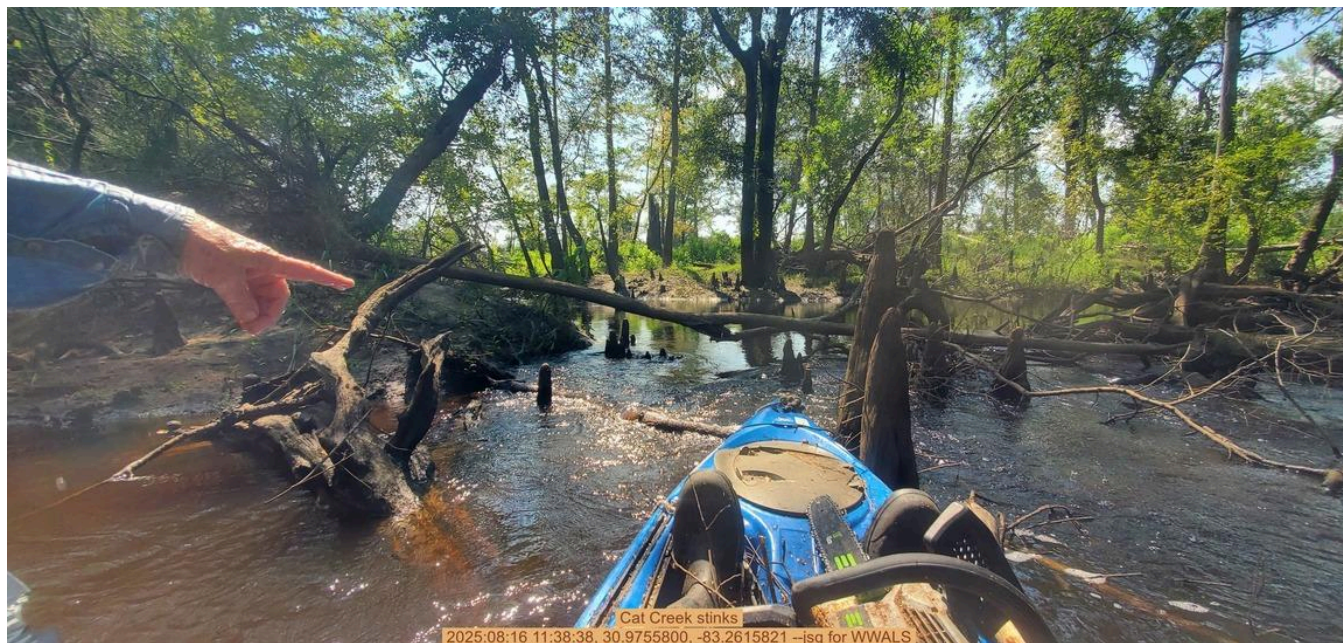


Cat Creek Nine Element Plan

This Nine-Element Plan for Cat Creek, HUC 0311020303, facilitates finding and fixing contamination that is getting into the Withlacoochee River upstream from Valdosta, Georgia, from Cat Creek and its feeder creeks in Berrien and Lowndes Counties, Georgia.



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Table of Contents

Executive Summary	3
Overview of the Problem	3
The Nine Elements	5
A. Identify causes and sources of pollution	5
Water Quality Impairments and TMDLs	6
Table 1: Water Quality Impairments and TMDLs	6
Ranking of Contamination Sources	7
Table 2: Ranking of Contamination Sources	7
B. Estimate pollutant loading expected load reductions	8
Table 3: Implementation and Education Strategy	8
C. Develop management measures to achieve goal	9
Table 4: Existing Management Measures	9
Table 5: Additional Management Measures	11
D. Identify technical and financial assistance needed to implement plan	14
E. Develop an information/education component	14
F. Develop a project schedule	15
Table 6: Implementation Schedule	15
G. Describe the interim, measurable milestones	17
H. Identify indicators to measure progress	18
I. Develop a monitoring component	19
Appendix A: Example E. coli test results	20
Appendix B: Maps	21
Overview Map	21
Zoning and Land Use Maps	22
Lowndes County Character Area Map	22
Berrien County Character Area Map	23
Lanier County Character Area Map	24
Most Upstream Cat Creek Map	25
Batterbee Branch to Beaverdam Creek Map	26
Beaverdam Creek Map	27
Beaverdam Creek to Beatty Mill Creek Map	28
Ice Castle Creek Map	29
Manna Creek Map	30
Harlee Lane Run Map	31
Dowdy Lane Creek Map	32
Possum Creek Map	33
Beatty Mill Creek Map	34
Beatty Mill Creek to Withlacoochee River Map	35
Peters Creek Map	36
Beatty Branch Map	37
Lower Cat Creek Map	38

Executive Summary

Contamination coming down Cat Creek into the Withlacoochee River is the reason for this Plan. GA-EPD has listed the subject stream stretches in TMDLs for low Dissolved Oxygen (DO). Further testing has revealed fecal bacteria as a related problem. To find the contamination sources so they can be fixed requires more testing and of more types, including DNA testing, which is expensive. Such a plan will facilitate applications for grants to fund such testing, as well as education, outreach, and fixes to the problems.

Initial evidence for fecal contamination getting into the Withlacoochee River upstream from Valdosta came from water quality tests by the City of Valdosta at North Valdosta Road (US 41). Lowndes County has tested upstream on Cat Creek to the Berrien County line and confirmed the problem. WWALS Watershed Coalition, Inc. (WWALS) has demonstrated that the contamination usually does not come from farther upstream on the Withlacoochee River than Cat Creek, and that various parts of Cat Creek and its feeder creeks are contaminated at various times. Frequent testing of all those creeks, especially after heavy rains, is needed to determine the sources of contamination and low DO.

Such testing will inform outreach to landowners and other stakeholders about potential Best Management Practices (BMPs) to fix the sources of the contamination. Once potential BMPs are identified, various sources of grant and other funding can come into play. This Plan includes metrics to determine initial and target reductions in contamination and increases in DO in Cat Creek and its feeder creeks.

Overview of the Problem

Preliminary testing by WWALS on Cat Creek, Beaverdam Creek, and Beatty Branch indicates that the source is probably not the Ray City wastewater plant where **Beaverdam Creek** joins Cat Creek, since we have gotten high E. coli results upstream on Beaverdam Creek.

It could be Ray City sewage, except some of the high results seem to be upstream from Ray City.

There are pecan groves next to some feeder creeks, which rumor has it may be being fertilized with chicken manure, which could do it: DNA testing would sort that out.

We also need to test Rays Mill Pond at the top of Beaverdam Creek, just in case.

For **Beatty Branch**, while we got high results below the Moody AFB wastewater plant, we also got high results upstream at Bemiss Road. There is nothing upstream of there except the base itself, which is puzzling.

Meanwhile, downstream of the Moody AFB wastewater plant there are cows grazing near Cat Creek. They may or may not be contributing to the creek contamination.

Finally, there are many septic systems near small feeder creeks towards the bottom of Cat Creek and elsewhere.

For more about specific locations of potential contamination sources, see [Ranking of Contamination Sources](#) in [A. Identify causes and sources of pollution](#).

See also [Appendix B: Maps](#).

There is also anecdotal evidence, such as the [strong smell of cattle manure on Beatty Branch at Cat Creek Road](#), and [a smell of sewage where Cat Creek joins the Withlacoochee River](#).

See also the [ANNUAL REPORT, Lowndes County Impaired Streams Monitoring 2022-04-07](#), which says about Fecal Coliform, *E. coli*, and Mercury that, “Lowndes County has not identified any point sources within the drainage areas that can be attributed to the widespread exceedances. Based on the limited data collected to date, it is the opinion of Lowndes County that the cause of the exceedances is from natural conditions.”

WWALS test results have already covered more detail, including after rains, and upstream from Lowndes County. They indicate that more testing, especially after heavy rains, could be useful in finding the contamination sources.

The only way to sort this out is more testing, including DNA testing. That's how for a previous creek contamination problem (Okapilco Creek out of Brooks County) WWALS determined the source was cattle. <https://wwals.net/?p=53260>

DNA tests can also distinguish hogs, birds, cats, dogs, and humans. <https://wwals.net/?p=55966>

However, DNA tests are much more expensive than traditional Georgia Adopt-A-Stream (AAS) biological (*E. coli*) and chemical monitoring (including Dissolved Oxygen or DO).

It wouldn't hurt to do PFAS testing as well, because those forever chemicals come from numerous sources, ranging from no-stick frying pans and raingear to firefighting chemicals. Plus Moody AFB spilled PFAS into Beatty Branch and groundwater some years ago, according to its own 2016 report on the subject. <https://wwals.net/?p=47812>

WWALS found PFAS in the Withlacoochee River in 2022 tests, although not as high as in many rivers elsewhere in that nationwide survey organized by Waterkeeper Alliance. <https://wwals.net/?p=59860>

Like DNA tests, PFAS tests are quite expensive.

This Plan lays out potential costs and a roadmap for how to test to find the contamination sources and what to do about them.

The Nine Elements

This document describes the Cat Creek contamination problem and how to deal with it, in the form of a Nine-Element Plan for Cat Creek:

- a. Identify causes and sources of pollution
- b. Estimate pollutant loading into the watershed and the expected load reductions
- c. Develop management measures to achieve goal
- d. Identify technical and financial assistance needed to implement plan
- e. Develop an information/education component
- f. Develop a project schedule
- g. Describe the interim, measurable milestones
- h. Identify indicators to measure progress
- i. Develop a monitoring component

The U.S. Environmental Protection Agency (EPA) requires a Nine Element Plan to apply for grants under the Clean Water Act section 319 Nonpoint Source Program. The Georgia Environmental Protection Division (GA-EPD) has a similar requirement.

For more about Nine Element Plans, see these U.S. EPA publications:

- [A QUICK GUIDE to Developing Watershed Plans to Restore and Protect Our Waters](#)
- [Handbook for Developing Watershed Plans to Restore and Protect Our Waters](#)

This Plan is similar to the one in the 2013 Withlacoochee River Watershed Improvement Plan:

<https://www.sgrc.us/documents/transportation/watershed/Withlacoochee%20FINAL%20WIP.pdf>

See page 26 in that document, APPENDIX A: NINE (9) – KEY ELEMENT SUMMARY.

Beyond sorting out this particular contamination issue, a Nine Element Plan will make it easier for the participants, individually or collectively, to apply for other grants related to Cat Creek.

A. Identify causes and sources of pollution

“An identification of the causes and sources or groups of similar sources that will need to be controlled to achieve the load reductions estimated in this watershed based plan (and to achieve any other watershed goals identified in the watershed based plan), as discussed in item (b) immediately below. Sources that need to be controlled should be identified at the significant subcategory level with estimates of the extent to which they are present in the watershed (e.g., X numbers of dairy cattle feedlots needing upgrading, including a rough estimate of the number of cattle per facility; Y acres of row crops needing improved nutrient management or sediment control; or Z linear miles of eroded streambank needing remediation).”

First we review TMDLs, and then we rank contamination sources.

Water Quality Impairments and TMDLs

Cat Creek has been in GA-EPD Total Maximum Daily Loads (TMDL) lists for Dissolved Oxygen (DO) since at least 2001. See [Suwannee River Basin Dissolved Oxygen TMDL Submittals](#), GA-EPD, December 2001.

Table 1: Water Quality Impairments and TMDLs

Reach Name ID	Location	County(s)	Impairment	Miles Impacted	Category / Priority
Cat Creek GAR031102030308	Batterbee Branch to Beaverdam Creek*	Berrien	DO Pending	0.45	3N
Beaverdam Creek GAR031102030307	Rays Millpond to Cat Creek*	Berrien	DO Pending	2.4	3N
Cat Creek GAR031102030305	Beaverdam Creek downstream SR37 to Beatty Mill Creek**	Berrien, Lowndes	DO Not Supporting	4.2	4a
Cat Creek GAR031102030304	Beatty Mill Creek to Withlacoochee River near Ray City**	Lowndes	DO Not Supporting	4.2	4a
Beatty Branch GAR031102030306	Headwaters to Cat Creek***	Lowndes	DO Pending	3.2	3N

Table source: [Draft 2026 Rivers/Streams](#), in [Georgia's Draft 2026 305\(b\)/303\(d\) List Documents](#) –GA-EPD

- * DO is in Category 3N. Low DO may be natural due to the water being a blackwater stream.
- ** TMDL completed DO 2001.
- *** DO is in Category 3N. More information is needed to determine if low DO is a natural condition or an impairment
- According to [Description of the 305\(b\)/303\(d\) List of Waters](#):

Category 3N - Additional data/information is needed to determine if violations of water quality criteria are due to Natural Conditions.

Category 4a – Data indicate that at least one designated use is not being supported, but TMDL(s) have been completed for the parameter(s) that are causing a water not to meet its use(s).

This Plan will facilitate finding out what is causing the low DO, as well as high *E. coli* and other problems in these streams.

Ranking of Contamination Sources

Although there are two wastewater treatment facilities on Cat Creek or its tributaries, surprisingly so far neither of them seem to be a source of contamination. More likely are sewer system leaks, livestock, wildlife, animal-based fertilizer, and septic tanks.

