Jennings Environmental

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WATERSHED RESTORATION ACTION PLAN

Jonathan Creek
Haywood County, North Carolina

Submitted to:	Haywood Soil and Water Conservation District Haywood Waterways Association
Submitted by:	Jennings Environmental PLLC Greg Jennings, PhD, PE, President
Date:	July 2023

Introduction

The Jonathan Creek watershed includes 66.6 square miles in Haywood County, North Carolina. The creek generally parallels US Highways 19 and 276, then Interstate 40, before flowing into the Pigeon River approximately four miles upstream of Waterville Lake. The Town of Maggie Valley is located within the watershed. Upland areas within the watershed are primarily forested. However, areas closer to Jonathan Creek and its tributaries are dominated by various types of development and agricultural uses. In many cases, these land uses extend very close to streambanks, which has affected the quality of riparian buffers and led to increased streambank erosion, reduced water quality, and negative impacts to natural habitats. While Jonathan Creek is not on the North Carolina 303(d) list of impaired waterways, a 1.2-mile reach of an unnamed tributary has been on the list since 2016 because of pollution impacts to benthos. Appendix A contains overview maps of the Jonathan Creek watershed.

Haywood Soil and Water Conservation District (SWCD) and Haywood Waterways Association (HWA) are working with the North Carolina Department of Environmental Quality (NCDEQ) to develop a Watershed Action Plan for the Jonathan Creek watershed. This plan will be presented as a dynamic ArcGIS StoryMap, similar to the one developed for Walnut Creek in Wake County:

https://ncdenr.maps.arcgis.com/apps/MapSeries/index.html?appid=6f81e3b1ed114d9c91c91e0bf379cbeb

A primary component of the Watershed Action Plan is the identification of potential watershed improvement projects, generally focused on nonpoint source (NPS) pollution controls. These may include stream and riparian area restoration projects, stormwater control measures, and other methods to improve water quality. Haywood SWCD and HWA contracted with Jennings Environmental PLLC in 2022 to identify potential watershed improvement projects in support of the Jonathan Creek Watershed Action Plan.

Potential Watershed Improvement Projects

In collaboration with the clients and other stakeholders, the project team identified priority areas for potential projects within the Jonathan Creek watershed. These priority areas generally contain inadequate buffers, eroding streambanks, and are sources of nonpoint source pollution and sedimentation. Specific pollutants of concern include: sediment, nutrients, pathogens, dissolved oxygen (DO), and high temperature. This report summarizes the watershed improvement projects that were identified in the Jonathan Creek watershed and provides resources for project implementation, including conceptual design information, potential funding sources, and permitting requirements. Future work will require acquiring funding for implementation, detailed engineering design, permitting, construction, and vegetation to achieve water quality improvement objectives.

The project team evaluated potential projects that were identified from GIS data review, field reconnaissance, partner/stakeholder suggestions, and public input. Potential projects were visited to ground-truth baseline information and evaluate restoration needs and opportunities. A total of 26 potential projects were identified and are listed in Table 1, with more detail in tables and maps within Appendix B. These potential projects include areas critical to improving water quality and reducing sedimentation within the Jonathan Creek watershed, mostly focused on addressing severe streambank erosion and/or enhancing riparian buffers. Project details and conceptual plans for selected projects have been uploaded to the Watershed Improvements Project Tracker (WIPS) for inclusion in the NCDEQ ArcGIS StoryMap for Jonathan Creek. Haywood SWCD and HWA can work with NCDEQ to add or remove potential projects from the StoryMap, as appropriate.

Estimated Costs and Project Prioritization

Following the assessment of restoration opportunities and conceptual planning for the aforementioned projects, the project team determined the estimated costs for implementation of each project. Table 1 contains estimated costs for project implementation, including engineering design/permitting, construction, and planting to achieve project objectives. Cost estimates are based on typical fees for design, permitting, and implementation of similar restoration projects in North Carolina as of June 2023. Additional costs may be required for land acquisition and infrastructure improvements associated with stream crossings or utilities. These estimated costs should be used only for general planning purposes.

Table 1. Estimated Project Costs.

Project No.	Project Name	Estimated Costs			
		Engineering	Construction	Planting	Total
1	Ghost Town in the Sky	$ 80,000	$ 250,000	$ 30,000	$ 360,000
2	Maggie Valley Water Intake	$ 30,000	$ 100,000	$ 10,000	$ 140,000
3	Mary Rathbone Rich Park	$ 15,000	$ 35,000	$ 10,000	$ 60,000
4	BearWaters Brewing Company	$ 15,000	$ 50,000	$ 15,000	$ 80,000

