

CANNOP PONDS: THE NEXT CHAPTER

January 2023



Forestry England

Since we made the issues surrounding the condition and safety of the reservoirs at Cannop Ponds public, there has been much discourse and misunderstanding surrounding the project. We always understood that people would have lots of questions – many of which we don't yet have the answers to, but we felt it was important to let people know what was happening early on, while we're still gathering all the information needed to make the most informed decision about the next chapter at Cannop.

It's our hope that this document brings together all the strands of the story, and provides a more comprehensive overview of the many challenges and opportunities being faced. It is intended to set the record straight, explain the work that is being done, and, hopefully, bring people on the journey with us as we explore all the potential options and futures for Cannop Ponds.



CONTENTS

- | | |
|---------------------------|---------|
| 1. Where are we now? | Page 4 |
| 2. The story: at a glance | Page 5 |
| 3. The story: key factors | Page 6 |
| 4. The story: in detail | Page 8 |
| 5. Project timings | Page 23 |
| 6. FAQs | Page 24 |

WHERE ARE WE NOW?

The two bodies of water, known as Cannop Ponds, are classified as reservoirs due to being formed by man-made dams across the Cannop Brook. As such, they are subject to regular inspection by an external and independent reservoir engineer. The inspections of May 2021 identified that remedial works are required to keep the reservoirs safe and

functional, which Forestry England is legally obliged to act upon. The remedial works are significant in terms of time, cost and impact on the site, so Forestry England is undertaking due diligence to consider alternatives for Cannop Ponds that could reflect the natural importance of the site for the future, with significant potential for positive impacts on wildlife,

people and the climate. There is also the need to consider the Forest of Dean's land management plan, 'Our Shared Forest' (published in 2019), which details a number of long-term commitments to a more natural, connected and climate resilient approach to water management.

THE STORY: AT A GLANCE

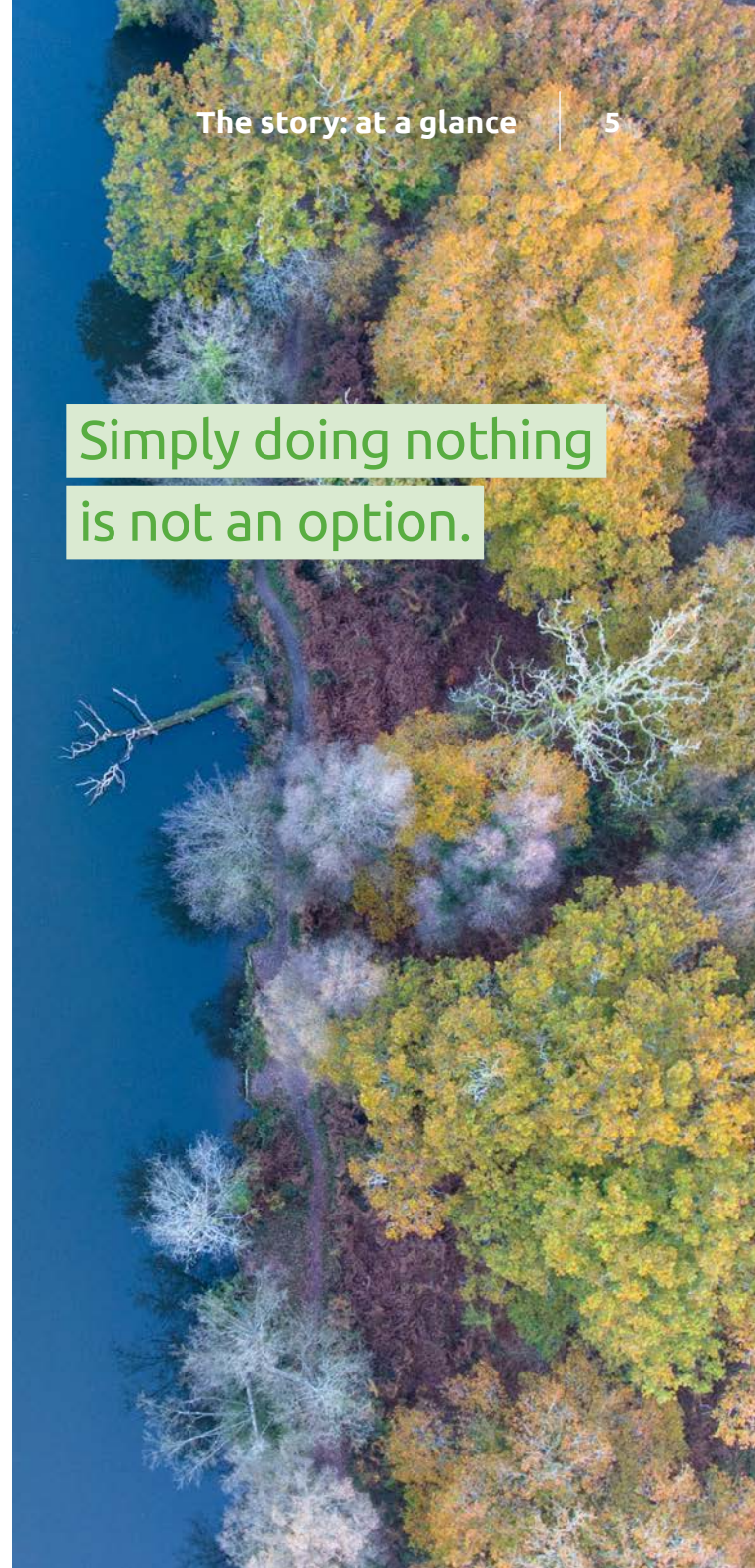
The question about the future of Cannop Ponds is by no means a simple one. Simply doing nothing is not an option.

As reservoirs, and having recently been inspected by an external and independent reservoir engineer, we are legally obligated – for the safety of communities downstream – to address a number of issues with the ageing industrial structures that support the reservoirs at Cannop Ponds. We, like anyone, can appreciate the picturesque nature of the site, but they aren't safe in their current form, and 'simply' securing the man-made reservoirs to modern standards, in line with our legal obligations, comes with great disruption and change. It's for this reason alone we began to explore whether there's a better future for Cannop.

The more we looked at what Cannop could be – for the community, for the climate, and for biodiversity – the more the legal obligation to do something began to feel like an opportunity to do some good. Something that not only secures the site's ability to cope with future flood events, but undoes some of the industrial interventions that changed the natural habitat that would have been, and the benefits that would've arisen.

