities will be less susceptible to flow and water quality impacts. Furthermore, the drought order will only affect part of the life-cycle of the macroinvertebrate community. While spring emergers may still be affected due to impacts during the overwintering period, the egg deposition and early instar phases will remain unaffected. The change in implementation period would result in only part of the Freshwater pearl mussels *Margaritifera margaritifera* being affected by the drought order. The early summer period when males shed sperm in the water will be unaffected due to the change in timing, but the shedding of larvae by females between July and September could partly be affected, although impacts are considered to be moderate at most.
Afon Tywi	8201-3	April-December	September to November	The drought order will not be implemented during upstream migration, spawning or incubation period for twaite shad (*Alosa fallax*). Impacts would potentially be limited to the downstream migration period for these species, although the extent of hydrological impacts will be limited in the lower reaches where this life-stage is likely to occur. While the drought order will not be implemented during the downstream migration period for smolt, the September to November implementation period could still coincide with the period when sea/brown trout (*Salmo trutta*) undertake upstream migration. Impacts on sea/brown trout migration is expected to be minor adverse at most. Similarly, the drought order implementation could coincide with the migration period of mature (silver) eel, although the full migration window will now not be affected. The drought order impacts will be limited to the start of the downstream migration period for sea

Option name	DP Option	DP 2015 timing	DP 2020 timing	Environmental Benefits arising from changes made
				lamprey (*Petromyzon marinus*). The changes in the implementation period will result in only part of the upstream and downstream migration period river lamprey (*Lampetra fluviatilis*) being affected and not the full migration window. The drought order will not be implemented during the spawning or incubation period for either bullhead (*Cottus gobio*) or any of the lamprey species, including brook lamprey (*Lampetra planeri*). Hydrological impacts associated with the macrophyte community will also be limited to the latter parts of the growing season when macrophyte communities will be less susceptible to flow and water quality impacts. Furthermore, the drought order will only affect part of the life-cycle of the macroinvertebrate community. While spring emergers may still be affected due to impacts during the overwintering period, the egg deposition and early instar phases will remain unaffected. The change in implementation period would result in only part of the Freshwater pearl mussels (*Margaritifera margaritifera*) being affected by the drought order. The early summer period when males shed sperm in the water will be unaffected due to the change in timing, but the shedding of larvae by females between July and September could partly be affected, although impacts are considered to be minor at most.
Brianne Reservoir	8201-4	All year	September to November	The environmental benefits related to the changes in the potential implementation period for the Brianne Reservoir Drought Order are similar to those discussed above for the Afon Tywi Drought Order (Option no. 8201-3).
Llechryd, Afon Teifi	8202-1	The hydrological and subsequent ecological impacts associated with this Drought Order are expected to be negligible regardless of implementation period.		
Nant y Moch	8203-2	The hydrological and subsequent ecological impacts associated with the Drought Permit are expected to be negligible regardless of implementation period.		
Llyn Cwellyn	8001-2	The hydrological and subsequent ecological impacts associated with the Drought Order are expected to be negligible regardless of implementation period.		
Alaw Reservoir	8001-3	All year	July to December	The majority of out-migrating Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta)* smolt would migrate between mid-March and mid-May and the changes to the implementation period would avoid impacts on migration during this period. The drought permit would still coincide with the migration periods for mature (silver) eel, adult Atlantic salmon, sea/brown trout adults and post metamorphic river and brook

