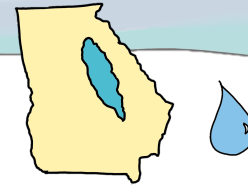


Waters of the Oconee River Basin: Uses, Benefits, and Flow-Related Metrics for Water Planning

Project Summary

This project focused on ways that people use and benefit from the **water resources** in the Upper Oconee Region.



Motivation for the Project

Much of the **Oconee River Basin** lies within the Upper Oconee Water Planning Region.



The existing water plan recognizes a wide range of uses and benefits of the region's waters but **lacks basin-specific information** on some of them.



What's in this Document?

- what we did to complete the project
- the uses and benefits identified as important by project participants from the basin
- how some uses and benefits depend on the amount of water in rivers or lakes
- flow metrics that indicate water availability for specific uses and benefits

The document concludes with bottom lines on how to use this information in updates of the regional water plan to support different benefits and uses of the region's waters for the long-term.



This collaborative project helps **fill that information gap**.

REVIEW DRAFT

This summary is available for review by members of the Upper Oconee Regional Water Planning Council. See the last page of this document for links to other products from this project.

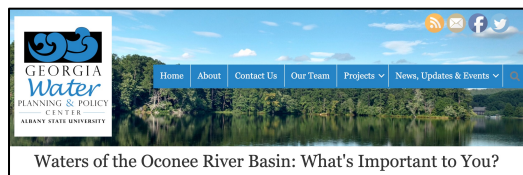


Uses and Benefits of Waterways in the Oconee River Basin: What Did the Project Involve?

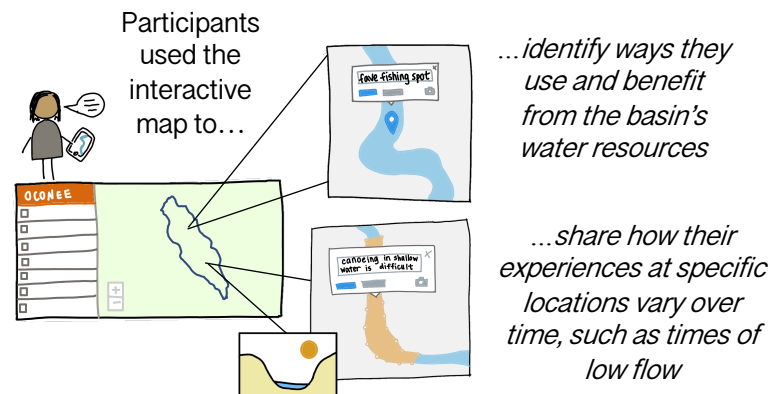
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Inputs from project participants:

We invited people across the basin to **tell us about the uses and benefits** of the basin's rivers, streams, and lakes that they find most valuable.



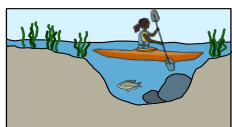
48 people contributed information through interviews, meetings, surveys, and an interactive map.



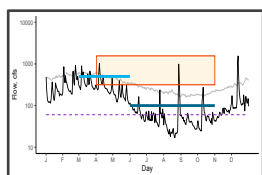
Review of scientific & technical studies:



We analyzed **scientific and technical studies** on basin water resources.



We focused on **flow-dependent** uses and benefits.



We used data to **create examples** of how flow metrics can be used in **water planning**.

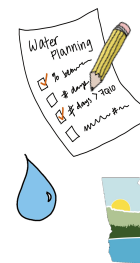
Project process:



Project products are for the...



Upper Oconee Regional Water Planning Council
to update management practices in the regional water plan



Georgia Environmental Protection Division
to use in water planning and management



General Public



What Uses and Benefits Did Project Participants Identify as Important to Them?

7 categories:

DRAFT



Surface water is withdrawn from streams, rivers, and lakes.

1

WATER SUPPLY



16 local governments or utilities in the basin provide public water supply with state permits for surface water withdrawals.