This exploration of alternative futures for Cannop presents possibly the most exciting regeneration project in the Forest of Dean – one that has the potential to redress a previous intervention and reinstate an invaluable wild ecosystem that could become an intrinsic part of the Forest's rich mosaic of habitats.

Simply doing nothing
is not an option.



THE STORY: KEY FACTORS

Cannop Ponds is at a crossroads in its history. The decision about whether to secure the future of the reservoirs by undertaking the significant necessary remedial works, or to remove them and pursue an alternative future of renaturalisation is a complicated one. There are many independent yet connected issues that need to be explored, and that work is already underway. The discovery work being undertaken on this mosaic of factors forms the basis of the more detailed story in the following section of this document.

The factors currently being explored are as follows and may be added to in future versions of this document.

SETTING THE SCENE

Why we're talking about Cannop Ponds.

THE OPTIONS

The options being explored in respect to both the Lower and Upper Cannop reservoirs.

THE LEGAL CONTEXT

The official status of the bodies of water as reservoirs and Forestry England's legal obligations.

THE COST

The cost implications of all potential avenues.

WHAT ARE WE (FORESTRY ENGLAND) STRIVING FOR?

Beyond a legal obligation, what's right for the future of the Forest?

OUR SHARED FOREST

How the principles of the Forest of Dean's land management plan apply.

SHORT-TERMISM VS. LONG-TERMISM

Weighing up what is right for the forest over 25, 50 and 100-year timelines.

CLIMATE RESILIENCE

The ability of the reservoirs to cope with current and future flood and drought events in comparison to alternative options.

NATIVE AND INVASIVE SPECIES

The existence and impact of non-native species.

BIODIVERSITY AND WILDLIFE

The contribution made by the current Cannop Ponds site towards biodiversity within the Forest of Dean, and the implications of alternative futures if the reservoirs are removed.

WETLAND AND RIVERINE HABITATS

The potential benefits associated with re-establishing areas of riverine and wetland habitats within the forest.

CASE STUDIES

Analysis of examples from around the world where reservoirs have been removed and the outcomes that have resulted.

AESTHETICS

What could the future of Cannop Ponds look like?

CULTURE, HISTORY AND HERITAGE

The cultural and historical significance of the Cannop Ponds site and its future role in the Forest of Dean.

TESTING, SURVEYS AND TECHNICAL STAKEHOLDER CONSULTATION

All the information gathering designed to ensure we reach the right decision.

PUBLIC ENGAGEMENT

The planned activity to engage the general public and gather their input to shape the future of Cannop Ponds.

WHAT WE KNOW FOR SURE

Clarification on a few of the things we can be certain of now.



**THE STORY:
IN DETAIL**

SETTING THE SCENE

Cannop Ponds are two of the largest bodies of water in the Forest of Dean. Each has its own man-made dam and is therefore technically a reservoir, not a natural occurring pond. These reservoirs were originally created in 1825 and 1829 to supply the industrial works at Parkend, but quickly fell out of use. They have since become a picturesque part of the Forest, but the reality is the man-made features that retain the reservoirs were made at a time where methods to protect against deterioration were not well understood. As such, they do not meet modern engineering standards and have had to undergo significant maintenance over the years to prevent failures.

Following a recent mandatory inspection by an external and independent reservoir engineer, the ageing dams at Cannop Ponds were found to present more significant issues than previously thought. In light of our changing climate and data evidencing increasingly intense storms, and frequent flood events putting pressure on Cannop Brook and the ageing dams,

doing nothing is not an option. If either dam wall was to breach, that is if the embankment were to fail and the entirety of the reservoir water body released, as a result of the increased volume of water, it would have a potentially catastrophic impact on the communities downstream. Flood risk mapping shows that Parkend, Whitecroft and Lydney would be vulnerable to flooding, with all the associated risks to life and infrastructure.

All factors considered, it is our obligation to act: to question whether proceeding with extensive corrective works to the reservoir's dam and surrounding infrastructure remains

the most appropriate, and responsible course of action.

Alternatively, could we pursue a more natural option, returning Cannop to something akin to the kind of habitat that it would have been before, remedying the interventions of the past and potentially providing a better future for Cannop Ponds.

No decision has yet been taken on the course of action at Cannop Ponds; we are very much in an evidence/information gathering phase so that we can determine what will provide the best medium and long-term outcome for the Forest.



THE OPTIONS

The significance of the issues identified at Cannop Ponds, the serious concerns about the ageing dams' resilience to our changing climate and the resulting interventions required, mean that it's our duty to explore further options for the future of the Ponds, we couldn't in good conscience do any less.

The 'repair and replace' option is responding to the actions identified by the independent engineer inspecting the dams and enforced by the Environment Agency. This is by no means the 'simple' option. The engineering inspections have flagged significant concerns with the spillways at both Upper and Lower Cannop dams. In brief, neither of the spillways are able to contain a 1 in 150-year flood event, and hence both dams are likely to breach in an extreme rainfall event. This requires the spillways to be widened, or additional spillways constructed. In addition to this, recently identified voids, coupled with a history of voiding (that is holes eroding within the dam structure) at Lower Cannop has resulted in an instruction to entirely

replace the spillway. The new structure(s) will need to be larger, stronger, and with a very much wider/deeper spillway. This will require the spillway to be removed down to foundation levels and rebuilt to modern standards. What this all means is that just

attempting to retain the Ponds isn't without significant disruption, draining of the reservoir and change to the existing idyll.

This requires the spillways to be widened, or additional spillways constructed.





The 'renaturalise' options are variations and degrees of how we might renaturalise the site by removing the dams, returning Cannop Brook to something akin to the riverine wetland habitat it would've been before the industrial interventions of the past. Restoring natural processes is an important long-term aim to improve the Forest's resilience, and its ability to adapt in the face of climate change. By focusing on the natural potential of the land, the renaturalisation of Cannop Ponds has the potential to become a global example of how reinstating a natural aesthetic and ecological functionality can be infinitely more beneficial to the Forest, the community, and the planet.

This doesn't have to feel like an obligation,
it's an opportunity to do so much good.

Picture walking amongst a natural watercourse that winds through a wetland landscape. What was once a break in the Forest is now a natural corridor connecting ecosystems. A flowing source of water separated by pools, flanked by a richly biodiverse habitat of wetlands and reedbeds, connected by a series of raised walkways, paths and wooden bridges. A new tapestry of ecosystems, providing homes for many endangered species, a vital stop for migrating birds, and an opportunity to get lost in nature in a way that wasn't previously accessible.

