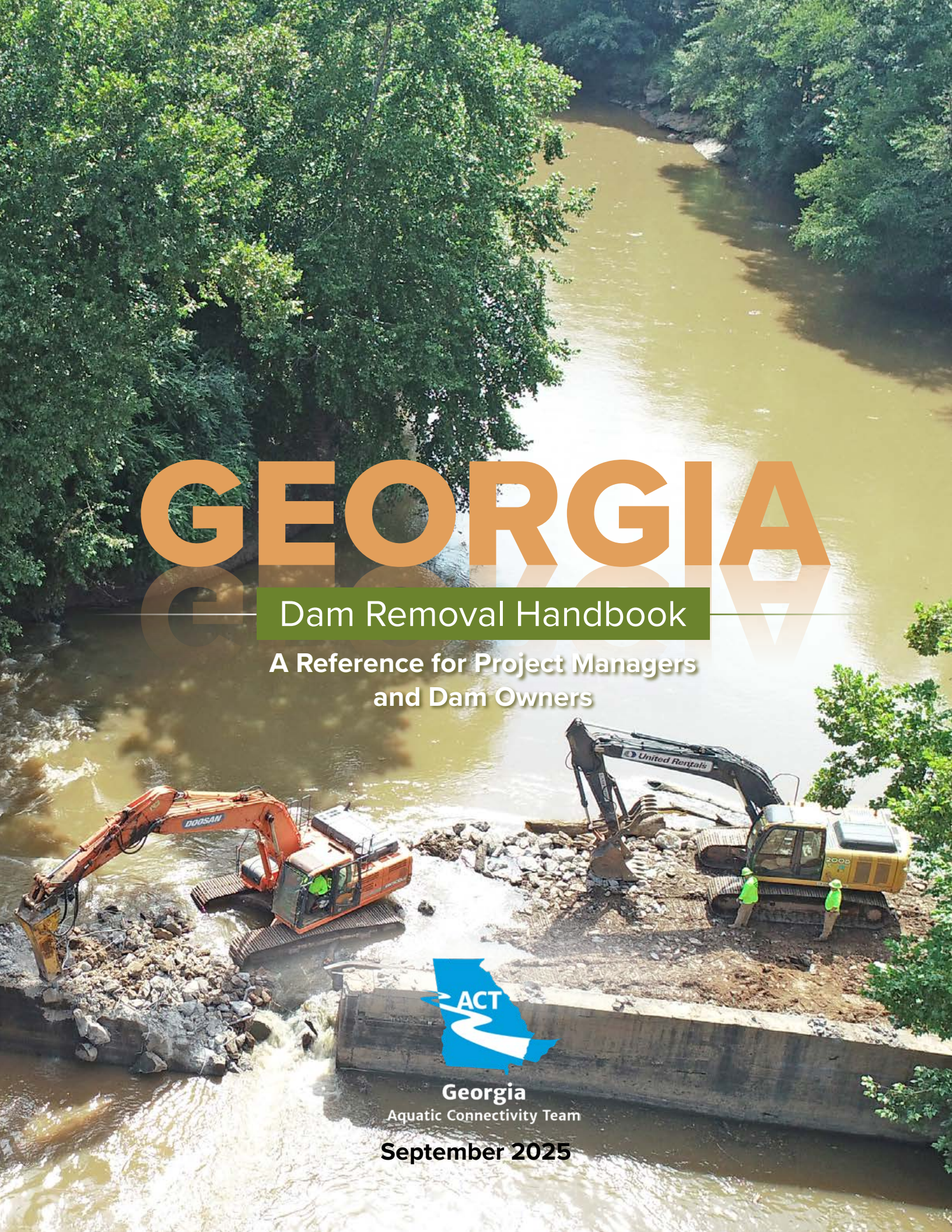

GEORGIA

Dam Removal Handbook

A Reference for Project Managers and Dam Owners

ACT

Georgia
Aquatic Connectivity Team

September 2025

CONTENTS

Cover:
Removal of the White Dam by the USFWS Aquatic Habitat Restoration Team, National Fish Passage Program, Middle Oconee River, Georgia.
Credit: Dr. Roger (Tripp) Lowe, UGA.

ACKNOWLEDGEMENTS

The Georgia Aquatic Connectivity Team (GA ACT) was created in 2015 to bring together a wide range of partners to support removal of obsolete dams across the State. This Handbook, which captures lessons learned from the removal of White Dam in 2018, and other projects, was coordinated by the GA ACT in collaboration with multiple state and federal resource and regulatory agencies, conservation organizations, academics and dam owners. For information on the GA ACT and for continuing updates on dam removal in Georgia, please visit ga-act.org.

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GEORGIA

Dam Removal Handbook

A Reference for Project Managers and Dam Owners

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Houston Mill Dam. / Credit: Alan Cressler.

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LIST OF ACRONYMS

Corps	United States Army Corps of Engineers
CWA	Clean Water Act
EPA	United States Environmental Protection Agency
ESA	Endangered Species Act
FEMA	Federal Emergency Management Agency
FPA	Federal Power Act
GA ACT	Georgia Aquatic Connectivity Team
GA CRD	Georgia Coastal Resources Division
GA DNR	Georgia Department of Natural Resources
GA EPD	Georgia Environmental Protection Division
GA SDP	Georgia Safe Dams Program
GA SHPO	Georgia State Historic Preservation Office
GDOT	Georgia Department of Transportation
GNIS	Geographic Names Information System
HUC	Hydrologic Unit Code
IPaC	Information for Planning and Consultation
NHPA	National Historic Preservation Act
NRCS	Natural Resources Conservation Service
NID	National Inventory of Dams
NMFS	National Marine Fisheries Service
NWP	Nationwide Permit
PCN	Pre-construction Notification
SARP	Southeast Aquatic Resource Partnership
T&E	Threatened & Endangered
TNC	The Nature Conservancy
UGA	University of Georgia
US FWS	United States Fish and Wildlife Service
USGS	United States Geological Survey

Why Remove Obsolete Dams in Ge

Obsolete dam removal offers many benefits for dam owners, communities, state and local economies, anglers, recreationists, wildlife populations, and the environment. Removing dams can improve:

- **Maintenance costs:** Dam owners may find the cost of removing a dam significantly lower than the cost of maintaining or repairing an aging structure that has outlasted its usefulness.
- **Dam Failure Prevention:** Storm events may place extreme burdens on aging dams causing them to fail. Safely planning and removing obsolete dams eliminates the risk of dam failure, potential impacts to populations and properties downstream during storm events, and the associated liability for dam owners.
- **Public safety:** Each year, fatalities result when swimmers, kayakers, canoers or anglers get trapped in the hydraulics below low-head dams. Removing obsolete dams permanently eliminates this danger and, potentially, the associated liability for the dam owner.

- **Fish populations:** Dam removal can help restore Georgia's once thriving migratory fish runs that were a significant contributor to the cultural landscape and heritage of Native Americans and early settlers of the state. Shad, sturgeon, striped bass and many other species have been shown to quickly return to spawning grounds once barriers are removed, restoring lost cultural traditions and improving sport fishing opportunities.

- **Recreation/Economic Benefits:** When dams come down, safe recreation can be established for water trails, parks, and greenways that support the local economy. According to the Outdoor Recreation Industry, in 2018 over $179 billion was spent on outdoor activities in the South Atlantic region of the United States alone, resulting in more than $10.6 billion in state and local tax revenues and more than 1.5 million jobs.

- **Water quality:** Restoring rivers and streams by removing dams can significantly improve water quality including reducing nutrient pollution, increasing dissolved oxygen, and restoring natural sediment transport regimes critical to support aquatic life.

- **Native Plant and Animal Species:** Many native aquatic and terrestrial species have adapted life cycles that are inextricably linked with the seasonality of free-flowing waters. For instance, removal of dams often restores habitat for species that formerly thrived in shoals (the shallow, fast-moving areas of water on bedrock or cobble) long ago flooded by impounded waters such as the beautiful shoal spider lily. (See Insert: Did you know? Georgia Shoals.) [1] [2]

- **Coastal Zone Benefits:** Coastal erosion can increase when river sediment is held behind dams. Restoring sediment to the coastal zone by removing dams may help to reverse deficits to coastal areas and create land building, thereby making coastlines more resilient to a changing climate.[3]

orgia?

If you are a dam owner interested in removing your dam or would like more information on dam removal, please contact the GA ACT through the Contact link on the GA ACT Main Webpage. https://ga-act.org/contact/

Please also contact the GA ACT if you:

- **Know of a dam that would be a good candidate for removal.**
- **Would like more information on how to become a Project Manager.**
- **Know of a dam that is not included in the databases referenced below.**
- **Would like to join and participate in the GA ACT.**

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[1] Manganiello, Christopher J. (2014) Fish Tales and the Conservation State. Southern Cultures, Volume 20, Number 3, Fall 2014, pp. 43-62. The University of North Carolina Press SOI: 10.1353/scu.2014.0030.

[2] Marcinek, Paula; Gagnon, Paula Johnson; Freeman, Mary C.; Straight, Carrie; Merrill, Michael D.; and Freeman, Byron J. (2005) Ecological Importance and Conservation Status of Southeastern River Shoal Habitat. A report submitted to U.S. Fish and Wildlife Service Agreement 1448-40181-00-G-087

[3] Warrick, J.A., Stevens, A.W., Miller, I.M. et al. World's largest dam removal reverses coastal erosion. Sci Rep 9, 13968 (2019). https://doi.org/10.1038/s41598-019-50387-7

Shoals Spiderlily. / Credit: Alan Cressler.

GEORGIA SHOALS

Flat Shoals Road, Hurricane Shoals Road, Cochran Shoals Park, Shoal Creek Park, Flat Shoals Elementary School, and the town of **North High Shoals** are among the dozens of roads, towns, parks, and buildings named after this river feature in Georgia. The ubiquitous use of the term may reflect the economic and cultural importance of this river feature to the early settlers and Native Americans before the era of dam building in the 20th century. Shallow, rocky shoals provided richly oxygenated water producing an abundance of fish and productive habitat for many aquatic species, including mussels indigenous to Georgia, the beautifully flowering Shoals Spiderlily (shown left), and the aptly named Shoal Bass. Restoration of rivers through removal of obsolete dams may restore shoal habitat and encourage restoration of these species and river features, which are important both historically and economically to Georgia.

Purpose of the Handbook / Introduction

Dams provide many useful functions across the country, including generating hydropower, supplying drinking water, and providing recreation. However, removing or modifying obsolete dams – those that no longer serve any purpose – has emerged as a viable means of restoring connectivity for aquatic life in rivers and streams, enabling safe passage for river and stream recreation, and providing dam owners with a cost-effective option for addressing unsafe, aging infrastructure. According to American Rivers' database on dam removals[4] and the 2024 Rivers Report[5], a total of 2,240 dams have been removed in the United States since 2012. In 2024 alone, 108 dams were removed, reconnecting 2,528+ upstream miles. This ties the record for the highest number of dams removed in a single year. According to American Rivers 2024 Report, "(o)f the 108 dams removed in 2024, more than 43 percent were motivated by safety concerns, liability concerns or economic considerations. It is one of the reasons why the continued investment of public funding in removing outdated dam infrastructure is so important."[6]

[4] American Rivers. 2025. Raw Dataset— ARDamRemovalList_figshare_Feb2025. Figshare. Retrieved: March 4, 2025

[5] American Rivers. American Rivers Report: 2024 Tied for Most Ever Dams Removed in US, Underscoring Momentum for River Restoration (2025) Retrieved from: https://www.americanrivers.org/media-item/american-rivers-report-2024-tied-for-most-ever-dams-removed-in-us-underscoring-momentum-for-river-restoration/

[6] Ibid.

The purpose of the ***Georgia Dam Removal Handbook (Handbook)*** is to provide dam owners and project managers in Georgia with the information and resources needed to undertake a dam removal or modification[7] project. All such projects have unique aspects and varying complexities, depending on the primary factors driving project initiation and permitting – whether it be restoration of aquatic life or water quality, improvement of public safety or cost reductions, and/or the protection of endangered species or historic or cultural sites. While many excellent sources of information on dam removal are available, this *Handbook* is specifically intended to address information gathering and the regulatory permitting process in Georgia. It provides direct links to the most-up-to-date information on relevant State and federal resources and regulatory agencies.

This *Handbook* includes a six-step approach to dam removal, encompassing information gathering, permitting, design, and removal. Project managers and dam owners should note that moving from conception and planning to actual removal of a dam may not be a linear process. Each of the steps may proceed at different speeds, with many occurring at the same time or in different order.

Dam removal is still a relatively new form of aquatic restoration in Georgia, and consultants and engineers may not be familiar with the logistical challenges. Successful implementation of these projects calls for close connections among the regulatory agencies, the contractor hired to remove the structure, and the consulting team designing the project. Such collaboration will help to ensure that what is "on paper" can be implemented on the ground and in the water, giving appropriate consideration to human safety, habitat issues, cost and timing.

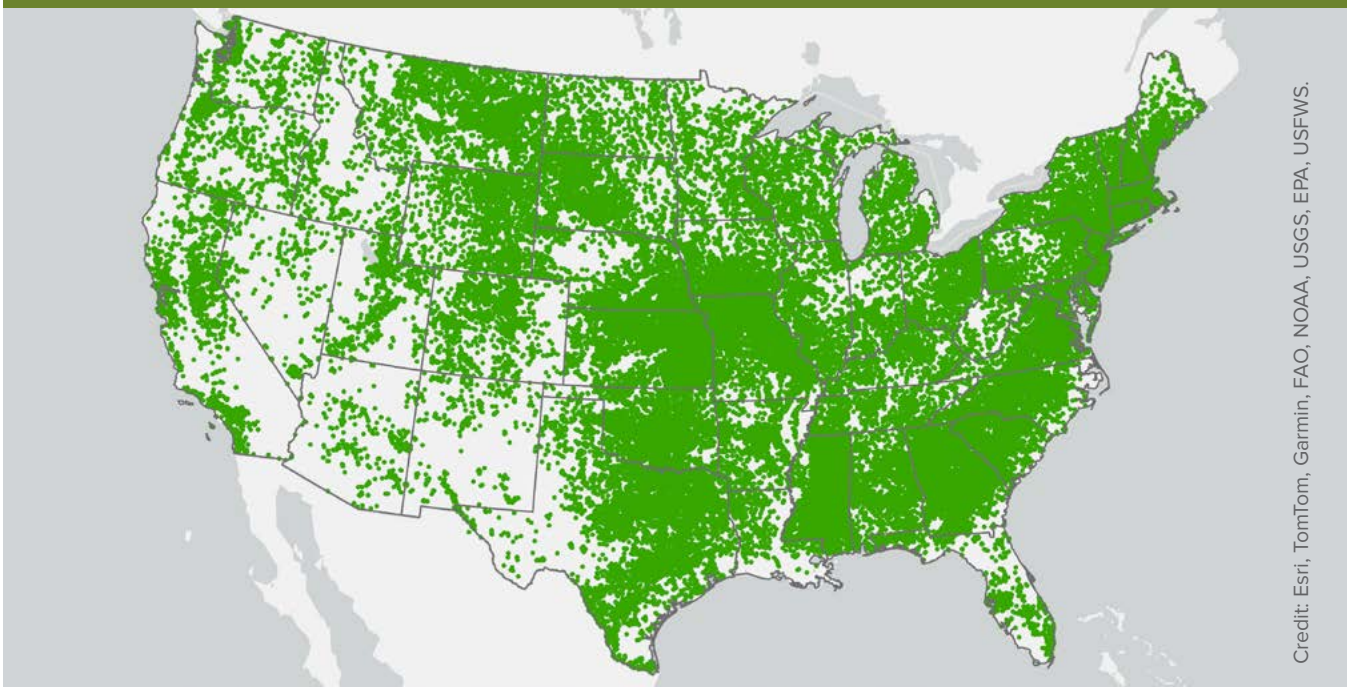
There are ample opportunities to remove dams that no longer serve a purpose and restore free flowing waters in the U.S. and in Georgia. Over 92,000 large and hazardous dams are identified in the U.S. Army Corps of Engineers' (Corps) National Inventory of Dams (NID) (see Figure 1).[8] [9] However, this list does not include

[7] Modification may include removing a portion of the dam but not the entire dam.

[8] The NID includes dams meeting one of the following criteria: 1) High hazard potential classification - loss of human life is likely if the dam fails, 2) Significant hazard potential classification - no probable loss of human life but can cause economic loss, environmental damage, disruption of lifeline facilities, or impact other concerns, 3) Equal or exceed 25 feet in height and exceed 15 acre-feet in storage, 4) Equal or exceed 50 acre-feet storage and exceed 6 feet in height.

[9] National Inventory of Dams. https://nid.sec.usace.army.mil/#/ Accessed 03/04/2025

Figure 1: The Army Corps of Engineers has identified 92,375 large dams in the National Inventory of Dams. Of those, only 3% have the ability to produce hydropower.

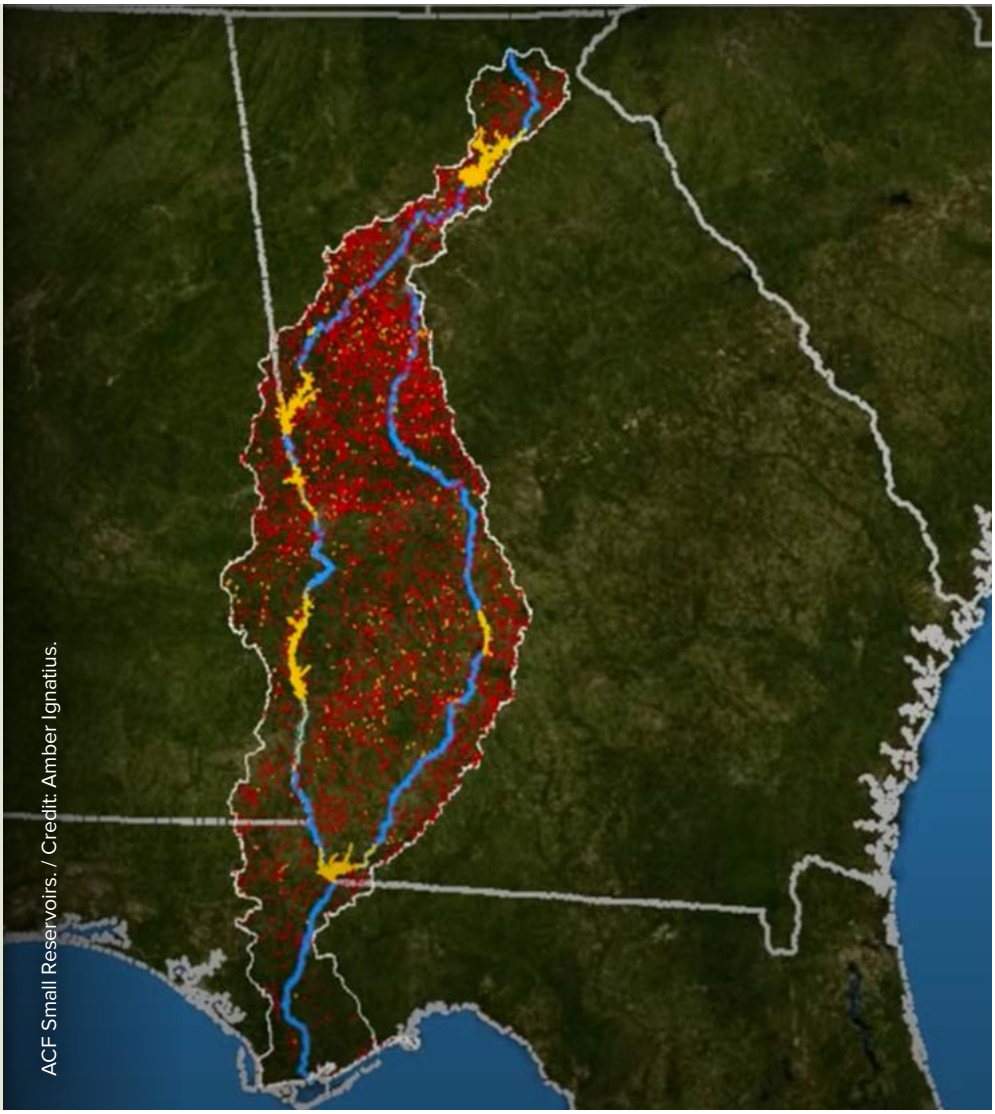


small and medium sized dams, defined as those that do not meet the requirements under the NID or State Dam Safety programs. These smaller dams do not fall under any regulatory program and are not included in any formal tracking system. The number of these dams is estimated to range from 2,000,000 to as many as 2,500,000 nationwide.[11] So far, the Southeast Aquatic Resources Partnership (SARP) has identified over 500,000 of these small dams within its National Aquatic Barrier Inventory.[12] Many of these smaller dams, such as those built to support the early mill economy, may no longer serve a functional purpose and thus are considered obsolete.[13] [14]

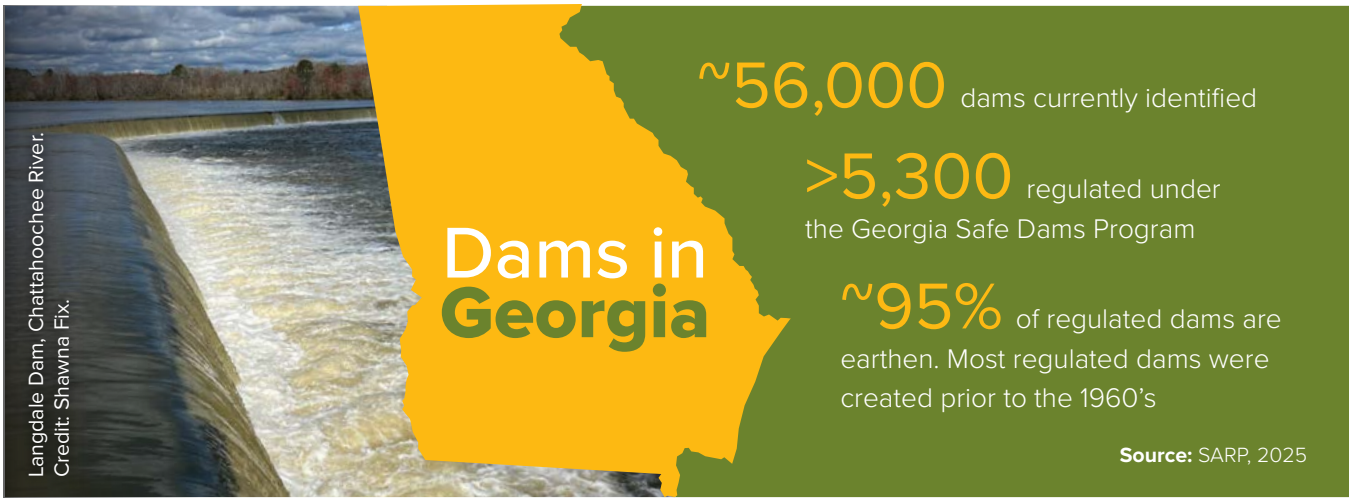
Since 2010, SARP, researchers, and other conservation practitioners, have worked to identify dams within the Southeastern United States that do not meet the criteria to be included in the NID. (See Insert: Identifying Small & Medium Dams).[15] While the total number of dams in the Southeast is not known, over 348,000 dams have been identified within SARP's Comprehensive Southeast Aquatic Barrier Inventory. Of those, approximately 16 percent (or over 56,000) are in Georgia. Only a small fraction of these meet the definition to be regulated under the Georgia Safe Dams Program.[16] As outlined in Step 3 of this *Handbook*, to qualify as a regulated dam under this program, a dam must be 25 feet in height and/or impound 100-acre feet of water. Around 5,300 dams in the State fall into that category. Over 95 percent of those regulated dams were constructed of earthen material. For regulated dams with known construction dates, most were constructed in the 1960s. The remaining dams are unregulated by state or federal programs.