5	Maggie Valley Methodist Church	$ 20,000	$ 65,000	$ 15,000	$ 100,000
6	River Point Lodge	$ 60,000	$ 160,000	$ 20,000	$ 240,000
7	Clement Property	$ 50,000	$ 200,000	$ 30,000	$ 280,000
8	Cottage Drive	$ 50,000	$ 180,000	$ 30,000	$ 260,000
9	Twinbrook Lane	$ 40,000	$ 100,000	$ 20,000	$ 160,000
10	Taylor Property	$ 30,000	$ 100,000	$ 10,000	$ 140,000
11	50 Sourwood Road	$ 15,000	$ 30,000	$ 5,000	$ 50,000
12	Mountain Retreat RV Park	$ 30,000	$ 100,000	$ 20,000	$ 150,000
13	Sewer Crossing near MVC	$ 15,000	$ 30,000	$ 5,000	$ 50,000
14	Big Spring Branch at MVC	$ 100,000	$ 400,000	$ 50,000	$ 550,000
15	UT Jonathan Creek at MVC	$ 100,000	$ 500,000	$ 60,000	$ 660,000
16	Jonathan Valley Elem. School	$ 40,000	$ 140,000	$ 40,000	$ 220,000
17	Winngray Campground	$ 60,000	$ 200,000	$ 60,000	$ 320,000
18	Garrett Creek (1)	$ 300,000	$ 1,400,000	$ 300,000	$ 2,000,000
19	Garrett Creek (2)	$ 60,000	$ 250,000	$ 30,000	$ 340,000
20	Grindstone Road Bridge	$ 15,000	$ 30,000	$ 5,000	$ 50,000
21	Dogwood Lakes	$ 100,000	$ 400,000	$ 60,000	$ 560,000
22	Jonathan Creek Fire Department	$ 30,000	$ 100,000	$ 30,000	$ 160,000
23	Leatherwood Branch	$ 250,000	$ 1,100,000	$ 250,000	$ 1,600,000
24	UT Jonathan Creek	$ 250,000	$ 1,000,000	$ 150,000	$ 1,400,000
25	White Oak Road	$ 15,000	$ 30,000	$ 5,000	$ 50,000
26	Few Property	$ 15,000	$ 30,000	$ 5,000	$ 50,000

To assist with project prioritization, a decision support tool was developed as a spreadsheet based on a Multi-Criteria Decision Analysis (MCDA) framework. Project information was input to the decision support tool for determining priority status of potential projects. The MCDA framework allows for project prioritization based on ratings for 12 project objectives. The project objectives that were evaluated are:

Risk Management

- Public Safety
- Infrastructure Protection
- Flooding Reduction

Ecosystem Health

- Habitat Enhancement
- Water Quality Improvement
- Floodplain Functions
- Buffer Enhancement
- Streambank Stability
- Geomorphic Equilibrium

Community Values

- Public Access and Education
- Aesthetics
- Recreation

The resulting project prioritization is presented in Table B2 in Appendix B. Higher ranked projects generally include longer stream restoration projects, which would achieve multiple objectives while benefitting from economies of scale. Lower ranked projects are generally shorter in length with complications from existing infrastructure and/or urbanization. However, potential projects should not be dismissed solely because of lower rankings. The lower ranked projects would still achieve many overall objectives related to risk management and ecosystem health. Haywood SWCD and HWA have the ability to change factors within the MCDA and reprioritize projects if desired.

Funding Opportunities and Permitting

Potential funding sources for the projects identified in this report include the following grant programs, most of which require local matching funds:

- NC Land and Water Fund:
  - https://nclwf.nc.gov/
  - Applications are due annually in February.

- NC DEQ Water Resources Development Grant Program:
  - https://deq.nc.gov/about/divisions/water-resources/water-resources-grants/financial-assistance
  - Applications are due semi-annually in June and December.

- NC DEQ 319 Grant Program:
  - https://deq.nc.gov/about/divisions/water-resources/planning/nonpoint-source-management/319-grant-program
  - Applications are due annually in May.

- NC Streamflow Rehabilitation Assistance Program (StRAP):
  - https://www.ncagr.gov/SWC/watershed/StRAP.html
  - The previous application window closed on March 31, 2022.

- USFWS Partners for Fish and Wildlife Program:
  - https://www.fws.gov/southeast/our-services/partners-program/
  - The application process can be initiated by contacting USFWS.

- NRCS Environmental Quality Incentives Program (EQIP):
  - https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/eqip/
  - The application process can be initiated by contacting the local NRCS conservationist.

- NC Community Conservation Assistance Program (CCAP):
  - http://www.ncagr.gov/SWC/costshareprograms/CCAP/index.html
  - The previous application window closed on March 25, 2022.

- The Pigeon River Fund:
  - https://cfwnc.org/grants/pigeon-river-fund
  - Applications are due annually in March and September.