Option name	DP Option	DP 2015 timing	DP 2020 timing	Environmental Benefits arising from changes made
				lamprey (*Lampetra fluviatilis* and *Lampetra planeri*). The changes will also result in only part of the macroinvertebrate life-cycle being affected.
Ffynnon Llugwy Reservoir	8001-4	April - December	July to December	The majority of out-migrating Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta)* smolt would migrate between mid-March and mid-May and the changes to the implementation period would avoid impacts on migration during this period. The drought permit would still coincide with the migration periods for mature (silver) eel, adult Atlantic salmon, sea/brown trout adults and post metamorphic river and brook lamprey (*Lampetra fluviatilis* and *Lampetra planeri*). The changes will also result in only part of the macroinvertebrate life-cycle being affected.
Cefni Reservoir	8001-5	May-November	July to December	The majority of out-migrating Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta*) smolt would migrate between mid-March and mid-May and the changes to the implementation period would avoid impacts on migration during this period. The drought permit would still coincide with the migration periods for mature (silver) eel, adult Atlantic salmon, sea/brown trout adults and post metamorphic river and brook lamprey (*Lampetra fluviatilis* and *Lampetra planeri*). The changes will also result in only part of the macroinvertebrate life-cycle being affected.
Bodlyn Reservoir	8033-2	April-November	July to October	The majority of out-migrating Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta*) smolt would migrate between mid-March and mid-May and the changes to the implementation period would avoid impacts on migration during this period. The majority of Atlantic salmon migration into the Afon Ysgethin is likely to occur from October to December and therefore a drought order being in place during October will limit impacts to the start of the migration period for these species. Most of the upstream migration period for sea/brown trout will remain affected. The downstream migration period of mature (silver) eel will now only be partly affected whilst the changes will also result in only part of the macroinvertebrate life-cycle being affected.
Afon Dwyfor	8034-1	The hydrological and subsequent ecological impacts associated with this Drought Permit are expected to be negligible regardless of implementation period.		
Crowhill	8206-1	April - September	August to November	The changes in potential implementation period would result in the drought order not being implemented during the downstream migration period of Atlantic salmon (*Salmo salar*) or sea/brown trout (*Salmo trutta*) smolt. The drought order could be implemented

Option name	DP Option	DP 2015 timing	DP 2020 timing	Environmental Benefits arising from changes made
				during the upstream migrating period of both species, but migration is unlikely to occur during the extreme low flows affected by the drought order. Similarly, the drought order implementation could coincide with the migration period of mature (silver) eel, although the full migration window will now not be affected. The drought order impacts will be limited to the start of the downstream migration period for sea lamprey (*Petromyzon marinus*). The changes will result in only part of the upstream and downstream migration period of the river lamprey (*Lampetra fluviatilis*) being affected and not the full migration window. Impacts on the downstream migration of both species and the potential impact on nursery habitat for all lamprey species, including brook lamprey (*Lampetra planeri*), is expected to remain major adverse. The changes will also result in the drought order not being implemented during the spawning or incubation period for either bullhead (*Cottus gobio*) or any of the lamprey species. Hydrological impacts associated with the macrophyte community will also be limited to the later parts of the growing season when macrophyte communities will be less susceptible to flow and water quality impacts. Furthermore, the drought order will only affect part of the life-cycle of the macroinvertebrate community. While spring emergers may still be affected due to impacts during the overwintering period, the egg deposition and early instar phases will remain unaffected.
Preseli	8206-2	All year	August to November	Available data suggests that the fish community associated with the hydrological reach between the Llys-y-Fran and Rosebush reservoirs is limited to brown trout (*Salmo trutta*). The Llys-y-Fran reservoir is a major migration barrier and impacts will be limited to juvenile habitat which would be affected regardless of the timing of the implementation. However, hydrological impacts associated with the macrophyte community will be limited to the later parts of the growing season when macrophyte communities will be less susceptible to flow and water quality impacts. Furthermore, the drought order will only affect part of the life-cycle of the macroinvertebrate community.
Llys y Fran (Freshet)	8206-7	The hydrological and subsequent ecological impacts associated with this Drought Order are expected to be negligible regardless of implementation period.		
Canaston	8206-8	N/A	August to November	The implementation period for this new option has been defined to avoid the downstream migration period of Atlantic salmon (*Salmo salar*) or sea/brown trout