The intermediate options could be designed and implemented to provide defined and measurable amounts of storm water attenuation and ecological enhancements. This could include holding water in a series of smaller in-line and off-line ponds and lakes, some of which might be suitable for fishing. An intermediate option might provide the best balance

of quantifiable benefits going forward whilst removing the long-term risks and costs associated with maintaining a registered reservoir.

As a result of exploring the alternative options, it's clear that this doesn't just have to feel like a legal obligation. It's an opportunity to do so much good – to do what so many other nations have already started, in undoing some unnatural interventions of the past.

At this stage we do not have enough information to make a sound assessment of any of these options. We have commissioned a number of surveys and further studies to provide us with the necessary information. We do know that whatever the future for the Cannop Valley, it will be designed as one for people to enjoy.

THE LEGAL CONTEXT

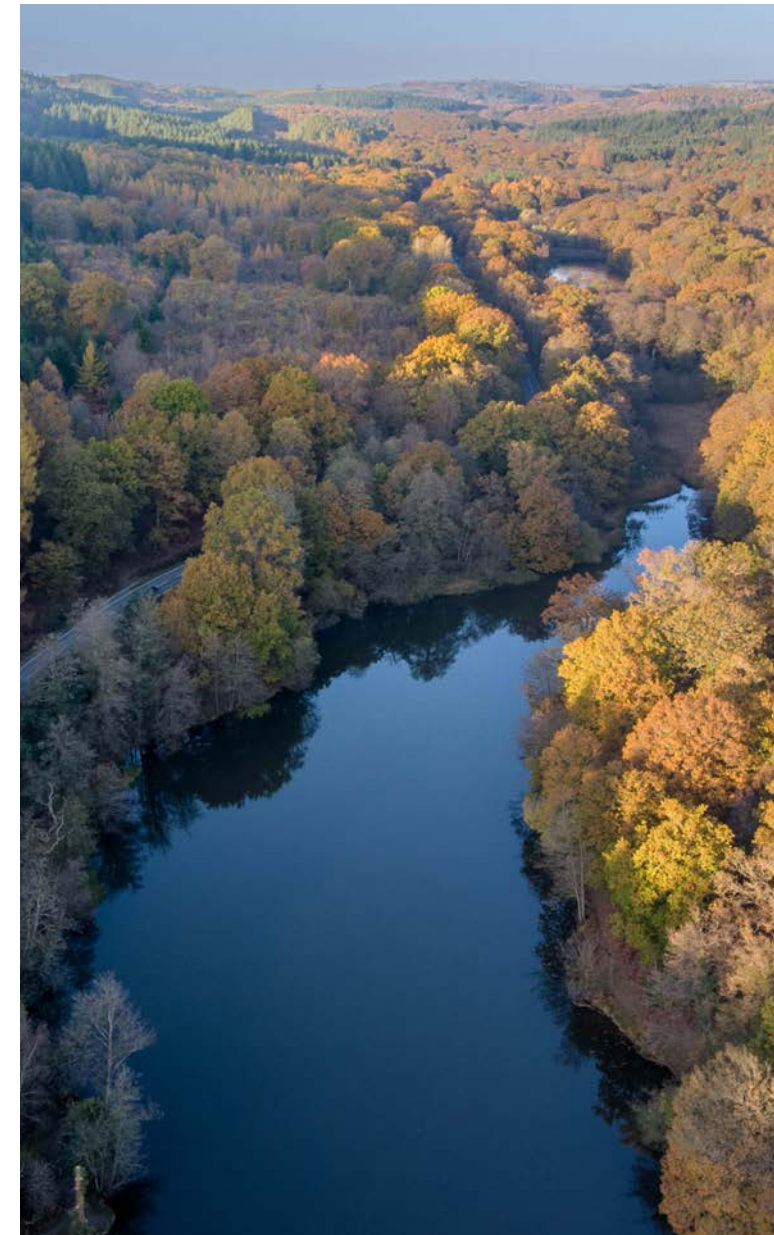
This whole project stems from the official status of Cannop Ponds as reservoirs under the Reservoirs Act (1975). Due to the Cannop Ponds being reservoirs, they are subject to periodic inspection by independent reservoir engineers. The ensuing findings have left us with the legal obligation to address the failings of the historic structures.

THE COST

There are cost implications to all potential avenues. Cost will not be the main driving factor behind any decision – either in an attempt to save money at the cost of choosing the best solution, or as a way of commercialising or generating further income. But we are a government body, partially funded by the taxpayer, and so it is our responsibility to ensure all avenues are explored to ensure we are doing the most responsible thing financially and for the future of the forest.

WHAT ARE WE STRIVING FOR?

As stewards of the Forest of Dean, it is the job of Forestry England to preserve the future of the Forest and address any threats it faces. When considering the appropriate course of action at Cannop Ponds, it's important to look at the implications well into the future. Firstly, because the requirement for maintaining the artificial structures in place at the reservoir will be an ongoing and potentially resource-intensive issue, and secondly, because the world and climate are changing at a pace that means the decisions we take now will have a profound effect on the Forest that will be experienced by future generations.





OUR SHARED FOREST

As part of our focus on the future of the Forest of Dean, we have spent the last few years developing the 'Our Shared Forest' land management plan. Published in 2019, Our Shared Forest sets out an agreed, understood and supported direction for what the Forest will look like, feel like and be like in 100 years' time. The purpose of the plan was to set a direction for how we manage the Forest going forward, taking into account a diversity of aspects from the woodlands and wildlife to water, geology and cultural and built heritage, as well as how it is used by the community and for recreation.

There are two fundamental philosophies at the heart of Our Shared Forest:

- 1. To be guided by the natural potential of the land;**
- 2. To act in accordance with the varied influences of our ever-changing world.**

Specific to the management of Forest water, a number of commitments are detailed in the plan. These include:

- “Enhance connectivity and functionality of watercourses”;
- “Naturalise water channels by creating natural structures to build habitat diversity”;
- “Remove non-functional artificial barriers that restrict the movement of water and fish”;
- “Create habitat to reduce volumes of water flowing down and out of the Forest in storm conditions”.

These pre-existing commitments further reinforce the case for Cannop Ponds to be returned to its natural state in the valley.



SHORT-TERMISM VS. LONG-TERMISM

Irrespective of which route is taken at Cannop Ponds, the short-term impact will be significant because the reservoirs will need to be drained for the works to be undertaken. There is no 'leave the Ponds as they are' option. However, the guiding principles of Our Shared Forest will help to determine what's right for the Forest, its habitats and its climate resilience in the long-term. This is not necessarily what's easy or what's been done before, but what will – in 25, 50, or 100 years – ensure a healthy Forest for people, wildlife and the climate.