Other private foundation grants available for watershed restoration are described on the NC Department of Environmental Quality web site:

https://deq.nc.gov/about/divisions/water-resources/planning/basin-planning/use-restoration-watershed-programs/funding

Stream restoration projects require permitting at the federal, state, and local levels for environmental, erosion control, and floodplain impacts. Environmental permitting is coordinated by the NC Division of Water Resources and US Army Corps of Engineers using the web-based Pre-Construction Notification (PCN) Form for Nationwide Permits along with corresponding Water Quality Certifications:

https://edocs.deq.nc.gov/Forms/Pre-Construction_Notification_Form

Once the application is complete, the Corps will process it within 45 days for a Nationwide or General Permit, and the NC DWR will process the 401 Certification within 60 days. Other permit approvals may be required by NC Wildlife Resources Commission, US Fish & Wildlife Service, and the State Historic Preservation Office.

If a Floodplain Development Permit is required, the stream restoration project may require coordination with NC Department of Public Safety Floodplain Management Branch to obtain a "No-Rise" Certification or a Letter of Map Revision (LOMR). Project managers should work closely with permitting agencies to determine specific requirements for implementation.

Projects that disturb more than one acre will require an approved erosion and sedimentation control plan from the local Haywood County program or the NC Division of Energy, Minerals, and Land Resources (DEMLR). Any project that includes public funding shall be directed towards DEMLR. Projects that disturb the trout buffer may require a trout buffer variance from DEMLR. Project managers should contact the Asheville Regional Office of DEMLR at (828) 296-4500 for all erosion control and buffer permitting requirements before initiating work.

APPENDIX A

REFERENCE MAPS

Sheet A1. Jonathan Creek Watershed Overview
Sheet A2. Jonathan Creek Watershed Land Cover
Sheet A3. Jonathan Creek - South
Sheet A4. Jonathan Creek - North

Confluence with Pigeon River

Interstate 40

US Highway 19

US Highway 276

Legend

- Watershed Boundary
- Municipal Boundary
- Town Park
- US/NC Highway
- Jonathan Creek
- Streams

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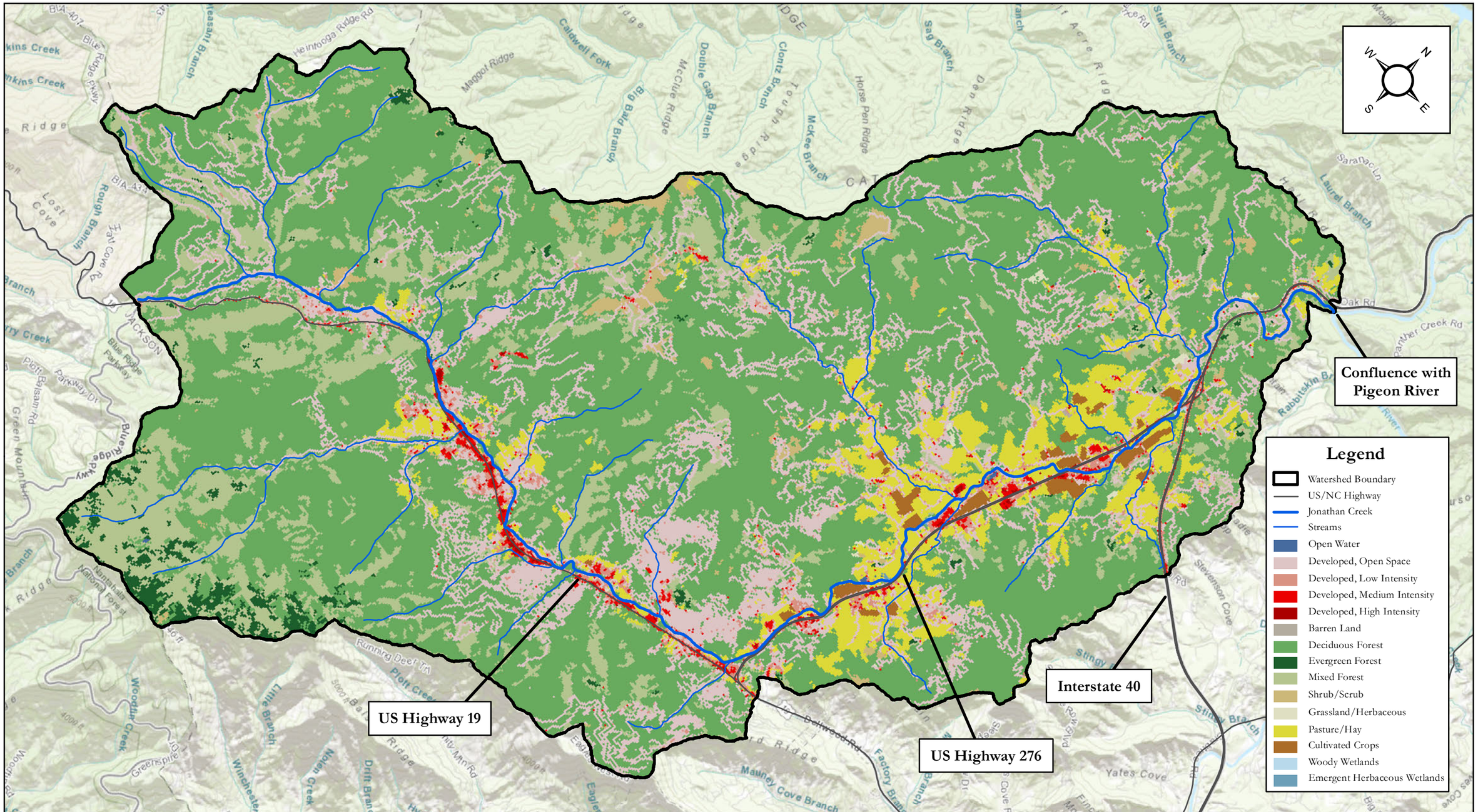
Jonathan Creek Watershed Overview