Identifying Small & Medium Dams

A remote sensing exercise identified 24,613 small, 736 medium and 13 large reservoirs in the Apalachicola-Chattahoochee-Flint river basin. Approximately 11,000 were dams on streams. Of those, only 1,129 meet the definition to be included in the Corps' National Inventory of Dams. (Ignatius & Stallins, 2011)



ACF Small Reservoirs. / Credit: Amber Ignatius.



In addition to the information provided in this Handbook, project managers and dam owners may find the following resources of value:

- American Rivers' Removing Small Dams, A Basic Guide for Project Managers[17] provides general information for project managers including project management and design, information on potential funding sources, and recommendations on community involvement.

- The Environmental Protection Agency's Frequently Asked Questions on Removal of Obsolete Dams[18] provides information on water quality, Clean Water Act (CWA) permitting requirements, and EPA-related funding sources.

- A wide variety of other state-specific guides or State dam removal webpages also provide valuable information including North Carolina,[19] South Carolina,[20] Massachusetts,[21] and Vermont.[22] ■

[11] Poff, N.L., and Hart, D.D., (2002), How dams vary and why it matters for the emerging science of dam removal: BioScience, v. 52, no. 8, p. 659–668. [Also available at https://academic.oup.com/bioscience/article-abstract/52/8/659/254886?redirectedFrom=fulltext

[12] National Aquatic Barrier Inventory: __

[13] Graf WL. 1993. Landscapes, commodities, and ecosystems: The relationship between policy and science for American rivers. Pages 11–42 in Water Science and Technology Board, National Research Council. Sustaining Our Water Resources. Washington (DC): National Academy Press

[14] U.S. Environmental Protection Agency. (2016). Frequently Asked Questions on Removal of Obsolete Dams. Retrieved from https://www.epa.gov/cwa-404/frequent-questions-removal-obsolete-dams

[15] Ignatius, A., & Stallins, J. (2011). Assessing Spatial Hydrological Data Integration to Characterize Geographic Trends in Small Reservoirs in the Apalachicola-Chattahoochee-Flint River Basin. Southeastern Geographer, 51(3), 371-393. www.jstor.org/stable/26228966

[16] Georgia Safe Dams Program: https://epd.georgia.gov/watershed-protection-branch/safe-dams-program

[17] American Rivers (2015) Removing Small Dams. A Basic Guide for Project Managers. https://s3.amazonaws.com/american-rivers-website/wp-content/uploads/2016/05/24144210/

[18] EPA (2016) Frequently Asked Questions on Removal of Obsolete Dams. https://www.epa.gov/sites/default/files/2016-12/

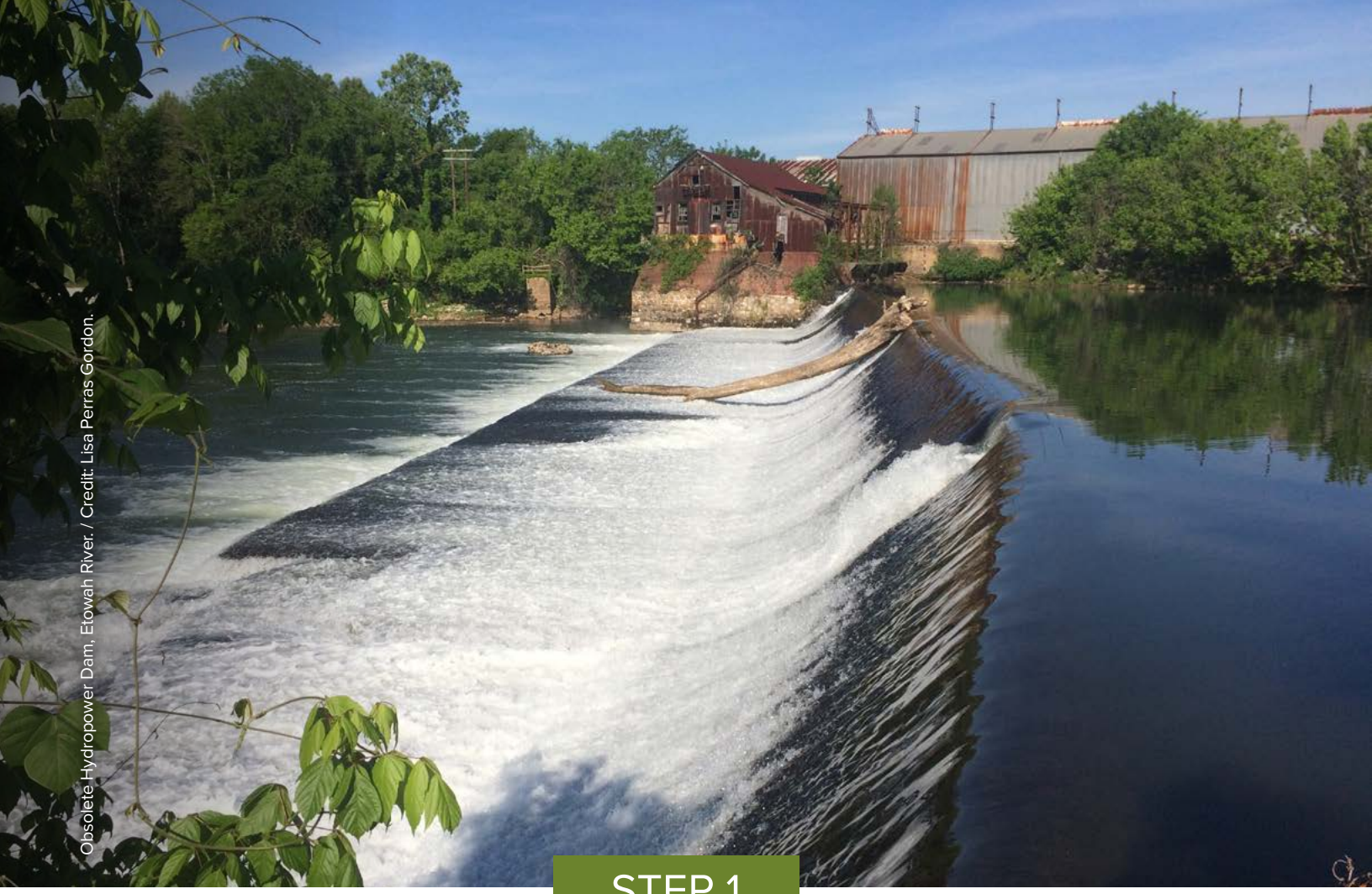
[19] NC Aquatic Connectivity Team (2022) North Carolina Dam Removal Handbook. https://www.americanrivers.org/wp-content/

[20] SC Aquatic Connectivity Team Regulatory Committee (2021) https://www.americanrivers.org/wp-content/uploads/2022/01/SC-Dam-Removal-Handbook_FNL.pdf

[21] Massachusetts Dam Removal: https://www.mass.gov/guides/

[22] Vermont Dam Removal: https://vnrc.org/clean-water/dam-removal/

Please note that all permits and approvals must be obtained prior to any removal or modification of a dam in Georgia.



Obsolete Hydropower Dam, Etowah River. / Credit: Lisa Perras Gordon.

STEP 1

Research the Dam

Section 1.1
Getting Started

The first step in beginning a dam removal project is to gather information about the dam. The project manager or dam owner can collect a significant amount of data and information to save costs and time before beginning the permitting process or selecting an engineer to construct the project.[23] As noted throughout the document, the project manager or dam owner should keep an open line of communication with the Corps Project Manager. This communication will be critical in determining how much information is needed for the federal CWA permitting process. The information outlined below includes that which will be needed for permitting as well as additional information needed to design the removal or conduct outreach. The amount of information needed will vary by project. Not all information outlined below may be needed.

The dam's name and address will be helpful for all subsequent steps. Google Maps[24] "Map" and "Satellite" views and Google Earth[25] are excellent resources to help determine the physical address of the dam, or the closest address nearby, as well as the dam's latitude and longitude. SARP's National Aquatic Barrier Prioritization Tool[26] is also a great resource to help identify the exact location of a dam. In addition, many dams can by identified by name: the dams removed on the Chattahoochee River in 2012, for example, had been known as the Eagle & Phoenix and the City Mills dams; the dam removed by UGA in 2018 was called Whitehall or White Dam.

[23] Note: The process of removing a dam is often called "construction," a term used throughout this Handbook to refer to active removal of the dam.

[24] Google Maps: https://www.google.com/maps/place/Georgia

[25] Google Earth: https://earth.google.com/web/

[26] National Aquatic Barrier Prioritization Tool: https://aquaticbarriers.org

Section 1.2
Determining the Current Dam Ownership

According to the Georgia Safe Dam Program (GA SDP), the "owner of a dam is considered to be anyone who owns any portion of the dam or appurtenant works of the dam. This is generally determined using county tax records. If these records indicate that [the owner's] property includes any part of the dam, [the property owner is] judged to be either an owner or partial owner of the dam." The rules that apply under the GA SDP, "... do not distinguish between the owner/operator of a dam" stating that, "[i]f your property does not include a portion of the dam, but you are an operator (such as by holding an easement, performing maintenance activities, controlling the spillways, etc.), you are also considered an owner."

The GA SDP notes that in Georgia, dams are owned by state or local governments, public utilities, and private individuals. Due in large part to the issue of multiple owners, it is difficult to provide exact proportions of ownership categories. In many cases, a dam may be owned by multiple entities. In Georgia, as well as nationally, 60 to 70 percent of dams are considered privately owned. Around 30 percent of the regulated dams in Georgia are considered state owned. A majority of state-owned dams are classified as flood-control dams, many of which were designed and built by the U.S. Department of Agriculture, Natural Resources Conservation Service (NRCS) (formerly known as the Soil Conservation Service) to mitigate downstream flooding. These flood-control dams were built on private land and once constructed, their operation and maintenance were turned over to state and/or local government entities via easement agreements.

It is a common misconception that many of the regulated dams in the state and across the country are abandoned. In reality, only 2,900 dams out of over

Dam owners may have responsibilities for maintaining their dam to ensure its structural integrity, the safety of those who recreate on or around the dam, and the liability associated with any potential dam failure. Maintaining dams over a long period of time may cost more when compared to the one-time cost of removal for obsolete dams that no longer serve a purpose.

Graysville Dam. / Credit: Sara Gottlieb.

92,000 dams in the NID are indicated as not having an owner (approximately 3%). That percentage is even smaller in Georgia, (for more info, see Section 1.6.1).

In addition to determining basic ownership of the dam, project managers will also need to determine:

- Who owns the property on either side of the dam?
- Who owns land below the dam that could be impacted by its removal?
- Who owns the homes/lands on impounded waters that could be impacted?

Many resources are available to help determine dam information:

- Property appraisal, tax parcel information and the dam owner's name may be available online through sites such as the Georgia Department of Revenue's On-line Property Search[27] or qpublic,[28] a tax assessor site that references many counties in Georgia. Access to information may vary significantly by county.
- Adjacent property owners/neighbors may know who owns the dam.
- Local libraries, historical associations and museums are excellent sources of local information if searching for addresses, latitude/longitude or a dam's name.
- The Georgia Soil and Water Conservation Commission manages a Watershed Dam Program[29] that includes 357 dams. Dams can be identified by county-location online.

Section 1.3
Physical Properties of the Dam

Once the dam owner has decided to move ahead with removal, information on the physical construction of the dam and surrounding structures should be collected for the permitting process. Researching the historical background of the dam may provide important information on its original design and building materials. Understanding how the dam was built is critical for permitting as well as for estimating costs of removal. The following information should be compiled:

- Maps or photographs that show the dam and the surrounding landscape, such as historic aerials, USDA soil maps, topo maps, etc.
- Technical plans on the dam, including 'as-builts,' showing construction material.
- Dam dimensions (i.e., height and width.)
- Date constructed. If this date is known but other construction details are lacking, local newspapers may be able to provide additional information about the dam's history. The Georgia Newspaper Project[30] has digitized more than 1 million pages of the state's newspapers.
- Date modified (any significant additions, upgrades, repairs, operation and maintenance history).
- Construction material (e.g., earthen, rock, concrete, fill material inside dam, mixed, etc.).
- Original purpose (hydropower, amenity pond, water supply, etc.)
- Dam type – specifically, is water impounded (creating a lake or pond behind the dam), or is water freely flowing over the dam without causing significant modification of the shape of the river or stream upstream (known as a run-of-river dam)?
- Ancillary features.
  - *For hydropower facilities:*
    - *Is there a powerhouse, turbines, sluice run, bypass channel, etc.?*
    - *Are the control structures currently functioning?*
    - *Do gates still open? Have they been removed?*
    - *Are panels missing?*
    - *Is there water passing through the dam?*
  - For earthen dams:
    - *Is there a roadway on the top of the dam?*
    - *Are there overflow spillways or discharge pipes, or leakage through the dam?*
    - *Are foliage/trees growing on the dam? If so, what is the size?*

[27] Georgia On-line Property Search https://dor.georgia.gov/property-records-online

[28] qpublic: https://qpublic.schneidercorp.com

[29] Watershed Dam Program: https://gaswcc.georgia.gov/watershed-dams

[30] Georgia Newspaper Project: https://www.libs.uga.edu/gnp

Section 1.4
Public Infrastructure

Removing a dam may impact infrastructure in the surrounding area. A project manager or dam owner should identify public infrastructure upstream and downstream of the dam. At a minimum, upstream infrastructure should include the length of any impounded waters, which can be determined by measuring from the top of the dam back to the bed of the river.

- Note approximate distance from dam to bridges, abutments and retaining walls. Identify roads either on the dam, or those in close proximity, identify road ownership (state, local, private) by contacting the county or the Georgia Department of Transportation.
- Identify water utility lines (e.g., sewer/stormwater) by contacting local public works departments.
- Identify underground and aerial utility lines such as gas, electric, telecommunications, and cable lines either by visual observation, contacting utilities such as local EMCs, Georgia Power and Atlanta Gas & Electric or searching https://www.georgia811.com/.
- Consult Google Earth to identify land uses, structures, infrastructure and other important features that might not be obvious or visible during a site visit.

Bridge footings and elevated sewer line downstream of dam. S. Fork Peachtree Creek, Georgia. / Credit: Emmaline Arter.

Section 1.5
Historical Significance of the Dam

Some dams and their associated structures are designated historic properties – defined as any prehistoric or historic district, site, building, structure, or object that is generally over 50 years old. Information on when a dam and associated structures were built, and their historical significance will be needed for the permitting process. Books, photographs, maps, and other historical documents can provide details about historical dam ownership, construction, and use. Local libraries, college and university libraries, historical associations, and museums are excellent sources of information. To begin the process, access the following resources:

- Check to see if the dam is listed on the National Register of Historic Places.[31]
- Check to see if the dam has been identified by the Georgia State Historic Preservation Office within the Georgia Natural, Archaeological, and Historic Resources GIS.[32]

If the dam is not designated as a historic structure, check to see if it is over 50 years old. If existing records do not note the age of the dam, some resources may help identify at least a date range within which it was constructed:

- Georgia's landscape has been captured by aerial photography since the 1930s. Black and white images, which can be searched at the county level, are available online through the Georgia Aerial Photograph collection.[33]
- Historic Aerials.[34]
- Georgia's tax assessor records[35] may also include historical information.
- Sandborn Fire Insurance Maps.[36]

The following resources may also help determine the age of the dam, provide additional information about its history or identify if it is located in a historically important area (for example, battlefields, Indian mounds, hydroelectric plant, mill, or commercial enterprise):

- The Georgia Archives maintains a Historical and Cultural Organizations Directory.[37]
- The Georgia Historical Society[38] may have information on local Affiliate Chapter Programs.
- Many Georgia communities and counties have a published local history, which may include basic information about the age of a dam and associated properties and identify relevant individuals and/or business interests.
- College libraries have excellent resources: the University of Georgia, for example, has an extensive collection[39] of local history resources, including historical images, maps, and other documents.
- The Digital Library of Georgia[40] is a clearinghouse that provides access to statewide resources.
- The Georgia River Network's guidebook series[41] provides historical information and "little known facts" on many river features.
- Georgia's State Historic Preservation Office[42] files can provide information by topic.

[31] National Register of Historic Places: https://npgallery.nps.gov/nrhp

[32] Georgia Natural, Archaeological, and Historic Resources GIS: https://www.gnahrgis.org/PublicHome/Index?ReturnUrl=%2f

[33] Georgia Aerial Photograph Collection: https://dlg.usg.edu/collection/gyca_gaphind

[34] Historic Aerials: https://www.historicaerials.com/

[35] Georgia Tax Assesor Records: https://qpublic.schneidercorp.com/

[36] Sandborn Fire Insurance Maps: https://www.loc.gov/collections/sanborn-maps/about-this-collection/

[37] Historical and Cultural Organizations Directory: https://georgiaarchives.org/ghrac/directory

[38] Georgia Historical Society: https://www.georgiahistory.com/?s=chapter#

[39] University of Georgia Library: https://libs.uga.edu/hargrett/

[40] The Digital Library of Georgia: https://dlg.usg.edu/

[41] The Georgia River Network Guidebook Series: https://ugapress.org/series/georgia-river-network-guidebooks/"https://ugapress.org/series/georgia-river-network-guidebooks/

[42] Georgia State Historic Preservation Office: https://dca.georgia.gov/community-assistance/historic-preservation

Section 1.6
Current Regulatory Status of the Dam

Most obsolete dams are not regulated under any state or federal program; however, a subset of dams in Georgia is regulated for safety or for hydropower generation. Determining whether the dam is covered under any regulatory program is a critical step in the process.

1.6.1 Georgia Safe Dams Program

The Kelly Barnes Dam near Toccoa, Georgia, burst on November 6, 1977, after two days of heavy rain, causing 39 fatalities and leaving 60 injured.[43] In response to that tragedy, then-President Jimmy Carter asked the Secretary of the Army to inspect 9,000 dams across the country, an undertaking that led to the creation of the NID and the establishment of the National Dam Safety Program. Forty-nine states now have state-run dam safety programs. GA EPD's SDP is authorized under the Georgia Safe Dams Act (OCGA §12-5-370 to 12-5-385) to "provide for the inventory, classification, inspection and permitting of certain dams in order to protect the health, safety and welfare of all of the citizens of the State by reducing the risk of failure of such dams to prevent death or injuries to persons."

Under this program, "Category I" dams include those for which failure would result in probable loss of human life. Category II dams include those where failure would not be expected to result in the probable loss of human life. Dams that do not meet either the Category I or Category II definitions are not covered under this program. To determine if a dam has been identified as Category I or II and is therefore covered under this program, visit the State webpage[44] and click on the state's Inventory of Dams. The associated Excel spread sheet can be searched by dam name, county or latitude/longitude. According to the State's November 2019 inventory, there are over 4,500 dams listed, including 679 Category I dams (a number subject to update over time). If the dam of interest is covered under the Georgia Safe Dams Programs, the dam owner must meet all of the responsibilities of the Act and the implementing Rules (Subject 391-3-8 Rules for Dam Safety). For dams covered under this program, locating all past dam inspections and dam safety reports will be helpful in the permitting process.

For Category I dams, it is important to note that Georgia's SDP specifies that "no person may remove a dam without the approval of the Director in accordance with the procedures required by the Act." For more information on the requirements of this program, see Section 3.4.3.

1.6.2 Federal Energy Regulatory Commission Licensed Dams

The Federal Energy Regulatory Commission (FERC) regulates non-federal dams that produce hydroelectricity.[45] All FERC licensed projects have individual project numbers and regularly submit compliance and other documents that address the physical details and characteristics of a dam. Information about FERC licensed dams is available via FERC's hydropower page[46] which is the official repository for FERC license data. Information is also available from the Hydropower Reform Coalition's portal.[47]

In Georgia, there are 18 operational FERC hydropower licenses; multiple projects can be covered under one license. The table below is a list of active FERC licenses in Georgia as of August 2019.

[43] Sanders, C. and Sauer, V. (1979). "Kelly Barnes Dam Flood of November 6, 1977, near Toccoa, Georgia." U.S. Department of the Interior U.S. Geological Survey. Retrieved from https://pubs.usgs.gov/ha/ha613/

[44] Georgia Safe Dams Program: https://epd.georgia.gov/watershed-protection-branch/safe-dams-program

[45] FERC does not regulate federal dams, including those operated in Georgia by the Army Corps of Engineers, for instance, Lake Lanier's Buford Dam.

[46] FERC Hydropower: https://www.ferc.gov/hydropower

[47] Hydropower Reform Coalition's Portal: https://hydroreform.org

Table 1				
Proj. N°	Project Name	KW	Licensee	Waterway
3102	High Shoals	1,027	Jason & Carol Victoria Presley	Apalachee River
2341	Langdale	1,040	Georgia Power Co (GA)	Chattahoochee River
2350	Riverview	480	Georgia Power Co (GA)	Chattahoochee River
2177	Middle Chattahoochee	129,300	Georgia Power Co (GA)	Chattahoochee River
2237	Morgan Falls	16,800	Georgia Power Co (GA)	Chattahoochee River
485	Bartlett's Ferry	17,300	Georgia Power Co (GA)	Chattahoochee River
2146	Coosa River	960,900	Alabama Power Co (AL)	Coosa River
1218	Flint River	5,400	Georgia Power Co (GA)	Flint River
659	Lake Blackshear	15,200	Crisp County Power Comm (GA)	Flint River
6951	Tallassee Shoals	1,900	Fall Line Hydro Co, Inc. (GA)	Middle Oconee River
2336	Lloyd Shoals	18,000	Georgia Power Co. (GA)	Ocmulgee River
2413	Wallace (PS&Con)	324,000	Georgia Power Co. (GA)	Oconee River
1951	Sinclair	45,000	Georgia Power Co. (GA)	Oconee River
2725	Rocky Mountain Pumped Storage	904,000	Georgia Power Co. (GA)	Oostanaula River
9988	John P. King Mill	2,125	Augusta Canal Authority	Savannah River
2935	Enterprise Mill	1,200	Enterprise Mill, LLC	Savannah River
5044	Sibley Mill	2,475	Augusta Canal Authority	Savannah River
12492	Miner Shoal Waterpower	1,200	Ha-Best, Inc.	Soque River

Source: https://ferc.gov/industries/hydropower.asp. Note: Rocky Mountain Pumped Storage Project is primarily owned by Oglethorpe Power (75% owner) which will be the primary contact for licensing compliance and relicensing. Georgia Power is part (25%) owner of the project.