This fresh approach to forestry is already reaping rewards in the Dean with programmes such as the reintroduction of beavers as a natural solution to managing water flow, a more sensitive approach to groundworks during nesting seasons, and the introduction of pine martens to control the grey squirrel population and protect veteran and new tree growth.

Cannop Ponds presents an opportunity to redress a previous intervention and reinstate an invaluable wild ecosystem that could become an intrinsic part of the Forest's rich mosaic of habitats – a global example of Forestry that's more in tune with nature and our planet.

CLIMATE RESILIENCE

As our climate changes and extreme weather events become a more common feature in news and life, serious flooding has become an issue we can no longer compartmentalise as freak occurrences; it is now a fact of life for low lying areas, with devastating consequences.

As a category 'B' reservoir, Upper Cannop is required to withstand a 1 in 1,000-year flood and pass a safety check for a 1 in 10,000-year flood. As a category 'C' reservoir, Lower Cannop is required to withstand a 1 in 150-year flood and pass a safety check for a 1 in 1,000-year event. The reason Upper Cannop has a higher classification is because, if it fails, it poses a terminal risk to Lower Cannop, which would be overwhelmed by the downstream deluge. This in turn would result in devastating flooding to the downstream communities of Parkend, Whitecroft and Lydney. This cannot be allowed to happen.

With concerns raised over the resilience of the reservoirs at Cannop, we commissioned flood studies for both Lower and Upper Cannop. The studies use modelling to calculate the flows expected in different scenarios. The studies concluded that neither reservoir could reliably pass even the minimum requirement of a 1 in 150-year storm. In addition to this, they also highlighted the very low level of storm attenuation provided by the two reservoirs in their current form. Storm water attenuation refers to the degree that a water body can ‘hold water back’ during a storm event so as to reduce the risk or magnitude of a downstream flood.

Neither dam was designed or built with flood mitigation in mind. They were built around 200 years ago to provide a reliable supply of water to Parkend Ironworks. Whilst repairs and modifications have been carried out over the decades to prolong the life of the dams, both structures should be viewed as approaching the end of their designed lives.

This need for climate resilience isn’t just about futureproofing ourselves from some intangible event; the effects

of climate change are being felt now. Whether it be as a solution to drought or extreme prolonged rainfall, our reservoirs need to be better equipped to cope with the current and future challenges we face. This isn’t to say the reservoirs couldn’t be made more resilient, it’s just that the structures that would have to replace the existing ones would be far more intrusive, with a far greater footprint, and with far fewer of the knock-on biodiversity benefits of the alternative options being considered.

Just choosing an option that even partially renaturalises the site at Cannop would undoubtedly unlock many of the benefits of working with natural processes. Not only do these options potentially permit greater volumes of storm water attenuation using naturally forming areas of marsh, wet woodland, off-line pools and woody debris dams, but wetlands are proven to naturally absorb and store vast amounts of carbon, acting as our planet’s greatest form of carbon capture. Restoring these natural processes presents very real ecological and biodiversity benefits.



NATIVE AND INVASIVE SPECIES

The UK's rivers, canals, lakes and ponds are under attack. Non-native plants and aquatic species have found their way into our waterways via agricultural use, for ornamental purposes, through water supply transfers, and in the case of Cannop Ponds – like many others – partially as a result of being artificially stocked for angling purposes. These Invasive Non-Native Species (INNS) pose a significant threat to native wildlife through increased predation pressure, introduction and spread of pathogens, and the loss of genetic integrity through hybridisation.

But it's about more than just the fish stocks. Cannop Ponds is also experiencing the pressures associated with the arrival of alien species such as the zebra mussel and North American signal crayfish, which carry the deadly crayfish plague that has already contributed to a 70% decline in our native white-clawed crayfish since the 1970s.

Reversing the damage being done by non-native aquatic species certainly isn't something that will happen overnight, but there are things we can do to give nature a helping hand. By removing invasive non-native species where we find them, and



reconnecting the flow of water blocked by the existing barriers, we can encourage a much healthier water source and free the flow of native aquatic species. It's an opportunity to improve the ecosystem and help our native species thrive.

BIODIVERSITY AND WILDLIFE

It's our ambition that our nation's forests become more joined up. Large bodies of water can interrupt this. By reinstating a natural watercourse in a wetland landscape, we will be working with nature to improve biodiversity by creating vital corridors for aquatic and surface-dwelling wildlife.

Wetlands are one of the world's most biodiverse habitats. They provide homes for many endangered species, offer a lifeline for freshwater species and act as vital habitat for millions of reed-nesting and migratory birds.

Regenerating and rewilding Cannop Ponds will not only redress previous human interventions, but also has the potential to repair some of the impact we have on the ecosystem in the present. Wetlands can remove up to 60% of metals and up to 90% of nitrogen in water, purifying it so life can thrive again.

WETLAND AND RIVERINE HABITATS



Wetlands are a sadly dwindling habitat that can bring numerous benefits if reintroduced. Not only do they provide a unique draw for nature, but they are also effective carbon sinks for the climate and efficient water traps for extreme weather events such as flooding and drought. The option of restoring the pre-existing stream system at Cannop would aim to reinstate naturally-functioning freshwater and wetland ecosystems that create

opportunities for vastly improved habitat provision and species presence, thus providing a nature-based solution to tackle the decline of the natural environment.

This approach is in line with building more ecological resilience into the way nature is conserved, restoring the multiple services that flow from naturally functioning ecosystems, and adapting to climate change.

Wetlands can remove up to 60% of metals and up to 90% of nitrogen in water, purifying it so life can thrive again.

CASE STUDIES

The idea of reintroducing natural watercourses and wetlands through dam and weir removal is not a new one. The ecological, environmental, and fiscal benefits associated with dam removal are far from theoretical at this point – with many nations and groups such as Dam Removal Europe already demonstrating how dam removal has become a more realistic, viable, and beneficial approach to river restoration. Currently, more dams are being removed in North America and Western Europe than are being built.