0 0.5 1 2 3 4 Miles

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet A1



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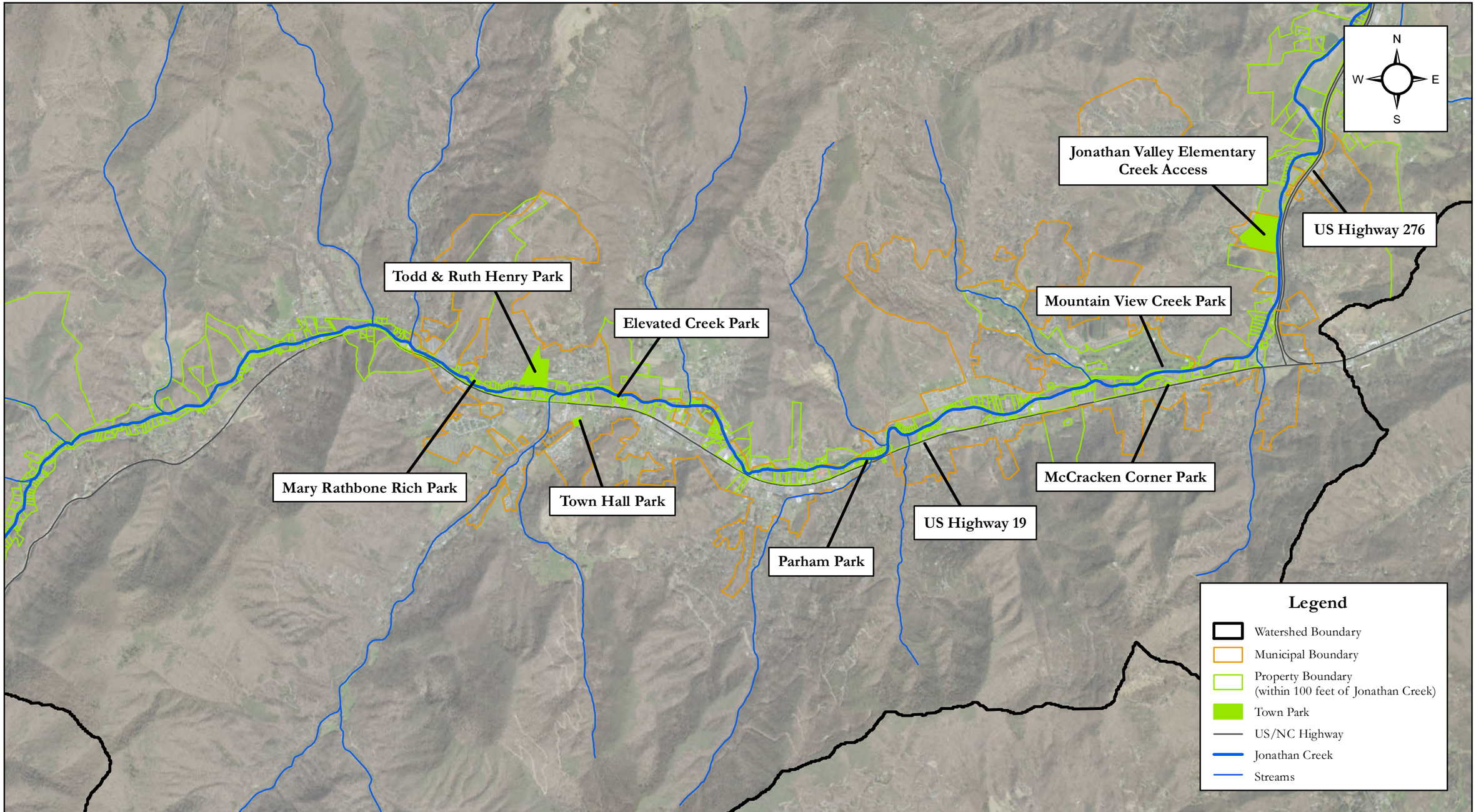
Jonathan Creek Watershed Land Cover