Decommissioned/Surrendered FERC Licenses:
Some hydropower dams may no longer meet profitable power generation needs, no longer generate hydropower, or may need expensive maintenance to continue to operate. In these instances, hydroelectric dam owners may choose to surrender their license to FERC. Once the owner goes through the full process of license surrender and meets FERC's requirements for decommissioning (ensuring the site is not operational and meets safety requirements), the owner may choose to remove the dam. Two of the dams listed above – Langdale and Riverview – have been going through the decommissioning process. Once FERC issues a surrender order, dam removal will begin.

FERC Exempt Licenses:
Two types of operational hydropower projects are exempted from the full FERC licensing provisions: Conduit Exemptions and 10-MW Exemptions. Conduit exemptions are issued to hydropower projects on existing conduits (for example – a manmade canal), the primary purpose of which is not power generation. Conduit-exempted projects must be located on a conduit used for agricultural, municipal, or industrial consumption and are not integral to a dam. The 10-MW exemption is reserved for projects that generate 10-MW or less and will be built on an existing dam or project that utilizes a natural water feature. These exempted projects must still comply with any special conditions identified by the US Fish & Wildlife Service (US FWS) and the Georgia Department of Natural Resources (GA DNR), which exercise administration over the fish and wildlife resources, in the manner provided by the Fish and Wildlife Coordination Act (16 U.S.C. 661, et seq.) as required under Section 30(c) for the Federal Power Act[48] (FPA). General conditions for the 10-MW or less exemption are listed below and may be granted for an existing dam or at a natural water feature, such as a waterfall. Conditions include:

[48] 16 U.S.C. § 823a(c) 30(c) of FPA - The construction, operation, and maintenance of the exempt project must comply with any terms and conditions that the US FWS, NMFS, and GADNR have determined are appropriate to prevent loss of and/or damage to fish or wildlife resources or otherwise to carry out the purposes of the Fish and Wildlife Coordination Act.

Juliette Dam. / Credit: Sara Gottlieb.

- No expiration
- 10 MW or less
- Located at an existing dam or a natural water feature
- Subject to mandatory fish and wildlife conditions, section 30(c) of FPA
- Requires NEPA and NHPA analysis
- Project boundary must enclose dam and reservoir
- Applicant must possess all real property rights at time of filing unless on federal land

Table 2 identifies the FERC Exempt hydropower dams in Georgia as of August 2019. Each of these projects are described as Non-Conduit Exemptions or 10-MW Exemptions by FERC.[49]

Revoked FERC Licenses:

On rare occasions, a permittee can have its license revoked by FERC, which has the enforcement authority to take this action under the FPA. FERC may require additional provisions in revoking the license, such as decommissioning all hydropower equipment. Dam owners are not automatically required to remove a dam once a license is revoked. In October 2014, the FERC license was revoked for Juliette Dam located near Forsyth, Georgia. The revocation order required all hydropower generating equipment to be decommissioned. ■

[49] FERC Hydropower: https://ferc.gov/hydropower

Table 2

Project N°	Project Name	KW	Exemptee	Waterway
7238	Dalesmoore Plantation	100	Forbes H. Mathews	Red Oak Creek
7141	Milstead Dam	1,000	Mill Shoals Hydro Company, LLC	Yellow River
2350	Riverview	480	Georgia Power Co (GA)	Chattahoochee River

CHECKLIST: Dam Information

OWNERSHIP

- ☐ Dam Name
- ☐ Lat/Long
- ☐ Dam owner
- ☐ Property owner on sides of dam
- ☐ Property owner on impounded waters

PHYSICAL PROPERTIES

- ☐ Height/Width
- ☐ Date Constructed
- ☐ Date Modified
- ☐ Construction Material
- ☐ Original Purpose
- ☐ Ancillary Features

PUBLIC INFRASTRUCTURE

- ☐ Bridges/Abutments
- ☐ Roads
- ☐ Water Utilities
- ☐ Utility Lines

HISTORICAL SIGNIFICANCE

- ☐ Historical ownership
- ☐ Historical/unique construction
- ☐ Historical use
- ☐ Associated historical people
- ☐ Associated historical buildings
- ☐ Historically significant location

REGULATORY STATUS

- ☐ Category 1 Dam Regulated under the GA Dam Safety Program?
- ☐ If so, are there dam inspections and dam safety reports?
- ☐ FERC Licensed, Exempt or Revoked Dam?

Snapping Shoals Dam, South River. / Credit: Alan Cressler.

STEP 2

Research the River and Surrounding Landscape

Researching the river ecosystem and riparian area around the dam is critical to understanding the potential impact of dam removal. This section provides resources for the project manager or dam owner preparing to research the area surrounding the dam.

Section 2.1
Basic Description of the Resource

In addition to providing hard copies of maps of rivers and their surrounding landscape, the United States Geological Survey (USGS) National Map Viewer[50] is a good resource for basic information that may be needed for the permitting process:

- Zoom in on the topo map to see the official name from the US Geographic Names Information System (GNIS) for a stream or river. Small streams may not have an official name.
- Identify tributaries and see if there are confluences with other major rivers up or downstream.
- Identify the stream by segment description, if necessary, e.g. "from Hwy 110 to the confluence with Big Creek."
- If a waterbody is impounded, determine if the impoundment has its own name that differs from that of the dam. Many dams can be found in the "Crossings" layer, a sublayer within the "Cultural Points" group layer in the "Geographic Names (GNIS)" layer.
- Turn on the "Watershed Boundary Dataset" layer to obtain a watershed Hydrologic Unit Code (HUC) name and number.

[50] USGS National Map Viewer: https://www.usgs.gov/tools/national-map-viewer

- USGS stream gage locations are visible in the "Point Event" sublayer within the "National Hydrography Dataset" layer.
- Obtain land cover classifications and topographic/ elevation data from various layers.

Other good resources for information about rivers and streams include:

- SARP's National Aquatic Barrier Prioritization Tool,[51] which provides information about various aquatic passage barriers, including dams.
- The USGS Stream Stats site,[52] which provides estimated stream flow statistics and various watershed characteristics, including land use.

American River's Removing Small Dams: A Basic Guide for Project Managers[53] (see pg. 16) provides an excellent description of a process for completing geomorphological surveys and base mapping, which will be needed to assess hydraulics and sediment. Overall, this guide states that the survey should include:

1. Cross sections of the river and adjacent land, upstream and downstream of the dam.
2. A longitudinal profile of the "thalweg" (i.e., the deepest part of the river channel) through the impoundment as well as upstream and downstream of the dam.
3. A survey of the depth of soft sediment throughout the impoundment (often described as the "depth of refusal," or the point where a rod hits a hard surface and cannot easily be pushed further down).
4. A delineation of the resource areas that will be affected, including wetlands, and ordinary high and low water marks.[54] (For additional information on wetlands and sediment, see Sections 2.4 and 2.5, respectively.)
5. A hydrology and hydraulics (H&H) assessment to assess the magnitude and frequency of flows in the river (including depths, velocity, and scour potential).

Section 2.2 Water Quality

Information about whether the dam has had documented impacts on water quality may be needed for the permitting process. This information can also be used if applying for grants or funding tied to demonstrating that water quality may be improved by dam removal. According to EPA, "[v]irtually every dam will have an impact on the river or stream where it is located, although the types and extent of the impact will vary based on the size, operation, and purpose of the dam as well as the size and general characteristics of the waterway. In general, increased retention time of water behind dams causes physical, thermal, and chemical changes to take place both in the impounded and downstream waters."[55] These changes may impact water quality relating to nutrients, temperature, sediments, algal blooms, dissolved oxygen, pH, hydrogen sulfide, iron, manganese, and other metals. The presence of the dam may also cause impacts to aquatic life as measured through biological sampling and metrics, including macroinvertebrates (e.g. crayfish or dragonfly larvae), mussels, or fish. For more information on water quality and dams under the CWA, as well as the potential for grants to address dams that cause water quality impacts, see EPA's Infographic (page 22) and Frequently Asked Questions on Removal of Obsolete Dams.[56]

GA EPD and volunteers through programs such as GA EPD's Adopt-A-Stream program collect water quality data and information on many rivers, streams and lakes. The following resources provide access to readily available water quality data:

- GA EPD assigns all waterbodies a "designated use," establishing the waterbody's water quality goal. In Georgia, there are six designated uses – (a) Drinking Water Supplies, (b) Recreation, (c) Fishing,

[51] National Aquatic Barrier Prioritization: https://aquaticbarriers.org

[52] USGS Stream Stats https://streamstats.usgs.gov/ss/

[53] American Rivers (2015) Removing Small Dams. A Basic Guide for Project Managers. https://s3.amazonaws.com/american-rivers-website/wp-content/uploads/2016/05/24144210/NatlDamProjectManagerGuide_06112015.pdf

[54] Ordinary High Water Mark is defined as, "...that line on the shore established by the fluctuations of water and indicated by physical characteristics such as clear, natural line impressed on the bank, shelving, changes in the character of soil, destruction of terrestrial vegetation, the presence of litter and debris, or other appropriate means that consider the characteristics of the surrounding areas." Corps Regulatory Guidance Letter, 2005 (RGL 05-05), and 33 CFR 328.3(e)

[55] EPA Frequently Asked Questions on Removal of Obsolete Dams (2016) https://www.epa.gov/sites/default/files/2016-12/documents/2016_december_2_clean_final_dam_removal_faqs_0.pdf

[56] Ibid.

(d) Wild River, (e) Scenic River and (f) Coastal Fishing – each having associated narrative and numeric standards. Waterbodies may have more than one designated use. To determine a waterbody's designated use(s), search for it by waterbody name in Georgia's most recent Water Quality Standards.[57] Note that States are required to update their standards every three years. To find a state's most current standards in effect for CWA purposes, go to EPA's state-specific water quality standards page.[58]

- If Drinking Water Supply is one of the designated uses, note that raw water intake structures in the river could be impacted by dam removal. For example, an upstream intake could be exposed when the dam is removed and the impounded water is lowered, or a downstream intake could be impacted by sediments released during removal.
- Information on water quality may also be found by going to EPA's How's My Waterway?[59]
- GA EPD monitors waterbodies across the state to assess water quality as required under Section 305(b) of the CWA. Using the State's Assessment Methodology, GA EPD compares the results with the State Water Quality Standards to determine if waterbodies are meeting their designated use. That information, submitted to EPA in the State's Integrated 305(b)/303(d) Reports,[60] may include information relating to water chemistry or biological indicators (such as macroinvertebrate or fish), or information on historical or legacy pollutants (such as PCBs or mercury). The Georgia Environmental Management and Assessment System (GOMAS) database contains GA EPD water quality data through the public portal.[61]

[57] Georgia Water Quality Standards: https://www.epa.gov/sites/default/files/2014-12/documents/gawqs.pdf

[58] EPA State-specific Water Quality Standards: https://www.epa.gov/wqs-tech/state-specific-water-quality-standards-effective-under-clean-water-act-cwa

[59] EPA How's My Waterway: https://mywaterway.epa.gov

[60] Georgia EPD Water Quality in Georgia: https://epd.georgia.gov/https%3A/epd.georgia.gov/assessment/water-quality-georgia

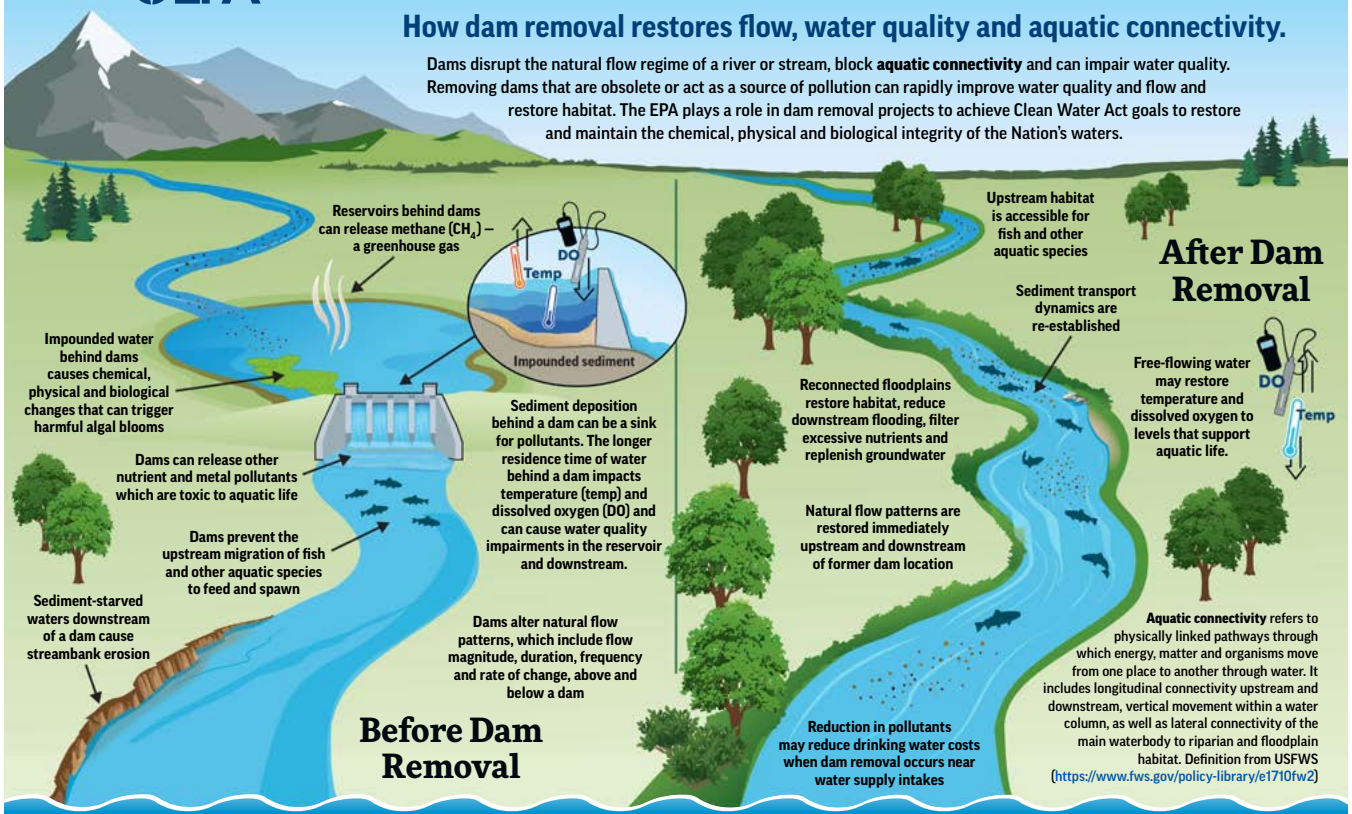
[61] Georgia Environmental Management and Assessment System (GOMAS) database: https://gomaspublic.gaepd.org

Praters Mill upstream. / Credit: Alan Cressler.

It's all connected!

How dam removal restores flow, water quality and aquatic connectivity.

Dams disrupt the natural flow regime of a river or stream, block **aquatic connectivity** and can impair water quality. Removing dams that are obsolete or act as a source of pollution can rapidly improve water quality and flow and restore habitat. The EPA plays a role in dam removal projects to achieve Clean Water Act goals to restore and maintain the chemical, physical and biological integrity of the Nation's waters.



Aquatic connectivity refers to physically linked pathways through which energy, matter and organisms move from one place to another through water. It includes longitudinal connectivity upstream and downstream, vertical movement within a water column, as well as lateral connectivity of the main waterbody to riparian and floodplain habitat. Definition from USFWS (https://www.fws.gov/policy-library/e1710fw2)

How Does the Clean Water Act and the EPA Play a Role?

1. Water Quality Integrated Reporting

Every two years states generate an Integrated Report to share the conditions of their waters under **Section 303(d) and 305(b) of the Clean Water Act**. States assign each waterbody a category to represent the available information about the status of water quality attainment. A state's impaired waters list may categorize a water as impaired by hydrologic alteration, such as dams or other control structures.

2. Permitting

Section 404 of the Clean Water Act requires a permit before the discharge of dredge or fill material into waters of the United States from the US Army Corps of Engineers or state program (Michigan and New Jersey). Dam removal or construction requires a permit and generally compensatory mitigation will not be required for dam removal projects. If there is reason to believe contamination is present a sediment evaluation may be required. In some cases dam removal may serve as compensatory mitigation for other impacts.

3. Water Quality Certification

Section 401 of the Clean Water Act requires any applicant proposing an activity that "may result in any discharge" into navigable waters to obtain a certification from the state or Tribe in which the discharge originates. The certification can include conditions to ensure that the permit will comply with water quality standards and other conditions such as monitoring, revegetation and quality assurance plans.

4. EPA Related Funding

The following funding sources can be used to support dam removal activities

- **Clean Water Act Section 319(h)** grants (the Nonpoint Source Program)
- Five Star and Urban Water Restoration Grant Program
- Clean Water State Revolving Fund

For more information, refer to the **Frequently Asked Questions on the Removal of Obsolete Dams** (see link below) and **Overview of Clean Water State Revolving Fund Eligibilities** (http://www.epa.gov/sites/default/files/2016-07/documents/overview_of_cwsrf_eligibilities_may_2016.pdf).

Want to learn more? Check out these additional resources.

The EPA's **Frequently Asked Questions on the Removal of Obsolete Dams** provides more information on the dam removal impacts to water quality, Clean Water Act permitting requirements and EPA-related funding (https://www.epa.gov/cwa-404/frequent-questions-removal-obsolete-dams).

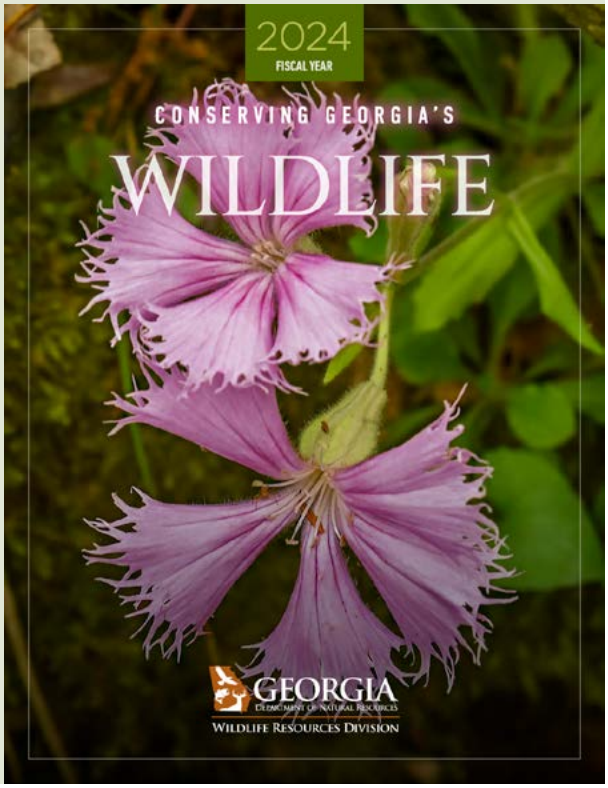
For compensatory mitigation proposals involving the removal of obsolete dams see **Determination of Compensatory Mitigation Credits for the Removal of Obsolete Dams and Other Structures from Rivers and Streams** (https://usace.contentdm.oclc.org/utils/getfile/collection/p16021coll9/id/1473).

Dam removal can result in water quality improvements and water body delisting! Check out the **Success Stories** webpage to find dam removal projects funded with Section 319 support (https://www.epa.gov/nps/success-stories-about-restoring-water-bodies-impaired-nonpoint-source-pollution).

The EPA works with other federal agencies to support dam removal projects and aquatic connectivity. Check out the **Federal Interagency Fish Passage Portal** for resources, funding and technical assistance related to aquatic connectivity projects (https://www.epa.gov/system/files/documents/2021-12/cwsrf-nps-best-practices-guide.pdf).

Georgia's Aquatic Biodiversity

According to **Georgia's Wildlife Resources Division, 2024 Annual Wildlife Report, *Conserving Georgia's Wildlife*** "The southeastern U.S. is a recognized hotspot globally for aquatic biological diversity and one of the temperate world's richest areas for freshwater crayfishes, mussels, snails, and other aquatic groups. Georgia exemplifies this pattern, ranking among the top four states nationwide in native species of mussels (127), fishes (265), crayfishes (70), and aquatic snails (84). Unfortunately, Georgia is also among the top states in imperiled freshwater aquatic species. The State Wildlife Action Plan recognizes 152 imperiled freshwater aquatic species in Georgia, more than half of which have a significant portion of their global range within the state's boundaries. Approximately 22 percent of Georgia's freshwater fishes, 28 percent of mollusks and 36 percent of crayfishes are rated as imperiled or critically imperiled in the state. Yet even these numbers understate the problem because they don't include an additional 48 species, most of them mollusks, considered historic or extirpated from Georgia." To learn more - take a look at the Freshwater Aquatic Species section beginning on page 25.



For more information, see https://view.publitas.com/georgia-department-of-natural-resources/dnr-2024-wcs-comprehensive-report/page/1

- Waters that have been identified as impaired can be viewed in the ArcGis Hub for Georgia.[62]
- Georgia provides access to GIS Data Sets[63] for their Integrated 305(b)/303(d) Reports that, according to GA EPD, also allow access to coverages for river basins, groundwater recharge areas, HUCs, landfills, RiverCare 2000, and the Georgia GIS Clearinghouse.
- Georgia's Adopt-A-Stream[64] program has a robust data set that may have relevant water chemistry and biological data.
- Local stakeholders, neighbors and newspapers, among other sources, may have anecdotal accounts of water quality issues.