Groundwater mostly supplies water for **industrial & agricultural** use



irrigation of crops, animal & nursery operations

kaolin mining, paper/forest products


2

DIRECT ECONOMIC BENEFIT



4 **hydropower dams** in operation or recently operated in the basin



Dams **generate electricity** used to meet peak demand, but dams also **alter aquatic habitat** and  **block fish passage.**

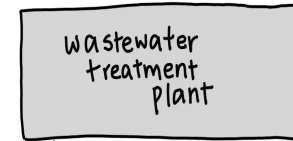
Reservoirs created by 2 of the dams are valued for **recreational use.**

Communities with developed boat launches along the river benefit from money spent on boating and other recreation, as do **private outfitters.**



Economic benefits from property along waterways include higher property value, land-based recreation enhanced by waterway connections, and attractive scenery

3



decreases pollutant levels

WATER QUALITY & WASTEWATER ASSIMILATION

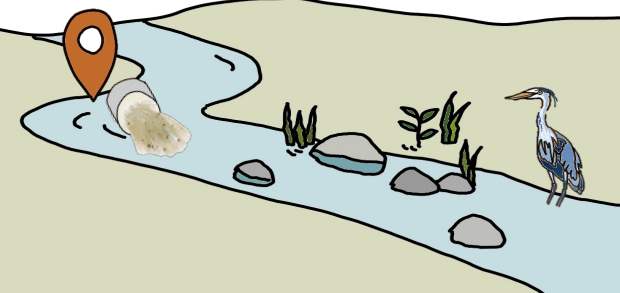
Treated municipal and industrial wastewater is returned to surface waters where pollutants are assimilated through natural processes.

Water quality is also impacted by sedimentation, wastewater collection system overflows, and pollutants in stormwater runoff.



Pollutants in runoff can decrease recreational value, degrade habitat, and make disposal of wastewater more expensive.

Project participants identified locations in the basin with specific **water quality concerns.**

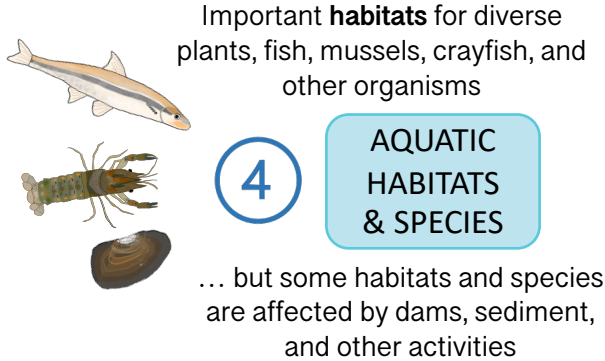




What Uses and Benefits Did Project Participants Identify as Important to Them?

7 categories:

DRAFT



4

AQUATIC HABITATS & SPECIES

Important **habitats** for diverse plants, fish, mussels, crayfish, and other organisms

... but some habitats and species are affected by dams, sediment, and other activities



14 species in decline = of special concern for biodiversity conservation

Shoals are river segments with shallow water, rocky bottoms, and faster flow. Shoals are important for fishes, plants, and invertebrates, and have recreational and historical significance.

Oxbows, sloughs, and oxbow lakes in the southern half of the basin are important habitats and recreational resources. Many sport fishes breed in oxbow lakes.

6

ENVIRONMENTAL & HISTORICAL EDUCATION

Sites that provide **water-related** educational and recreational opportunities, such as nature centers, designated historic sites, historic structures.



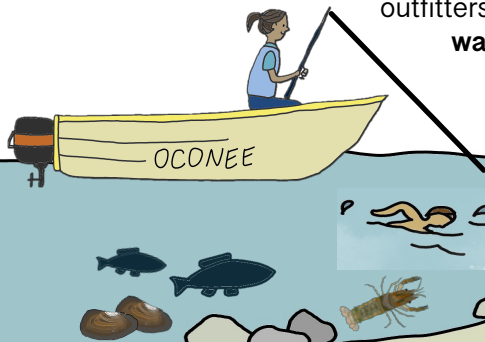
5

RECREATION ON RIVERS & LAKES

Project participants focused on recreational uses of the **large rivers and lakes** in the basin.

Recreational uses included motorized and non-motorized boating, fishing, swimming, wading.

Public areas, private locations, and outfitters that provide **access to the waterways** are valuable.