0 0.5 1 2 3 4 Miles

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet A2



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Jonathan Creek - South

0 0.25 0.5 1 1.5 2 Miles

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet A3

Jonathan Valley Elementary Creek Access

US Highway 276

Interstate 40

N
W
E
S

Legend

- Watershed Boundary
- Municipal Boundary
- Property Boundary (within 100 feet of Jonathan Creek)
- Town Park
- US/NC Highway
- Jonathan Creek
- Streams

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Jonathan Creek - North

0 0.25 0.5 1 1.5 2 Miles

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet A4

APPENDIX B

PROJECT OVERVIEWS

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Table B2. Multi-Criteria Decision Analysis Calculator

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Sheet B3. Overview: Project 2 (Maggie Valley Water Intake)
Sheet B4. Overview: Project 3 (Mary Rathbone Rich Park)
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Table B1
Jonathan Creek Watershed Plan
Potential Watershed Improvement Projects

Project No.	Project Name	Latitude	Longitude	Approximate Project Length	Potential Project Components
1	Ghost Town in the Sky	35.52076	-83.10733	540 feet (Jonathan Creek)	Streambank stabilization, Riparian buffer enhancement, Stormwater treatment
2	Maggie Valley Water Intake	35.52034	-83.10635	250 feet (Jonathan Creek)	Streambank stabilization and fishing access with in-stream structure, Riparian buffer enhancement
3	Mary Rathbone Rich Park	35.51950	-83.10407	240 feet (Jonathan Creek)	Fishing access with in-stream structure, Riparian buffer enhancement
4	BearWaters Brewing Company	35.51860	-83.10132	390 feet (Jonathan Creek)	Riparian buffer enhancement
5	Maggie Valley Methodist Church	35.51897	-83.09827	360 feet (Jonathan Creek)	Riparian buffer enhancement, Stormwater treatment
6	River Point Lodge	35.51870	-83.09658	300 feet (Campbell and Jonathan Creeks)	Streambank stabilization with in-stream structures, Riparian buffer enhancement
7	Clement Property	35.51879	-83.08919	1,460 feet (Jonathan Creek)	Streambank stabilization with in-stream structures, Riparian buffer enhancement
8	Cottage Drive	35.51689	-83.08132	1,070 feet (Jonathan Creek)	Streambank stabilization, Floodplain creation, Riparian buffer enhancement
9	Twinbrook Lane	35.51213	-83.07729	460 feet (UT Jonathan Creek)	Stream restoration, Riparian buffer enhancement, Sewer line removal
10	Taylor Property	35.51604	-83.06342	400 feet (Jonathan Creek)	Streambank stabilization, Riparian buffer enhancement
11	50 Sourwood Road	35.51791	-83.05557	100 feet (Jonathan Creek)	Streambank stabilization, Riparian buffer enhancement
12	Mountain Retreat RV Park	35.51845	-83.05251	740 feet (Jonathan Creek)	Streambank stabilization, Riparian buffer enhancement
13	Sewer Crossing near MVC	35.52054	-83.04610	100 feet (Jonathan Creek)	Riparian buffer enhancement, Sewer line removal