Case studies across the UK and the rest of Europe can be found here <https://damremoval.eu/case-studies>



Top left: Ribble River, UK (credit Ribble Rivers Trust)

Top right: Barde River, Denmark (credit Jan Kamman)

Bottom: Llangolen Lower Weir, River Welsh Dee
(credit Cyfoeth Naturiol Cymru-Natural Resources
Wales, LIFEDeeRiver)

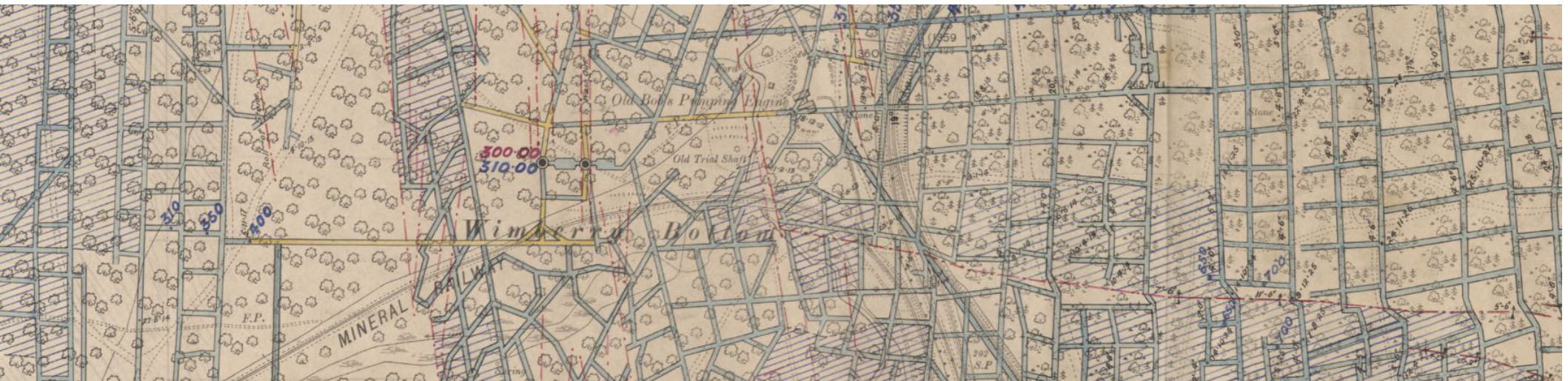


AESTHETICS

There's no escaping the fact that we are talking about the future of a picturesque part of the Forest, without having painted a picture of what could potentially take its place. It's possible that when people hear about the removal of the dams as a potential option, all they picture is a void with no intrinsic beauty. We aren't ignorant to the importance of undisturbed beauty as an essential part of what makes

the Forest. Many of us live and work in the Forest and have spent time at the Ponds ourselves. We have no desire to replace it with a soulless alternative, built solely for functionality. The irony is that, 200 years ago, functionality was the sole purpose of the Ponds we know today. We've seen the beauty a wilder, less visibly managed alternative can provide, which is why we are enthused by its potential.

When we've engaged the community on the cultural relevance of the Forest in the past, it has painted a picture of a melting pot of influences, but one word that comes up more than most is 'wild'. Which is why we've searched for options that could work to restoring the native wilderness, redressing the human interventions of the past, and creating a spot equal in beauty but providing so much more.



CULTURE, HISTORY AND HERITAGE

We recognise the Ponds represent a part of the last 200 years of the Forest's industrial heritage. However, the failing dam structures themselves are a significant part of this heritage. Whether the decision is taken to retain the reservoirs or not, some of this built heritage will have to be sacrificed in our legal obligation to make the dams safe. It's also important to consider that the options to remove the reservoirs could unveil much earlier stages of local heritage that are currently hidden.

Given the age of the reservoirs, in relation to the working history of the Forest, the dams themselves represent a fairly contemporary view of what the Forest has been witness to. If an alternative future was pursued and the reservoirs removed, we'd expect to see an array of surprising artefacts cataloguing the Forest's past. Salvaging these findings will be an invaluable boon to our cultural heritage. Working with Worcestershire Archaeology Group, we would look to capture these hidden treasures to further deepen our understanding of the Forest's rich cultural history.

Whether the decision is taken to retain the reservoirs or not, some of this built heritage will have to be sacrificed in our legal obligation to make the dams safe.



TESTING, SURVEYS AND TECHNICAL STAKEHOLDER CONSULTATION

During Autumn 2022, Forestry England began working with design engineering consultants, Arup, to talk with professional stakeholders and industry experts. This will look at whether the **'renaturalise'** options are viable and supported by the evidence, or whether the **'repair and replace'** option, or an alternative **'intermediate'** option would deliver a more optimal solution.

Arup has been employed by Forestry England to provide advice and undertake certain specific technical tasks. Arup's team is leading a significant programme of technical and scientific surveys, research

and testing during Autumn of 2022 and extending into early 2023.

The range of works covers geotechnical and geo-environmental surveys, river channel surveys and an array of ecology surveys covering animal, bird and aquatic life.

The results of these surveys and consultations will inform our work in exploring the potential routes and help ensure we reach an option that leaves the community, the Forest and the future of Cannop in a better position than we find it.