Table 2: Ranking of Contamination Sources

Source	Extent (Miles, acres, etc.)	Permitted	Estimated Contribution (Rank 1-5)	Comments
Livestock	2 miles	N	3	Cattle and some horses
Agricultural Runoff	0.4 miles	N	3	Animal manure fertilizers
Wildlife	5 Miles	N	3	Deer everywhere
Stormwater Runoff	5 Miles	N	2	Could be anywhere
Failing Septic Systems	4 Miles	Y	3	Many possibilities
Publicly Owned Treatment Works	NA	Y	1	Ray City and Moody AFB
Failing Sewer Lines	1.5 miles	Y	2	Ray City and Moody AFB

The two Publicly Owned Treatment Works (POTW), each of which has feeder sewer lines, are:

- In Berrien County, Ray City's wastewater plant, at the Beaverdam Creek Confluence with Cat Creek.
- In Lowndes County, Moody Air Force Base's wastewater plant, which is run by Lowndes County, on Beatty Branch.

Animal-based fertilizers are most likely in pecan groves. Observation and testing, especially DNA testing, should readily determine presence or absence.

- In Berrien County, along Ramblinwood Road and Johnson Road at Baskin Road.
- In Lowndes County, along Cat Creek Road and GA 122.

There are septic tanks:

- In Berrien County on Mill Pond Place and Water Lily Way off of Baskins Road, along Harlee Lane and Ridgewood Drive off of Possum Creek Road, etc.
- In Lowndes County, along GA 122, along Beatty Mill Creek and Beatty Branch, and especially along Radar Site Road, Vienna Church Road, Cat Creek Road, and nearby.

See also [Appendix B: Maps](#).

B. Estimate pollutant loading expected load reductions

“An estimate of the load reductions expected for the management measures described under paragraph (c) below (recognizing the natural variability and the difficulty in precisely predicting the performance of management measures over time). Estimates should be provided at the same level as in item (a) above (e.g., the total load reduction expected for dairy cattle feedlots; row crops; or eroded streambanks).”

Table 3 below shows implementation and education strategies for types of target audiences.

Source assessment is the key to effective management measures, because different sources need different measures.

Education is intertwined with BMP implementation, so farmers, homeowners, landowners, municipalities, counties, and other governmental entities can make decisions to enhance the health of the waterways.

Table 3: Implementation and Education Strategy

Source	Target Audience	Message	Delivery Mechanism
Streambank erosion, land clearing and construction practices	Riparian landowners, builders, contractors	Encourage landowners to leave a conservation buffer, provide attractive landscaping for natural vegetation.	Information material disseminated and implement BMPs.
Cattle and livestock access	Agriculture managers, landowners	Control livestock access, establish fencing, create proper stream crossings, provide alternate funding sources	With NRCS and Conservation Districts, and other partners provide information at fairs, field days, and events, implement BMPs.
Failing septic systems	Homeowners	Properly maintain your septic system to prevent water quality degradation.	Information material, repair failing systems. disseminated to local Health Departments and landowners.
Agriculture practices	Agriculture managers, landowners	By reducing livestock access to surface water you are protecting a resource that is very valuable to everyone.	Implement BMPs and hold field days or workshops.
Cropland	Agriculture managers, landowners	By reducing erosion access to surface water you are protecting a resource that is very valuable to everyone.	Implement BMPs and hold field days or workshops.
Stormwater runoff	Local officials, residents	Protect the waterways by reducing the amount of pollutants entering the river, make public aware of where stormwater goes.	Drain markers, informative seminars for local officials, brochures for the public, tours of model stormwater site, implement appropriate BMPs.

Sources of coliform bacteria include human (septic tanks or wastewater systems), pets, livestock, wildlife, and agricultural practices, all potentially entering waterbodies directly or through ditches, stormwater pipes or easements, or sewer systems.

Even though the Cat Creek watershed is small, it contains rural, suburban, and urban land uses, and management practices have to vary accordingly. Proposed actions include agricultural BMPs, stream channel BMPs, stormwater management BMPs, sanitary sewer system improvements, and urban or residential education components.

C. Develop management measures to achieve goal

“A description of the NPS management measures that will need to be implemented to achieve the load reductions estimated under paragraph (b) above (as well as to achieve other watershed goals identified in this watershed-based plan), and an identification (using a map or a description) of the critical areas in which those measures will be needed to implement this plan.”

For maps, see [Appendix B: Maps](#).

See also above for [Table 3: Implementation and Education Strategy](#).

Table 4: Existing Management Measures

Regulation/Ordinance or Management Measure	Responsible Government, Organization or Entity	Description
Local Wetlands Policy Ordinance	Berrien County Lowndes County City of Ray City	Water Resource District Ordinance applies to the Georgia Planning Act Part V: Environmental Criteria.
Protected River Corridor Plan Ordinance	Berrien County Lowndes County City of Ray City	Water Resource District Ordinance applies to the Georgia Planning Act Part V: Environmental Criteria.
Farm Service Agency	USDA - FSA	Requires producers to comply with conservation plans for the farm, wetland provisions, planting flexibility provisions, as well as to keep the land in agricultural use.
Conservation Reserve Program (CRP)	USDA - FSA	Ongoing financial and technical assistance to encourage farmers to convert erodible cropland to vegetative cover.
Environmental Quality Incentives Program (EQIP)	USDA - FSA	Ongoing financial and technical assistance to install /implement structural and management practices on eligible agricultural land and/or for commodity operations.
Soil Testing	Landowner with assistance from UGA - Cooperative	Applies to soil sampling taken on a regular basis to minimize impacts of fertilizers, pesticides, and herbicides in waterways.

	Extension and/or licensed contractor	
Erosion & Sedimentation Ordinance	Berrien County Lowndes County	Adopted and enforced.*
Illicit Discharge Ordinance	Berrien County Lowndes County	Adopted and enforced.*
Stormwater Utility	Berrien County Lowndes County	Adopted and enforced.*
Cover Crop, Critical Area Planting, Fence, Heavy Use Area Protection, Irrigation System - Sprinkler, Pasture and Hay Planting,	USDA - NRCS and landowner in Berrien County and Lowndes County	Ongoing financial and technical assistance to install /implement structural and management practices on eligible agricultural land and/or for commodity operations.
Groundwater Recharge Development Ordinance	Berrien County Lowndes County City of Ray City	Water Resource District Ordinance applies to the Georgia Planning Act Part V: Environmental Criteria.
Storm water detention/retention standards	Berrien County Lowndes County City of Ray City	Adopted and enforced.*
Manure Management Plan	Landowner with assistance from NRCS, UGA - Cooperative Extension, and/or licensed contractor	Applies to keeping records of manure applications and continuous soil sampling.
South Georgia MultiJurisdictional Solid Waste Management Plan	Berrien County Lowndes County	The update to the multi-jurisdictional solid waste plan was completed in 2002. In 2007, the Lowndes County Solid Waste Management Plan (SWMP) was completed and is scheduled to be update in 2017.†
NPDES Stormwater Phase II Permit	Berrien County Lowndes County	Following requirements as identified in permit.†
Section 319(h) Grant – Well and Septic Tank and Online Referencing Mapping (WelSTROM) System	SGRC	Approved by GA EPD and began work in 2007. This provides a tool for local governments and regional agencies to guide future decisions, such as development, infrastructure expansions, TMDL development and implementation, and education outreach on all new septic systems.†

**Update this for Berrien; †Get current status*

Table 5: Additional Management Measures

Testing, Analysis, and Reporting	Cost Per Unit	Est. Total Cost	Impairment Addressed	Load Reduction (%)	Benefits
VSU Faculty		\$6,569 /year	All	NA	Coordinate students doing analyses and make recommendations
VSU students		\$4,500 /year	All	NA	Perform GIS and other tasks as directed by faculty
Suwannee Riverkeeper		\$12,000 /year	All	NA	Communicating with collaborators and potential contamination sources, attending meetings of local governments, etc., interpreting test results and coordinating followup, starting with notifying contamination sources; getting data into Know Your River (KYR) including automating, and educating the team about KYR and how to use it.
WWALS E.D.		\$12,000 /year	All	NA	Coordinating WWALS personnel for the project
WWALS Water Quality Coordinator		\$12,000 /year	All	NA	Coordinating WWALS water quality testers for the project
WWALS water quality testers	\$21 /site /test	\$12,000 /year	All	NA	Performing water quality tests, reporting them to the WWALS Testing Committee for review, filing them with Georgia Adopt-A-Stream, providing recommendations.
WWALS publicity		\$4,000 /year	All	NA	Weekly reports on social media, posting signs after contamination events, and otherwise notifying the public.
Tester Mileage	\$0.725 /mile	\$3,619 /year	Travel to test	NA	Enables finding sources causing the TMDLs and determine when levels are within limits
E. coli test materials	\$10	\$12,480 /year	FC	NA	Find sources causing the TMDLs and determine when levels are within limits
Chemical test supplies (pH, DO, etc.)	\$3	\$936 /year	Acidity, DO, etc.	NA	Find sources causing the TMDLs and determine when levels are within limits
DNA test kits	\$125	\$4,500 /year	Species of contamination	NA	Find which species are causing contamination
PFAS test kits	\$79	\$1,896 /year	Forever chemical contamination	NA	Find sources and levels of PFAS contamination and determine when levels are within limits

Metal test kits (lead, mercury, etc.)	\$170	\$3,060 /year	Metal contamination	NA	Find sources and levels of metal contamination and determine when levels are within limits
Newfields		\$35,000 /year1	KYR GIS mapping and reporting	NA	Making all the test results and other data accessible.
Newfields		\$19,200 /year	KYR Annual maintenance after year 1	NA	Making all the test results and other data accessible.
ESRI		\$550 /year	GIS map hosting	NA	Making all the test results and other data accessible.
BMP	Cost Per Unit	Est. Total Cost	Impairment Addressed	Load Reduction (%)	Benefits
Ag Riparian Buffer	NA	NA	DO, FC	50-75%	Act to intercept sediment, nutrients, pesticides, and other materials in surface runoff and reduce nutrients and other pollutants in shallow subsurface water flow. They also serve to provide habitat and wildlife corridors and can help reduce erosion by providing stream bank stabilization.
Livestock Exclusion Fencing	\$2.56 LF or \$3.55 LF	NA	DO, FC	75%	Reduce sediment and possibly nutrient yield from streams draining pastures.
Limited Access Crossing	NA	NA	DO, FC	NA	Less erosion and sedimentation in the water.
Streambank Restoration	NA	NA	DO, FC	NA	Helps to improve habitat for the aquatic and semi-aquatic life supported by the stream, serve as a pollutant buffer, and act as a physical buffer against cattle and other animals that may trample or erode the streambank.
Bio-retention Areas	\$17 SF	NA	DO, FC	75-90%	Removes pollutants through a variety of physical, biological, and chemical treatment processes.
Stormwater Wetlands	\$14 CY	NA	DO, FC	70%	Improves water quality, flood control. Enhances wildlife, and removes pollutants through sedimentation and filtration.
Increase E&S Efficiency	NA	NA	DO, FC	75%	Helps mitigate increased sediment loads to streams.
Education Outreach	NA	NA	DO, FC	NA	Helps to increase awareness on the importance of water quality.

Vegetative Buffers	NA	NA	DO, FC	50-80%	Highly effective for controlling sedimentation, erosion, and pollution from runoff.
Cover Crops	\$28 AC to \$92 AC	NA	DO, FC	40-60%	Prevents erosion.
Heavy Use Area Paddocks	\$2.36 SF to \$11.36 SF	NA	DO, FC	80%	Reduces erosion while improving water quality.
Septic System Repairs	\$710 to \$7,100	NA	FC	50-75%	Reduces fecal coliform from nearby streams.
Pet Receptacles	\$500	NA	DO, FC	NA	Helps remove bacteria, pathogens, and nutrients via stormwater runoff.
Filter Strip	\$640 AC	NA	DO, FC	50-80%	Protects water quality by trapping soil particles, nutrients, and pesticides, they can also improve water infiltration and enhance wildlife habitat.
Promote a naturalized landscape	NA	NA	DO, FC	NA	Improves water quality and reduces erosion.
Grass Waterway	\$7 LF	NA	DO, FC	60-80%	Provides pretreatment, partial infiltration of runoff in suitable soil conditions, generally less expensive than extruded curb, good for small drainage areas, and relatively low maintenance requirements.
Rain Barrels	\$285	\$10,000	FC	NA	Reduces stormwater runoff and acts as an alternative water source.

DO: Dissolved Oxygen; FC: Fecal Coliform

Potential evaluation methods for the above measures include:

- Physical water quality monitoring
- Chemical water quality monitoring
- Biological life measurements
- Photographic or visual evidence, before and after photos
- Documentation of site BMPs installed
- Pollutant loading measurements
- Stakeholder surveys, evaluate knowledge or change in behavior
- Focus groups, to determine effectiveness of project activities

D. Identify technical and financial assistance needed to implement plan

“An estimate of the amounts of technical and financial assistance needed, associated costs, and/or the sources and authorities that will be relied upon, to implement this plan. As sources of funding, States should consider the use of their Section 319 programs, State Revolving Funds, USDA's Environmental Quality Incentives Program and Conservation Reserve Program, and other relevant Federal, State, local and private funds that may be available to assist in implementing this plan.”

Funding opportunities for local governments, non-profits, and individuals may include, but are not limited to: U.S. Environmental Protection Agency (EPA), GA-EPD, U.S. Department of Agriculture – Natural Resource Conservation Service (NRCS), U.S. Fish and Wildlife Programs (USFWS), and GA Environmental Facilities Authority (GEFA). Funding sources and opportunities change on a yearly basis.

See Table 5: Implementation Schedule in F. Develop a project schedule.

E. Develop an information/education component

“An information/education component that will be used to enhance public understanding of the project and encourage their early and continued participation in selecting, designing, and implementing the NPS management measures that will be implemented.”