Table B1
Jonathan Creek Watershed Plan
Potential Watershed Improvement Projects

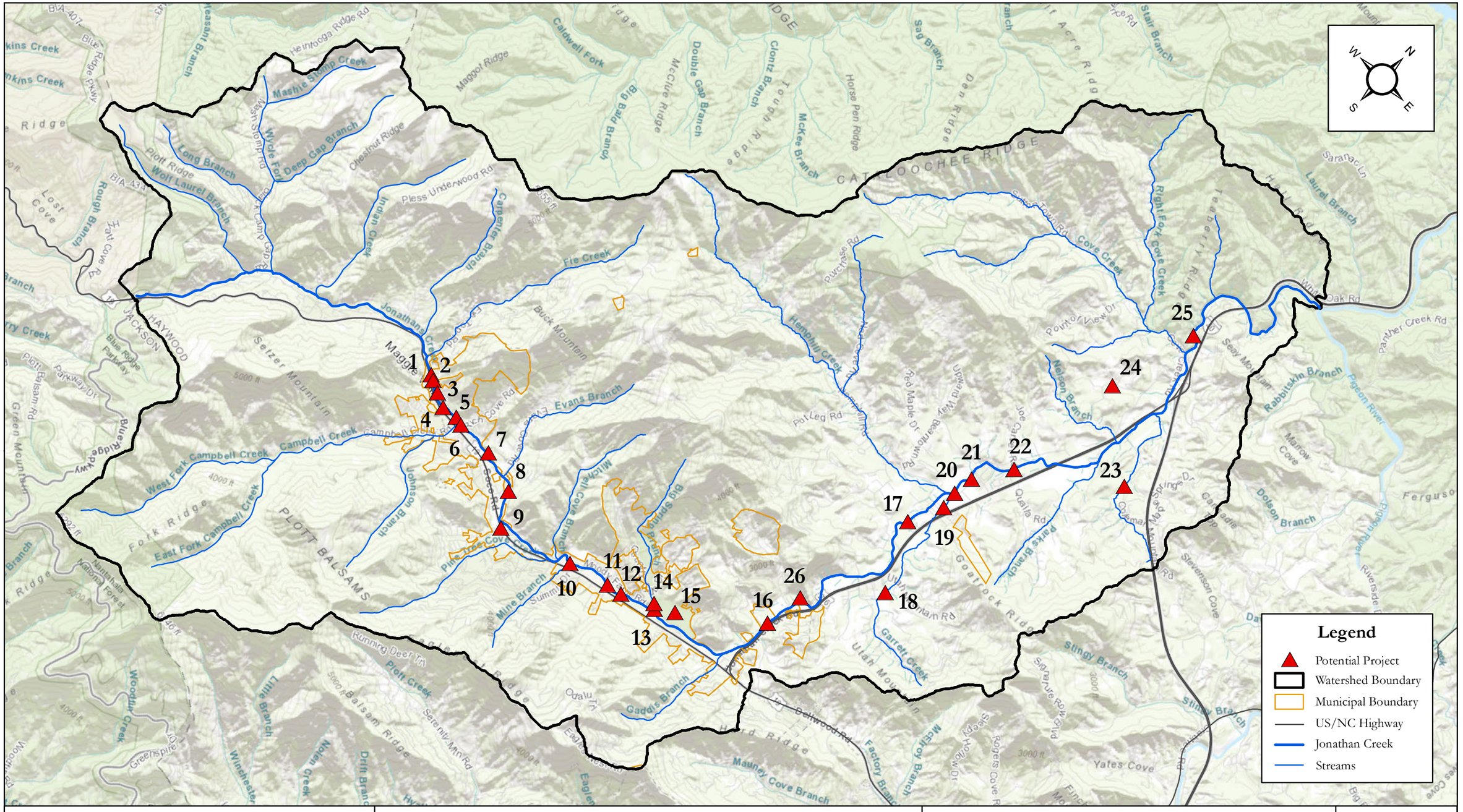
Project No.	Project Name	Latitude	Longitude	Approximate Project Length	Potential Project Components
14	Big Spring Branch at MVC	35.52113	-83.04693	2,200 feet (Big Spring Branch)	Stream restoration, Riparian buffer enhancement
15	UT Jonathan Creek at MVC	35.52251	-83.04298	2,600 feet (UT Jonathan Creek)	Stream restoration, Riparian buffer enhancement
16	Jonathan Valley Elementary School	35.53169	-83.02937	1,050 feet (Jonathan Creek)	Streambank stabilization with in-stream structures, Riparian buffer enhancement, Stormwater treatment
17	Winngray Campground	35.55826	-83.02485	1,900 feet (Jonathan Creek)	Streambank stabilization, Riparian buffer enhancement
18	Garrett Creek (1)	35.54815	-83.01812	9,000 feet (Garrett Creek)	Stream restoration, Agricultural BMPs, Riparian buffer enhancement
19	Garrett Creek (2)	35.56378	-83.02207	1,400 feet (Garrett Creek)	Stream restoration, Riparian buffer enhancement
20	Grindstone Road bridge	35.56651	-83.02257	150 feet (Jonathan Creek)	Streambank stabilization, Riparian buffer enhancement
21	Dogwood Lakes	35.56991	-83.02227	2,400 feet (Jonathan Creek)	Streambank stabilization, Floodplain creation, Riparian buffer enhancement
22	Jonathan Creek Fire Department	35.57571	-83.01804	660 feet (Jonathan Creek)	In-stream structure for bridge protection, Riparian buffer enhancement
23	Leatherwood Branch	35.58619	-83.00128	6,800 feet (Leatherwood Branch)	Stream restoration, Agricultural BMPs, Riparian buffer enhancement
24	UT Jonathan Creek	35.59565	-83.01661	5,000 feet (UT Jonathan Creek)	Stream restoration, Agricultural BMPs, Riparian buffer enhancement
25	White Oak Road	35.61006	-83.01282	200 feet (Jonathan Creek)	Streambank stabilization, Riparian buffer enhancement
26	Few Property	35.53798	-83.02745	150 feet (Jonathan Creek)	Streambank stabilization, Riparian buffer enhancement

Table B2
Jonathan Creek Watershed Plan
Multi-Criteria Decision Analysis Calculator