7

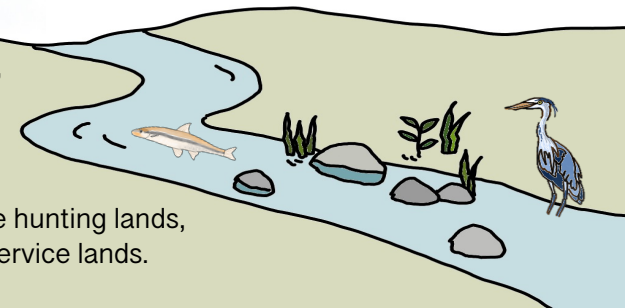
RECREATION & HABITAT ON LANDS ALONG RIVERS & LAKES

Benefits from **protected lands** also include water quality protection, aesthetic value, and floodplain habitats.



Activities on land include hiking, picnicking, birding, wildlife observation, camping, hunting, bank fishing.

Recreation occurs on public parks, greenways, private hunting lands, state wildlife management areas, and US Forest Service lands.



Flow-Related Benefits and Uses of the Oconee Basin



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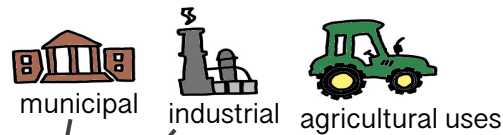
Scientific and technical studies on the Oconee River Basin highlight **5 kinds of uses or benefits** that are closely tied to streamflow or lake levels.



These 5 kinds of uses and benefits were also emphasized as important by project participants from the basin.



WATER SUPPLY



34 permitted surface water withdrawals

RIVER & LAKE RECREATION



HABITATS & SPECIES

maintenance of:

- river channel form
- capacity to assimilate pollutants
- water quality
- floodplain habitats
- wetland habitats
- aquatic habitats

supports at least:

- 65 fish species
- 11 native crayfish species
- 16 native mussel species



HYDROPOWER

generates power sold during peak demand

3 operational hydropower facilities

Tallassee Dam

Wallace Dam

Sinclair Dam



WASTEWATER DISCHARGE

disposal of treated wastewater, relies on natural capacity of waterbody to process or assimilate pollutants

90 National Pollutant Discharge Elimination System (NPDES) permits

**Uses shown in blue are already considered in the regional water plan*

**This project adds new information on uses shown in orange*



Developing Metrics for Flow-Related Benefits and Uses

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5 categories of uses or benefits were identified as important and closely tied to streamflow or lake level:

This connection allows development of metrics that can be applied in water planning to inform selection of management practices.



water supply



wastewater discharge



hydropower

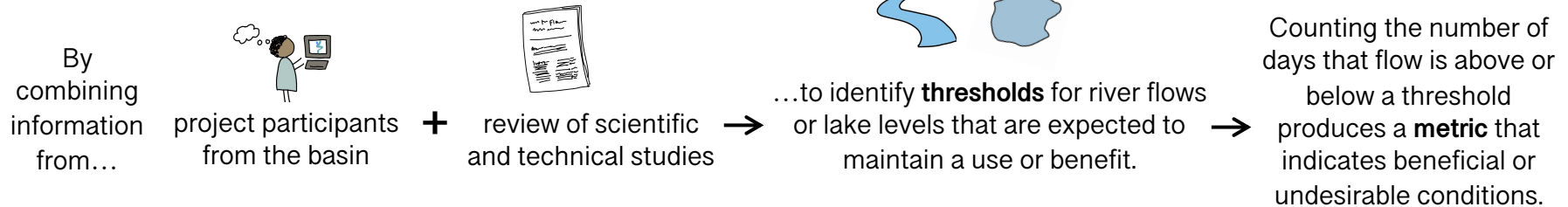


river and lake recreation



habitats and species

How did we develop flow-related benefits and metrics?



Updates to regional water plans already consider metrics for:

water supply

wastewater discharge

This project developed metrics for:

river and lake recreation

habitats and species

These metrics can be applied in technical analysis of water availability to **flag time periods or conditions of concern.**



Water planners can look at **how often beneficial or undesirable conditions occur now** for various uses and how those conditions may change with increased water demand **in the future**.