1. Publish results as part of the WWALS Weekly Water Quality Report
2. Publish one-sheet rack cards with high-level summaries and QR Code leading to more
3. Hold at least one annual online-by-zoom WWALS Webinar on the results
4. Hold an in-person seminar at VSU on the subject
5. Present at relevant bodies, such as Alapaha Soil and Water Conservation District, Suwanee-Satilla Water Planning Council, Seven Rivers RC&D, county commissions, city councils, Comprehensive Plan update meetings, fairs, field days, festivals, and other events.

For specific audiences, see Table 3 above.

F. Develop a project schedule

“A schedule for implementing the NPS management measures identified in this plan that is reasonably expeditious.”

See Table 6.

Table 6: Implementation Schedule

2026	
Measureable Milestone	Party Responsible
Contact Stakeholder and Advisory Groups to present and discuss funding options and future goals.	NRCS, WWALS, VSU
Finalize this Plan	WWALS, VSU, NRCS
Apply to GA-EPD for a grant	VSU and WWALS
2027	
Measureable Milestone	Party Responsible
Execute contract with GA-EPD	VSU
Identify appropriate students to assist with GIS mapping and other tasks	VSU
Dedicate part of a staff position to manage students	VSU
Employ a part-time water quality coordinator	WWALS
Hire water quality testers to be compensated per test per site and for mileage	WWALS
Purchase testing kits and materials for E. coli, chemical, DNA, metals (lead, mercury, etc.) and PFAS testing.	WWALS
Proceed with testing locations as in (H) below	WWALS
Dedicate part of a staff position to coordinate WWALS personnel, do outreach, and publish results	WWALS
Regular publication of results in WWALS Weekly Water Quality Report	WWALS

Coordination and Liaison with Watershed Citizens, Stakeholders, and Advisory Groups.	NRCS, VSU, WWALS
Engage Newfields to implement the Suwannee River Basin in Know Your River and pay for ESRI subscription.	WWALS
2028	
Measureable Milestone	Party Responsible
Present a community educational workshop.	VSU, WWALS, NRCS
Identification of one or more sources of contamination	WWALS, VSU
Identification of relevant BMPs	VSU, WWALS, NRCS, landowners
Implementation of relevant BMPs	WWALS, VSU, NRCS, landowners
Reduction in E. coli, preferably below 1,000 cfu/100 mL, weekly and after rain events at sites in (G) below	WWALS
2029	
Measureable Milestone	Party Responsible
Reduction in E. coli, preferably below 410 cfu/100 mL, weekly and after rain events at sites in (H) below	WWALS
Annually	
Measureable Milestone	Party Responsible
Identify appropriate students to assist with GIS mapping and other tasks	VSU
Dedicate part of a staff position to manage students	VSU
Employ a part-time water quality coordinator	WWALS
Deploy water quality testers compensated per test per site and for mileage	WWALS
Replenish testing kits and materials for E. coli, chemical, DNA, metals (lead, mercury, etc.) and PFAS testing.	WWALS

Proceed with testing locations as in (H) below	WWALS
Dedicate part of a staff position to coordinate WWALS personnel, do outreach, and publish results	WWALS
Regular publication of results in WWALS Weekly Water Quality Report	WWALS
Coordination and Liaison with Watershed Citizens, Stakeholders, and Advisory Groups.	NRCS, VSU, WWALS
Newfields annual maintenance (after year 1) of the Suwannee River Basin in Know Your River and ESRI subscription.	WWALS
Education Outreach (website, media, workshops/field days, etc).	WWALS, NRCS
Encourage and install appropriate BMPs.	NRCS, WWALS
Review and revise the Plan.	WWALS, VSU, NRCS

G. Describe the interim, measurable milestones

“A description of interim, measurable milestones for determining whether NPS management measures or other control actions are being implemented.”

1. Obtain grant from GA-EPD or other source and execute contract
2. Employ a part-time water quality testing coordinator
3. Hire water quality testers to be compensated per test per site and for mileage
4. Proceed with testing locations as in (h) below
5. Identification of one or more sources of contamination
6. Implementation of relevant BMPs
7. Reduction in E. coli, preferably below 1,000 cfu/100 mL, weekly and after rain events at:
 - a. Cat Creek at GA 122, Cat Creek Road, and Confluence with Withlacoochee River (if accessible); see [Overview Map](#)
 - b. Beaverdam Creek at Park Street; see [Beaverdam Creek Map](#)
 - c. Beatty Mill Creek at Beatty Mill Creek Road; see [Beatty Mill Creek Map](#)
 - d. Beatty Branch at Cat Creek Road; see [Beatty Branch Map](#)

H. Identify indicators to measure progress

“A set of criteria that can be used to determine whether loading reductions are being achieved over time and substantial progress is being made towards attaining water quality standards and, if not, the criteria for determining whether this watershed based plan needs to be revised or, if a NPS TMDL has been established, whether the NPS TMDL needs to be revised.”

The criteria:

1. Dissolved Oxygen (DO). See [Suwannee River Basin Dissolved Oxygen TMDL Submittals](#), GA-EPD, December 2001, which recommends:

Numeric. A daily average of 5.0 mg/l and no less than 4.0 mg/l at all times for waters supporting warm water species of fish. 391-3-6-.03 (c) (l)

Natural Water Quality - GAEPD. It is recognized that certain natural waters of the State may have a quality that will not be within the general or specific requirements contained herein...

Natural Water Quality - EPA. “Where natural conditions alone create dissolved oxygen concentrations less than 110 percent of the applicable criteria means or minima or both, the minimum acceptable concentration is 90 percent of the natural concentration.”

The same document recorded for CAT CREEK (CR 777) NEAR BARRETTTS, GA., DO minimum 0.9, maximum 10, average 4.7 over 20 samples. Since the average is more than 4.0 and less than 5.0, presumably the minimum is the problem.

We aim to document an average between 4.0 and 5.0 mg/L., or reasons for why it is low, such as accumulated decaying vegetation.

2. E. coli below 410 cfu/100 mL weekly and after rain events for:
 - a. Cat Creek at GA 122, Cat Creek Road, and Confluence with Withlacoochee River (if accessible); see [Overview Map](#)
 - b. Beaverdam Creek at Park Street; see [Beaverdam Creek Map](#)
 - c. Beatty Mill Creek at Beatty Mill Creek Road*; see [Beatty Mill Creek Map](#)
*if indicated by high Cat Creek E. coli at Cat Creek Road but not at GA 122.
Other feeder creeks may also need such testing; see [Appendix B: Maps](#).
 - d. Beatty Branch at Cat Creek Road; see [Beatty Branch Map](#)
 - e. Radar Site Branch at Cat Creek Road†
 - f. Backe Branch at Radar Site Road†
 - g. Pams Branch at Robinson Road†
† Not needed if Cat Creek Confluence is testable and tests well;
see [Lower Cat Creek Map](#)
3. No significant DNA markers for human, cattle, horse, hog, dog, cat, or bird DNA at
 - a. Cat Creek at GA 122, Cat Creek Road, and Confluence with Withlacoochee River (if accessible)

I. Develop a monitoring component

“A monitoring component to evaluate the effectiveness of the implementation efforts over time, measured against the criteria established under item (h) immediately above.”

1. Start with weekly water quality monitoring at the locations from (G) above.
2. Also monitor after big rain events.
3. Take periodic DNA and PFAS samples, especially after big rain events.
4. Add the rest of the locations from (H) above.
5. Even when the goals in (H) have been achieved, continue monitoring weekly at the locations from (G) above, if funding is available.

Appendix A: Example *E. coli* test results

	2023-01-18		2023-01-19		2023-01-20		2023-01-21		2023-01-22		2023-01-23		2023-01-24		2023-01-25		2023-01-26	
Composite Water Q	Fecal Coliform	E. coli	Fecal Coliform	E. coli	Fecal Coliform	E. coli	Fecal Coliform	E. coli	Fecal Coliform	E. coli	Fecal Coliform	E. coli	Fecal Coliform	E. coli	Fecal Coliform	E. coli	Fecal Coliform	E. coli
Previous year: https://docs.google.com/spreadsheets/d/1UEjkTXgGzRBf4GbDwcwlQylGma26BNMG_5EVeJpm1Ow/edit?gid=317772187#gid=317772187	(CFU/100 mL)	(MPN/100 mL)	(CFU/100 mL)	(MPN/100 mL)	(CFU/100 mL)	(MPN/100 mL)	(CFU/100 mL)	(MPN/100 mL)	(CFU/100 mL)	(MPN/100 mL)	(CFU/100 mL)	(MPN/100 mL)	(CFU/100 mL)	(MPN/100 mL)	(CFU/100 mL)	(MPN/100 mL)	(CFU/100 mL)	(MPN/100 mL)
Georgia																		
Withlacoochee River																		
Withlacoochee River @ GA 122 (Hagan Bridge)				W166														W533
Withlacoochee River @ Franklinville Road (Tyler Bridge)				W100														W200
Beaverdam Creek																		
Beaverdam Creek @ Ramblinwood Road																		W333
Beaverdam Creek @ Main Street (US 41)																		W766
Beaverdam Creek @ Park Street																		W533
Beatty Branch																		
Beatty Branch @ Bemiss Road																		W2,433
Beatty Branch @ Beatty Road																		W700
Beatty Branch @ Cat Creek Road																		W666
Cat Creek																		
Cat Creek @ GA 37																		W200
Cat Creek @ GA 122																		W400
Cat Creek @ Cat Creek Road																		W833
Withlacoochee River @ Skipper Bridge Gauge		Rain 0.00*		Rain 0.00*		Rain 0.00*		Rain 0.00*		Rain 1.34*		Rain 0.00*		Rain 0.00*		Rain 1.26*		Rain ?*
Withlacoochee River @ Skipper Bridge				W66														
Withlacoochee River @ Staten Road				W33														
Withlacoochee River @ US 41 (N. Valdosta Rd.)	V305	V255		W66	V210	V215					V1,475	V1,570						W733
Withlacoochee River @ Langdale Park Boat Ramp																		W666
Sugar Creek																		
Sugar Creek @ Salty Corner Landing																		W700
Withlacoochee River																		
Withlacoochee River @ I-75 Landing																		W466
Withlacoochee River @ GA 133	V150	V425			V130	V100					V1,140	V1,990						W500
Little River																		
Deep well @ 161 Royal St., Sylvester		Rain 0.00*		Rain 0.03*		Rain 0.00*		Rain 0.01*		Rain 1.48*		Rain 0.00*		Rain 0.00*		Rain 1.50*		Rain 0.00*
Little River @ Upper Ty Ty Road (Tifton)		Rain 0.01*		Rain 0.19*		Rain 0.00*		Rain ?*		Rain 1.48*		Rain 0.00*		Rain 0.00*		Rain 1.43*		Rain 0.00*
Little River @ GA 37 (Adel-Moultrie Landing)		Rain 0.00*		Rain 0.39*		Rain 0.00*		Rain 0.02*		Rain 2.85*		Rain 0.00*		Rain 0.00*		Rain 2.02*		Rain 0.00*
Folsom Bridge GA 122 Little River Gauge		Rain 0.00*		Rain 0.14*		Rain 0.00*		Rain 0.00*		Rain 2.07*		Rain 0.00*		Rain 0.00*		Rain 0.94*		Rain 0.00*
Little River @ GA 122 (Folsom Bridge)				W0														W1,033
Little River @ Troupville Boat Ramp				W33														W333, W133
Withlacoochee River																		
Withlacoochee River @ US 84 W	V70	V60			V20	V70					V705	V1,335						

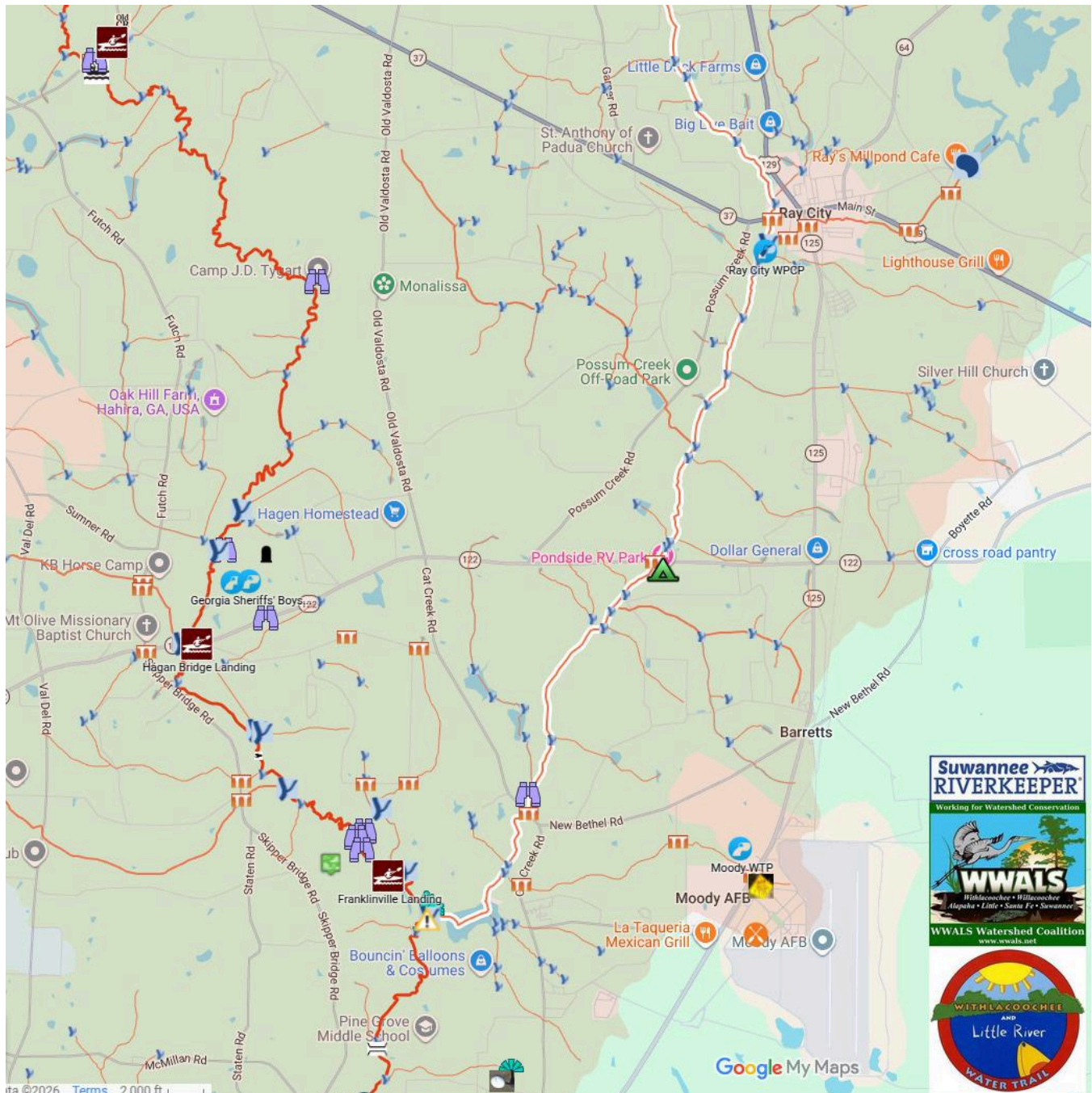
https://docs.google.com/spreadsheets/d/1UEjkTXgGzRBf4GbDwcwlQylGma26BNMG_5EVeJpm1Ow/edit?gid=317772187#gid=317772187