	Project Ranking Based on Potential for Achieving Objectives and Cost-Effectiveness	Project Objectives												For each objective, enter its weighting factor from 0 to 3, representing the importance of the objective for project ranking. For each project, enter its score from 0 to 5 for each objective, representing its potential to achieve the objective.		
		Risk Management			Ecosystem Health						Community Values					
		Public Safety	Infrastructure Protection	Flooding Reduction	Habitat Enhancement	Water Quality Improvement	Floodplain Functions	Buffer Enhancement	Streambank Stability	Geomorphic Equilibrium	Public Access & Education	Aesthetics	Recreation			
	Objective Weighting Factor	3	2	2	2	3	2	2	3	2	2	2	1	MCDA Score (points)	Points per Unit Cost	Project Rank Based on Points per Unit Cost
1	Ghost Town in the Sky	2	4	2	3	3	3	4	3	3	3	4	1	77	0.12	25
2	Maggie Valley Water Intake	3	4	1	2	2	1	4	2	2	4	3	4	67	0.12	22
3	Mary Rathbone Rich Park	3	3	1	3	2	2	4	3	2	5	4	5	77	0.31	9
4	BearWaters Brewing Company	1	2	2	2	2	2	4	3	1	3	3	2	58	0.28	14
5	Maggie Valley Methodist Church	1	2	2	2	3	3	4	3	2	3	3	2	65	0.23	17
6	River Point Lodge	4	4	2	3	3	3	4	4	3	2	3	1	82	0.10	26
7	Clement Property	1	1	2	3	3	3	3	5	3	1	2	1	64	0.33	4
8	Cottage Drive	4	4	3	3	3	3	4	3	3	1	2	1	77	0.32	8
9	Twinbrook Lane	2	4	3	3	3	2	3	3	2	2	2	1	67	0.19	18
10	Taylor Property	2	1	2	2	3	2	3	5	2	1	3	1	63	0.18	21
11	50 Sourwood Road	4	4	1	1	2	2	2	3	2	1	2	1	58	0.12	24
12	Mountain Retreat RV Park	3	4	2	2	2	2	2	3	2	2	2	2	62	0.31	10
13	Sewer Crossing near MVC	2	5	4	2	2	1	2	2	2	1	3	1	59	0.12	23

Table B2
Jonathan Creek Watershed Plan
Multi-Criteria Decision Analysis Calculator

	Project Ranking Based on Potential for Achieving Objectives and Cost-Effectiveness	Project Objectives												For each objective, enter its weighting factor from 0 to 3, representing the importance of the objective for project ranking. For each project, enter its score from 0 to 5 for each objective, representing its potential to achieve the objective.		
		Risk Management			Ecosystem Health						Community Values					
		Public Safety	Infrastructure Protection	Flooding Reduction	Habitat Enhancement	Water Quality Improvement	Floodplain Functions	Buffer Enhancement	Streambank Stability	Geomorphic Equilibrium	Public Access & Education	Aesthetics	Recreatoin			
	Objective Weighting Factor	3	2	2	2	3	2	2	3	2	2	2	1	MCDA Score (points)	Points per Unit Cost	Project Rank Based on Points per Unit Cost
14	Big Spring Branch at MVC	2	2	2	3	4	3	4	3	3	3	3	3	76	0.30	11
15	UT Jonathan Creek at MVC	2	2	2	3	4	3	4	3	3	3	3	3	76	0.30	12
16	Jonathan Valley Elementary School	4	2	2	2	2	2	3	3	2	5	4	4	75	0.36	3
17	Winngray Campground	2	2	2	2	2	2	2	3	2	2	2	1	54	0.32	7
18	Garrett Creek (1)	1	2	3	4	4	4	5	4	4	1	3	1	80	0.36	2
19	Garrett Creek (2)	2	3	3	4	4	3	4	4	3	2	3	1	81	0.33	5
20	Grindstone Road Bridge	3	3	1	2	2	2	3	4	2	1	3	1	62	0.19	19
21	Dogwood Lakes	5	4	4	3	3	2	3	4	3	2	3	1	85	0.36	1
22	Jonathan Creek Fire Department	3	4	1	2	2	2	3	3	2	4	3	3	69	0.28	13
23	Leatherwood Branch	1	2	2	4	4	4	5	4	4	1	3	1	78	0.33	6
24	UT Jonathan Creek	1	2	2	4	5	4	5	4	4	1	3	1	81	0.28	15
25	White Oak Road	3	3	1	2	2	2	3	4	2	1	3	1	62	0.25	16
26	Few Property	2	4	1	2	2	2	3	4	2	1	3	1	61	0.18	20



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HAYWOOD WATERWAYS ASSOCIATION

Potential Watershed Improvement Projects

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet
B1

Re-design parking areas to optimize parking capacity and traffic flow while allowing for appropriately-sized stormwater features and an enlarged riparian buffer

Install stormwater control measures (bioretention areas or stormwater wetlands), sized to treat stormwater runoff from 6.5 acres of impervious area and other contributing area (stormwater features as drawn = 0.74 acres)

On the left bank, widen and enhance the riparian buffer with native trees, shrubs, and grasses (minimum 25 feet width); manage invasive plants throughout the project area.