Results of this technical analysis are used to update the plan's management practices.

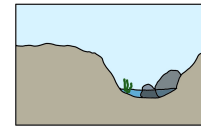
Understanding How Flows Affect Different Water Uses

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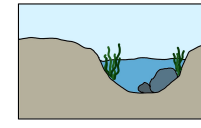
Using hydrographs to visualize flows and metrics

Flow levels vary naturally, which can positively OR negatively impact water uses and benefits.

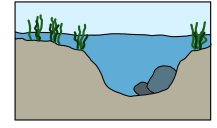
Due to this variability, flows are not expected to always support all water uses. But, understanding how flows affect water uses can inform water planning decisions.



low flow

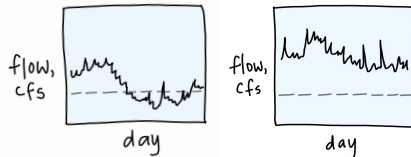


average flow



high flow

What are hydrographs?

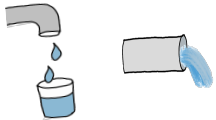


- **Hydrographs** show the amount of water, measured in cubic feet per second (cfs), in a river over time.
- Hydrographs are useful tools to visualize flow, thresholds, and metrics for flow-related uses and benefits.

Examples on the following pages include location-specific information on hydrographs to illustrate how various uses can be affected during high and low flow years.

Evaluating thresholds using water planning metrics

Metrics derived from thresholds for specific uses are applied in the technical analysis that **supports regional water planning**.



The analysis starts by looking at metrics that indicate undesirable conditions for water supply and wastewater assimilation.



Metrics for other water uses can then be applied to evaluate how uses that are important today may change in the future.

What are thresholds?

Thresholds are river flow or lake levels that are expected to support a specific use or benefit.

What are metrics?

Metrics are counts that tell us how often or how long flows are above or below a specific threshold.



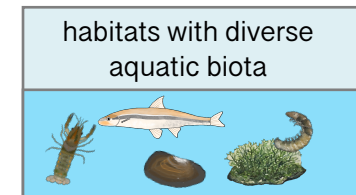
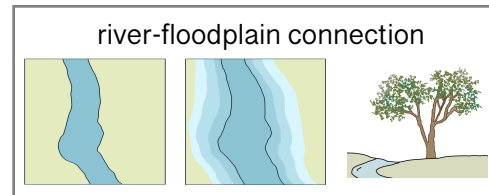
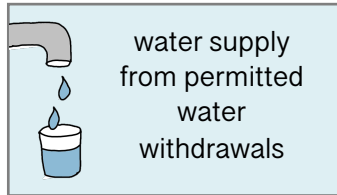
Management practices can then be identified to meet future needs for water supply and wastewater assimilation. Practices can also be identified to manage impacts on other uses important to people in the basin.

Water Planning Examples: Metrics

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The following pages show examples to illustrate thresholds and metrics in a dry year and a wet year at two locations in the Oconee River Basin: the Middle Oconee River at Athens and the Oconee River at Dublin. Similar metrics have been developed at other locations. Our [project website](#) provides more information.

Water uses and benefits shown in examples:



Associated **flow thresholds and metrics**:

- **Water supply**

Water withdrawal permits generally include a low flow protection threshold. The number of days with flow below that threshold is used as a metric. Metrics from withdrawal and wastewater permits are already used in water plan updates.

- **Recreation flows***

Thresholds show the range of flow levels that support paddling – flows above are not safe for the average paddler and flows below make it difficult to float a kayak or canoe. Our metric is the number of days in this range.

Metrics for habitats and species

identify conditions that put the long-term survival of the basin's diverse aquatic resources at risk.

Flows for habitats and species*

- **River-floodplain connection**

Threshold shows flows that connect the river and floodplain, allowing nutrients and species to move between different habitats and supporting trees and other species that rely on flooding. Metric is the number of days above threshold.

Flows for habitats and species*

- **Spring and early summer baseflows**

Threshold indicates sufficient flows for fish reproduction and survival and growth of young fishes. Metric is number of days below threshold.