W for WWALS, V for Valdosta. 410 colony-forming units (cfu) per 100 milliliters (cfu/100 mL) is the one-time test limit (in red). 1,000 is the alert limit (in violet).

Appendix B: Maps

Overview Map

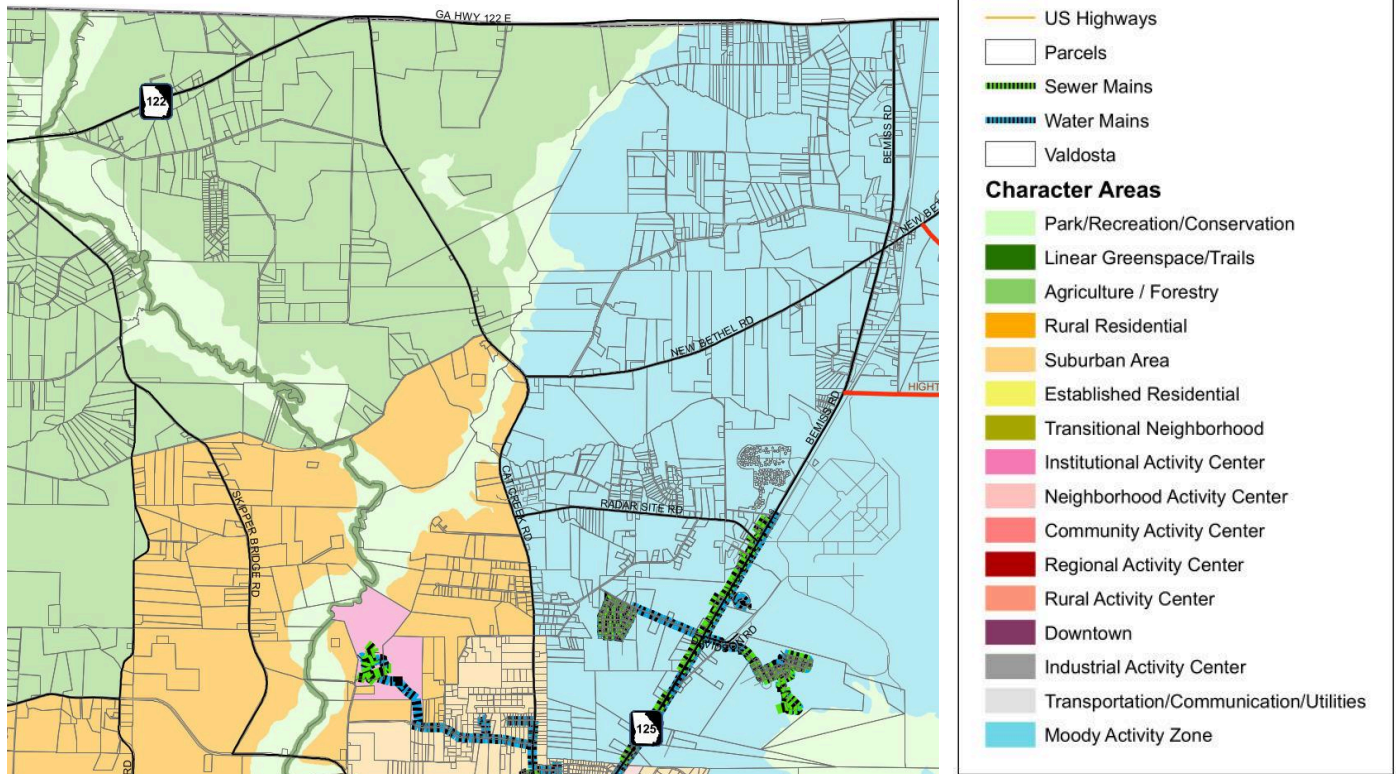
This map covers all of Cat Creek within the study area, from Batterbee Branch just upstream from GA 37 in Berrien County to the Withlacoochee River just below Franklinville Road in Lowndes County. Several of the left-bank (east) Cat Creek tributaries start in Lanier County.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=31.057922316451684%2C-83.18659992822266&z=12

Zoning and Land Use Maps

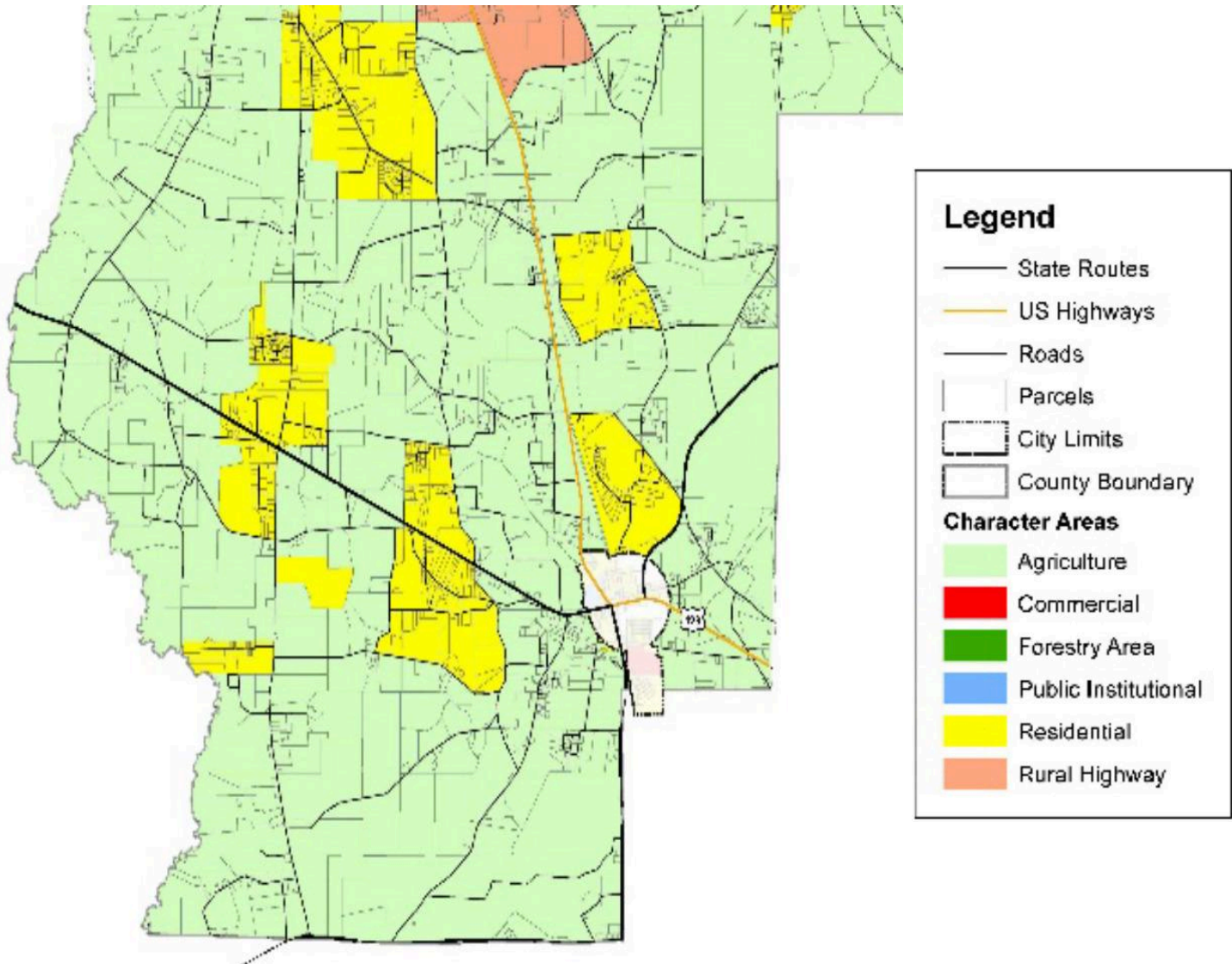
Lowndes County Character Area Map



From the 2021 Update to the Lowndes County Comprehensive Plan.

The most downstream part of Cat Creek is in a Rural Residential Character Area, and does have many houses with septic tanks. Upstream in Lowndes County, the right (west) bank of Cat Creek is all Agriculture / Forestry, with many fields, livestock, and pecan groves. The left (east) bank is in the Moody Activity Zone, with various restrictions because of Moody Air Force Base. Nonetheless, there are many houses, etc. there, plus Moody's own wastewater treatment plant and sewer system, and a golf course.

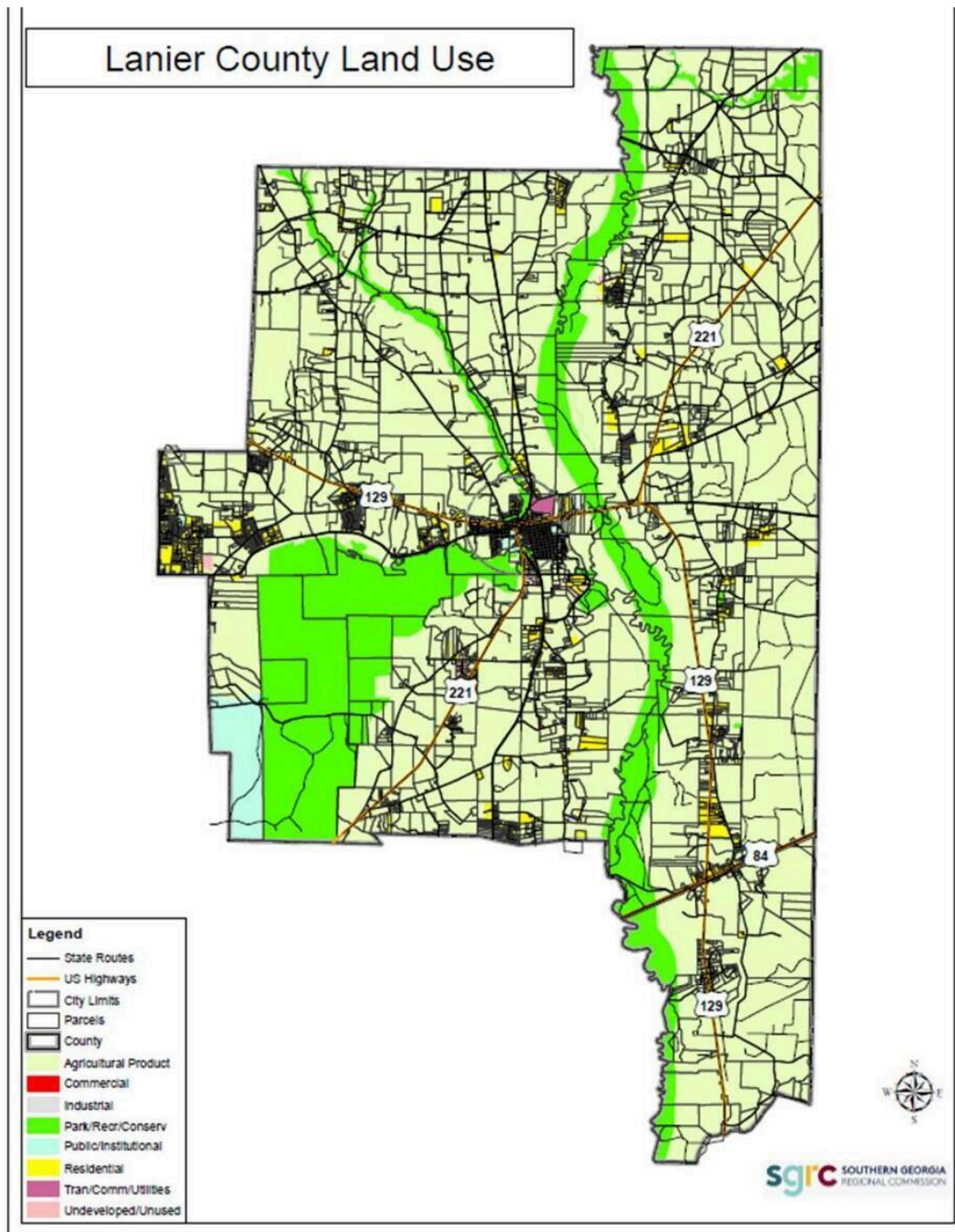
Berrien County Character Area Map



From the 2025 Update to the Berrien County Comprehensive Plan

The subject area is mostly Agriculture Character Area, except for Ray City and Residential Character Area to its north.