[62] ArcGIS Hub for Georgia: https://hub.arcgis.com/signin

[63] GIS Data Sets: https://epd.georgia.gov/geographic-information-systems-gis-databases-and-documentation

[64] Georgia's Adopt-A-Stream: https://adoptastream.georgia.gov

Section 2.3
Wildlife Resources

Georgia is part of a globally recognized biodiversity hotspot for aquatic life. With 265 species of freshwater fishes, it ranks third in the U. S., surpassed only by Alabama and Tennessee. (To learn more, see sidebar Georgia's Aquatic Biodiversity or go to Georgia Freshwater Fish).[65]

The Wildlife Resources Division[66] (WRD) of the GA DNR regulates hunting and fishing, provides protection for endangered wildlife, and conserves Georgia's wild resources. It has many online resources for exploring the presence of species and critical habitats. The CWA Section 404 permitting process requires the identification of key species and habitats, both aquatic and terrestrial,

[65] Georgia Freshwater Fish: https://georgiawildlife.com/FreshwaterFish

[66] Georgia Wildlife Resources Division: https://georgiawildlife.com

Shoal Bass. / Credit: Les Ager.

in the area affected by the dam removal. The following questions should be addressed:

- Are there species of conservation concern present in the project area? Use the GA DNR Data Portal[67] to query at the HUC 10 level. Submit a request for an Environmental Review from the Wildlife Resources Division to identify species of concern at the site.
- Are species or habitat in the project area identified as a priority in the State Wildlife Action Plan?[68]
- Are there economically or recreationally important aquatic or riparian species in the project area?
- Consider how removal of the dam may positively or negatively impact species. For instance, will dam removal allow fish movement above and below the dam? Will released sediment affect species or their habitats downstream?
- Will migratory fish species (e.g., American Eel, Shad, white basses, Robust Redhorse, or sturgeons) stand to benefit?
- Will non-migratory species (e.g., endemic species like the Chattahoochee Bass and Shoal Bass) benefit?
- Would dam removal create, restore, or enhance habitat for species (e.g., support mussels; increase aquatic diversity; enable spawning by species of concern)

[67] GA DNR Data Portal: https://georgiabiodiversity.org/portal/

[68] State Wildlife Action Plan: https://georgiawildlife.com/WildlifeActionPlan

- Are invasive species present – i.e., fish such as Snakeheads, Blueback Herring, Spotted Bass or Asian Carp, shellfish such as zebra mussels, or plants such as Hydrilla? Are they present above and below the dam? Would dam removal allow invasive species to expand their distribution? Review the complete list of invasive species and the efforts to address them in Georgia at the WRD's Invasive Species Strategy.[69]

The US FWS and the National Marine Fisheries Service (NMFS or NOAA Fisheries) are charged with protecting threatened or endangered (T&E) species and designated critical habitat covered under the Endangered Species Act (ESA). Impounding water through dams has caused or contributed to the endangerment of some imperiled species, particularly those adapted to free-flowing water throughout the southeastern US. Removing dams may provide opportunities for the restoration of local populations of some species. To determine if T&E species are present, explore the US FWS's Information for Planning and Consultation (IPaC) tool[70] for species under the jurisdiction of the US FWS. Contact NOAA Fisheries for information about species under their jurisdiction. If T&E species are present, be sure to note the requirements to consult with the US FWS by following the steps in the IPaC tool or directly with NOAA Fisheries, more fully discussed in Step 3. Once you've added your project to IPaC, you can conduct a regulatory review which will guide you through some helpful questions for making a determination on ESA. The IPaC report will also provide contact information for your local FWS field office, where someone can help you determine next steps.

[69] Georgia's Invasive Species Strategy: https://georgiawildlife.com/invasive-species

[70] US FWS Information for Planning and Consultation Tool: https://ipac.ecosphere.fws.gov

Trispotted Darter. / Credit: Alan Cressler

Section 2.4
Connectivity

Dams act as barriers to aquatic organism passage, significantly altering and blocking the migration of native anadromous, catadromous, and potamodromous fish.[71] Removing dams provide significant benefits for increasing the range of important fish species and restoring connectivity in rivers and streams. Two highly effective and versatile tools are available to better understand the benefits for removing a barrier.

National Aquatic Barrier Prioritization Tool.
SARP's Comprehensive Southeast Aquatic Barrier Inventory[72] includes over 348,000 dams and approximately 46,000 assessed road stream crossings. Together with Astute Spruce, a software engineering firm, SARP has created an online tool to prioritize these barriers for removal or bypass based on ecological metrics. This tool, called the National Aquatic Barrier Prioritization Tool,[73] allows users to visualize the inventory of barriers, understand information about each barrier's river network, and identify top priority structures for removal based on the geographic area of interest. The results can then be used to work with GA ACT members and landowners to implement passage projects. The tool can be used in the planning process to understand the impact of dam removal, including, for example, the number of reconnected river miles. To explore how many river miles may be gained, click on "Prioritize", then "dams." Once the map opens, select "State" then begin typing, "Georgia." Zoom to the area of interest and click, "Select dams in this area." Once a dam is selected, the tool will provide information on Feasibility & Conservation Benefit, Miles Gained, Dam Height, Threatened & Endangered Species, and more.

The Southeast Conservation Blueprint.
The Southeast Conservation Blueprint is the primary product of the Southeast Conservation Adaptation Strategy (SECAS). It is a living, spatial plan to achieve the SECAS vision of a connected network of lands and waters across the Southeast and Caribbean. The Blueprint is regularly updated to incorporate new data, partner input, and information about on-the-ground conditions. The Blueprint identifies priority areas based on a suite of natural and cultural resource indicators representing terrestrial, freshwater, and marine ecosystems. A connectivity analysis identifies corridors that link coastal and inland areas and span climate gradients.

You can access the Blueprint[74] to see if your project is in a regional priority area—an especially helpful point to highlight for grant applications. The Blueprint Explorer[75] allows you to export pdf reports at a HUC12 scale or upload your own shapefile with a specific project boundary. A Blueprint report for the state of Georgia[76] is available on the SECAS resources page[77] and is updated regularly with the best available data. Perhaps the best part about this resource is that it comes with free user support. You can reach out to a SECAS staff member, and they will help you access Blueprint data to support your project and connect you with other helpful resources as well. Find your local Blueprint User Support specialist on the SECAS website.[78]

[71] Anadromous species live part of their life cycle in salt water but return to freshwater to spawn. In Georgia, these species include American Shad, Hickory Shad, Blueback Herring, Atlantic Sturgeon, mullet and Striped Bass. Catadromous species, such as American Eels, live in freshwater and return to salt water to spawn. Potamodromous species live entirely within freshwater; however, they spend much of their lifecycle downstream and migrate upstream to spawn. In Georgia, Robust Redhorse is an example of a potamodromous species.

[72] Comprehensive Southeast Aquatic Barrier Inventory: https://southeastaquatics.net/sarps-programs/southeast-aquatic-connectivity-assessment-program-seacap/prioritization-connectivity-tools-and-other-resources/connectivity-resources/tools/barrier-data

[73] National Aquatic Barrier Prioritization Tool: https://aquaticbarriers.org

[74] Southeast Conservation Blueprint: https://secassoutheast.org/blueprint

[75] Southeast Conservation Blueprint Explorer: https://apps.fws.gov/southeastblueprint/

[76] Blueprint Report for the State of Georgia: https://secassoutheast.org/pdf/Georgia_Blueprint2024_report.pdf

[77] SECAS Resource Page: https://secassoutheast.org/resources

[78] Blueprint User Support: https://secassoutheast.org/staff

Section 2.5
Wetlands

The presence of jurisdictional wetlands regulated under Federal law is an important consideration in the regulatory permitting process. Wetlands are defined by EPA and the Corps as "...areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas." (See EPA Section 404 of the Clean Water Act).[79]

Wetlands may have been present prior to the dam, or the construction of the dam may have created wetlands adjacent to the impounded area of the river or stream over time. Dam removal could have direct and immediate effects on any existing wetlands within the project area directly around the dam. Natural wetlands may have existed on the lowest terraces of the floodplain before impoundment, and removal of the dam could prompt reestablishment of the original wetland community. Alternatively, wetlands created by a dam could be cut off from their water source post-removal, if the river drops back down into its original channel. These wetlands would then have relict hydric soils, (soils that are either permanently or seasonally saturated by water), and the community could eventually revert to an upland.

Topography is key to considering if wetlands are present. Incised channels in narrow valleys may not typically have wetlands adjacent to them. Conversely, if the valley is relatively wide and flat, and the floodplain is not cut off from the river, impoundments could alter the hydrology of the middle terraces enough to saturate the soil and create new wetlands. Another scenario is that a moderately incised channel, once impounded, could overflow onto a relict floodplain, re-hydrating soils and reestablishing wetlands. Other circumstances may result in creation of wetlands.

A qualified wetland delineator should be engaged to identify and map all wetlands that would or could be affected by the project. A list of consultants is available from the Corps. Regulatory agencies may choose to make a distinction between natural and man-made wetlands for purposes of permitting and mitigation. They may also consider the relative environmental condition and functionality of the wetlands, which means that a functional assessment may also be required. There are various functional assessment methods available, one or more of which may be applicable when used by a qualified wetland assessor.

Section 2.6
Sediment

Addressing sediment will likely be a key component of working with the regulatory agencies during the permitting process. All rivers contain sediment, which consists of sand, silt, clay, gravel, rocks, minerals, and organic matter. The movement of sediment through waterbodies is an important geophysical process that distributes nutrients and other materials across the landscape. Dams slow the flow of water and impede the natural movement of sediment downstream. Sediment may build up behind a dam over time and is an important issue to consider in dam removal projects. Waters downstream of a dam may have been sediment-starved while the dam was present, and dam removal will play an important role in restoring natural sediment transport dynamics. However, release of sediment can cause abrasion or bury aquatic plants, animals, or habitat.[80] Sediment can also be contaminated with pollutants, putting downstream drinking water and aquatic life at risk if released without remediation. Properly collecting and analyzing data on the quantity and quality of sediment upstream of a dam is critical to safely managing sediment in a removal project. The process is iterative, starting with readily available information that is reanalyzed as more data becomes available).[81]

[79] EPA Section 404 of the Clean Water Act: https://www.epa.gov/cwa-404/how-wetlands-are-defined-and-identified-under-cwa-section-404

[80] U.S. Environmental Protection Agency. (2016). "Frequently Asked Questions on Removal of Obsolete Dams." Retrieved from https://www.epa.gov/cwa-404/frequent-questions-removal-obsolete-dams

[81] Subcommittee on Sedimentation. (2017). "Dam Removal Analysis Guidelines for Sediment." U.S. Department of Interior. Retrieved from https://acwi.gov/sos/pubs/dam_removal_analysis_guidelines_for_sos_final_vote_2017_12_22_508.pdf

Accumulated sediment behind Houston Mill Dam. / Credit: Alan Cressler.

Sediment quantity can vary depending on the dam design, location, and historic land use surrounding and upstream of the body of water. For example, some low-head dams may have comparatively little sediment trapped within their impoundments due to the constant flow of water over the dam. Measuring the relative sediment volume is done by finding the ratio of the existing reservoir sediment mass to the average annual sediment mass entering the reservoir.[82] If the volume is negligible, the Corps may determine that no extensive sediment investigations are needed. Volumes that are greater than negligible will likely require further investigation. Work with the Corps to determine how the sediment will be addressed during removal.

A due diligence review will be needed to determine if the sediment behind the dam may be contaminated by pollutants. Contamination occurs when pollutants enter an upstream waterbody through stormwater runoff, effluent discharge, or illegal dumping; the slow water behind the dam causes contaminants to settle and accumulate in the sediments.[83] The potential for contamination can often be informed by investigating the historical land use and human activities of the upstream watershed. For example, sediment contamination could be the result of industrial manufacturing upstream of the dam. Extensive land clearing activities for agriculture or development and high proportions of impervious surface are other indicators of potential sediment contamination. Work with the Corps to determine if sediment chemistry sampling and analysis is needed. For references that may be helpful, see the EPA's Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual[84] or the Corps' Dam Removal Analysis Guidelines for Sediment.[85]

[82] Ibid.

[83] Ibid.

[84] EPA Methods for Collection, Storage and Manipulation of Sediments for Chemical and Toxicological Analyses: Technical Manual: https://www.epa.gov/sites/default/files/2015-09/documents/collectionmanual.pdf

[85] U.S. Army Corps of Engineers. (2017). Dam Removal Analysis Guidelines for Sediment: https://rsm.usace.army.mil/initiatives/other/DamRemovalAnalysisGuidelines2017_508.pdf

Section 2.7
Federal Emergency Management Agency (FEMA) Flood Hazard

FEMA creates flood hazard maps that outline the flood risk areas in municipalities around the country. Dam removal projects located in Special Flood Hazard Areas may have special requirements. For more information, review FEMA's Flood Zone Maps[86] and the FEMA Document Library.[87]

Section 2.8
Historical Use of the River

If possible, compile information on the cultural importance of the river before the dam was created. Names associated with the pre-dam natural features of the river – references to shoals, ferry crossings, wildlife or aquatic life – may indicate its original use. These references may also indicate how Native Americans and early settlers used the river as communal fishing grounds or as a location for fishing weirs, for example, before the dam was built. Restoration of the river after dam removal may also restore some of these historical uses or cultural attributes now buried under impounded waters.

Section 2.9
Recreation/Public Safety

Information on the river's recreational uses may or may not be needed for the permitting process but could be of value as the dam owner or project manager conducts community outreach on the project. Dam removal usually changes the aesthetics and function of the waterbody. If the dam impounds water, its removal can result in the loss of activities that require lake conditions, such as sport fishing for lake-dependent species, experiencing lake-like conditions in a watercraft,

[86] FEMA's Flood Zone maps: https://www.fema.gov/about/glossary/flood-zones

[87] FEMA Document Library: https://www.fema.gov/media-library/assets/documents/28161

Recreation on the South River. / Credit: South River Watershed Alliance.

and swimming. Conversely, removal of the dam may increase opportunities for river recreation and improve safety for paddle sports as well as provide sport fishing opportunities for species adapted to free-flowing water. Dam removal can also provide opportunities to develop water trails, which can be economically important to rural communities (See Section 2.11).

Dams can be a physical barrier to recreation as well as a safety concern due to dangerous hydraulic conditions below the dam.[88] Many of the most dangerous dams for recreational users are low-head or run-of-the-river dams. They are characterized by their low height, allowing water to consistently flow over the top of the dam. The water falling over the dam creates circulating

Danger Warning. / Credit: Lisa Perras Gordon.

[88] Wright, K. & Tschantz, B. (2011). "Hidden Dangers and Public Safety at Low-head Dams" The Journal of Dam Safety 9 (1). Retrieved from https://damsafety.org/sites/default/files/TschantzWright_PublicSftyLowDams_JDS2011_1.pdf


Ocmulgee River Paddle Trip. / Credit Alan Cressler.

currents that trap people and objects underwater. The hydraulics are practically inescapable for anyone or anything passing over the dam or even those who approach the dam from below and become entrained in the 'boil'. There is no national database to track the deaths associated with dams, however researchers at Brigham Young University compiled a database[89] [90] listing at least 776 deaths at 366 low-head dams since the 1950s. Additionally, American Whitewater has maintained a database[91] on paddle sports fatalities on moving water for several decades, which includes a category for fatalities associated with low head hydraulics.

Unmaintained dams can also be subject to infrastructure failures. Extreme weather events that increase the volume and force of water pushing against a dam can cause devastating breaches. The potential for dam failures may increase as extreme weather events increase. The South Carolina Department of Health and Environmental Control reported that 32 dams failed in South Carolina during an extreme storm event in October 2015, including 17 in Richland County alone. These failures, "exacerbated already dangerous flooding conditions and caused mandatory evacuations of communities. The threat of weakened, rain-soaked dams failing continued well after the storm had passed, causing great concern from the threat of continued evacuations in communities already dealing with property damage and safety concerns." [92] The Association of State Dam Safety Officials is the national organization dedicated to improving dam conditions and safety in the US. For more information, see the ASDSO webpage.[93]

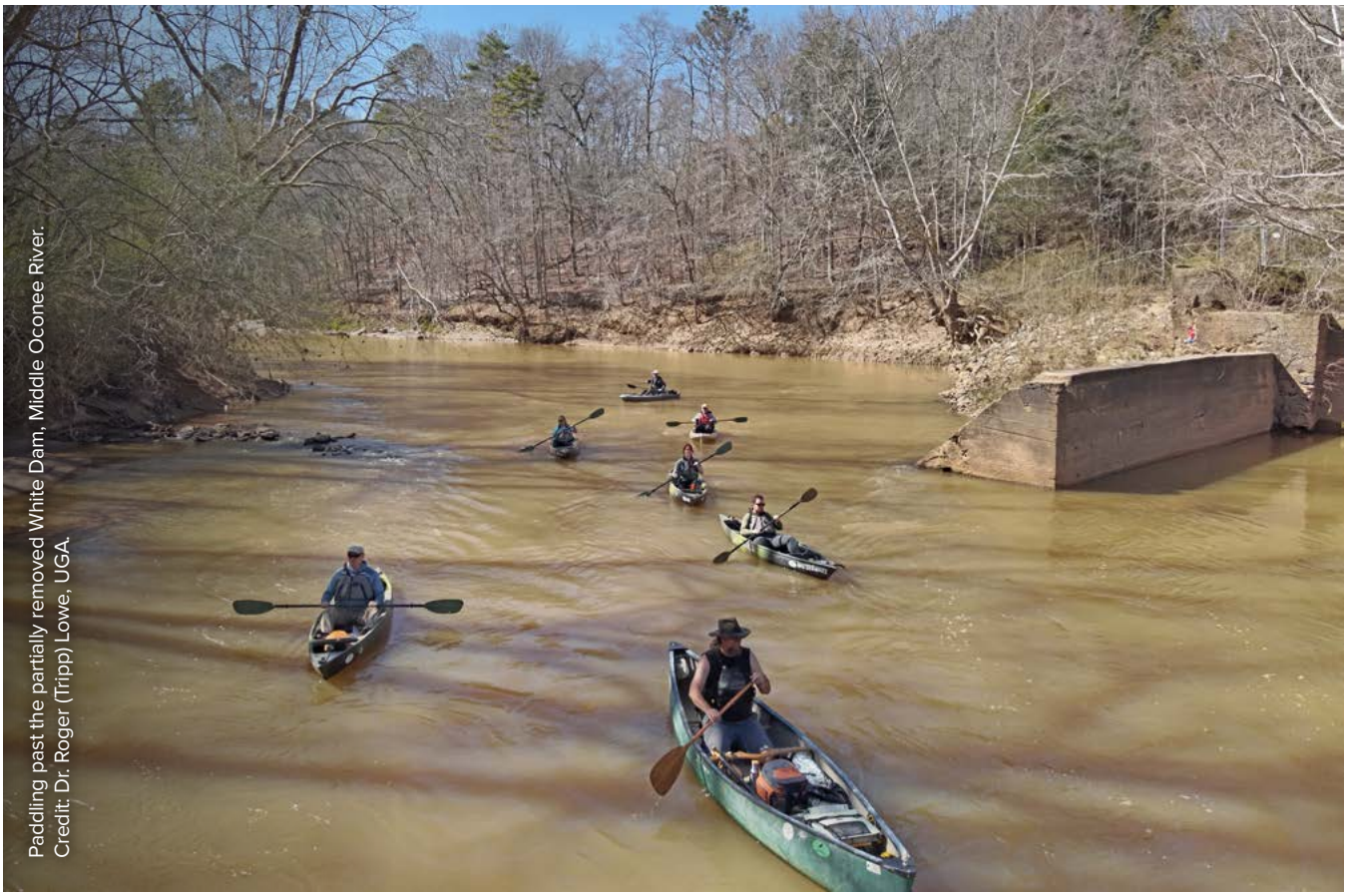
[89] Brigham Young University Fatality Database: https://krcproject.groups.et.byu.net/browse.php

[90] Kern, E., Guymon, J., Walbridge, C., & Tschantz, D. B. Locations of Fatalities at Submerged Hydraulic Jumps. Brigham Young University. Retrieved from http://krcproject.groups.et.byu.net/browse.php Accessed February 18, 2020)

[91] American Whitewater fatalities database: https://www.americanwhitewater.org/content/Accident/view/

[92] U.S. Environmental Protection Agency. (2016). "Frequently Asked Questions on Removal of Obsolete Dams." Retrieved from https://www.epa.gov/cwa-404/frequent-questions-removal-obsolete-dams

[93] Association of Dam Safety Officials: https://damsafety.org



Paddling past the partially removed White Dam, Middle Oconee River. Credit: Dr. Roger (Tripp) Lowe, UGA.

Recreation on the Chattahoochee River following removal of two historic mill dams. / Credit: Whitewater Outfitter.

Section 2.10
Ecosystem Services and Resiliency

A free-flowing river moves in four dimensions: laterally across the floodplain, longitudinally from the headwaters to the ocean, vertically from the surface to the groundwater, and temporally with its flow varying across the timeline. Dams impede a river's ability to move in these four dimensions. Healthy, connected, free flowing rivers provide a wide variety of ecosystem services[94]

- Secured food sources in the form of healthy fisheries, aquaculture, and agriculture.
- Reduced floodwater intensity by allowing the river to spread into the floodplain, reducing the force and height of the water in the channel.
- Protected biodiversity within the river.
- Improved water quality from higher dissolved oxygen levels, lower temperatures and nutrients.
- Protected human health by minimizing stagnant waters associated with disease spreading vectors.
- Protected coastlines against erosion and saltwater intrusion by transporting sediment downstream where it builds and sustains coastal marshes.
- Increased opportunities to experience the religious, spiritual, and cultural importance of free-flowing rivers, such as baptisms, tribal ceremonies, and swimming.

[94] Dandekar, P. (2018). "Free-Flowing Rivers Sustaining Livelihoods, Cultures and Ecosystems." Retrieved from https://www.internationalrivers.org/wp-content/uploads/sites/86/2021/01/free-flowing_rivers-sustaining_livelihoods.pdf

Section 2.11
Economics

Dam removal can create new economic opportunities for communities through the development of ecotourism. Paddling is a growing sport with a meaningful impact on Georgia's economy. According to the Georgia River Network[95] there are approximately one million paddlers in the state. As reported by the GA Department of Economic Development – those outdoor enthusiasts contributed $11.3 billion in economic benefits in 2016 alone.[96] Access to free-flowing rivers brings customers to outfitters, lodges, restaurants, grocery stores, retail stores, and transportation companies. River-focused tourism can also stimulate the economy in indirect ways through an increase in tax revenue, real estate value, and employment opportunities.[97] Investing in infrastructure for outdoor recreation attracts new businesses and an active workforce, strengthening the local economy and the social wellbeing of the community.[98] According to the Outdoor Industry Association, the removal of the City Mills and Eagle & Phenix dams in Columbus, Georgia brings recreational visitors valued at over $42 million per year to the surrounding area (See Case Study No. 1 for more information)

Water trails, the sections of rivers, wetlands, and coastal areas with public access for recreational boating, kayaking, canoeing, paddle boarding, and fishing are the aquatic equivalent of hiking trails. Currently there are 38 water trails in Georgia that combine to cover 2,500 miles of river, 170 miles of coastal saltwater, and 400,000 acres of wetlands. These are showcased on the Georgia River guide free mobile app.[99] These areas provide opportunities for social and economic development. For example, the 58 miles of the Chattooga River designated as a National Wild and Scenic River draws 43,000 visitors a year, generating roughly $2.7 million in a six-county area. Trust For Public Land and 80 partner organizations worked with local communities to envision a plan for Chattahoochee RiverLands, comprised of 100 miles of trails and parks along the Chattahoochee River. Over the next decade, the Chattahoochee Riverlands will grow to connect 19 cities across seven counties, generating more than $3.2 million annually from outdoor recreation.

Trout fishing can offer representative figures for the popularity and economic importance of fishing in free-flowing rivers and streams. The value of trout fishing in Georgia is estimated to exceed $172 million annually, with more than 100,000 trout fishing licenses sold each year.[100] Many migratory fish are important for commercial and recreational angling. Without a barrier, they can migrate further, expanding fishing opportunities to anglers upstream. American and Hickory shad are athletic seafaring fish that annually migrate to freshwater rivers and streams between February and May. These acrobats put up quite a fight, offering thrilling experiences to anglers by taking to the air in an effort to shake the hook, leading to new interest in shad fishing in Georgia.