- **Summer and fall baseflows**

Low flow threshold for survival of fishes and aquatic plants and insects. Metric is number of days below threshold, when exposure of the river channel leads to significant loss of habitat and insects that are important food sources for fish.



*This project adds metrics for recreation and for habitats and species to those available for water planning. These metrics can be used with water supply and wastewater discharge metrics to evaluate the effect of changes in water demand on the uses and benefits valued by people in the basin.

Water Planning Example for the Middle Oconee River, Athens, GA

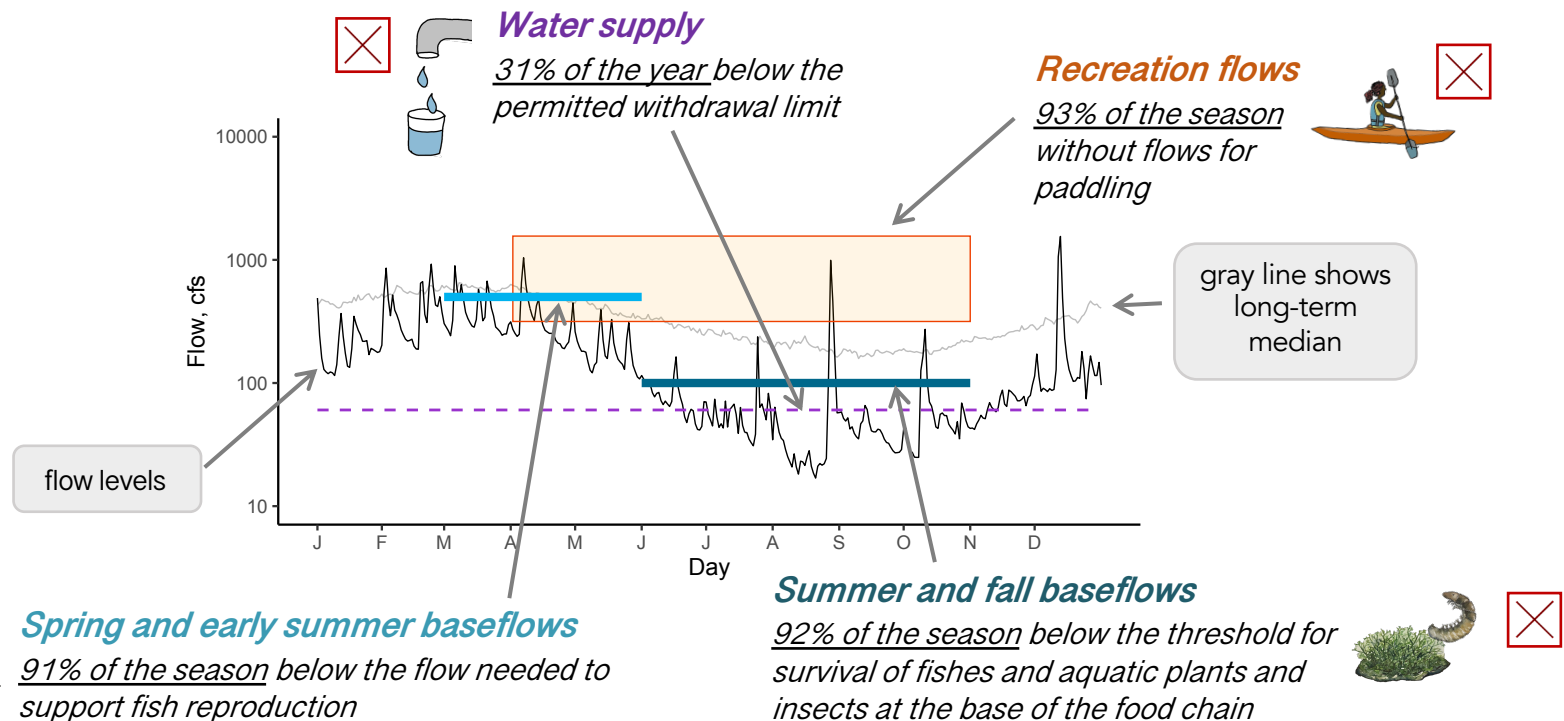
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Example of a LOW flow year



2008 was a severe drought year

Hydrograph is from a low flow year during a multi-year drought. The river showed the effects of prolonged dryness and increased withdrawals to meet higher demand for water supply.