Lanier County Character Area Map



Lanier County and City of Lakeland 2021 Comprehensive Plan

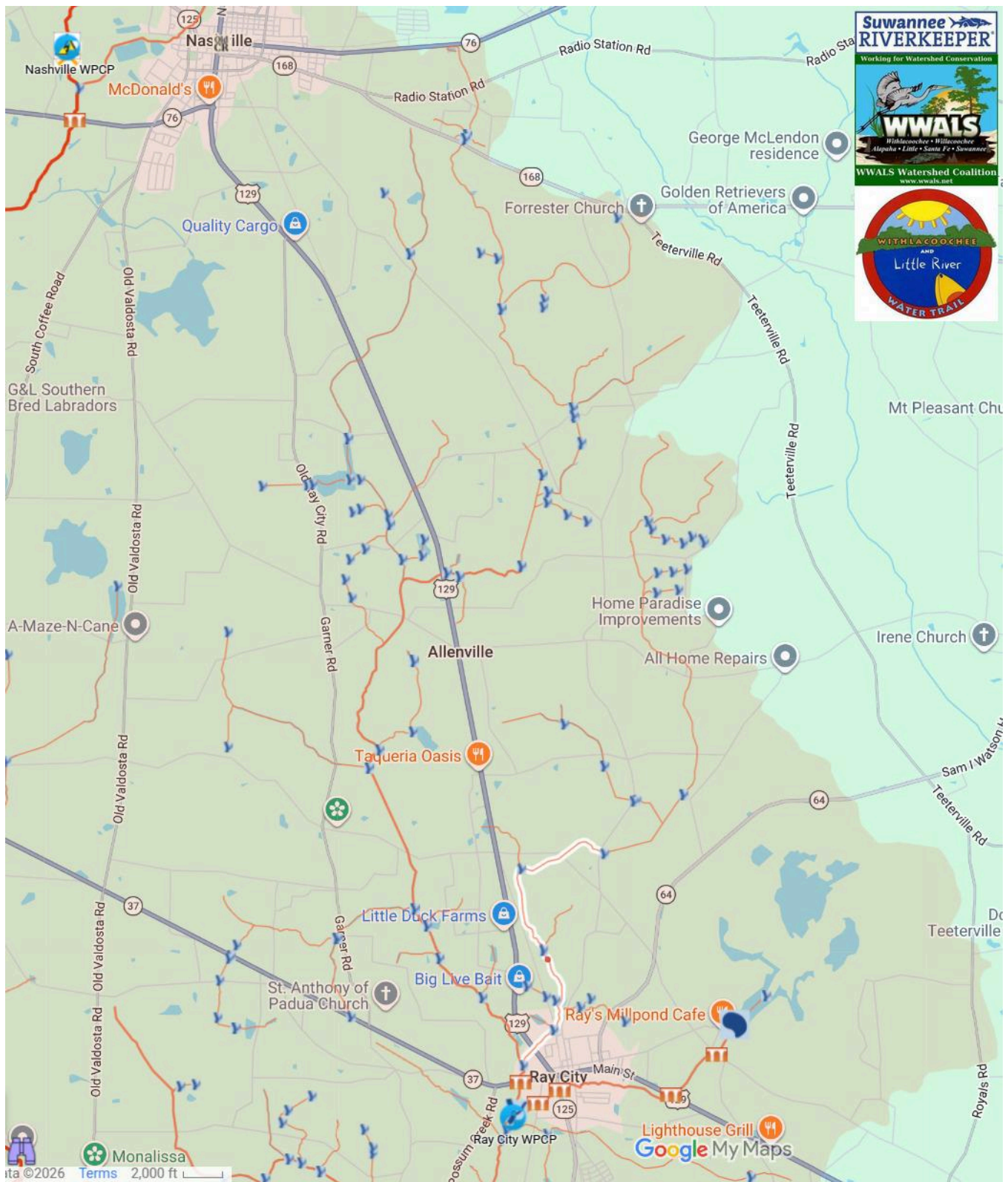


From the [2021 Update to the Lanier County Comprehensive Plan](#)

The big wide green heading northeast into Lakeland is for Banks Lake, which is in the Alapaha River Basin. The blue in the southwest corner is the Moody Activities Zone. North of that is the rest of Lanier County that drains to Cat Creek, all in Agricultural Product Character Area. Yet middle left is a subdivision, southeast of Ray City, and there are other houses, some densely grouped.

Most Upstream Cat Creek Map

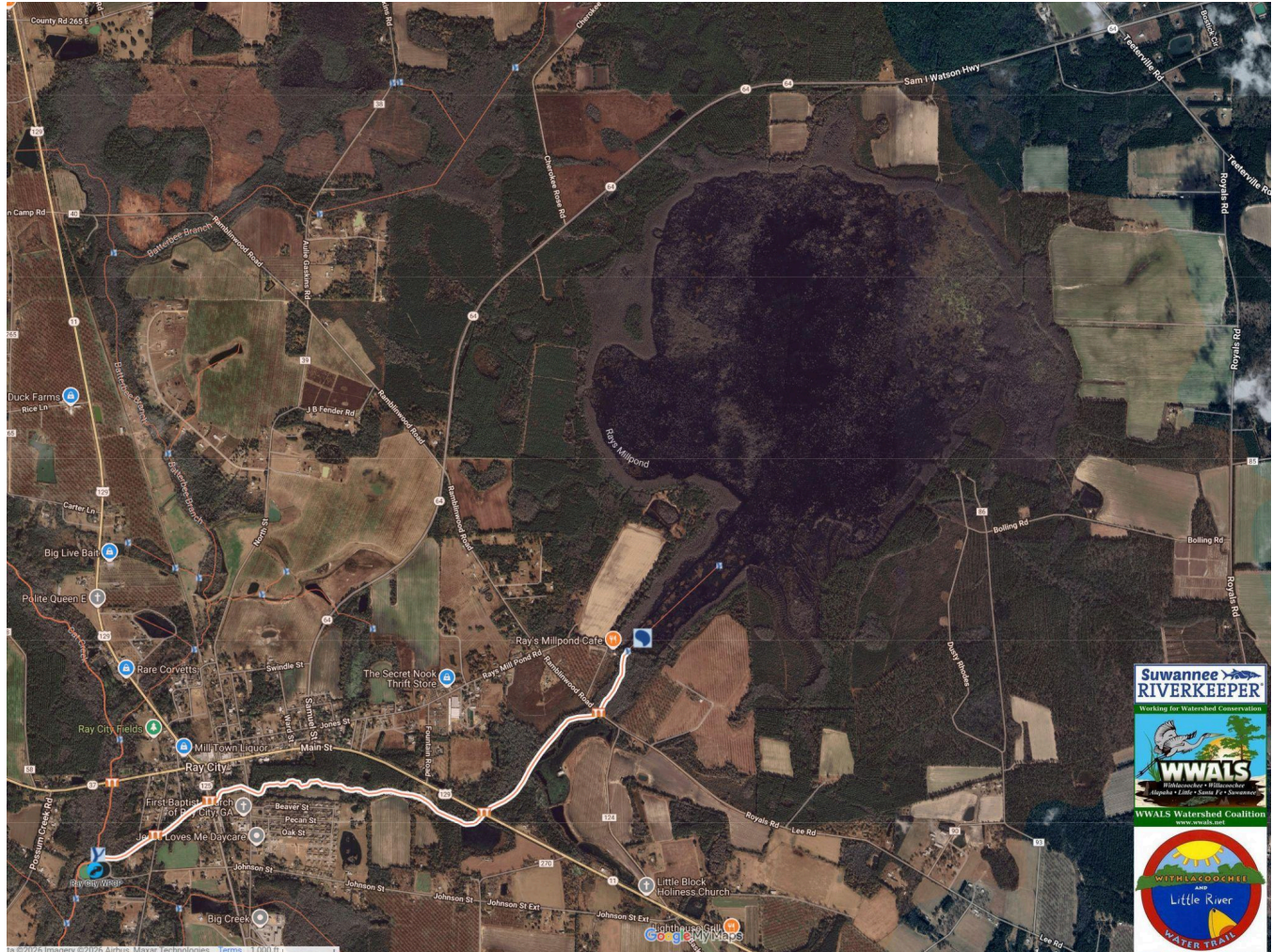
From Batterbee Branch upstream, as far north as Nashville. Batterbee Branch itself branches almost that far up. Most likely we will not have to test far up, but if we do there are crossing roads.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=31.14173924717691%2C-83.17600542827849&z=13

Batterbee Branch to Beaverdam Creek Map

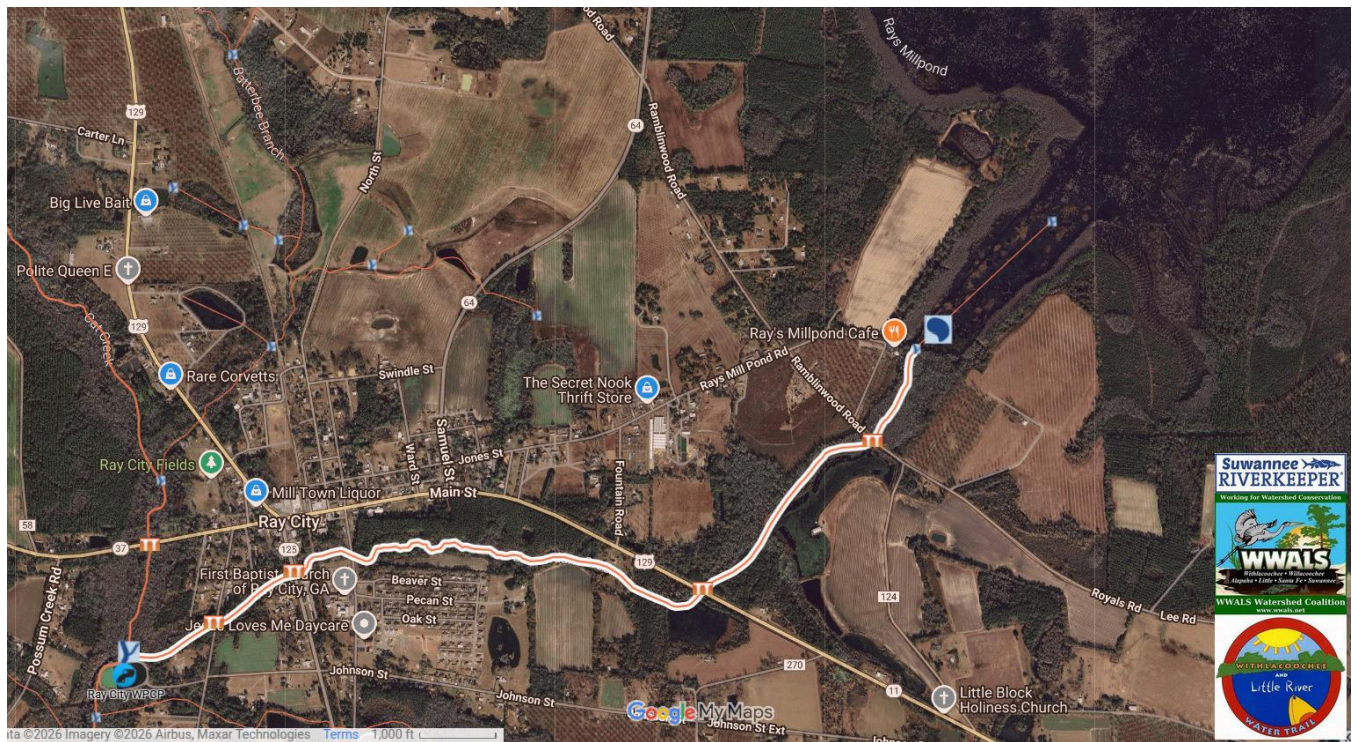
The shortest stretch of Cat Creek is Batterbee Branch to Beaverdam Creek, which is GAR031102030308 from Table 1. Beaverdam Creek itself has many stretches of interest, from Rays Millpond at the top, through pecan groves, houses, Ray City, and the Ray City Wastewater Treatment Plant at its Confluence with Cat Creek. The east half of Rays Millpond is in Lanier County.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=31.097695658795843%2C-83.1697469125399&z=15