[95] Georgia Rivers Network: https://garivers.org/water-trails-and-paddling/

[96] Georgia Comprehensive Outdoor Recreation Plan (pg. 39) https://gadnr.org/sites/default/files/dnr/pdf/Statewide_Comprehensive_Outdoor_Recreation_Plan%28SCORP%29.pdf

[97] Warren, N. (2015). "An Economic Argument for Water Trails." River Management Society. Retrieved https://www.garivers.org/images/Economic_Benefits/2015_Warren.pdf

[98] Outdoor Industry Association. (2017). "The Outdoor Recreation Economy." Retrieved from https://outdoorindustry.org/wp-content/uploads/2017/04/OIA_RecEconomy_FINAL_Single.pdf

[99] Georgia River Guide Free Mobile App: https://garivers.org/georgiariverguide/

[100] Georgia Department of Natural Resources. (2018). "Wildlife Resources Division Fact Sheet." Retrieved from https://georgiawildlife.com/sites/default/files/wrd/pdf/trout/Trout%20Information%20Sheet.pdf

Recreation on the South River. Credit: South River Watershed Alliance.

CHECKLIST: Information on the River

WATERBODY DESCRIPTION

- ☐ Waterbody Name(s)
- ☐ HUC 10
- ☐ USGS Gage Numbers & Locations
- ☐ Survey & Base Mapping
- ☐ Hydrology & Hydraulics Assessment

WATER QUALITY

- ☐ Designated Use
- ☐ Drinking Water Intakes
- ☐ Existing Water Quality Issues
- ☐ Wastewater Discharge

WILDLIFE RESOURCES

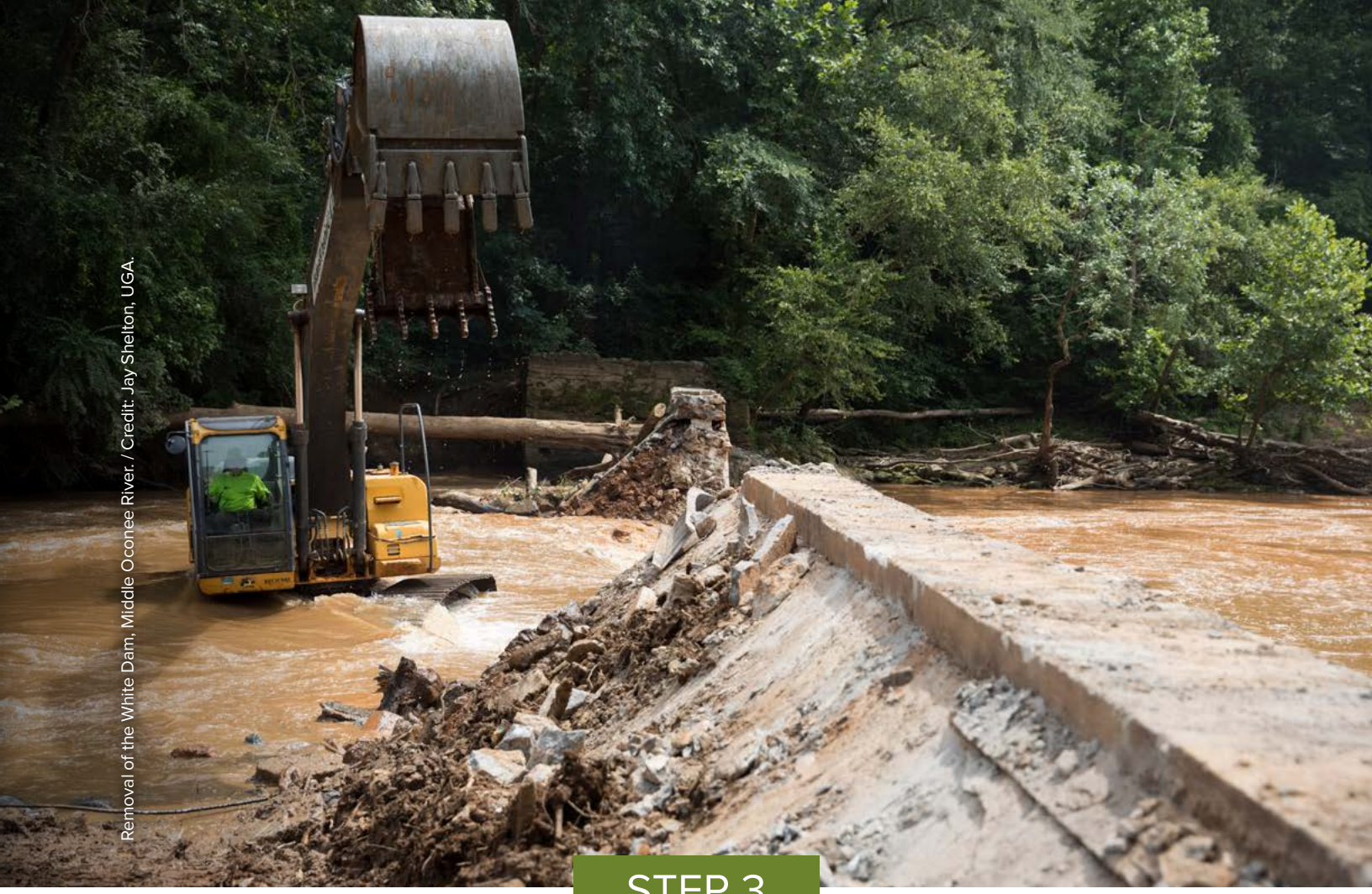
- ☐ State or Federally Listed Species Present
- ☐ Priority Species in State Wildlife Action Plan
- ☐ Migratory Species Present or Should be Present
- ☐ Number of Miles Connected Post Removal
- ☐ Endemic Non-Migratory Species
- ☐ Invasive Species

WETLANDS

- ☐ Manmade wetlands that could be impacted
- ☐ Natural wetlands that could be impacted

SEDIMENT

- ☐ Sediment Analysis
- ☐ Due Diligence Testing for Contaminants
- ☐ Sediment mapping?



Removal of the White Dam, Middle Oconee River. / Credit: Jay Shelton, UGA.

STEP 3

Understanding the Regulatory Process for Obtaining a Permit for Removal of Dams in Georgia

Section 3.1
Federal Regulatory Authorities Overview

Section 404 of the Clean Water Act requires that a permit be obtained before dredged or fill material can be discharged into jurisdictional waters of the United States, with some limited exemptions for forestry, ranching, and farming activities. The Corps is the primary agency for issuing Section 404 permits, conducting or verifying jurisdictional determinations, as well as enforcing permit conditions (for more information see EPA 404 Permit Program).[101] The EPA works closely with the Corps to interpret policy, guidance, and environmental criteria used in permitting, including by ensuring that water quality is protected as outlined in the Section 404(b)(1) guidelines (40 CFR Part 230).

Section 10 of the Rivers and Harbors Act (1899) governs the construction and modification of structures created in navigable waters of the United States. A list of these waters[102] is maintained by the Corps. On a case-by-case basis, dam breaching, dam modification or dam removal

[101] EPA Section 404 Clean Water Act permitting program: https://www.epa.gov/cwa-404/permit-program-under-cwa-section-404

[102] US Army Corps of Engineers navigable waters list: https://www.sas.usace.army.mil

activities may require a permit under Section 404 or Section 10. The Corps has guidance stating that "...if a dam operator modifies or deviates from normal operation of the dam in such a manner that bottom sediment accumulated behind a dam could be removed and transported downstream through the dam, either deliberately or accidentally, that activity may require a permit pursuant to Section 404." (Regulatory Guidance Letter (RGL) 05-04).

Additionally, 33 USC 408 (Section 408) requires the Corps to process requests by private, public, tribal, or other federal entities to make alterations to, or temporarily or permanently occupy or use, any federally authorized Civil Works project. In addition to structures, alteration of flowage easements and other associated areas are subject to Section 408 review. All Corps Districts are currently developing Standard Operating Procedures (SOP) for requests to alter Corps Civil Works projects. The Corps Project Manager (PM) will determine whether or not a proposed project has potential to adversely affect a federally authorized project.

Section 3.2
Corps Permitting Overview

The South Atlantic Division[103] of the Corps includes six districts primarily in the Southeastern U.S.: Charleston, Jacksonville, Mobile, Savannah,[104] Wilmington, and the Caribbean. Applications for federal permits to remove a dam located within the geographic boundaries of the State of Georgia would be processed by the Regulatory Division of the Savannah District. If a dam removal project is proposed on waters forming State boundaries, applicable Corps Districts with adjoining regulatory boundaries will determine the "lead" District for permit application and processing. Persons or parties planning dam removal projects on rivers or streams forming Georgia state boundaries should begin that process by contacting the Savannah District office for a determination.

[103] US Army Corps of Engineers, South Atlantic Division: https://www.sad.usace.army.mil

[104] US Army Corps of Engineers, Savannah District: https://www.sas.usace.army.mil

White Dam prior to modification, Middle Oconee River. / Credit: Alan Cressler.

Applicants may navigate through the Savannah District homepage to locate our offices. Permit application submittals are split into the Piedmont or Coastal geographic regions of the Savannah District. The address for the two Corps Branch Offices are:

Piedmont Branch Office
4751 Best Road, Suite 140
College Park, Georgia 30337

Coastal Branch Office
100 West Oglethorpe Avenue
Savannah, Georgia 31401

The Corps prefers requests be submitted through the Regulatory Request System (RSS)[106] which streamlines the permitting process.

[105] US Army Corps of Engineers E-Submittal Application: https://www.sas.usace.army.mil

[106] USACE Regulatory Request System. https://rrs.usace.army.mil/rrs

Section 3.3
Individual v. General Permits

Two types of Section 404 permits may be used to authorize a dam removal project – an Individual Section 404 Permit or one or more general permits. There are also two types of general permits – Regional General Permits and Nationwide Permits (NWP) (see sidebar Nationwide Permits). The Corps District office decides on a case-by-case basis which type of permit is needed, based largely on the amount of fill the project is expected to place in U.S. waters. In general, the thresholds for nationwide permits are less than 0.5-acre. Large, complex projects with potential for significant impacts may require review and authorization under the individual permit process. Small projects expected to have minimal adverse effects may be handled under the general permit process.

Applicants should begin to collect the information outlined in Steps 1 & 2 for initial scoping of the project. Once that is done, but prior to completing and submitting any permitting forms, applicants should begin the process by scheduling a pre-application

Nationwide Permits

NWPs that have been, or potentially could be, used for dam removal in Georgia:

NWP No.3 Maintenance
- The repair, rehabilitation, or replacement of any previously authorized fill.
- The removal of previously authorized structures.

NWP No.27 Aquatic Habitat Restoration, Enhancement, and Establishment Activities
- Activity must result in net increase in aquatic resource functions.
- Activity must result in aquatic habitat that resembles reference conditions.

NWP No. 33 Temporary Construction, Access, and Dewatering
- Temporary structures, work, and discharges necessary for construction activities.

NWP No. 53 Removal of Low-head Dams
- The removal of low-head dams to restore streams and enhance public safety.

meeting with the appropriate Corps office. This can be achieved through the RRS, under the Permitting or Apply for a Permit tab. After that initial discussion, the Corps may schedule a meeting with participating state and federal agencies of the Interagency Review Team (IRT)[107] and then coordinate the review process with IRT members. For example, the Corps will ensure that the presence of threatened and endangered species under the Endangered Species Act is reviewed by US FWS or the National Marine Fisheries Service NOAA Fisheries, and they will help the applicant with obtaining additional permits that may be needed.

During the IRT meeting, the applicant may receive information regarding permitting options and application requirements, as well as requests for additional information. The Corps will also assign a Project Number and a Corps PM. **Maintaining clear and open lines of communication with the Corps PM is the best way to facilitate timely and accurate Section 404 regulatory review of the proposed project.**

The length of the Section 404 regulatory process will depend in large part upon the type of permit required, the complexity of the proposed project, quality and thoroughness of information submitted by the applicant, and the applicant's responsiveness to requests for information from the Corps.

Once instructed by the Corps PM to do so, the applicant can begin the process of applying for a permit by visting RRS.[108] The Savannah District provides more detailed information on the NWP permitting process on its Regulatory Permitting webpage.[109]

Individual Permit:
If the Corps determines that the project will require an individual permit, the applicant must complete Form 4345 and submit it to the Corps.

Nationwide Permits:
If the Corps determines that the project can proceed under one or more NWPs, they will determine which NWP(s) is/are most appropriate. Relevant forms and information for the permit application:

Pre-Construction Notification (PCN): This PCN is the basic form to use with certain NWPs. Note that these forms are updated when the Corps renews the NWPs, typically on a 5-year schedule. NWPs are currently set to be reissued in 2026 and every 5 years thereafter. Note: If the Nationwide Permit PCN appears with a "Please wait..." at the top of the page, follow the instructions on the page to download the latest version of Adobe Reader. You can then upload the Nationwide Permit PCN to Adobe Reader to view the document.

Regional Conditions: The Savannah District also has regional conditions applicable to the Nationwide Permits, which are also updated when the Corps renews the NWPs. The Savannah District Nationwide Permit Regional Conditions (RCs) can be found at the bottom of the District's Regulatory Permitting Page or through this link. The Regional Conditions document provides applicants with detailed information on how to apply for a NWP as well as valuable resources and related links.

Section 3.4
State Regulatory Overview

The State of Georgia has permitting procedures in multiple program areas that applicants must follow when considering dam removal.

3.4.1 Section 401 Water Quality Certification

The Corps' Regional Conditions specify that the GA EPD has issued a Section 401 water quality certification for nationwide permits. Each project does not need an individual Section 401 certification from the State but must meet the general conditions for the NWP certification. One of those conditions requires that GA DNR be notified before beginning work on any and all NWP authorized projects.

3.4.2 State of Georgia Buffer Requirements

If the dam removal could potentially involve work within Georgia's State mandated stream buffers (O.C.G.A. Section 12-7-6(b)(15-17) of "The Erosion and Sedimentation Act of 1975"), Appendix A of the NWP Regional Conditions

[107] The IRT is comprised of the U.S. Environmental Protection Agency, U.S. Fish and Wildlife Service, Georgia Environmental Protection Division, Georgia Coastal Resources Division (coastal resources), and the U.S. National Oceanic & Atmospheric Administration, National Marine Fisheries Service (coastal resources).

[108] US Army Corps of Engineers E-Applications: https://rrs.usace.army.mil/rrs

[109] US Army Corps of Engineers Regulatory Permitting: https://rrs.usace.army.mil/rrs/home/permitting

outlines the requirements to determine if a buffer variance is needed from the GA EPD. Applicants are encouraged to visit Georgia EPD's webpage for erosion and sedimentation forms,[112] or contact GA EPD at (404) 651-8554, for further guidance on buffer determinations and variances. For a direct link to the State's Rules see GA R&R - GAC - Rule 391-3-7-.05. Buffer Variance Procedures and Criteria[113] and GA R&R – GAC – Rule 391-3-7-.11 for Coastal Marshlands Buffer Variance Procedures and Criteria.

3.4.3 NPDES Permitting for Construction Stormwater Permits

If one or more acres of land will be disturbed during the dam removal project, an NPDES Stormwater Construction Permit will be needed. Specifically, a permit is needed, "where construction activities will result in contiguous land disturbances equal to or greater than one (1) acre or tracts of less than one (1) acre that are part of a larger common plan of development with a combined disturbance one (1) acre or greater." (EPD Construction Stormwater Permit Fact Sheet, 2018). Step-by-step instructions for applying for coverage under a general permit can be found on GA EPD's Construction Stormwater General Permits Webpage.[114]

3.4.4 Georgia Safe Dams Program

As outlined under Step 1, to be considered a dam under the Georgia Safe Dams Program,[115] a structure must either be at least 25 feet tall (vertical height) or store at least 100 acre-feet (volume) at maximum capacity. If a structure meets either of these criteria it would be considered a dam under the Georgia Safe Dams Act (Act) and then further classified as Category I or Category II. It is important to note that these classifications are not based on the condition of the dam but rather on the potential consequences should it fail. Category I structures are those that if they failed would probably result in loss of life. Category II dams are those without any structures, such as homes or businesses, located in a potential flood zone.

Georgia is home to approximately 500 Category I dams and approximately 4,000 Category II dams. Additionally, The Nature Conservancy and SARP estimate that there are more than 56,000 total dams in Georgia, most of which fall below the height and storage criteria to be defined as a dam under the Act. These structures, along with any dam owned or regulated by the FERC, are considered exempt from the Act. Other dams considered exempt are those that have less than 15 acre-feet of storage, regardless of height, or those that are less than 6 feet tall, regardless of storage.

When a dam is classified as Category I, the owner is given 180 days to submit the permit package to bring the dam into compliance with the Act. In general, these owners have several options for addressing the dam's compliance, including upgrading the dam to Category I standards, changing the classification of the dam by either modifying the dam or removing the hazards downstream, or breaching the dam. There are pros and cons to each of these options that an owner must consider before determining the best option. Generally, upgrading the dam to Category I standards will be the most expensive option, initially. Breaching the dam is often the cheaper option when considering only engineering and construction costs. Other factors, such as environmental impact and loss of property values, can make breaching a less viable option.

According to the Georgia Safe Dam Program's Frequently Asked Questions,[116] owners who choose to breach a Category I dam are required to fill out a breach application and retain an Engineer of Record to submit design plans for safely carrying out the effort. Once the plans are approved and the dam has been breached, owners will have no further responsibilities under the Safe Dams Program. The Safe Dams Program maintains a list of qualifying Engineers of Record on the webpage linked above.

The Georgia Safe Dams Program notes the importance of recognizing that in some cases, removing a dam

[112] GA EPD's Erosion and Sedimentation Forms: https://epd.georgia.gov/forms-permits/watershed-protection-branch-forms-permits/erosion-and-sedimentation-forms

[113] Buffer Variance Procedures and Criteria: https://rules.sos.ga.gov/GAC/391-3-7-.05?urlRedirected=yes&data=admin&lookingfor=391-3-7-.05

[114] Construction Stormwater General Permit: https://epd.georgia.gov/forms-permits/watershed-protection-branch-forms-permits/storm-water-forms/npdes-construction

[115] Georgia Safe Dams Program: https://epd.georgia.gov/watershed-protection-branch/safe-dams-program

[116] Georgia Safe Dams Program FAQ: https://epd.georgia.gov/safe-dams-program-frequently-asked-questions-faq#field_related_links-102-13

may increase the potential risks to downstream areas. Such would be the case for a dam that provides flood protection. Careful consideration should be given to the impacts of removing a dam that protects downstream populations from frequent flood events. Such a dam may be suited to partial removal, leaving a lower structure to protect against frequent flooding.

3.4.5 State Historic Preservation Office (SHPO) Coordination

Under Step 1, the applicant should have collected relevant historical background information on the dam. That information will be used when the Corps Project Manager is assigned to coordinate review of the project with the State Historic Preservation Office (SHPO). Section 106 of the National Historic Preservation Act (NHPA) requires that federal agencies take into account the impacts of their "undertakings" on historic properties. "Undertakings" are anything a federal agency does, funds, or regulates in some way (such as, permits, licenses, etc.). More information including a "Citizen's Guide to 106 Review," can be found on the Advisory Council of Historic Preservation's (ACHP) webpage.[117]

The overall purpose of Section 106 is to take into account historic properties during a project's planning process. As such, SHPO, the federal agency, and other consulting parties (tribes, the public, etc.) should be involved early and often throughout the project's timeline. Those parties can provide feedback on alternatives, technical assistance, and similar comments. That being said, the Section 106 process often cannot be completed until a preferred alternative has been selected as final, the scope of work is known, and project plans are near completion. Without this information, impacts to historic properties cannot be completely assessed. Additionally, considering the proximity to water and the nature of dam removal causing ground disturbance, keep in mind that an archaeological survey may need to be completed by a Secretary of the Interior's Qualified Professional. All surveys needed are the responsibility of the applicant.

Although some federal agencies delegate the responsibility for this review to applicants, the Corps is one of the federal agencies that does not delegate their Section 106 responsibilities. Applicants should be in constant contact with their Corps Project Manager, who understands the process and will consult with an internal Corps cultural resource specialist and, if necessary, the SHPO office. Formal consultation with SHPO may or may not be needed and will be determined by the Corps Project Manager. Be responsive to the Corps Project Manager's requests for any additional information to keep the process moving forward. Applicants should note that one outcome of a review may be an adverse effect determination. If this happens, applicants should remember that a Section 106 assessment of effects is based solely on the impacts on historic properties, with no consideration given to potential benefits to the environment, the surrounding community, costs, or similar factors. If a project is determined to have an adverse effect, it simply means a few more steps are necessary to proceed. The first two steps are to look at all alternatives that would avoid or minimize the impact to historic properties, such as maintaining the dam as-is, partial versus full breach, etc. If, after all alternatives have been explored that avoid or minimize the adverse impact of partial or full demolition and data-driven explanations for ruling out these alternatives have been provided, with SHPO's and other consulting parties' acceptance, then the third step is mitigation. Mitigation must benefit preservation/history and have some linkage with the impacted area. Once mitigation is agreed to by all parties and a legally binding Memorandum of Agreement or Permit Special Condition is executed, then the project can continue concurrently with the mitigation.

The ACHP is charged with ensuring federal agency regulatory compliance with the NHPA. Although ACHP is usually not involved with the Section 106 process it will occasionally become involved if the project is precedent-setting or very complicated or if it engenders numerous conflicting viewpoints, or if the applicant is asked to involve one of the required consulting parties. If the project is determined to have an adverse effect, the federal agency or their delegate is required to ask the ACHP if they want to be involved in the resolution of adverse effects, regardless of whether it has been involved in the past. Most of the time, the agency does not get involved unless one of the above circumstances occurs. ■

[117] Advisory Council on Historic Preservation: https://www.achp.gov/protecting-historic-properties

Juliette low head dam and Zellner Island shoals on the Ocmulgee River. / Credit: Alan Cressler.

STEP 4

Planning and Design of the Project

Once the information outlined in steps 1, 2, and 3 of this Handbook has been gathered, it is time to begin the planning and design phase. Project planning and design are case-specific and can be relatively simple or, in the case of larger projects, involve multiple intermediate steps – including a feasibility study, a conceptual design, and a preliminary design – before the final design is completed. Dam removal planning and design is not a linear process. It is the job of the owner's project manager to coordinate multiple work streams in synchrony through the planning, design and implementation phases.

Section 4.1
Identifying Consultants

Dam removal, as a practice, is relatively new in Georgia. One of the most critical tasks in the dam removal process is the selection of qualified consultant to lead the project. Environmental, economic, ecological, engineering, social and legal complexities require a multidisciplinary approach. An effective lead consultant can assist project partners in building a successful team. Dam removal projects depend on effective communication between project partners, regulators, and consultants. For these reasons, taking the time to carefully research the dam, the river and surrounding landscape, and the basic regulatory process prior to selecting consultants is essential. If the project manager or dam owner is uncertain of how to find qualified professionals, one option is to consult the Georgia Safe Dams program's list of Engineers of Record,[118] which is updated regularly.