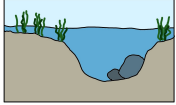


Low flow years can bring flows that are not always sufficient to support these water uses and benefits, particularly during multi-year droughts. If future demand leads to more time with insufficient flow, recovery after droughts may take longer.

Water Planning Example for the Middle Oconee River at Athens, GA

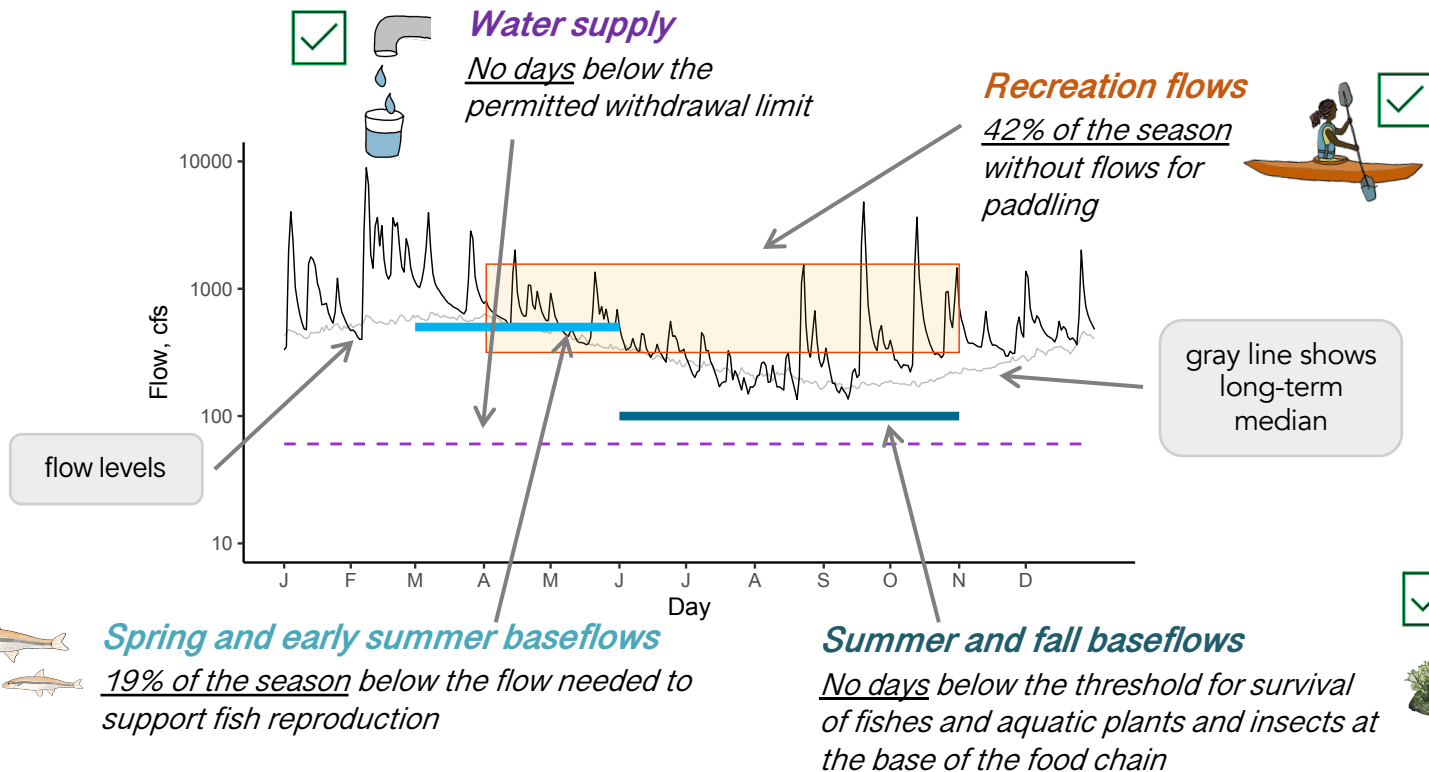
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Example of a HIGH flow year



2020 was a wetter year

Hydrograph is from a high flow year for the Middle Oconee River. Flows were above the annual long-term median flow for most of the year.