Beaverdam Creek Map

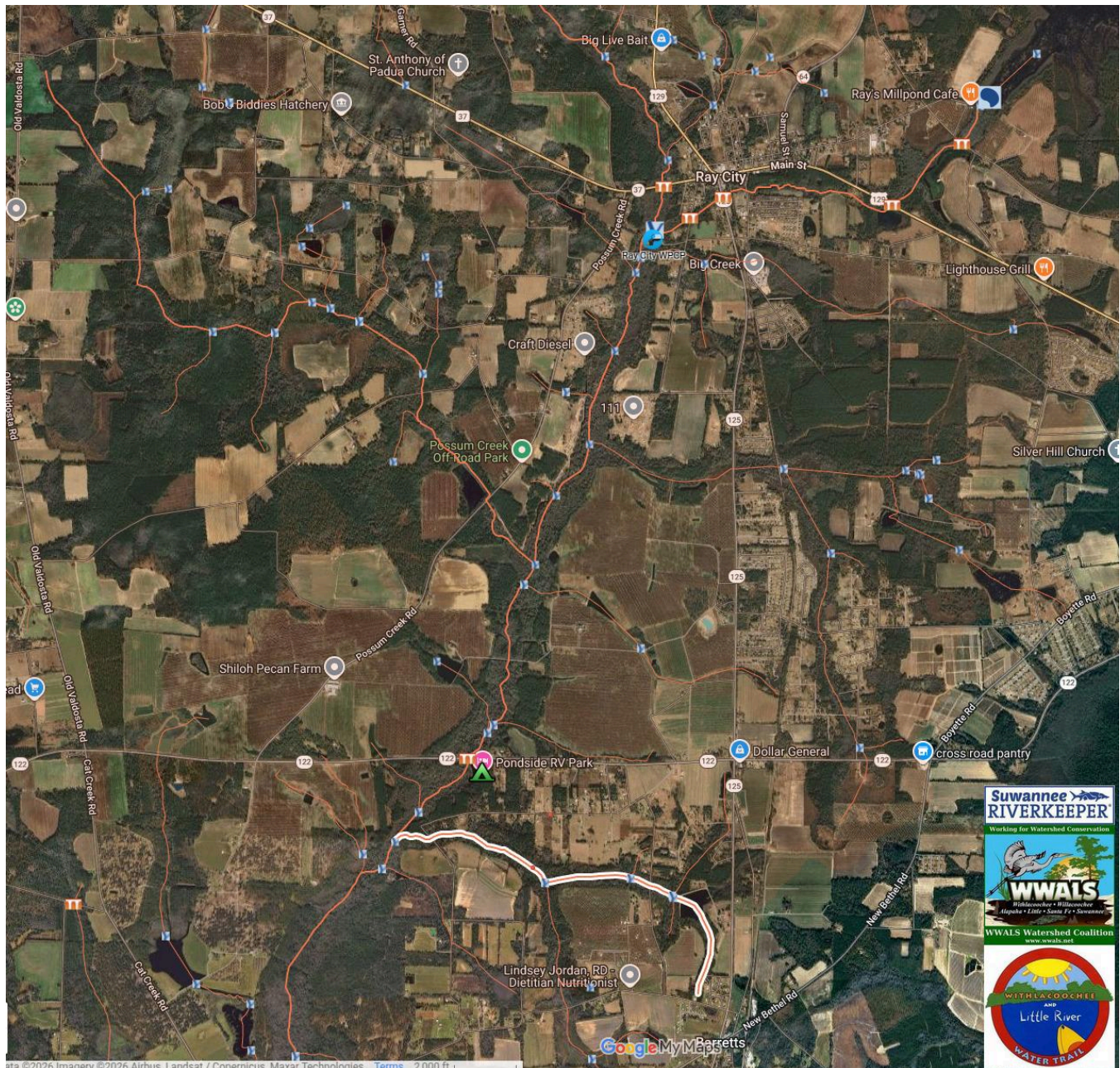
Omitting most of Rays Millpond makes more detail visible in Beaverdam Creek, including the bridges for test samples. Rays Millpond to Cat Creek is GAR031102030307 from Table 1.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=31.089379934432603%2C-83.17623533587648&z=15

Beaverdam Creek to Beatty Mill Creek Map

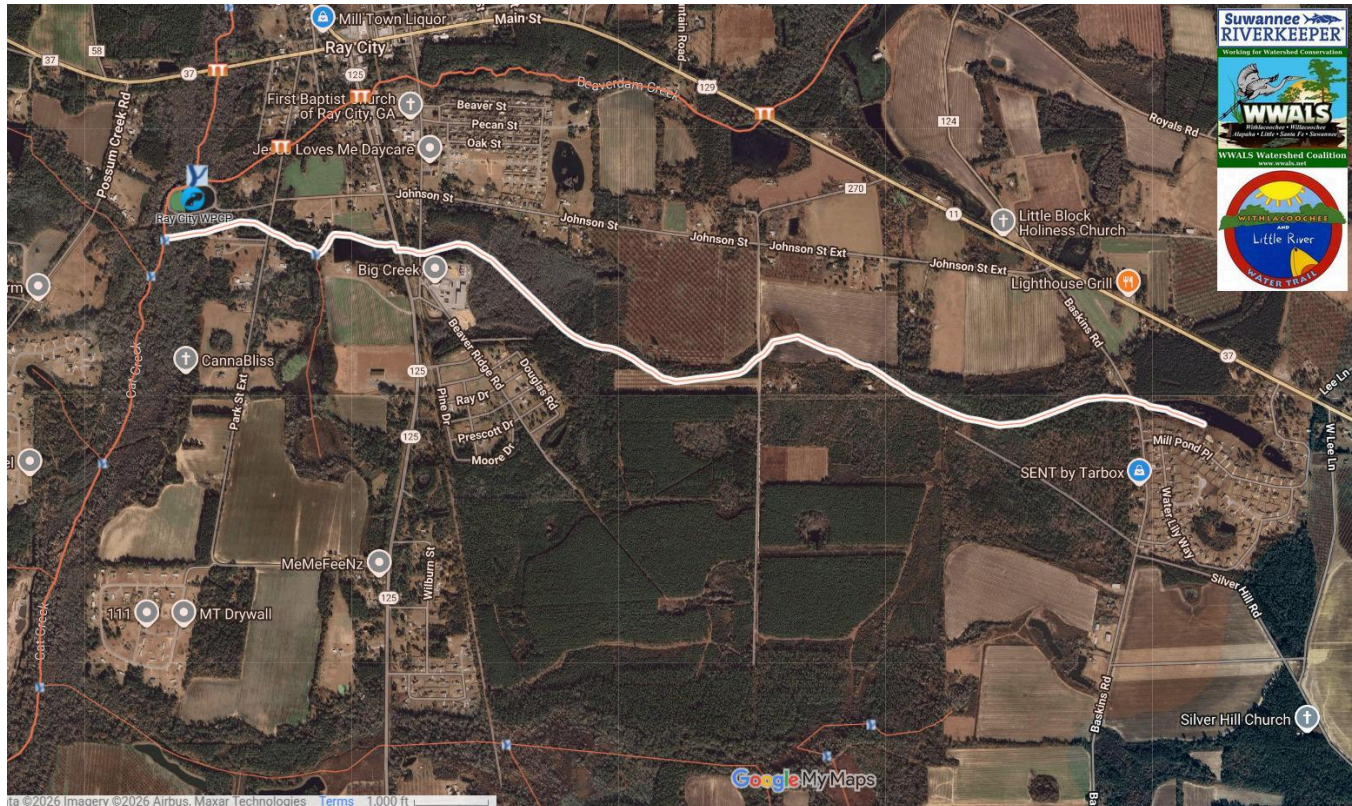
This is GAR031102030305 from Table 1. This stretch includes several other extensive feeder creeks.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=31.046128116668122%2C-83.2052211401785&z=14

Ice Castle Creek Map

What we're calling Ice Castle Creek comes in from the left bank of Cat Creek not far below Beaverdam Creek. It has a subdivision at its top on Mill Pond Place and Water Lily Way, fields and a pecan grove, and the Beaver Ridge Road subdivision that did not exist when the 2013 Withlacoochee Plan was written. Most of that is in Lanier County. In Berrien County, Southern Recycling Industries and Big Creek Trucking are at 64 Pauline Avenue, and there are houses downstream through Park Street Extension.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=31.063614438937606%2C-83.1808422354126&z=15

Manna Creek Map

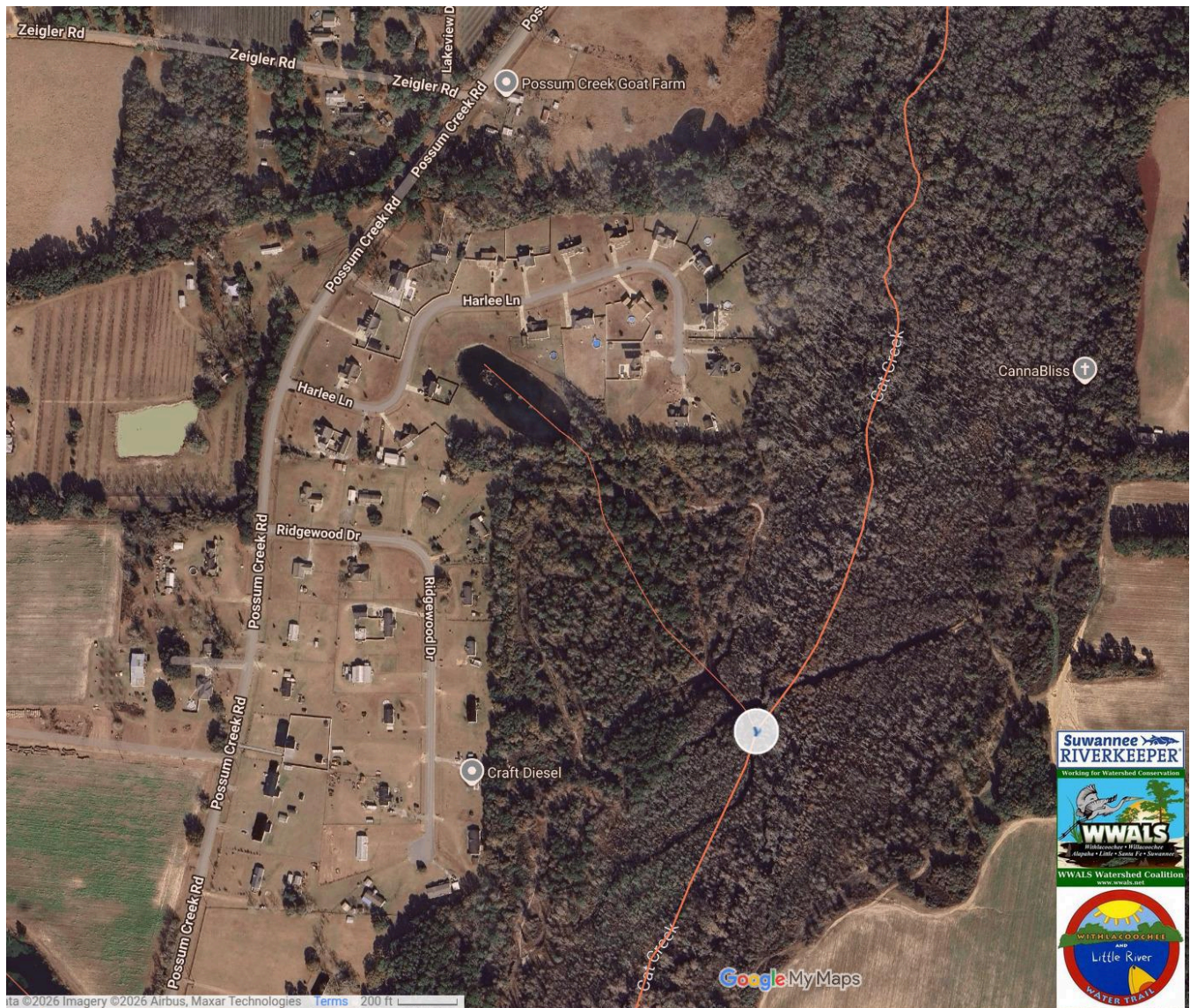
Coming in from the right bank of Cat Creek is Manna Creek. It seems to have mostly swamp and planted pines, plus some houses.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=31.074484934530442%2C-83.21748991397601&z=16

Harlee Lane Run Map

Tiny Harlee Lane Run on the right bank has many houses and a goat farm.