PUBLIC ENGAGEMENT

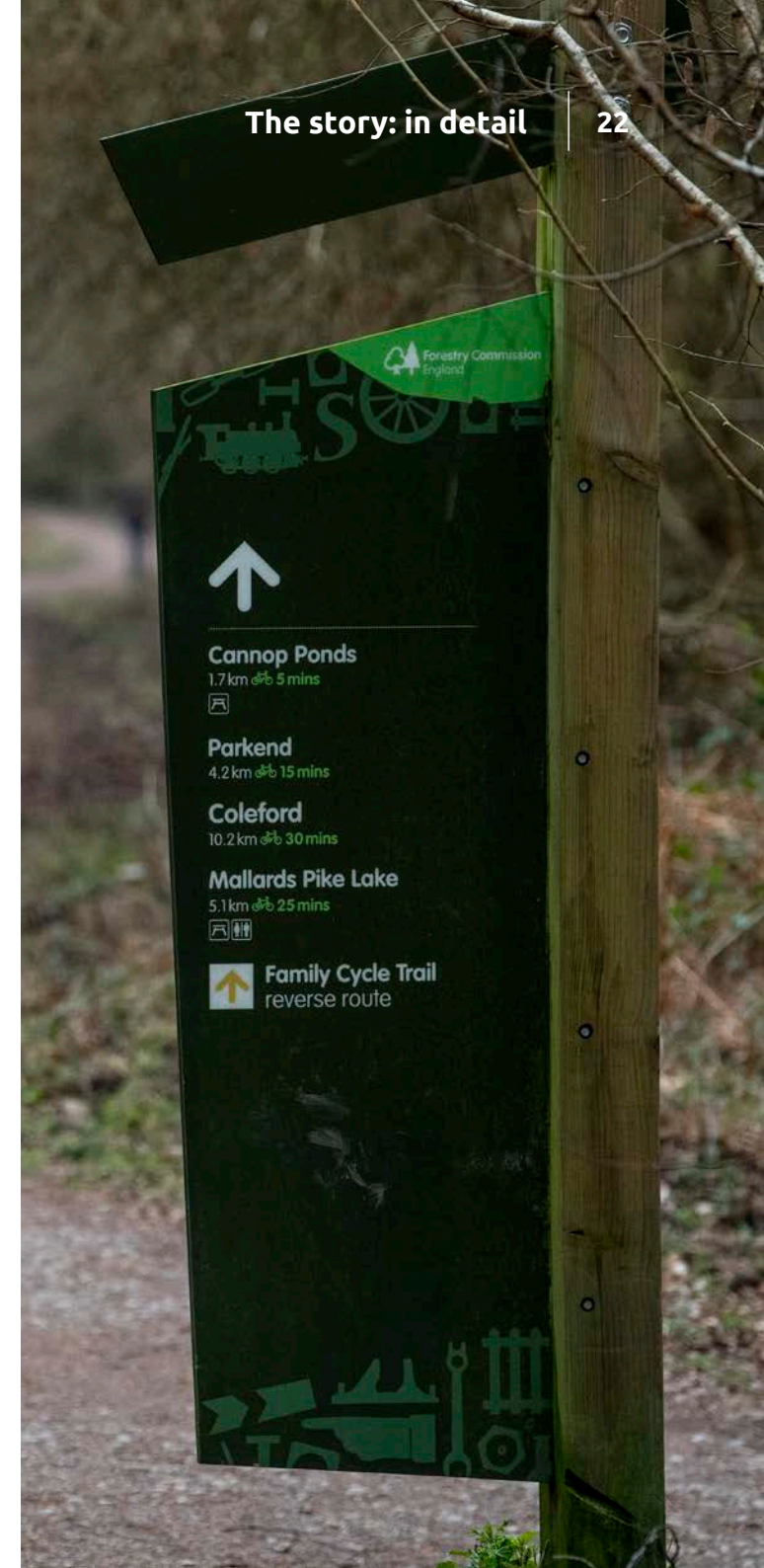
At the heart of our plans is a desire to connect people to nature, and maximise the benefits of woods and forests for people of all ages, abilities and backgrounds. Whilst any decision we take is likely to be controversial, as no option is without change to what people know and love, we will aim to keep people involved, informed and aware. We will remain open to listening and hearing everyone's views.

There will be numerous opportunities for the public to engage with us as the story evolves, and we will continue to update people with the results of surveys and dates as and when they happen.

WHAT WE KNOW FOR SURE

Although there continues to be a great many unknowns, as we wait for analysis of surveys and modelling, there are a few certainties we do know that could help mitigate some speculation.

- 1. There isn't legally or in good conscience an option to do nothing. As it stands, the dams at Cannop Ponds are not safe, even just making them good will require change.**
- 2. Public access – although significantly disrupted during whichever works are decided upon – will be open for the future of Cannop. No option is under consideration that would restrict the public from the site, in fact we would hope wherever possible to improve access for all.**
- 3. Even repairing and replacing what exists – in line with modern reservoir/dam requirements – will require the reservoirs to be drained, a significant period of disruption, and not an insignificant amount of change to the existing site.**
- 4. Any alternative option will have to provide at least equivalent, or superior benefits to community access, flood management, drought resilience and biodiversity.**
- 5. No option is being considered to provide an additional commercial benefit or alternative income stream for Forestry England.**
- 6. There is no intention to change the usage of the site and turn it into a road, car parking, housing, etc. The intention is to keep and enhance the space as a beautiful place for people to connect with nature.**



PROJECT TIMINGS

Due to the complex nature of the project it is impossible to provide concrete timings from here to completion of the works, but the current projected timeline is as follows:

Q1 2023: Public engagement events will be held to present the options, share the information and insight that is available at the time and answer questions.

Spring 2023: The programme of surveys and testing will be completed and results analysed. From this, Forestry England will develop a preferred course of action based on the findings.

Autumn 2023: The preferred course of action will be fully scoped and a Planning Application submitted (this will be required irrespective of which course of action is decided upon – from repair and replace through to complete renaturalisation). Details of the preferred option will be made available to the public and views will be received to help shape the final scheme.

Winter 2023 / Spring 2024: Ground investigations to take place to inform the decision making process.

Spring/Summer 2024: Engineering works to begin.

Project completion date will be subject to the works involved in delivering the agreed scheme.



FREQUENTLY ASKED QUESTIONS (FAQS)

At the early stages of any project (whether it be a sensitive community matter or not) it's a given that people will have questions. As is expected during the information gathering stage, we won't have all the answers, but we will endeavour to clear up any confusion and keep the conversation open wherever we can.

Many of the answers to these questions may have already been covered throughout this document, but it's worthwhile reiterating where needed.

Q. CANNOP PONDS ARE SURELY PONDS NOT RESERVOIRS?

A. Whilst commonly known as 'ponds', the Upper and Lower Cannop bodies of water have been created by damming Cannop Brook and collectively hold around 100,000m³ of water above 'normal' ground level.

As such, they are properly defined, registered and managed as reservoirs.

Many would ask 'what's in a name?', but the reality is what makes a body of water a pond, a lake, or a reservoir is pre-determined and, as such, certain rules and regulations apply. All reservoirs over 25,000m³ are required to be registered under the Reservoirs Act 1975.

Until recently, Upper Cannop was not registered as a separate entity under the Reservoirs Act 1975 but as part of Lower Cannop, as it was thought its stored water volume was below 25,000m³. In early 2022, depth surveys confirmed the stored water volume to be circa 28,000m³ and, therefore, it has subsequently been independently registered with the Environment Agency. This does not mean Upper Cannop was not managed or inspected prior to its registration, but that it is now subject to the specific legal requirements of the Reservoirs Act 1975.

Q. WHY ARE OPTIONS FOR THE FUTURE OF THE RESERVOIRS BEING CONSIDERED?

A. In accordance with the Reservoirs Act 1975, the dams are under the supervision of an external and independent engineer who undertakes annual visits and provides a written statement on works undertaken and required to maintain the reservoirs. This is nothing new, since the first inspection of Lower Cannop in November 1976, we have always closely monitored the water levels and invested in necessary maintenance and works to keep the dams and reservoirs compliant.

As a result of the latest inspection – an 'S10' inspection which is undertaken once every ten years, by an independent 'all-reservoirs panel engineer', who report to the Environment Agency – much more significant concerns, repairs, and replacements were identified. On the

realisation that what was required this time meant more than a significant cost, it meant draining the reservoirs and replacing some of the notable heritage features like the spillway with much more imposing modern alternatives – simply to make the site safe, with no additional environmental benefits – we felt it was our responsibility to explore further options.