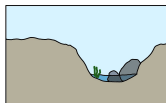
In high flow years, flows are generally sufficient to support water supply, paddling, and aquatic habitat and species, including fish reproduction. Water planners can see how this changes with future demand and adopt management practices if needed.

Water Planning Example for the Oconee River at Dublin, GA

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In two hydrographs from the Oconee River at Dublin, the black line shows the daily flow over a year. The colored lines show flow levels needed to support water supply (in purple) and river-floodplain connection (in green).

low flow year



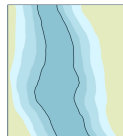
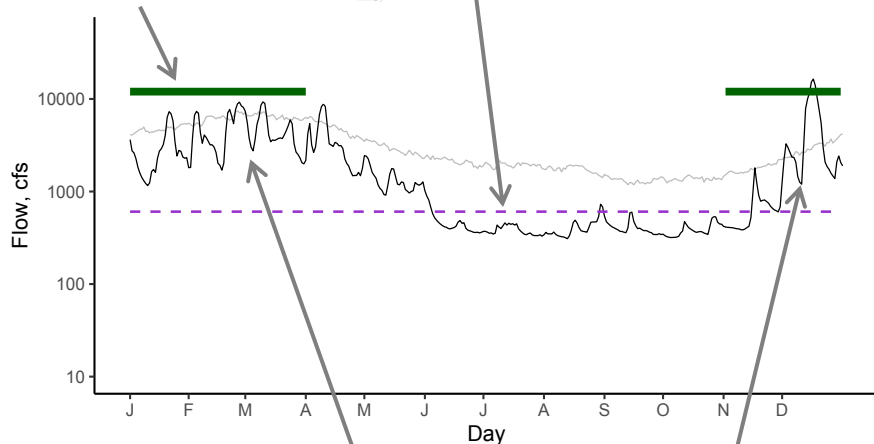
2008 was a severe drought year

river-floodplain connection threshold



Water supply

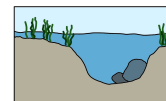
44% of the year below the permitted water withdrawal limit



River-floodplain connection

98% of the season below flows that connect the river and floodplain

high flow year

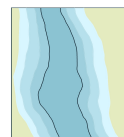
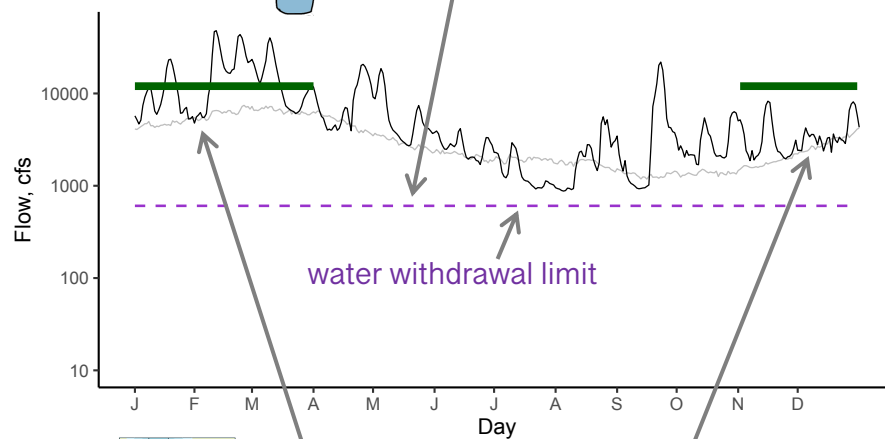


2020 was an overall wetter year



Water supply

No days below the permitted water withdrawal limit

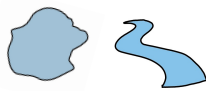


River-floodplain connection

70% of the season below flows that connect the river and floodplain



Low flow years can bring periods with flows below the threshold for water supply withdrawal and result in few days of connection between the river and floodplain. In high flow years, flows are generally above the water supply threshold and there are longer periods of river connection to the floodplain.