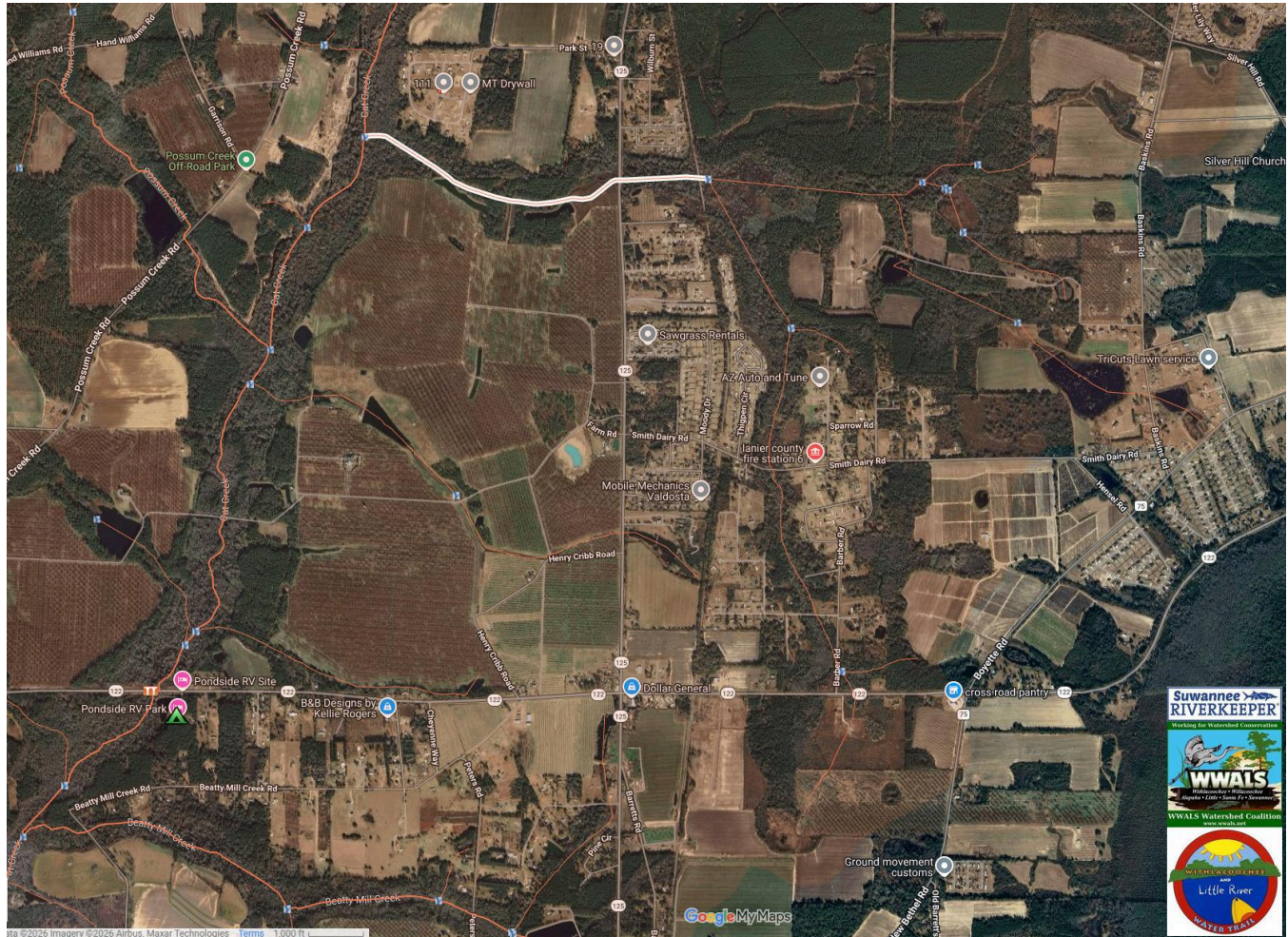


https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=31.06206775913434%2C-83.20937711698713&z=17

Dowdy Lane Creek Map

Coming into Cat Creek from the left bank, Dowdy Lane Creek and its feeder branches have numerous houses and some pecan groves. East of GA 125 they are in Lanier County.

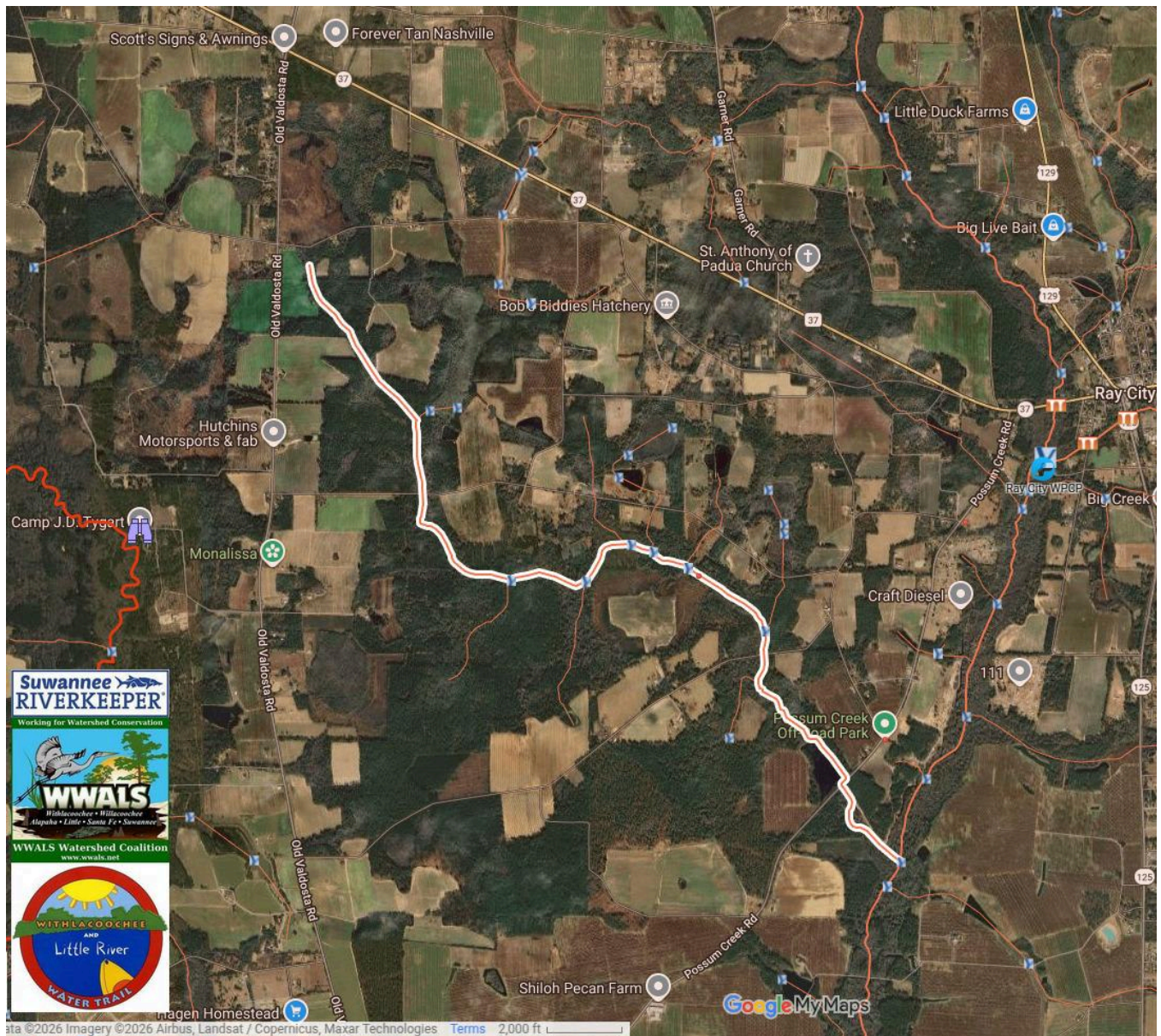
Note also the two smaller creeks, Cat Creek left bank downstream, coming off of Henry Cribb Road, with various houses.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=31.036201073077436%2C-83.19023444189529&z=15

Possum Creek Map

Possum Creek on Cat Creek right bank is mostly agricultural, plus an offroad park at its bottom.

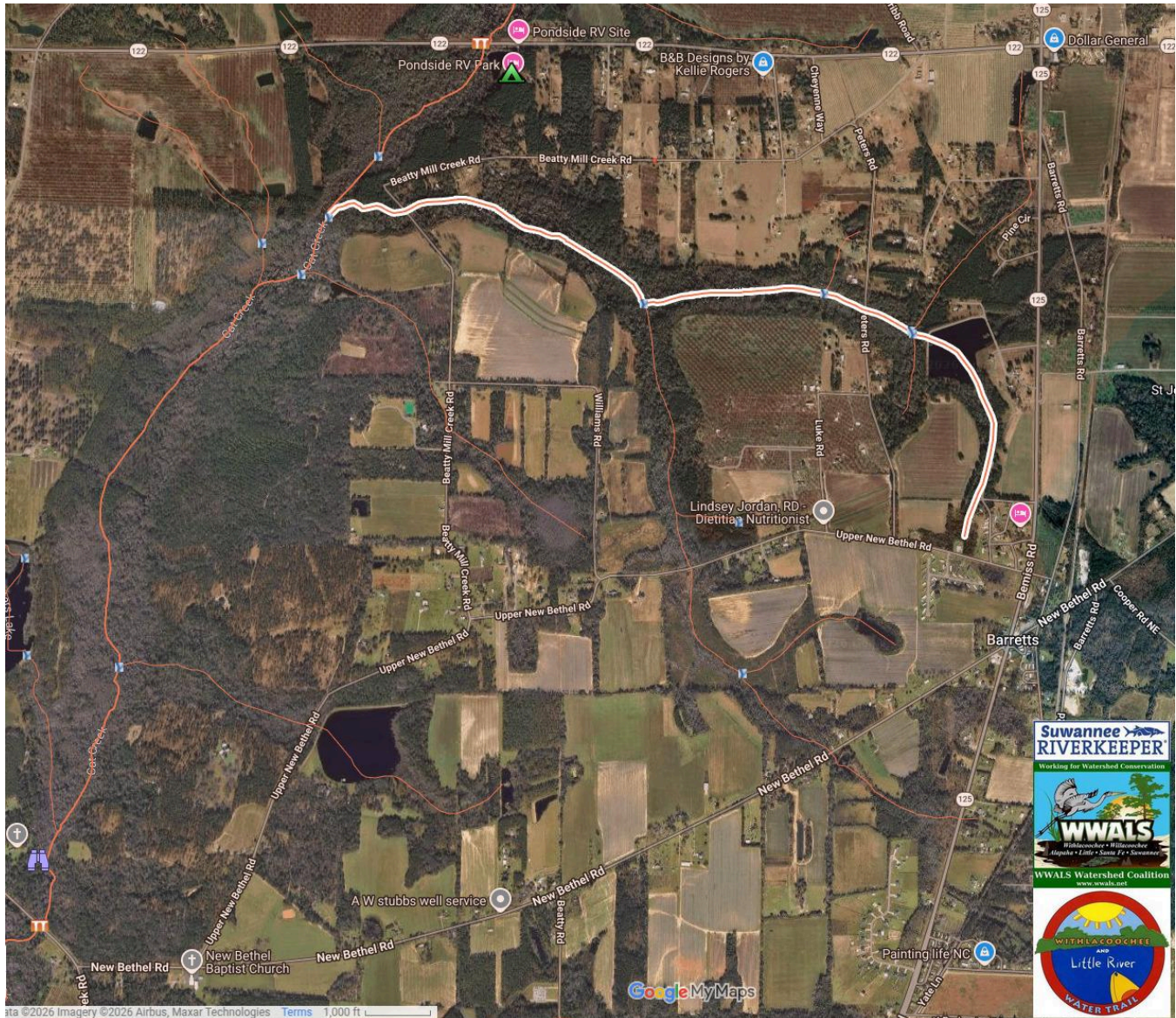


https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxCeOrA&ll=31.077756619537812%2C-83.22677779089355&z=14

Beatty Mill Creek Map

We can sample on Beatty Mill Creek Road if we must, for Beatty Mill Creek with its many houses, fields, and at least one pecan grove.

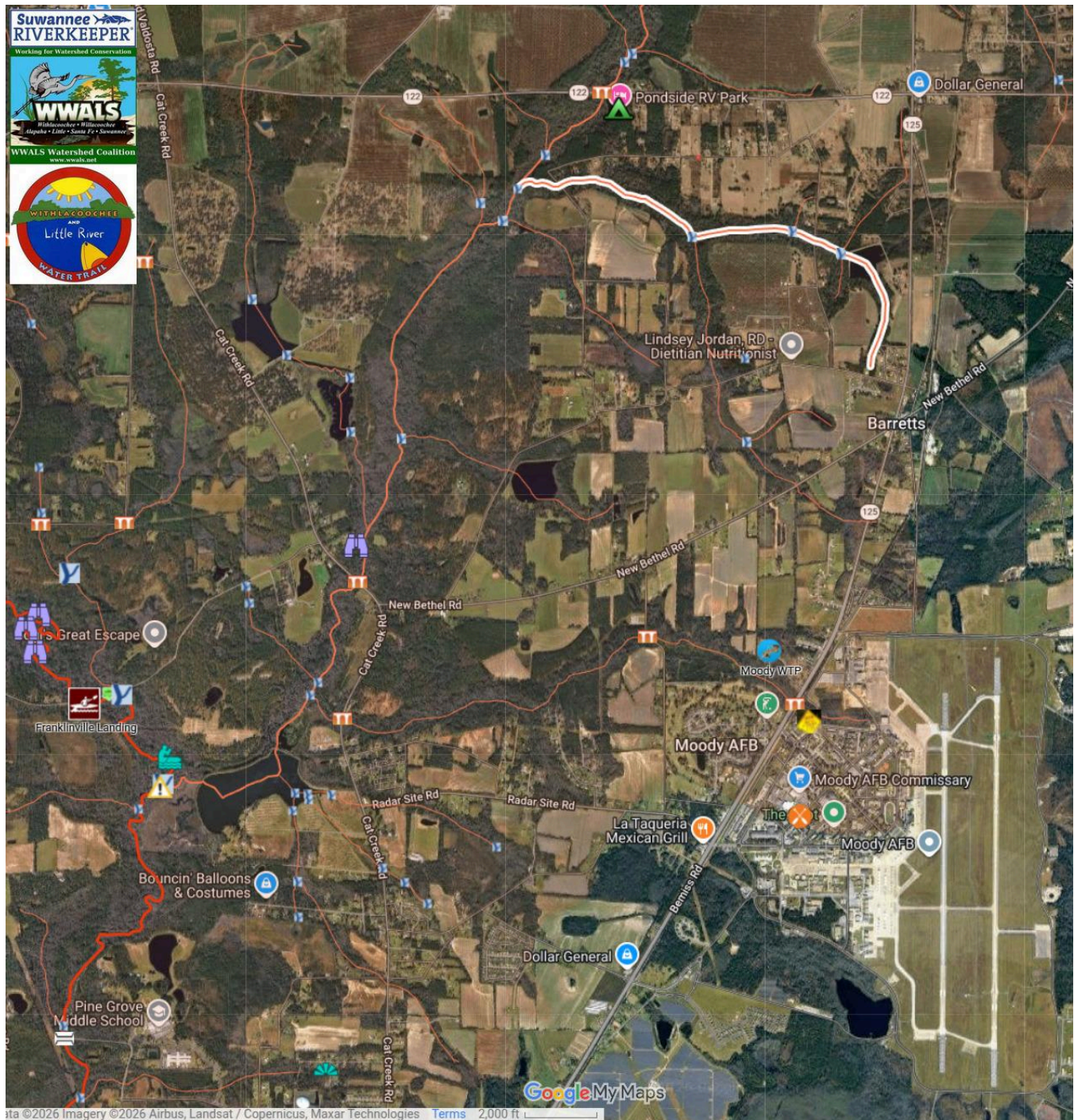
Note also the two small Cat Creek right bank streams, and the two downstream left bank streams, all mostly agricultural.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=31.00985881539779%2C-83.20716897631911&z=15