[118] For Georgia Safe Dams Engineers of Record scroll to the bottom of this page: https://epd.georgia.gov/watershed-protection-branch/safe-dams-program

Note that this list must be used if the dam is regulated under the Georgia Safe Dams Program. For additional information, see the GA ACT webpage.[119]

Section 4.2
Identifying Relevant Stakeholders

As a project plan is being developed, it will be important to consider those outside the core project partners that will be affected by the dam removal. Careful consideration of values and opinions of relevant stakeholders can help to minimize conflict as information about the project becomes public. From the outset of the planning process, the project team should develop a clear outreach plan to share with stakeholders on the purpose and intent of the removal. The facts related to benefits of dam removal including in this Handbook may provide helpful information during the outreach portion of the project.

Section 4.3
Evaluation of Project Alternatives

As information from all relevant stakeholders is assimilated, the project team will need to remember that the final plan will be evaluated by multiple regulatory agencies. The final design may include a comprehensive evaluation of designs to assess impacts to resources as well as the costs and benefits that may result in modification of the original design.

This process should begin with careful consideration of all potential effects of removing the dam. Much of the information required has already been described in previous sections of this handbook. Beyond information gathered for the permitting process, this step should consider all stakeholders involved. Examples of the types of effects to consider are:

- Ecological Effects (Please refer to Step 2.0 Basic Description of the Resource, Mapping & Surveys of this document for details)
- Economic Considerations
  - Dam owner costs and benefits
  - Societal costs and benefits
  - Recreational costs and benefits
  - Environmental costs and benefits
  - Property value considerations
  - Costs/risks associated with dam
  - Availability of funding for dam repair or removal
- Societal Issues
  - Community relationship to the river
  - Services provided by the dam
  - Community sentiment towards the river and the dam and dam removal process
  - Historical significance of the dam
  - Recreational safety
- Technical/Engineering Issues
  - Feasibility of repairing and maintaining the existing structure
  - Feasibility and design of dam removal

Ultimately, an evaluation of project alternatives should result in a process that is acceptable to all relevant stakeholders.

Section 4.4
Stages of Project Design

For simple, straightforward projects the information gathered in steps 1, 2, and 3 of this Handbook, plus the results of analyzing project alternatives, may be sufficient to develop a final project design for the purposes of permit application. The project's lead consultant should make this determination. For more complex projects, and to ensure successful implementation subsequent to permitting, additional stages will likely be required. These intermediate stages may include the following:

4.4.1 Feasibility Studies

If problems or questions arise during the early stages of information gathering and project planning, a more detailed feasibility study may be warranted. This study may be conducted by project partners with appropriate skills, by consultants, or a combination of the two. Feasibility studies often involve collection of additional data including economic, technical, legal and logistical considerations. The goal of this process is to identify the best solution to achieve identified project goals.

Section 4.4.2 Conceptual Design

Once the project team identifies an optimal approach, it is time to prepare a concept-level description of planned work. This concept-level description may

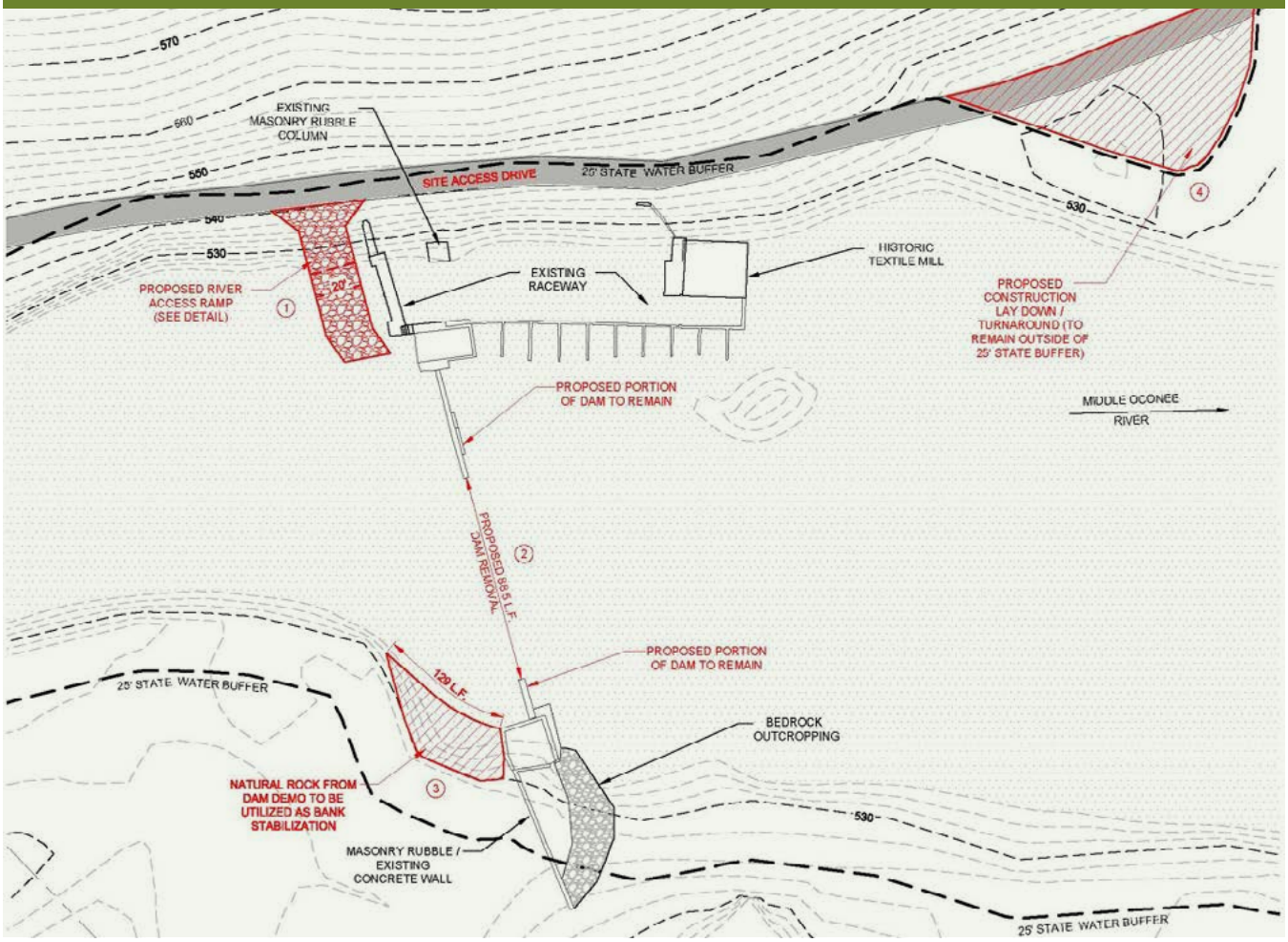
[119] Georgia Aquatic Connectivity Team: https://ga-act.org

be referred to as a “10% design” and will include preliminary drawings or other materials that can be used to articulate the overall design to key stakeholders, including regulators, to enable them to provide feedback before details are finalized.

4.4.3 Preliminary Design

After any questions or concerns raised by key stakeholders and regulatory agencies have been addressed, a more detailed plan, sometimes referred to as a “30% design” can be prepared.

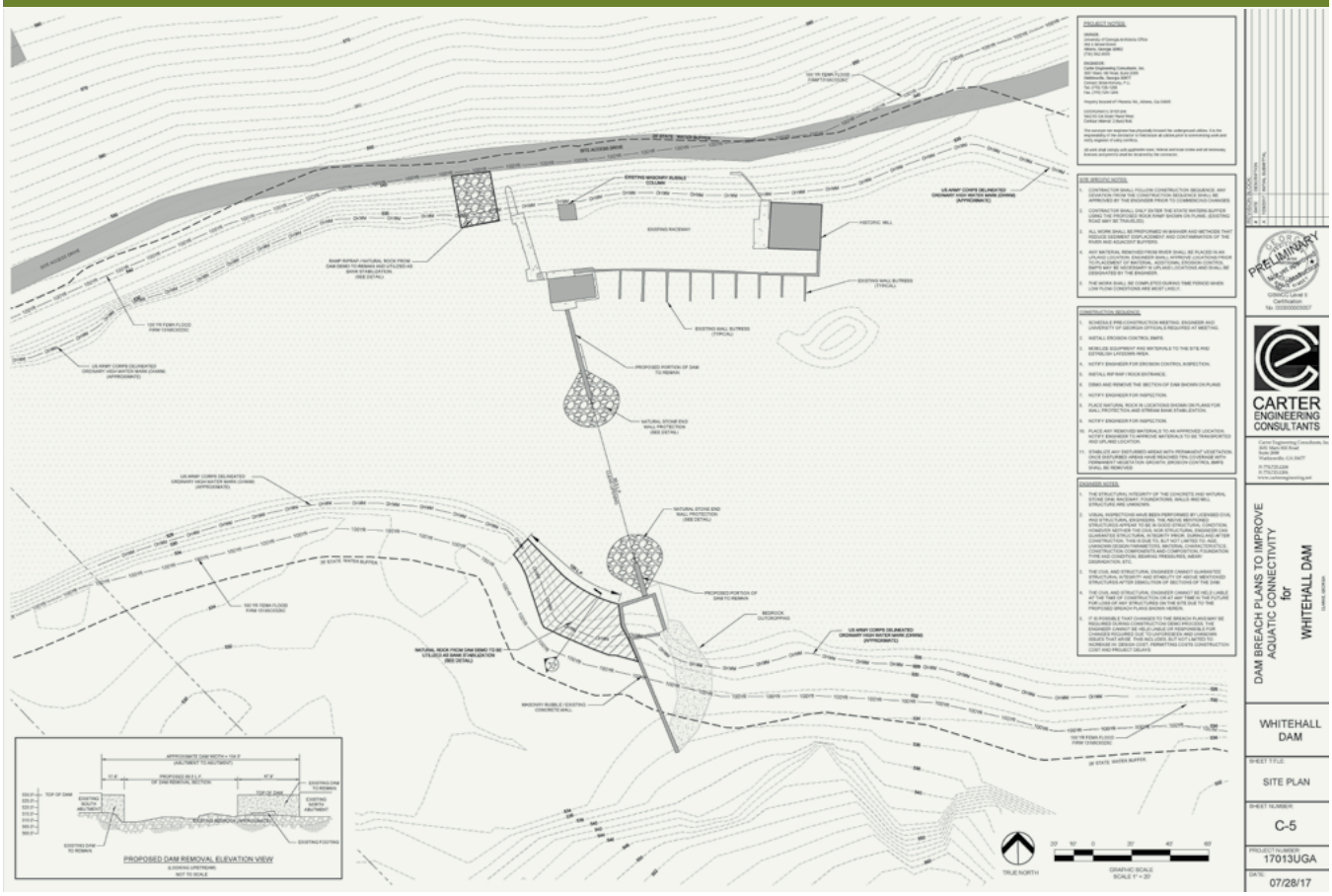
Figure 2: Preliminary or proposed conceptual design drawing for White Dam, Athens, GA.



4.4.4 Final Design

The last stage of the design phase is the preparation of construction documents and specifications. These documents encompass all project design requirements including detailed drawings and specifications; machinery, equipment, and material specifications; and a technical memorandum describing the analysis process and approach. Final design may include the following:

Figure 3: Final design drawing submitted with permit application, White Dam, Athens, GA.



- Design drawings showing plans for dam removal, sediment management, and channel restoration in keeping with the project's complexity. Plan sheets typically include base maps and drawings of:
  - Existing site conditions
  - Staging areas and access
  - Removal plan
  - Dewatering plan (sometimes completed by the contractor)
  - Delineation of resource areas
  - Proposed plan view
  - Proposed cross sections
  - Proposed longitudinal profile
  - Erosion prevention and sediment control practices
  - Infrastructure replacement/protection
  - Habitat feature installation schematics
- Project specifications providing details on the construction work that will be completed. For very simple projects, specifications may be included directly on the design plans. Typically, specifications detail the following:
  - Timeline for construction and restoration
  - Construction equipment needs
  - Material specifications and quantities
  - Project sequencing
  - Staging area treatment
  - Site access route treatment
  - Dewatering
  - Other site-specific details, i.e., planting plans, traffic control, infrastructure protection, etc.

4.4.5 Pre-Construction Public Relations

At this stage of the project, it is very important to make sure the community is aware of the upcoming removal and has a chance to ask questions and get information. American's River's Removing Small Dams, A Guide for Project Managers[120] provides a good overview on this process (see Step 7).

[120] American Rivers. Removing Small Dams, A Basic Guide for Project Managers (2015) Retrieved from: https://s3.amazonaws.com/american-rivers-website/wp-content/uploads/2016/05/24144210/NatlDamProjectManagerGuide_06112015.pdf

4.4.6 Additional Considerations

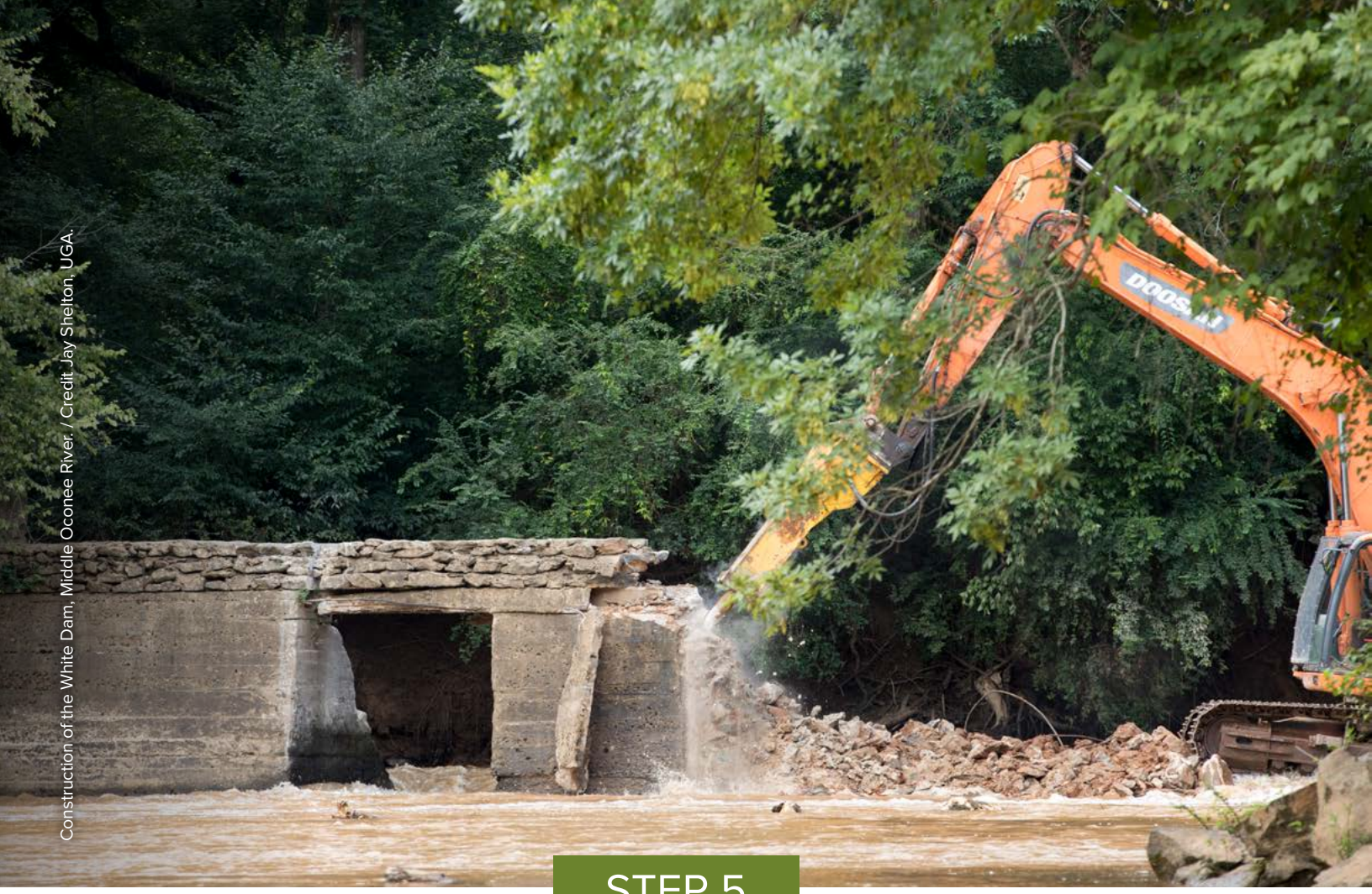
- Data collected during the preliminary design can provide the baseline for post-project monitoring, if the preliminary design analysis is done with monitoring in mind. (See 'project monitoring' in Step 6: Post-Removal Actions for more information.)
- Permit Identification – The lead consultant will assist the applicant in applying for the appropriate federal, state, and local permits required. Permits must be on site and available during construction.
- Technical Memorandum – A Technical Memorandum, prepared to accompany all design documents submitted for permit consideration, should describe the analysis and provide a recommended approach for each issue.
- Cost Estimate – The design team, with the help of the lead consultant, should develop cost estimates to bring the recommended approach to completion, including costs of permitting and construction.

The following table provides a list of tasks for a relatively complex project. All of them may not be necessary for any given project, while some additional tasks may be needed depending on the project. ■

EXAMPLE: Project Tasks for a Work Plan

- ☐ Hire Project Engineer
- ☐ Create Scope of Work (SOW) and timeline for all project staff and/or contractors
- ☐ Create Education and Outreach strategy
- ☐ Conduct outreach to affected stakeholders
- ☐ On-going communication with your group (watershed council, federal/state partners, other)
- ☐ Participate in public meetings with affected stakeholders
- ☐ Build Technical Team and facilitate Technical Team meetings
- ☐ Collect background site data
- ☐ On-going communication with agency staff
- ☐ Participate in Technical Team meetings; incorporate feedback into project design & timeline
- ☐ Create a hydrological model of the system
- ☐ Conduct topographic and bathymetric site survey (including longitudinal profile)
- ☐ Collect current discharge data
- ☐ Conduct pebble counts
- ☐ Conduct sediment sampling
- ☐ Conduct geomorphic survey
- ☐ Collect and analyze discharge data from historic records.
- ☐ Create reports, maps and alternatives analysis of site options for maintaining or removing dam
- ☐ Develop conceptual design for preferred alternative
- ☐ Develop preferred alternative to the 60% design level to submit for permits
- ☐ Prepare permit applications and all necessary accompanying data
- ☐ Prepare 90% design for final permit agency review
- ☐ Prepare 100% design
- ☐ Prepare bid and specification documents and distribute to potential contractors
- ☐ Manage bid process to select project contractors(s) for project implementation
- ☐ Provide construction oversight
- ☐ Provide any required site monitoring during construction (typically water quality sampling)
- ☐ Prepare as-builts upon project completion
- ☐ Prepare final reports for funding agencies
- ☐ Conduct archaeology survey (per SHPO standards)

Modified based on Hoffert-Hay, D. 2008. Small Dam Removal in Oregon: A Guide for Project Managers. Oregon Watershed Enhancement Board.



Construction of the White Dam, Middle Oconee River / Credit Jay Shelton, UGA.

STEP 5

Implementation and Construction

As dam removal is a relatively new form of aquatic restoration in Georgia, even experienced consultants and engineers may not be familiar with the associated logistical challenges. Consequently, successful implementation depends on linking the contractor who will actually remove the structure with the consulting team designing the project to be certain that what is "on paper" can actually be implemented on the ground and in the water. Such collaboration will also help make sure that the design considers human safety, habitat, cost, and timing.

Once an initial conceptual design is available, a site visit should be scheduled with the Corps project manager, consulting engineer and the contractor who will implement the final plan. This visit will allow all parties to talk through the design and make changes as needed. Additional site visits will likely be required throughout the planning and design process.

While the final approach for removing the structure will have been documented during the project planning and design phase, some issues may have a significant effect on implementation. These include:

- The condition of the dam and associated structures in terms of safety concerns including public access to the site
- Access to the site by contractors for construction equipment, materials, and staging areas
- Site limitations, such as utilities or topographic constraints

Section 5.1
Project Deconstruction

Once all of the work on planning and design has been completed, and all necessary permits have been obtained, removal can be scheduled. The physical

work of removal will likely take a relatively short time in comparison to all other stages of a project.

The project manager should work closely with the consulting team to select an experienced contractor to do the physical work of removal or deconstruction. Construction may be bid out to qualified contractors, who must be licensed, bonded, and insured. In some cases, agency programs may provide qualified personnel and the appropriate equipment to complete some or all work (see inset on the US FWS National Fish Passage Program, pg. 47). During construction, the project manager and other members of the design team should always be present on-site to oversee the process. For all dam removal projects, unforeseen circumstances may arise, requiring rapid decision-making and response.

If site monitoring is required by the permit (e.g., water quality, biological, geomorphological monitoring, etc.), it should be done by professionally qualified personnel. Site monitoring may help to demonstrate the ecological impact of the removal. Even if monitoring is not required by the project permit, video and photographic documentation of all critical steps of the removal process are recommended to record and help communicate the project's outcome to all stakeholders.

Once removal is initiated, deviating from the original project design may become necessary. In such cases, notes should be made on the design drawings indicating all modifications.

Section 5.2
Public Relations During Construction

Dam removals are uncommon and will likely get a lot of attention. It is important to have sufficient personnel prepared to handle visitors to the site and even inquiries from local media. While this is an excellent opportunity to tell your project's story, everyone involved must exercise all appropriate safety precautions. Prior to initiating construction, the project manager should delegate someone with detailed knowledge of the overall plan to interact with visitors. Consult the contractors and equipment operation crew and establish a designated viewing zone a safe distance from the active site.

Credit: UGA Marketing and Communications.

Prior to removal, a viewing zone for visitors should be established a safe distance from the active site.

U.S. Fish and Wildlife Service, National Fish Passage Program and the Southeast Aquatic Habitat Restoration Team

The U.S. Fish and Wildlife Service, National Fish Passage Program (NFPP) is a federal program which provides financial and technical assistance to reconnect aquatic habitats through the removal of barriers. The NFPP works in partnership with state and federal agencies, non-government organizations, universities, and tribes. The NFPP focuses solely on issues surrounding aquatic barriers (including obsolete dams) and restoration of waterway connectivity. This nationwide program includes the Southeast Aquatic Habitat Restoration Team, who have worked successfully with stakeholder groups in a number of states including Georgia. The members of this team are highly experienced equipment operators who have successfully removed dams of all sizes.