Bottom Lines for Water Planning



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Metrics are available for 4 types of water uses and benefits that are important to people from the basin → **and** are tightly tied to streamflow or lake levels.



Metrics are used in the technical analysis of water availability.

- Evaluate conditions under **current** water demand
- Then apply estimates of **future demand**
- **If undesirable conditions** for a use is more frequent or lasts longer than with current demand, planners can identify management practices to address that challenge.



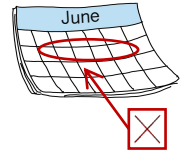
Management practices can address information needs, planning activities, or hands-on water management. They can be near-term or longer-term actions and they may benefit multiple uses.



Metrics for water supply and wastewater assimilation are applied first to flag time periods with undesirable conditions for these uses.



- **Water supply** metrics indicate times with challenges in meeting water demand due to low flows.
- **Wastewater** metrics identify times with greater risk of pollution impacts because flow is lower than needed to dilute wastewater.



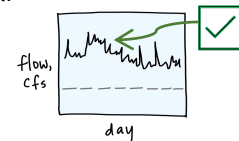
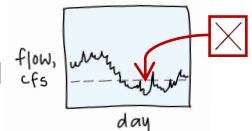
New planning metrics for recreation or species and habitats show how meeting water demand can affect other uses that people value. They can be applied in the same way as water supply and wastewater metrics.



- **Recreation** metrics identify times when low or high flows limit boating.
- For **species and habitats**, dry season baseflow metrics are important to long-term survival of fish, plants, and insects, which can survive the stress of *some* low flow periods. But, more frequent or longer periods of low flow puts the long-term survival of the food web at risk and may impact sport fishing.

Examples of management practices water planners could adopt:

- **Coordinate drought responses** among water providers that rely on the same source to address low flow impacts on water supply, boating, and aquatic habitats and species
- **Monitor metrics** with each plan update to track decreases in recreation, opportunity or risk to long-term viability of habitats and species
- **Consider impacts on other uses** when expanding or siting new water supply reservoirs
- **Identify information needed** to use metrics in next revision of the plan

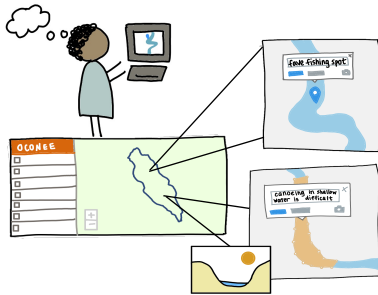


Project Outcomes, Products, and Request for Comments

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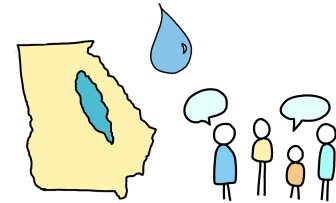
Project Outcomes:

This project illustrates the range of uses and benefits from the basin's water resources that people see as important and adds new basin-specific information for use by planners and basin residents thinking about water availability for the long term.



Detailed results are presented in maps that allow a user to choose what interests them:

- Specific uses and benefits
- Specific areas within the basin
- Individual points



This project provides information that water planners, water managers, and members of the public can use to ensure that, long-term, the region's water resources continue to support the range of uses and benefits that people enjoy today.

Project products are available on the project website:

This project's products can be found on the project website:

<https://h2opolicycenter.org/projects/waters-of-the-oconee-river-basin/>

- Project Summary
- Map – Participant Input on Important Uses and Benefits
- Map – New Planning Metrics: Recreation; Habitats and Species
- Description of Maps and Map Layers
- Review of Scientific and Technical Literature
- Supplemental Map: Volunteer Water Quality Monitoring Sites

Funding:

This project was funded by a Regional Seed Grant Implementation Grant from the Georgia Environmental Protection Division.

More information on Georgia's regional water planning program can be found at

<https://waterplanning.georgia.gov>.

Acknowledgements

We greatly appreciate the time and knowledge contributed by all who participated in this project and reviewed draft products.

This summary was prepared in August 2022 by Gail Cowie, Laura Rack, and Carol Yang. For more information, contact Gail Cowie at gcowie@h2opolicycenter.org.