Option name	DP Option	DP 2015 timing	DP 2020 timing	Environmental Benefits arising from changes made
				(*Salmo trutta*) smolt. The drought order could be implemented during the upstream migrating period of both species, but impacts will be limited to part of the migration period only. Similarly, the drought order could coincide with the migration period of mature (silver) eel, although the full migration window will not be affected due to the proposed timing. The drought order impacts will be limited to the start of the downstream migration period for sea lamprey (*Petromyzon marinus*). The restricted implementation period will result in only part of the upstream and downstream migration period of the river lamprey (*Lampetra fluviatilis*) being affected and not the full migration window. Impacts on the downstream migration of both species and the potential impact on nursery habitat for all lamprey species, including brook lamprey (*Lampetra planeri*), is expected to remain major adverse. The restricted timing will result in the drought order not being implemented during the spawning or incubation period for either bullhead (*Cottus gobio*) or any of the lamprey species. Hydrological impacts associated with the macrophyte community will also be limited to the latter parts of the growing season when macrophyte communities will be less susceptible to flow and water quality impacts. Furthermore, the drought order will only affect part of the life-cycle of the macroinvertebrate community. While spring emergers may still be affected due to impacts during the overwintering period, the egg deposition and early instar phases will remain unaffected. Impacts on the macroinvertebrate and macrophyte community is still considered to be major adverse.
Afon Rhondda Fawr	8112-1	All year	September to November	The changes in the implementation period would result in impacts on the macrophyte community being limited to the month of September and not the full growing season. The changes would also result in only some life-stages of the macroinvertebrate community being affected, with spring egg depositions and overwinter stages unaffected. Although the upstream migration of Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta*) will still be affected, the changes would result in the downstream migration of smolt and the spawning and egg incubation period for these species being unaffected. The changes would also result in the drought permit avoiding the overwintering period of gravid white-clawed crayfish (*Austropotamobius pallipes*) females, the release if juveniles, and part of the moulting period.

Option name	DP Option	DP 2015 timing	DP 2020 timing	Environmental Benefits arising from changes made
Talybont Dead Storage	8116-3	The hydrological and subsequent ecological impacts associated with this Drought Order are expected to be negligible regardless of implementation period.		
Llwynon Reservoir	8109-1	All year	September to November	The changes in the implementation period would result in impacts on the macrophyte community, including the nationally scarce moss, *Fissidens rufulus*, being limited to the month of September and not the full growing season. Although the upstream migration of Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta*) will still be affected, the changes would result in the downstream migration of smolt and the spawning and egg incubation period for these species being unaffected. The changes would also result in only some life-stages of the macroinvertebrate community being affected, with spring egg depositions and overwinter stages unaffected.
Afon Lwyd	8109-4	All year	September to November	The changes in the implementation period would result in impacts on the macrophyte community being limited to the month of September and not the full growing season. The changes would also result in only some life-stages of the macroinvertebrate community being affected, with spring egg depositions and overwinter stages unaffected. Although the upstream migration of Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta*) will still be affected, the changes would result in the downstream migration of smolt and the spawning and egg incubation period for these species being unaffected. The changes would also result in the drought permit avoiding the overwintering period of gravid white-clawed crayfish (*Austropotamobius pallipes*) females, the release if juveniles, and part of the moulting period.
Pontsticill Reservoir	8119-1	All year	September to November	The changes in the implementation period would result in impacts on the macrophyte community, including the nationally scarce moss, *Fissidens rufulus*, being limited to the month of September and not the full growing season. Although the upstream migration of Atlantic salmon (*Salmo salar*) and sea/brown trout (*Salmo trutta*) will still be affected, the changes would result in the downstream migration of smolt and the spawning and egg incubation period for these species being unaffected. The changes would also result in only some life-stages of the macroinvertebrate community being affected, with spring egg depositions and overwinter stages unaffected.

Option name	DP Option	DP 2015 timing	DP 2020 timing	Environmental Benefits arising from changes made
Dysynni	8021-1	The hydrological and subsequent ecological impacts associated with this Drought Permit are expected to be negligible regardless of implementation period.		

Table 1 – Changes made to each Drought Permit/Order included in the draft Drought Plan to reduce environmental effects