Q. WHAT HAS BEEN DONE TO DATE?

A. In early 2021, the annual supervising engineer’s visit to Lower Cannop identified a small sink hole adjacent to the spillway at the top of the dam and raised other issues, such as the condition of the masonry retaining wall on the spillway. As a result, an early periodic (‘S10’) inspection was instructed and undertaken in May 2021.

The periodic inspection required several legally enforceable actions to be taken. These included:

- removing unauthorised modifications which had been made to the spillway;

- further investigation of the condition of the spillway;
- maintenance of the spillway;
- undertaking a new flood risk assessment;
- removal of trees to the left-hand side of the approach to the weir.

In addition, the report required a longer-term action to replace the spillway.

In autumn 2021, the short-term actions from the report were all completed.

Further investigation of the spillway identified that large voids (holes) had formed beneath it. These were repaired in the late summer of 2021 by pumping liquid concrete under the spillway slab. These are the latest repairs in a history of voiding within the dam over the past 50 years. Voiding within the Lower Cannop Dam had been identified and addressed in 1978, 1986, 1992-1995, 2003 and 2020, in addition to that observed and addressed in 2021.

In late 2021, a new flood study was completed. This showed that both

Upper and Lower Cannop reservoirs do not meet the standards for the flows of water during extreme rainfall events.

As a category ‘B’ reservoir, Upper Cannop is required to safely pass a 1 in 1,000-year rainfall event without any water flowing over the dam, and a 1 in 10,000-year event with only minor flows allowed. As a category ‘C’ reservoir, Lower Cannop is only required to safely pass a 1 in 150-year and 1 in 1,000-year event respectively. The reason Upper Cannop has a higher classification is because, if it fails, it poses a terminal risk to Lower Cannop, which would be overwhelmed by the downstream deluge.

The flood study for Upper Cannop shows that the spillway is too small and cannot accommodate the 1 in 1,000-year flood flow. Should a rainfall event of that magnitude occur, the dam will over-top and a catastrophic failure could result. This is a greater risk due to the uneven, earthen nature of the dam at Upper Cannop.

The position at Lower Cannop is less clear as the spillway considerations are

made more complicated by the volume of water that is diverted to the hydro-electric plant. However, the overall assessment is that Lower Cannop does not reliably contain the 1 in 150-year storm flow without risk of water flowing over the dam.

The original design of the reservoirs would never have anticipated the standards to which modern reservoirs are built. It is also very unlikely that the dams would have been designed with any particular calculation of likely storm flow and need to accommodate those flows.

The inadequacies of the two spillways could, ordinarily, be met by widening or installing supplementary spillways. However, this significant alteration of the existing idyll begs the question of whether there is a better alternative.

Q. WHY IS THIS BEING DONE NOW?

A. The issues identified in the last periodic inspection mean that, under the Reservoirs Act 1975, Forestry England has both a legal and a moral obligation to act, and we are given dates that actions have to be completed by.

The required changes to make the reservoirs safe for the future, in terms of their ability to retain the current volumes of water, plus the growing volumes predicted in light of our changing climate, would have a significant impact on the existing site:

- Increasing the spillway capacity by widening the existing, or more likely building new wider spillways;
- Raising the height and levelling of the dams so that, if over-topped, the water level is equally spread across the dam top and not focused into a low point;
- Buttressing and reinforcing their downslope faces;
- Rebuilding the structures to stop water ingress, and thus prevent voids from forming due to erosion;
- Draining the reservoirs to complete works.

Considering the potential scarring of a much-loved site, we are acting now to ensure we have the time to find a solution that leaves us in a better position than we find ourselves. It is our duty to look at all options for the future

of the reservoirs before committing substantial resources to developing and implementing a preferred solution.

We must ensure Cannop meets with current standards for public safety, but we'd like to do it in a way that brings as many benefits for the community and the future of the Forest as humanly possible.

Q. WHAT IS THE TIME FRAME FOR THIS PROJECT?

A. The original deadline for completion of the works required to address the issues identified with the reservoirs was November 2022. We have written to the Environment Agency requesting a formal extension, highlighting the significance of the works and the importance of finding the right solution for the community and the future of the Forest.

In the meantime, we have commissioned surveys, including those to document the wildlife and the heritage, and will be carrying out further flood modelling work. We are also talking to professional stakeholders to take on a wider range of professional views.

These will take time to complete and then the information will need to be analysed. We do not anticipate having sufficient information until spring 2023 to make a decision on a preferred way forward. A decision on the preferred way forward, and its associated Planning Application, is therefore not expected before autumn 2023.

Whichever option is taken forward for implementation will require various legal approvals, licences and consents. At this time the earliest start date for engineering work would be spring/summer 2024.

Q. WHAT OPTIONS ARE BEING CONSIDERED?

- A.** We are exploring numerous options (as detailed on page 10) in respect to both Lower and Upper Cannop Ponds. With multiple possibilities and variations across 'repair and replace' and 'renaturalise', or an 'intermediate' option that blends aspects of both, at this stage we are gathering data and opinions of experts to ensure that the ultimate decision is made for the right reasons.

Q. IS FORESTRY ENGLAND TRYING TO SAVE MONEY BY NOT REPAIRING THE DAM?

- A.** No. We are at the early stages of thinking about the future of Cannop Ponds and we do not have firm costs for any of the options. We do know, however, that all options will involve very significant costs.

We have always invested money into the maintenance of the structures at Cannop, because the ageing structures simply weren't designed and can't be expected to perform this long and with modern pressures in mind.

Forestry England is a public body and we must consider any expenditure carefully. It would be irresponsible and short-sighted to upgrade the existing dams without considering alternative options that might provide greater long-term benefits to the community and the future of Forest. We'd like to reassure everyone that, although it's our duty to be financially responsible, the future of Cannop Ponds isn't being decided with commercial benefits in mind.

Q. WHAT IS THE ENVIRONMENTAL BENEFIT OF THE EXISTING RESERVOIRS?

- A.** The picturesque, tranquil aesthetic of the reservoirs as they are might well paint the picture of a natural ecosystem, but what exists is far from the valley's natural state. The reservoirs represent man's historic disregard for natural processes in favour of rapid industrial development. Although the reservoirs have been a constant presence for 200 years, they are an industrial intervention that stopped the natural course of the river, and have since been artificially stocked with invasive, non-native species for their fishing value.