For more information contact:

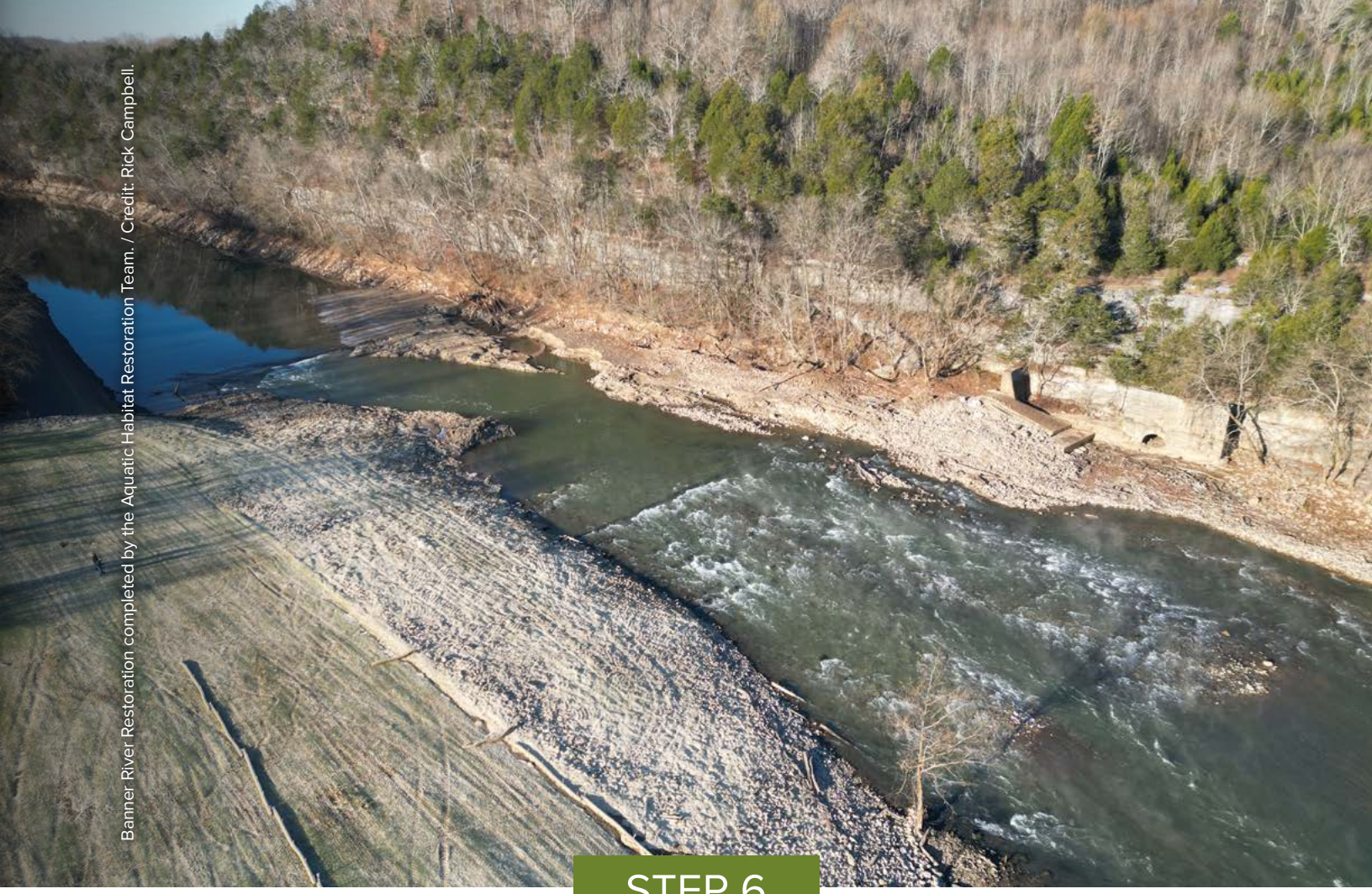
Tripp Boltin US FWS - South Atlantic-Gulf and Mississippi Basin Fish Passage Coordinator / walter_boltin@fws.gov

Credit: Rick Campbell.

Credit: Rick Campbell.

Credit: Rick Campbell.

Credit: Lisa Perras Gordon.



Banner River Restoration completed by the Aquatic Habitat Restoration Team. / Credit: Rick Campbell.

STEP 6

Post Removal Actions

Monitoring project results is an important step in the dam removal process. First, a project evaluation should be completed to determine if the engineering design was constructed properly and to ensure that the project is performing successfully in terms of infrastructure and public safety. If required by the permit, environmental monitoring may be needed to demonstrate that habitat restoration goals were met.

Section 6.1 Project Evaluation

If required by the permit or of interest to the project manager or dam owner, the project team should plan to complete regular inspections of the removal site. They may seek the assistance of the lead consultant in developing a checklist of issues to inspect periodically. The checklist might include visual or quantitative assessments of vegetation growth, erosion and sediment transport, and scour around remaining infrastructure, such as abutment.

Section 6.2 Environmental Monitoring

If required, environmental monitoring of dam removal projects will involve evaluating changes in ecological, hydrologic, and geomorphic parameters to assess project success. If a monitoring plan was developed during the project development phase, it will have established pre-project baseline conditions. Trained personnel from universities, environmental consulting firms, or scientific staff from various non-profits can complete environmental post-construction monitoring activities to evaluate how conditions have changed. In some cases, state or federal agencies can provide assistance with project monitoring, such as by evaluating fish populations before and after dam removal.

The U.S. National Oceanic and Atmospheric Administration (NOAA), in cooperation with various partners, has prepared useful monitoring-related resources including the Stream Barrier Removal Monitoring Guide[121] by the Gulf of Maine Council on the Marine Environment and NOAA's Guide for Monitoring and Evaluation for Restoration Projects.[122]

A useful approach to post-project monitoring includes installation of fixed photo stations to photograph the site from the same location repeatedly over time. A number of parameters can be monitored to track the ecological success of a project. Broad categories include:

Ecological Response

- Evaluate changes in fish, benthic macroinvertebrate, and other aquatic species communities.
- Evaluate vegetation regrowth on exposed lands, quantifying both native and invasive exotic species abundance and distribution.

River Channel Response

- Evaluate sediment transport and deposition, erosion, and habitat structure by surveying channel morphology and analyzing bed material samples.

Water Quality Response

- Evaluate changes in water quality, including such parameters as water temperature, dissolved oxygen, and turbidity.

Hydraulic Response

- Evaluate changes in flow velocities that may impact aquatic species movement and recreational boating safety in the river.

Drone imagery can be very useful in monitoring changes in river morphology after dam removal.

Finally, once the removal is complete, report it to American Rivers[123] to add it to the database and get a dot on the national tracking map!

[121] Stream Barrier Removal Guide: https://www.gulfofmaine.org/streambarrierremoval/Stream-Barrier-Removal-Monitoring-Guide-12-19-07.pdf

[122] NOAA's Guide for Monitoring and Evaluation of Restoration Projects: https://www.fisheries.noaa.gov/national/habitat-conservation/monitoring-and-evaluation-restoration-projects#restoration-center-monitoring-and-evaluation-guiding-principles

[123] To report a dam removal, go to: https://www.americanrivers.org/threats-solutions/restoring-damaged-rivers/dam-removal-map/

Kayaking on the Chestatee River. / Credit: Lisa Perras Gordon

Looking Ahead

The GA ACT was created to support and encourage the removal of obsolete dams in Georgia for the benefits to dam owners, recreational users, fish passage, water quality, state and local economies, native species, climate resiliency, and public safety. The GA ACT hopes that the links, contacts, and information provided in this Handbook will assist dam owners or project managers in preparing applications and navigating the regulatory process successfully.

As the practice of dam removal continues to grow in Georgia, the GA ACT will provide updates to the Handbook and share the community's experiences and lessons learned on the webpage[124] and elsewhere. The GA ACT looks forward to tracking the number of dams removed and the river miles restored in Georgia, improving public safety and restoring the beautiful natural heritage of the State. ■

Please visit the GA ACT webpage, ask questions, leave comments and learn how you can help to restore rivers and streams in Georgia.

Shulls Mill. / Credit: Rick Campbell.

[124] AGA ACT: ga-act.org

AHRT Night Hammer. Credit Rick Campbell

CASE STUDIES

N° 1: City Mills and Eagle & Phenix:

Two Large, Historical Dams Originally Built for Mills Removed

In 2012 and 2013, the City Mills and Eagle & Phenix run-of-river dams became the first major dams to be intentionally breached and partially removed in Georgia and Alabama.

In the late 1980s, residents of the Columbus, Georgia area started discussing the possibility of breaching or fully removing two Chattahoochee River dams dating to the nineteenth century. By the early 2000s, an initiative shepherded by Uptown Columbus, Inc. – in collaboration with Phenix City, Alabama, the U.S. Army Corps of Engineers, other stakeholders, and their contractors – launched an ecological restoration and recreational enhancement project in the Chattahoochee River Fall Line region.

The City Mills dam site is located approximately 1.3 miles downstream of Georgia Power's existing North Highlands Dam. The Eagle & Phenix site is an additional 0.75 miles downstream from City Mills. Portions of the dams and the associated power houses remain in place on the river's banks. Both dam complexes contributed to the National Register of Historic Places (NRHP)-listed Columbus Historic Riverfront Industrial District National Historic Landmark status. In 2018, the Eagle & Phenix powerhouse opened as a repurposed special event space, and the City Mills property is expected to be converted into commercial and residential properties.

After spending over $24 million in public and private funds, the breaching and partial removal of the two structures opened up 2.3 miles of river and previously inundated shoals that were further altered to create the nation's longest urban, artificial whitewater paddling course. Between opening on Memorial Day 2013

and mid-2017, more than 100,000 people reportedly floated down the river. Combined with redevelopment of land on both sides of the Chattahoochee River – including 22 miles of trails, playgrounds, a splash-pad, amphitheaters, and a zip-line attraction in downtown Columbus and Phenix City – the whitewater course is said to have contributed to growth in the number of area restaurants, businesses, and residences as well as a 45 percent increase in gross receipts for the local economy.

Step 1: Information on the Dams

Two sources provide information on the physical, human, and cultural history of dams. The first is maintained by Uptown Columbus: "Investigations into the Historic Mill Dams on the Chattahoochee River."[125] A second source is the "Historical & Cultural Resources" section (Appendix C) of the U.S. Army Corps of Engineers *Section 206 Environmental Restoration Report: Aquatic Ecosystem Restoration of the Chattahoochee River at Columbus, Georgia and Phenix City, Alabama.*[126]

Eagle & Phenix Dam. / Credit: unknown.

Prior to breaching and partial removal, the City Mills dam may have been the oldest on the Chattahoochee River. The first dam at the site was constructed in 1828. The original wood crib dam was replaced with a masonry dam immediately downstream in 1871, which was rebuilt in 1883. The dams provided hydropower for grist and flour mills. The approximately 10-foot-tall and 850-foot-long dam that was breached in 2013 was built between 1904 and 1907.

The Eagle & Phenix dam was constructed in 1844. Like the City Mills dam, the original dam was a wood crib structure that eventually transformed into a 17-foot tall and 900-foot-long masonry barrier. The Eagle & Phenix Mills shared the dam site and hydropower with Muscogee Mills. Over the years the dam and associated structures were reconfigured on at least four occasions. In 1880, the Eagle & Phenix Mills installed electrical generation equipment in the powerhouse and was one of the first sites in Columbus to use electricity for lighting. The powerhouse supplied electricity to an operational textile mill until 2002, when a lightning strike and fire damaged the facility. Subsequently the mill ceased operations. In 2003, W.C. Bradley Company acquired the Eagle & Phenix dam and powerhouse.

Dam removal and reconstruction. Credit: Todd Rehm.

Step 2: Information Relating to the Stream or River

The best source of information for preconstruction and planning for hydrology, stream flow, habitat, and significant species can be found in the U.S. Army Corps of Engineers *Section 206 Environmental Restoration Report: Aquatic Ecosystem Restoration of the Chattahoochee River at Columbus, Georgia and Phenix City, Alabama.*[127] This report contains the Environmental Assessment and Finding of No Significant Impact statement, a full discussion of alternatives, the U.S. Fish and Wildlife Coordination Act Report, and other related documents.

[125] "Investigations into the Historic Mill Dams on the Chattahoochee River: https://southres.com/uptowncolumbusdams/index.php

[126] U.S. Army Corps of Engineers, Section 206 Environmental Restoration Report: Aquatic Ecosystem Restoration of the Chattahoochee River at Columbus, Georgia and Phenix City, Alabama (September 2004).

[127] Ibid.

Step 3: The Regulatory Process to Obtain the Approval for Removal in Georgia and Alabama

In 2012 and 2013, the City Mills and Eagle & Phenix run-of-river dams became the first major dams to be removed in Georgia. The dams, mills, and associated properties are National Historical Landmarks (NHL) located in the Columbus Riverfront Industrial District that was listed with the National Register of Historical Places in 1978.

As an aquatic restoration project, these barrier removals occurred under the terms of a single individual U.S. Clean Water Act Section 404 permit. In September 2004, the U.S. Army Corps of Engineers Mobile District issued an Environmental Assessment and Finding of No Significant Impact. In 2010, under Section 106, the project was determined to have an adverse effect on the historically significant NHL. The resolution of adverse effect process (avoidance, minimization, and mitigation) resulted in mitigation including archival recordation of the dams, archaeological investigation, historic narratives, educational outreach documents, preservation of portions of the dams nearest the banks, and utilization of removed portions of the dams in historic exhibits. In March 2011, the Georgia Environmental Protection Division issued a U.S. Clean Water Act Section 401 Water Quality Certification and a Stream Buffer Variance (Georgia Erosion and Sedimentation Control Act). This was followed by the issuance of a Section 404 Permit in May 2011.

Both dams were independently owned and regulated by the Federal Energy Regulatory Commission (FERC). The City Mills Dam (P-8519) was exempt from FERC licensing because the project produced less than 10 megawatts but was still mandated to meet some FERC requirements. The mill and dam properties were transferred from private ownership to Uptown Columbus; the mill is currently in private ownership. The Eagle & Phenix Dam (P-2655) license was held by Consolidated Hydro Southeast Energy, Inc. until the dam and powerhouse were acquired by W.C. Bradley Company in 2003 (the FERC license expired in 2009); the dam property was transferred to Uptown Columbus prior to removal. In 2011, FERC approved Uptown Columbus' applications for surrender of both licenses, and then Uptown Columbus initiated the decommissioning process.

According to the Corps, in 2004 it was assumed that the shallow reservoir pools behind the two dams did not contain "significant quantities of sediments" in need of excavation. While some sediment was expected to be removed, the Corps proposed "limited grassing of approximately 25 acres of the newly exposed pool bottoms" to reduce erosion problems and the planting of native bottomland hardwood tree species.

Step 4: Plan and Design the Project

Not unlike other Fall Line rivers in Georgia, this 2.3-mile section of the Chattahoochee River was inundated for over 170 years. The Chattahoochee River from the Corps-operated West Point Lake's headwaters to Lake Seminole was 97 percent impounded prior to restoration. The goal of the dam removal project was to restore a few miles of a unique Fall Line section of river to a free-flowing condition to benefit state threatened species and species of concern. The plan included breaches in both dams, construction of rock 'fish' ramps to improve aquatic passage, rock weirs to ensure a back water refuge above the Eagle & Phenix dam, modification of five combined sewer overflow outlets to ensure water quality, and a constructed whitewater boating course.

Project planners and designers also had to coordinate with the Georgia Power Co. and the Corps. Georgia Power's North Highlands Dam and the Corps' West Point Dam to control the amount, timing, and duration of flows of water on this section of the Chattahoochee River. Flows can vary between 800 cubic feet per second (cfs) to more than 10,000 cfs, depending on upstream generation and release schedules to meet flood control, navigation, electrical generation, and other Corps project needs throughout the Chattahoochee River basin. Additionally, Georgia Power had to build a new weir just below North Highlands to maintain a pool at the base of the dam after City Mills was removed. North Highlands was built assuming that the pool would always be there, and if the base of the dam had been dewatered, the turbines would have become

unstable. The weir remains in operation today to maintain the pool below the dam.

The restoration project was led by Uptown Columbus, Inc. Permitting and regulatory consulting was provided by CH2M Hill. The whitewater recreation elements were designed and engineered by the McLaughlin Whitewater Design Group.[128] They conducted extensive stream bed mapping (bathymetric survey) and hydraulics modeling (including construction of a physical model) to understand how the river flowed under different conditions, and how those flows would meet both ecological restoration and recreation goals. Batson-Cook Construction[129] performed the work, including the breeching of the dams and constructing the whitewater course elements: two channels, multiple water diversion elements, and an adjustable hydraulic diversion called Wave Shaper.

The $24 million project was financed by public and private funds. Over half of the money—$13.8 million—was provide by individual, corporate, and foundation donors. The remaining $10.6 million in public funding came from the city of Columbus ($5 million), the U.S. Army Corps of Engineers ($5 million), and the National Oceanic and Atmospheric Administration ($600,000).

Step 5: Project Implementation/Dam Deconstruction


Columbus Whitewater. Credit: Chattahoochee Riverkeeper.


Columbus Whitewater. Credit: Chattahoochee Riverkeeper.

The breaching and partial removal of both dams was phased. The Eagle & Phenix was breached in 2012, and City Mills was breached one year later. To dewater the working areas, water was passed through each powerhouse. Physical removal was accomplished by controlled explosive detonation and mechanical excavation. Rock and other debris from the dams was removed from the stream bed except for some rock that was repurposed for instream flow diversions, rock weirs, and stream bank protection.

Step 6: Post Removal Assessment

A 2017 post-barrier removal assessment[130] echoes the economic benefits stated above and indicates "the dam removal project has not been successful at restoring riverine fish" as anticipated.

While a 2.3-mile section of the Chattahoochee River's 430 miles is now barrier free, it remains constrained by the upstream North Highlands Dam and downstream by the back waters of Walter F. George reservoir. Two old mill dams were removed, but new large artificial drops, a mechanical Wave Shaper, and two sculpted channels funnel significant volumes of water at high velocity through the whitewater course. For riverine fish, the whitewater course may have become a new barrier. According to the assessment, this barrier may not allow native river fish to move upstream through the rapids, but it may also prohibit the upstream movement of non-native species such as flathead catfish. The case of one riverine fish species—the Shoal Bass—is more perplexing. Prior to removal, isolated Shoal Bass communities lived in each impoundment. A primary justification for the ecological restoration project was that barrier removal would

[128] McLaughlin Whitewater Design Group Chattahoochee River Restoration: https://mclaughlinwhitewater.com/projects/chattahoochee-river-restoration/

[129] Baston-Cook Construction Chattahoochee River Restoration: https://www.batson-cook.com/portfolio/chattahoochee-river-restoration

[130] Steven M. Sammons (Auburn University) for Uptown Columbus, Inc., Responses of Fish Assemblages to Dam Removal on the Chattahoochee River, Georgia (September 13, 2017).

facilitate the development of a continuous population of shoal bass. According to the assessment, the opposite may have happened, and shoal bass appear to disappear from this reach for unknown reasons.

Like most barrier breaching and removal projects, including others referenced in this Handbook, sediment did move downstream as demonstrated by "large, vegetated islands" that "formed in mid channel and on the Alabama side of the river after the dams were breached."

Additional "restoration projects continue, including removal of invasive plants and planting" of shoal spider lilies.

Additional information for this case study can be found at the following:

Michael Eubanks and James O. Beckalew, "Chattahoochee River Restoration: Removal of City Mills and Eagle Phenix Dams," Proceedings of the 2005 Georgia Water Resources Conference, held April 25-27, 2005, at the University of Georgia.

"$24.4 million Chattahoochee River restoration project a blend of public, private funding," Columbus Ledger-Enquirer (April 6, 2013), https://www.ledger-enquirer.com/news/local/article29292949.html.

Nº 2: Three Small, Non-regulated Earthen Dams Removed in 2020 by The Nature Conservancy

Step 1: Research Information on the Dam

The Nature Conservancy removed three earthen dams on their own land in Marion County, just east of Fort Benning Army Base. There is no official record of the history or purpose of the dams. The following information has been gathered from aerial imagery and observational surveys. All three of the dams were likely built for recreational hunting, fishing and possibly agricultural water supply. The dams ranged in size between 280-475 feet wide and 9-20 feet tall, and they had all been naturally breached with their impoundments mostly drained. Two of the dams were overgrown with vegetation and they were all eroding sediment into their respective stream channels. The Nature Conservancy's land as well as most of the adjacent tracts are used for forest management, including active timber operations and wildlife related recreation via hunting leases. There was no major public or private infrastructure that would have been impacted by the dam removal projects, no hazardous material, and no known historical significance of the dams.

A google map containing the tract boundaries, barrier locations, and impoundment footprints can be accessed here: https://www.google.com/maps/d/u/0/edit?mid=16dG7MdXNG70BTIsPCDizyijoS-F8OjDv&usp=sharing

Little Pine Knot Dam was removed on the Little Pine Knot tract.

Step 2: Research Information Relating to the Stream or River

The original impoundments on the Hopkins Tract were 2.95 acres for the middle dam and 2.74 acres for the lower dam. The Little Pine Knot impoundment was 5.31 acres. All three impoundments were highly variable in size and depth due to breaching. The streams all exhibited bank instability and erosion, causing a significant amount of sedimentation. Removing the dams restored natural stream habitat for fish and crayfish, and reconnected existing habitat both downstream and upstream of the sites. There were no endangered species known to be impacted by the dam removals and there were no known invasive species in the area that the dam removals would have released. It was considered unlikely that the sediment behind the dams was contaminated since timber harvest had been the historical land use in the surrounding area. The land is currently maintained for native forest restoration and private hunting through a lease. It is not open for public recreation. Hunters seeking waterfowl that previously frequented the impoundments may experience a shift in the types of birds attracted to the area. However, conservation and restoration goals take precedence over hunting opportunities on these properties.

The two lower dams of the three were removed from Hopkins Tract.

Step 3: Know and Understand the Regulatory Process to Obtain a Permit for Removal in Georgia

The Pre-Construction Notices and permit applications were submitted to the U.S. Army Corps of Engineers on July 31, 2019. Both projects were conducted under the NWP 27 for Aquatic Habitat Restoration, Establishment, and Enhancement Activities. The Hopkins Tract project could have qualified under NWP 13 for Bank Stabilization, but due to The Nature Conservancy's commitment to ecological monitoring, the restoration permit ended up better fitting the project description. Permit applications for the projects were simultaneously submitted to the Georgia Environmental Protection Division for Stream Buffer Variances.

The Nature Conservancy's Buffer Variance permits were approved in 2019 by the Georgia Environmental Protection Division (BV-096-19-01 and BV-096-19-02) and the U.S. Army Corps of Engineers issued Nationwide Permits (SAS-2019-00724 and SAS-2019-00725).

Breach of lowest dam on Hopkins Tract, looking upstream.

Step 4: Plan and Design the Project

The purpose of these dam removals was to restore aquatic connectivity in the watersheds, reduce the amount of sediment input from the unconsolidated fill within the structures, and restore hydrologic function to the tributaries and their natural floodplain. The Hopkins tract dam removals focused on the widening and flattening of a notch area from each structure where they had already been breached and then stabilized the remaining fill to prevent erosion. The Little Pine Knot dam was modified by plugging the existing breach, creating a new notch on another part of the structure, and creating a new stream channel for 500-1000ft downstream of the dam using Natural Channel Design features. This approach was necessary due to the significant elevation difference between the existing impoundment and the downstream stream channel. Local materials and appropriate, native riparian vegetation were used to stabilize the channel following Natural Channel Design[131] principles.

[131] Natural Channel Design Principles: https://wildlandhydrology.com/resources/docs/River%20Restoration%20and%20Natural%20Channel%20Design/Rosgen_2011_Natural_Channel_Design.pdf

Credit: Henry Jacobs.

Drone footage of Hopkins Tract.