Beatty Mill Creek to Withlacoochee River Map

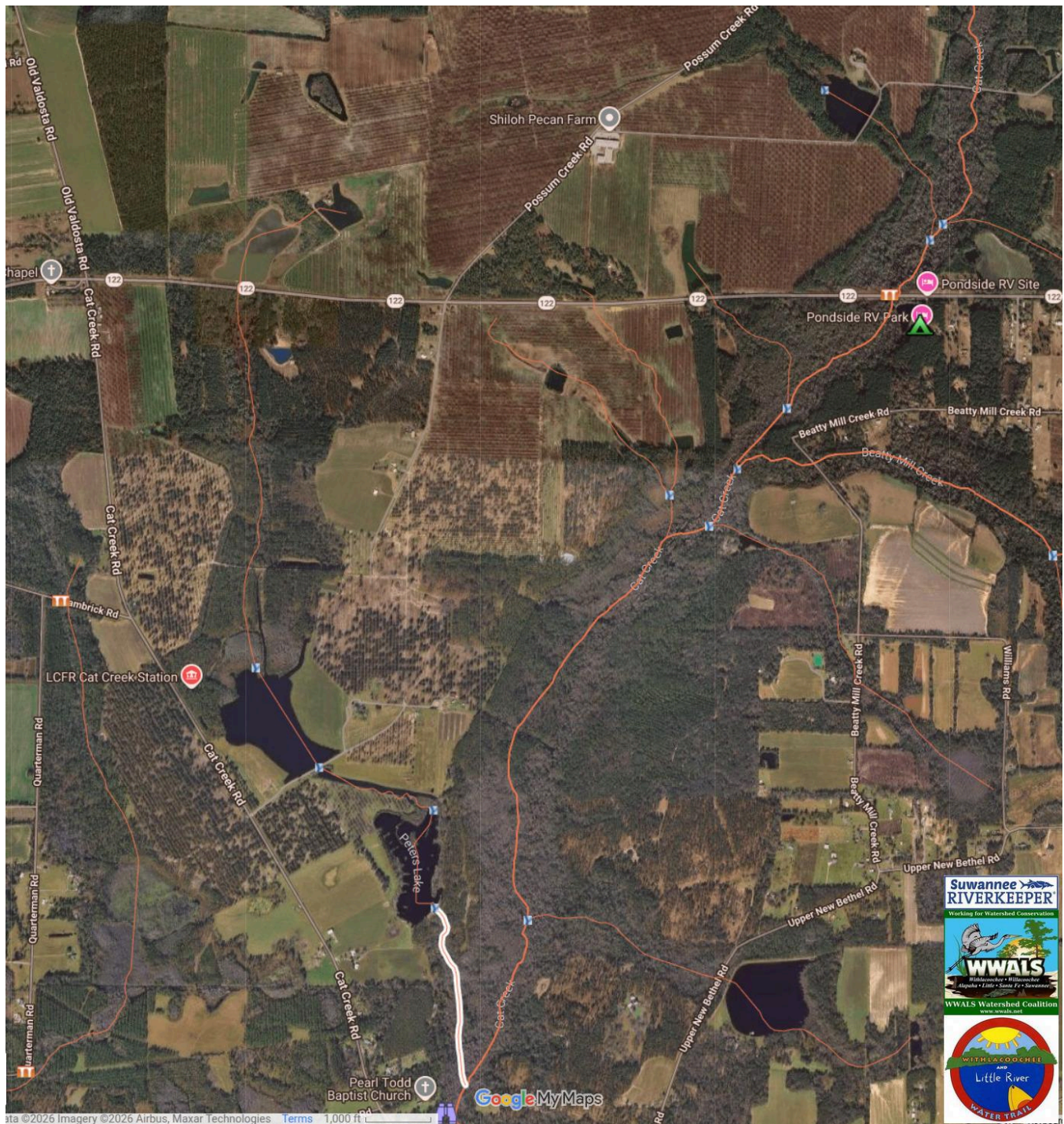
This is GAR031102030304 from Table 1. It is a very complicated stretch, with houses, fields, pecan groves, an Air Force Base, a golf course, a wastewater treatment plant, and basically everything except an incorporated city.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=30.992798094969377%2C-83.20808376440324&z=14

Peters Creek Map

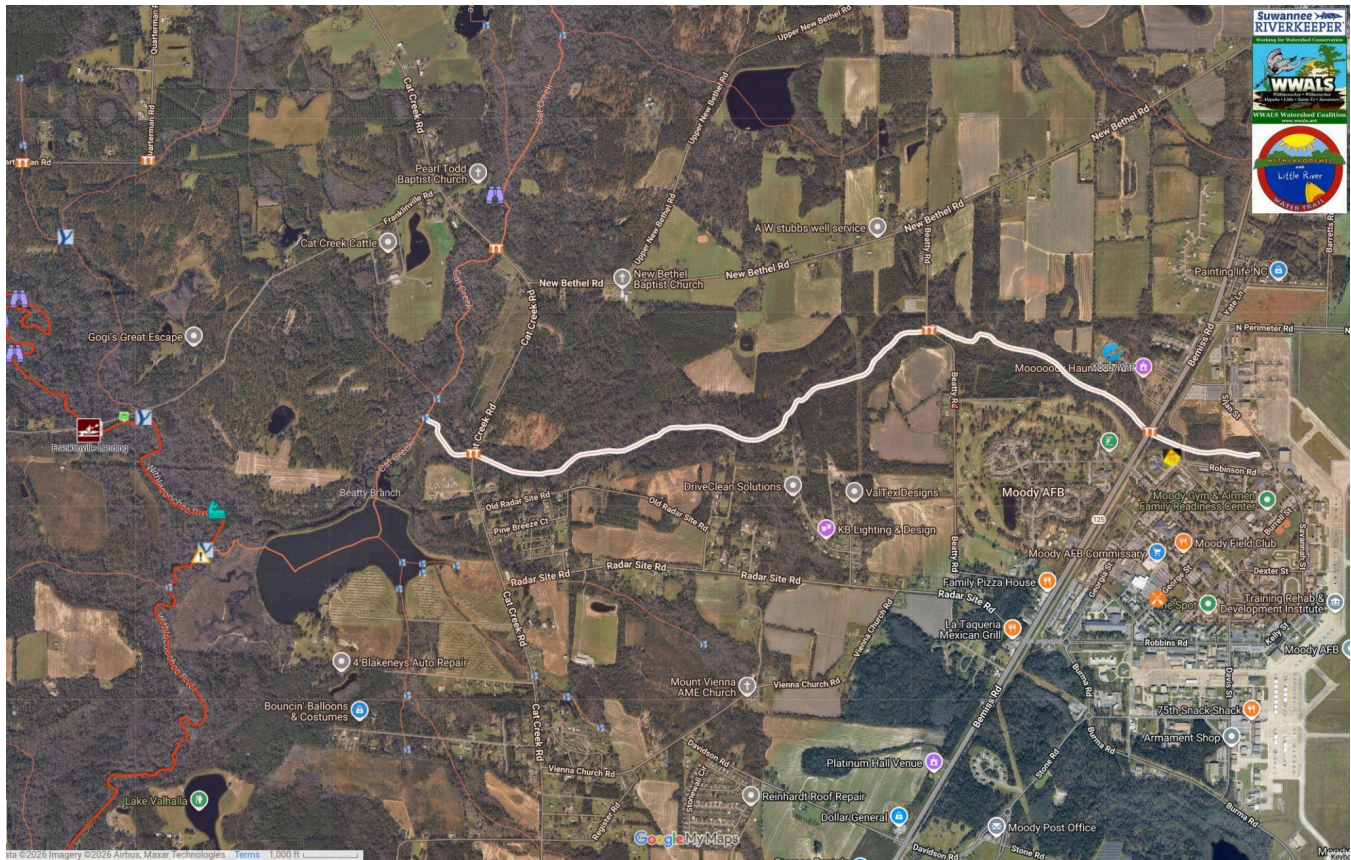
Coming down across GA 122, this creek has many pecan groves, cattle, other agriculture, and geese.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdKOCRxeCeOrA&ll=31.01607135334244%2C-83.24172573610377&z=15

Beatty Branch Map

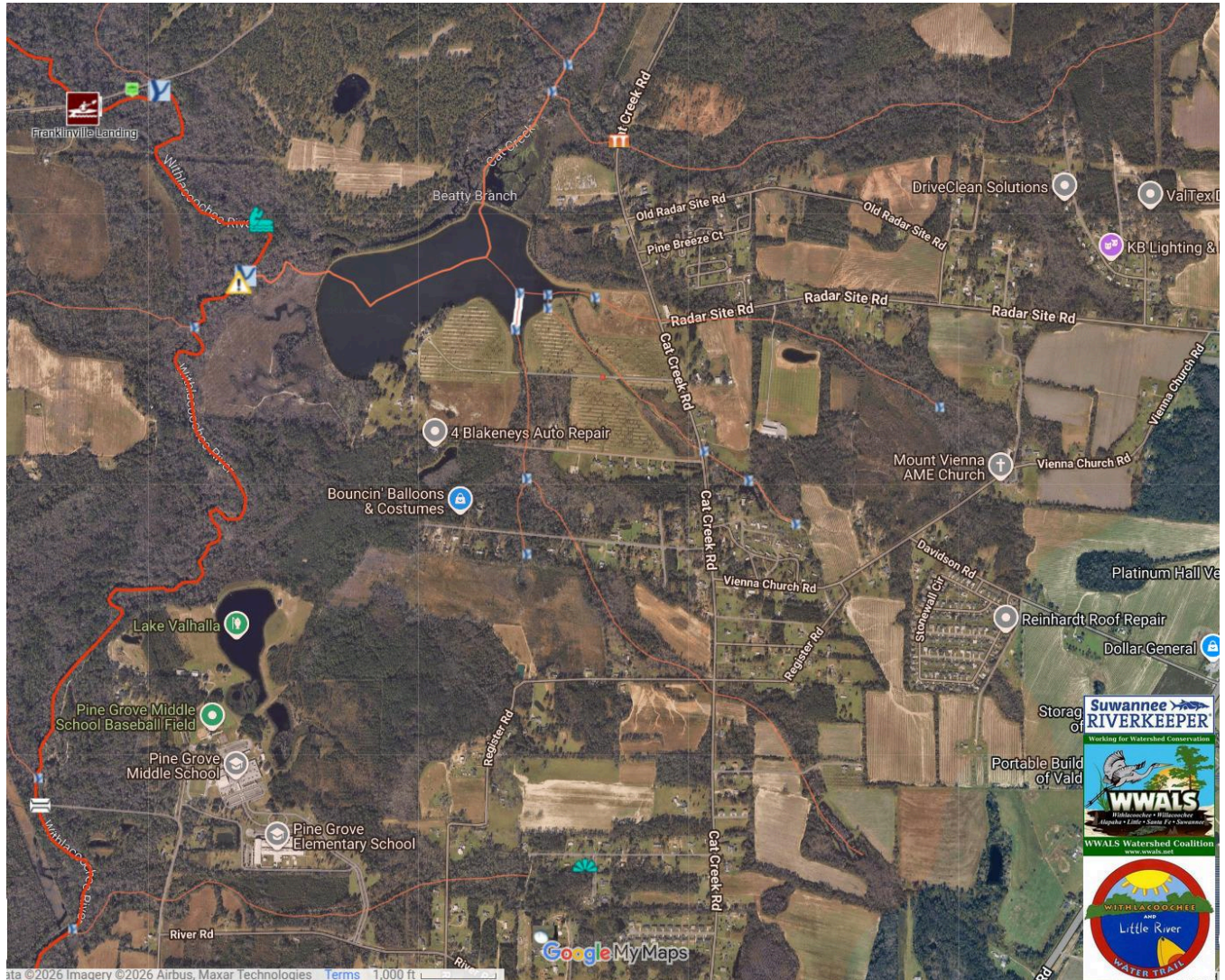
This is GAR031102030306 from Table 1. It includes an Air Force Base, a golf course, a wastewater treatment plant, fields, houses, and most everything else.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=30.981579998459306%2C-83.2341382302246&z=15

Lower Cat Creek Map

Below Beatty Branch, Cat Creek has several other feeder creeks, with many houses, pecan groves, and some fields, plus a large pond that geese like. Upstream to downstream on Cat Creek, these feeder creeks are Radar Site Branch, Backe Branch, and Pams Branch. They all have crossing roads which can be used as water quality sampling sites; see H. Identify indicators to measure progress.



https://www.google.com/maps/d/u/0/viewer?mid=1n4Q4zSxir_T8o4kdkOCRxeCeOrA&ll=30.972054804884436%2C-83.24636197958009&z=15