Beyond what we already know, it's important to gain a greater knowledge about the natural efficiencies and deficiencies of the site as it is. We will continue to commission further environmental surveys and water sampling to establish the range of species within the reservoirs and to assess their biodiversity value.

We would like Cannop valley to perform better for wildlife and particularly aquatic biodiversity, which is why restoring the stream and wetland system is being actively considered as an option. At this stage it is not possible to determine whether the restoration of the stream system will deliver the range of anticipated ecological benefits. Nor can we be sure that the Ponds aren't performing an essential role in support of other native species. This is why we have commissioned a range of further ecological surveys and assessments so we can reach an informed decision.

Q. HOW WOULD RESTORING CANNOP BROOK AFFECT BIODIVERSITY?

A. The option of restoring the existing stream system would aim to reinstate naturally functioning freshwater and wetland ecosystems. This promotes opportunities to re-naturalise both habitat provision and species presence, thus providing a nature-based solution to tackle the decline of the natural environment.

This approach is in line with building more ecological resilience into the way nature is conserved, restoring the multiple services that flow from naturally functioning ecosystems, and adapting to climate change.

As part of the decision-making process, any biodiversity gains of a potential stream restoration will be assessed against the value of the existing reservoirs to quantify the benefits that will be achieved.

Q. WHAT IMPACT WILL WORKS TO THE RESERVOIRS HAVE ON BATS?

A. Whichever option is progressed for the future of the reservoirs, the potential impacts and benefits for bats will be thoroughly assessed. We will engage with local bat groups and Natural England to ensure every opportunity is taken to maximise benefits for bats.

Q. WHAT WOULD BE THE IMPACT ON THE FISH IN CANNOP PONDS?

A. Yorkley Angling Club currently has rights to fish in the reservoirs. This lease came to an end on 31st December 2022 and Forestry England will work with the angling club to extend the lease as far as possible before works begin.

No angling will be possible during the works. Regardless of whether a decision is made to replace the dams and spillway or to remove them, the ponds will need to be either fully or partially drained to allow the work to be carried out. This is to ensure that works can be completed safely by reducing water pressures on the dams and to provide a buffer to prevent the work area being inundated with water from a storm event.

It is therefore likely that some or all the fish will need to be moved to another suitable location(s), following appropriate checks for fish health. Fish introduced to the reservoirs through fish stocking will likely not be suitable

for release into the water course below the dams as the stream is not sufficient to support the density, size and species of fish stocked in the reservoirs.

The exact details of how the fish will be managed during the works period will be developed by experts in the management and movement of aquatic wildlife and in collaboration with Yorkley Angling Club and the Environment Agency.

Q. CANNOP PONDS IS A WELL-LOVED FOCUS FOR VISITORS – WILL YOU BE RESTRICTING ACCESS?

A. Cannop Ponds is a popular destination accessed through well-used walking and cycling trails as well as a car park. Whichever option is pursued, providing a quality network of public paths so that people of all abilities can continue to enjoy this location into the future will be a key consideration.

The scale of this scheme gives us an opportunity to think about what we can provide to help people move around the area, sit and relax, and connect with nature and the industrial heritage

of the forest. However, exactly what is provided, and where, will be dependent on which option is taken forward.

Whichever option is pursued, the scale of the engineering works will be very significant, so, during the works, there will inevitably be a lengthy period where some paths are closed or diverted to allow the construction work to be undertaken safely.

Q. WHAT IS THE HERITAGE VALUE OF THE EXISTING RESERVOIRS? IF THE VALLEY IS RESTORED, WHAT WILL THE IMPACT BE?

A. The reservoirs are part of the industrial heritage of the Forest of Dean. That is why we commissioned a heritage impact assessment to look at their value and the impacts of any potential options for the reservoirs, and will make sure we take responsible actions based on specialist advice. The heritage value of the reservoirs, and especially the structures such as the spillways, would be affected significantly by the 'repair and replace' option, so it's important we understand the impact on these elements for all options.

We also recognise that landscapes do not stand still and must evolve – as the people building the dams on top of pre-existing industrial heritage of the area did. Restoring the valley would provide a unique opportunity to tell a deeper story of the rich industrial heritage of the area and how this has evolved over time. We would seek to do this through retention and preservation of important features of the reservoirs and through the provision of high-quality interpretation with the help of experts.

Q. IS FORESTRY ENGLAND CONSIDERING A SIMILAR APPROACH AT OTHER WATER BODIES IN THE FOREST OF DEAN?

A. No. Each lake and dam structure is inspected, assessed and maintained on its own merits.

Mallards Pike Lake was built relatively recently, and, as such, we know how it was constructed and have continuing confidence in its design. The spillway was damaged in recent flood events and has been repaired. We may need to carry out further repairs, and potentially

some re-sizing work on the spillway, to safeguard it for the future, but, no, we don't envisage any significant problems with this dam structure.

Woorgreens Lake makes use of a shallow depression, and thus the amount of water impounded by the low dam is relatively limited, and its (unlikely) breach will not cause any significant issues. In a similar way, any breach of the shallow dam at Speech House Lake will cause a peak flow that will dissipate before it reaches Mallards Pike Lake.

Q. WILL YOU BE PUBLISHING THE RESERVOIR ENGINEER'S REPORT?

A. Forestry England is a public body and, as such, is bound by the 'National Protocol for the Handling, Transmission and Storage of Reservoir Information and Flood Maps'. This protocol restricts the information relating to reservoirs that can be published. However, we have endeavoured to share the information from the independent reports that sets out why it is necessary to act (as detailed

in the 'What has been done to date?' section on page 25).

Q. WILL THE PUBLIC GET A CHANCE TO FEED BACK THEIR VIEWS?

A. Forestry England has an obligation to address the shortcomings identified in the design and capacities of the Lower and Upper Cannop dams under the Reservoirs Act 1975. Accordingly, we are looking at the feasible options available with a range of professional and technical consultants and consultees.

We have sought to ensure the community is made aware of the very significant issues that are impacting Cannop Ponds. Going public at this early stage, without all the answers, was a conscious decision on our part to keep the future of Cannop Ponds an open and frank discussion. We know what it means to people, and that getting this right for the community and for the future of the Forest is of the utmost importance.

We will be holding public engagement events, where we will be able to share more information and insight based on the results of the surveys and stakeholder and expert engagement. We are still organising these events but expect them to take place in the first half of 2023 and will share details with the public in due course.

We are listening to what people are saying as we consider the future. The key point is that doing nothing is not an option as at some point the dams will fail, and that is not an eventuality that can be allowed to occur.



forestryengland.uk/article/the-future-cannop-ponds