Step 5: Project Implementation /Dam Deconstruction

The Nature Conservancy contracted with Meanders River Restoration, Inc. in Ellijay, GA to design and construct the dam removals and stream channel restoration at all three sites. Both dams on Juniper Creek on the Hopkins Tract were partially removed by expanding the channel through the existing breach, removing material from the earthen dam structures, grading the slope on both streambank sides, applying coconut coir matting, hydroseeding and planting live stakes to stabilize the stream banks. Additionally, several in-channel structures including log cross vanes, toe wood, rock vanes and root wads were installed to add channel stability and habitat complexity. The lower-most dam on the Hopkins tract served as an off-road vehicle transportation route for land management and recreation, so an armored ford was installed.

Credit: Sara Gottlieb.

Erosion at Little Pine Knot dam face.

The design and construction of the Little Pine Knot Dam was more complicated due to the terrain at the site which included a significant drop in elevation between the existing upstream impoundment/wetland area and downstream channel. To address this challenge, the existing dam outlet and downstream channel were plugged, and a new channel was constructed in an area of the floodplain after being cleared of mature trees (some of which were used in the construction of in-stream structures including log cross vanes and root wads). A series of step-pools were created using log cross vanes, rock a-vanes and j-hooks to stabilize the stream channel and enable movement of aquatic fauna up- and down-stream.

Construction was initiated in December 2019, and it was completed for all three dam sites in March 2020. The Nature Conservancy conducted a final project inspection on April 13, 2020, the same day the Governor issued a statewide shelter-in-place order due to the COVID-19 pandemic. The total cost of the project was $305,900 which included clearing and grading a 0.5 mi access road at one site.

Credit: Sara Gottlieb.

Middle Hopkins dam post-construction in 2020.

Figure 4: Design for Little Pine Knot dam removal and steam restoration

Credit: Sara Gottlieb.

Step 6: Post Removal Evaluation and Monitoring

Ecological and geomorphic monitoring were conducted at both sites pre- and post-restoration and compared with data collected at reference sites by a group of faculty and students in the Earth and Space Science Department at Columbus State University. Crayfish and macroinvertebrates were used as monitoring subjects to assess aquatic species movement due to their known presence in the watershed, established monitoring protocols, and lack of collection permitting requirements.[132] [133] Fish movements were noted incidentally. Additionally, metrics of stream metabolism were monitored for use in an established method for detecting shifts in stream ecosystem function resulting from stream restoration.[134]

The results of these studies were the subject of a master's Thesis by Colin Light, and presentations at conferences by Troy Keller and Stacey Blersch. Funding was available for approximately 2 years of monitoring before, during, and after dam removal, but a full accounting of the ecological impacts of the restoration would require studies continuing for 5 or more years following project completion. Preliminary results indicated that crayfish were a useful indicator species for restoration but by the time monitoring effort ended, there wasn't evidence that crayfish populations at the restoration sites had fully recovered relative to the reference sites. Several undergraduate classes at Columbus State University accessed the sites as living laboratories during their studies of aquatic ecology and stream restoration.

The Nature Conservancy created a video highlighting this project and the partnership with Columbus State University to study the impact of the dam removals on stream and aquatic community restoration: https://www.youtube.com/watch?v=smGBUbiTQ-U

[132] Kuklina, I., A. Kouba, and P. Kozák. 2013. Real-time monitoring of water quality using fish and crayfish as bio-indicators: a review. *Environmental monitoring and assessment,* 185(6), 5043-5053.

[133] Poulos, H.M., K.E. Miller, R. Heinemann, M.L. Kraczkowski, A.W. Welchel, and B. Chernoff. 2019. Dam Removal Effects on Benthic Macroinvertebrate Dynamics: A New England Stream Cast Study (Connecticut, USA). Sustainability 11(2875) doi: http://dx.doi.org/10.3390/su11102875

[134] Blersch, S.S., D.M. Blersch and J.F. Atkinson. 2019. Metabolic Variance: A Metric to Detect Shifts in Stream Ecosystem Function as a Result of Stream Restoration. Journal of the American Water Resources Association, 55(3) p 608-621.

Nº 3: White Dam:

A Moderate-sized Historical Mill Dam Removed

In 2018, the White Dam, owned by the University of Georgia, became the first run-of-river dam in Georgia to be intentionally breached and partially removed solely for the purpose of habitat restoration.

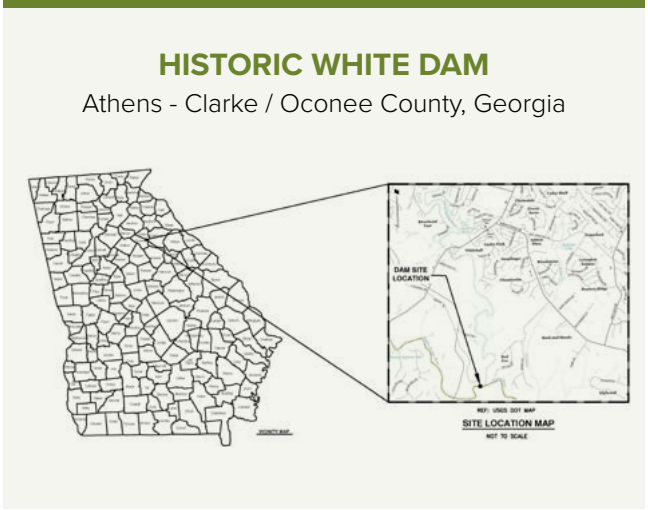
In October 2015 the first dam removal workshop in Georgia was held. It was hosted by The Nature Conservancy (TNC), Southeast Aquatic Resources Partnership (SARP), the University of Georgia (UGA) Warnell School of Forestry and Natural Resources, and American Rivers. A number of aquatic conservation professionals were present, including federal personnel from the US Fish and Wildlife Service, USDA Natural Resources Conservation Service, and US EPA. State agencies represented included the GA DNR Wildlife Resources Division, Fisheries and Non-game sections, GA DNR Environmental Protection Division, and GA EPD Safe Dams Program. Non-governmental organizations in addition to those hosting included the Georgia River Network, Upper Oconee Watershed Network, and others.

The workshop emphasized dam removal as a form of river restoration in the Southeast. In addition to formal presentations, this workshop provided a unique opportunity for all stakeholders to have conversations about the many and varied aspects of the process of dam removal.

Step 1:
Information on the Dam

Unfortunately, historical information about White Dam was difficult to acquire, incomplete, and often contradictory. The primary sources of historical information available on the White Dam were records kept by Warnell and a master's thesis entitled "Holding Back Time: How Are Georgia's Historic Dams Unique Resources?" published in 2012.

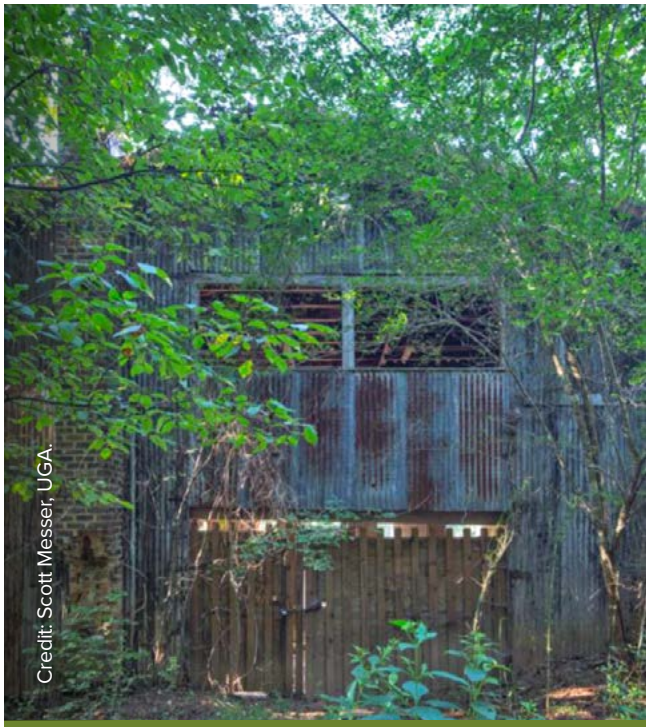
Figure 5: Site location map



John White, and his wife Janet Richards, natives of County Antrim, Ireland came to Athens, GA in 1837. Mr. White, a textile expert, took over management of the Georgia Manufacturing Company cotton mill, located on the Oconee River in Clarke County. This mill, built in 1827, was among the first cotton mills in Georgia. Mr. White's son, John Richards White, born in 1847, eventually assumed his father's management position at the company, building a new textile mill as well as the current White Dam.

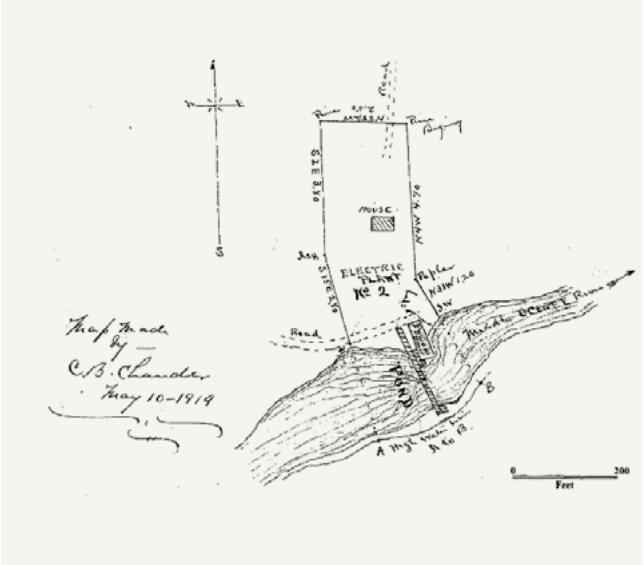
White Dam is located on the Middle Oconee River just upstream of the confluence with the North Oconee River adjacent to Whitehall Forest (figure 1). The dam (figure 2) was constructed between 1912 and 1913. John Richards White was among the pioneers utilizing the new technology of electricity, which freed factories from riverside sites. The hydroelectric power plant installation for the dam (figure 3) was completed by 1915 and was fully operational by 1916, according to a plat map of the area produced in May 1916 (figure 4). This power plant supplied electricity to the Whitehall Mills, including a yarn mill and a cotton mill located on Whitehall Road near the intersection with the Central Georgia Railroad lines, which were used to transport raw materials and finished products.

The White Dam.



Structure housing the electric generator adjacent to White Dam.

Figure 6: 1919 Plat showing White Dam and power plant



The Whitehall Mills and Electric Plant were sold to the Oconee Textile Company in 1937, then to Fickett Cotton Mills, Inc. in 1938. Modifications to the original plant occurred around 1940, including raising the dam level by several feet, moving the powerhouse a short distance downstream, and reinstalling the turbine at the end of a longer raceway. The plant remained in operation until the early 1950's, at which time the Whitehall Mills began purchasing all electrical power through the Georgia Power Company.

The dam and power plant were listed as structure number 68 in a Georgia state architectural survey conducted by Patricia Cooper in 1973. Cooper described the dam as being granite faced with concrete, and with a probable rubble core. She noted that the dam was intact, and that the powerhouse still contained machinery.

The Hardin family, who owned the property, donated the dam and surrounding land to the University of Georgia's School of Forest Resources in 1978. During the late 1980's, the feasibility of reactivating the hydroelectric plant was investigated, but ultimately it was determined that the project lacked economic viability.

In 1992 David Cullison conducted a Georgia State historic resources survey in which the dam is assigned resource ID 2952 and described as follows:

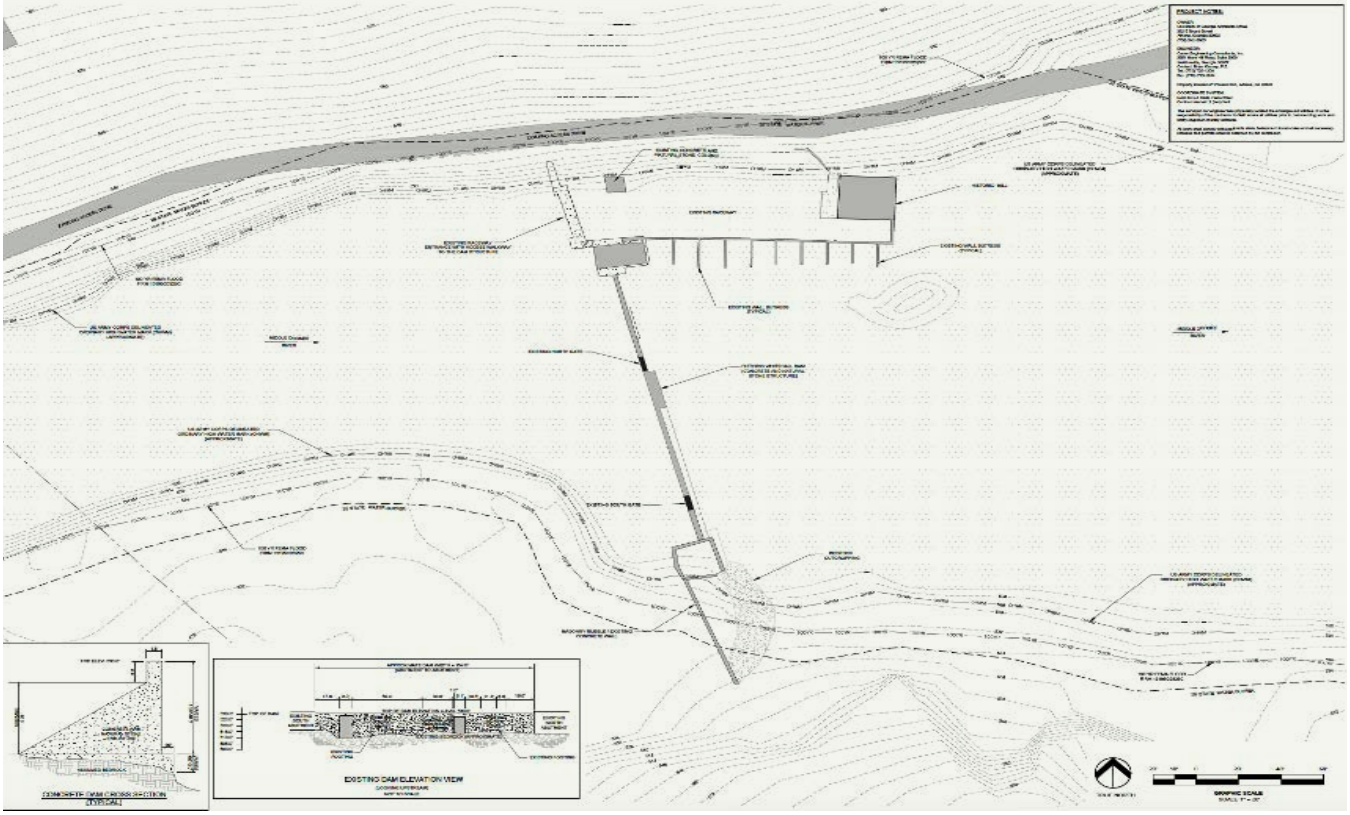
"Concrete gravity dam, with ogee section. Spillway at north end, open overflow gate near south end. Top two feet of dam constructed of stone, perhaps as an early addition. Stone foundations at either end of structure, though most of foundation is concrete. South wall of spillway is a concrete curtain wall with buttresses. Spillway is mostly dry. Stone and concrete platform at south end, possibly a foundation."

In the historical resource report Cullison assigned resource ID 2951 to the powerhouse, and described the structure as follows:

"One room, plan shape rectangular, roof type tin. Chimney material brick appears to be a later addition. Front has a large, fenced entry. Some machinery is still inside the building."

At the time of the proposed project the dam and powerhouse remained largely intact, and, from a historical perspective, the property retains integrity of location, design, materials, workmanship, and association. White Dam and the associated powerhouse together constitute an important historic resource that appears eligible for listing in the National Register of Historic Places.

Figure 7: Overall Existing Site Plan, Dam Breach Plans to Improve Aquatic Connectivity for Whitehall Dam, Clarke County, Georgia



Step 2: Information Relating to the Stream or River

The Altamaha River Basin supports a wide array of biologically diverse ecosystems. The watershed boasts the highest documented number of rare plants, animals, and natural community occurrences in the state of Georgia. For two years prior to removal, UGA Faculty, staff and students investigated the feasibility of modifying White Dam to improve aquatic connectivity and fish passage. As part of this investigation, they sought informal comment on the merit of this project from a number of interested stakeholders including the US Fish and Wildlife Service, US EPA, GA Department of Natural Resources, American Rivers, and others. These investigations identified the structure as a barrier to migration of anadromous American shad (Alosa sapidissima), and to localized migrations of resident fish species such as the imperiled Altamaha shiner (Cyprinella xaenura). Their efforts also indicated that restoring aquatic connectivity to this section of river could result in an increase in abundance or occurrence of native unionid mussels, of which many species are imperiled.

Step 3: The Regulatory Process to Obtain the Approval for Removal

In 2018, the White Dam became the first run-of-river dam in Georgia to be intentionally breached and partially removed solely for the purpose of habitat restoration. This removal occurred following completion of coordination between the US Army Corps of Engineers (USACE) Savannah District and other federal and state agencies as described in section 404 of the Clean Water Act. UGA was authorized to use Nationwide Permit No. 27 for Aquatic Habitat Restoration, Establishment, and Enhancement Activities within the Middle Oconee River (USACE permit file number SAS-2017-00086). Prior to issuance of this authorization, project planners and designers also had to coordinate removal with the Georgia Department of Natural Resources Environmental Protection Division and Athens-Clarke County.

Step 4: Plan and Design the Project

The project planning team comprised University of Georgia faculty and staff. Permitting and regulatory consulting was provided by Carter Engineering Consultants of Watkinsville, GA.

During initial investigation of the structure, the project team learned that White Dam had previously been identified by GA DNR and the US FWS as a potential impediment to native fish movement and aquatic connectivity. Since the cessation of power generation decades ago, the dam served no economic or flood-control functions but remains an in-channel obstruction. During high-flow periods, this obstruction collected a substantial pile of woody debris, which had to be removed regularly by UGA staff. Boaters had on occasion, been unable to navigate the dam and their boats had become impinged on the structure, demonstrating its potential safety risks. The objectives of this project were to restore aquatic habitat and enhance aquatic connectivity in the area around White Dam and the nearby sections of the Middle and North forks of the Oconee River.

Because this dam would be eligible for listing on the National Register of Historic Places, and recognizing that attainment of the objectives outlined above could result in adverse impacts on the historical value of this site, the project planners evaluated the following alternatives for this project:

1. Do Nothing/Status Quo

It was recognized that this could become the very first project of its kind permitted in the Savannah District of US ACE, but that numerous dam removal and modification projects have been completed throughout the US. After evaluating conditions in the area adjacent to the structure and consulting a number of interested stakeholders involved in projects of this type (including the US FWS, EPA, GA DNR American Rivers, and others), project planners rejected this alternative based on ecological concerns as well as concerns for the safety of boaters attempting to navigate this section of the river.

2. Total Removal

While total removal of all structures (dam wall, head race, and abutments on both banks of the river) associated with the dam would achieve the ecological and safety objectives, planners rejected this alternative primarily because it ignores the historical significance of the structure. Furthermore, the cost associated with total removal would have been significantly higher.

3. Construction of a by-pass channel

Project planners considered leaving the entire structure intact and digging a channel to by-pass the dam and restore ecological connectivity. This approach has been used successfully in other parts of the US. However, this alternative was rejected due to (1) logistical problems with the topography of the riparian areas on both banks, (2) concerns with hydrological stability, and (3) complications associated with ownership on the opposite side of the river from Whitehall Forest.

4. Modification to the existing structure

Including partial removal (breach of center section of dam wall) and stabilization of remaining portions (head race, end sections of the dam wall, and abutments on both banks of the river). After evaluation, this alternative was considered most practicable because it restored hydrologic and ecological function and connectivity to the river, while retaining most of the historically significant resource. This alternative was also determined to be the most cost-effective.

Description of most practicable alternative (partial breach):

The objective of the proposed breach was to maximize environmental and ecosystem benefits, while maintaining the structural integrity of the dam and retaining its historic value. After analyzing the hydraulic effects and consulting with a structural engineer, the best location for the proposed breach was identified between the existing sluice gates. The existing and proposed breach conditions of the dam and river were modeled to determine the change in hydraulic routing and what effects may occur due to the proposed breach. The modeling approach was detailed in the construction plans included in the permit application submission package. This construction alternative was selected to utilize the existing clean edges as the limits of the breach.

The approach called for the removal of all concrete and iron from a section of the center of the dam wall and retention of all native stone that was part of the original structure. This native stone was to be integrated back into the site to stabilize the portions of the structure that remain. Project managers felt that the design represented a balance between the ecological/safety benefits of modification to the existing structure and the impact on this historically significant resource.

Step 5: Project Implementation/Dam Deconstruction

The US FWS Southeast Regional Fish Habitat, Fish Passage, Maintenance and Construction Team was responsible for implementation of the construction design.

The breach plan included removing all of the concrete and natural stone wall and footing located between the two existing sluice gates. This resulted in an 88.5 linear foot open section, slightly offset to the south of the center of the dam. The remaining sections of the dam, on either side of the abutments, serve to protect the abutments from stormflow, and help maintain the structural integrity and historic value of the dam.

Minimization of effect:
During the pre-permitting investigation process, project managers consulted archaeologists, engineers, safety experts and aquatic ecologists to determine optimal placement and scale of modification to minimize the removal of historically significant material. They decided that an existing road could be used for all equipment staging and access required during construction. This road was already in use for regular maintenance and removal of woody debris that accumulated on the dam. A temporary river access ramp was utilized during construction.

The deconstruction of White Dam required seven days on site from start to finish.

Step 6: Post Removal Assessment

Archival Photo-Documentation of the existing structure, details of the proposed modification, and an environmental monitoring plan were submitted with the permit application package. USEPA Region 4 scientists assisted UGA in developing this plan. The monitoring plan included the following actions before and after removal:

- Bathymetry
- Benthic macroinvertebrate sampling
- Sediment sampling
- Water quality sampling
- Fish surveys

Under the terms of the project's NWP authorization, this monitoring was required under the terms to continue through the year 2021; however, the University of Georgia intended to continue monitoring beyond that time. The removal has been reported to American Rivers and is included in the national dam removal database.

Additional information on this case study can be found at the following:

Holding Back Time: How Are Georgia's Historic Dams Unique Resources? Mark Mooney. A Thesis Submitted to the Graduate Faculty of The University of Georgia in Partial Fulfillment of the Requirements for the Degree Master of Historic Preservation, Athens, Georgia, 2012. https://getd.libs.uga.edu/pdfs/mooney_mark_201205_mhp.pdf

White Dam Removal Quality Assurance Protection Plan. Derek Little, Project Leader. Field Services Branch, Science & Ecosystem Support Division, USEPA-Region 4. Project ID: 17-0038. Project Date: 2017-2019

Etowah River. / Credit: Alan Cressler.

Georgia
Aquatic Connectivity Team

If you are a dam owner interested in removing your dam, would like more information on dam removal in Georgia, are interested in becoming a Project Manager, would like to join and participate in the GA ACT, or know of a dam that would be a good candidate for removal, please contact the GA ACT through the Contact Link on the GA ACT Main Webpage. https://ga-act.org/contact/

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