N E W S

Stabilize stormwater outfall from parking lot

Leave 540 feet of stream in the existing planform location. As needed, grade streambanks to stable slopes and install in-stream structures for bank protection and improved habitat.

Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Design Elements

- Riparian Vegetation Enhancement
- Stormwater Treatment Area

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Overview: Project 1 (Ghost Town in the Sky)

0 50 100 200 300 400 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B2

On both banks, widen and enhance the riparian buffer with native trees, shrubs, and grasses (minimum 25 feet width); manage invasive plants throughout the project area.

Install boulder toe revetment as needed along the left bank to protect Bed & Breakfast property

Install single arm boulder vane on right bank to protect water intake

Install boulder steps to stabilize fishing access at desired location

N E S W

Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

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HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 2 (Maggie Valley Water Intake)

0 15 30 60 90 120 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B3

On both banks, widen and enhance the riparian buffer with native trees, shrubs, and grasses (minimum 25 feet width); manage invasive plants throughout the project area.

Install single arm boulder vane on right bank for fishing access

Install interpretive signs at constructed stormwater treatment wetland

N E S W

Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

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Overview: Project 3 (Mary Rathbone Rich Park)

0 20 40 80 120 160 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B4

On the left bank, widen and enhance the riparian buffer with native trees, shrubs, and grasses (minimum 25 feet width)

Manage invasive plants throughout the project area

On the right bank, install live stakes to enhance the riparian buffer

Install stormwater control measures (bioretention areas or stormwater wetlands), sized to treat stormwater runoff from buildings and parking areas.

N
W E
S

Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

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HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 4 (BearWaters Brewing Company)

0 20 40 80 120 160 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B5

On both banks, widen and enhance the riparian buffer with native trees, shrubs, andgrasses (minimum 25 feet width) on both streambanks; manage invasive plants throughout the project area.

Install stormwater control measures (bioretention areas or stormwater wetlands), sized to treat stormwater runoff from buildings and parking areas.

N

W E

S

Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

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HAYWOOD SOIL & WATER CONSERVATION DISTRICT

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Overview: Project 5 (MV Methodist Church)

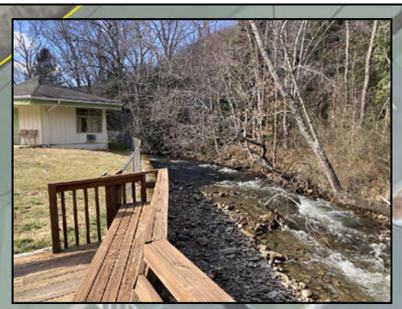
0 25 50 100 150 200 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B6

Along the left bank of Campbell Creek, install in-stream structures (boulder and log vanes) for bank protection, flow direction, and improved habitat.

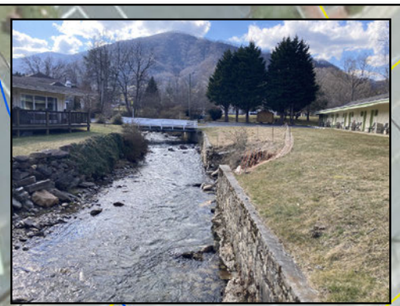
Remove endangered structures and grade point bar at confluence to a stable slope



Install an appropriately-sized bioretention area to treat stormwater runoff from building and parking lot (stormwater feature as drawn = 660 square feet)

On all streambanks, to the extent feasible, plant a riparian buffer with native trees, shrubs, and grasses; manage invasive plants throughout the project area.

Remove deteriorating stone walls along both sides of Campbell Creek. Stabilize the left streambank by grading to a stable slope (3:1 or flatter). Stabilize the right streambank using a combination of boulder revetments and grading.



Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Design Elements

- Riparian Vegetation Enhancement
- Stormwater Treatment Area

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 6 (River Point Lodge)

0 25 50 100 150 200 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B7

In selected areas with bank erosion, grade streambanks to stable slopes (3:1 or flatter) and reinforce with toe wood revetments as needed; install in-stream structures (log vanes) in these areas for bank protection, flow direction, and improved habitat.

Along the left bank of the upper 660 linear feet of Jonathan Creek, preserve the existing forested riparian buffer; manage invasive plants within the buffer as needed

Along the left bank of the lower 800 linear feet of Jonathan Creek, widen and enhance the riparian buffer with native trees, shrubs, and grasses (minimum 25 feet width); manage invasive plants throughout the project area.

N E S W

Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Design Elements

- Riparian Vegetation Enhancement
- Stormwater Treatment Area

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

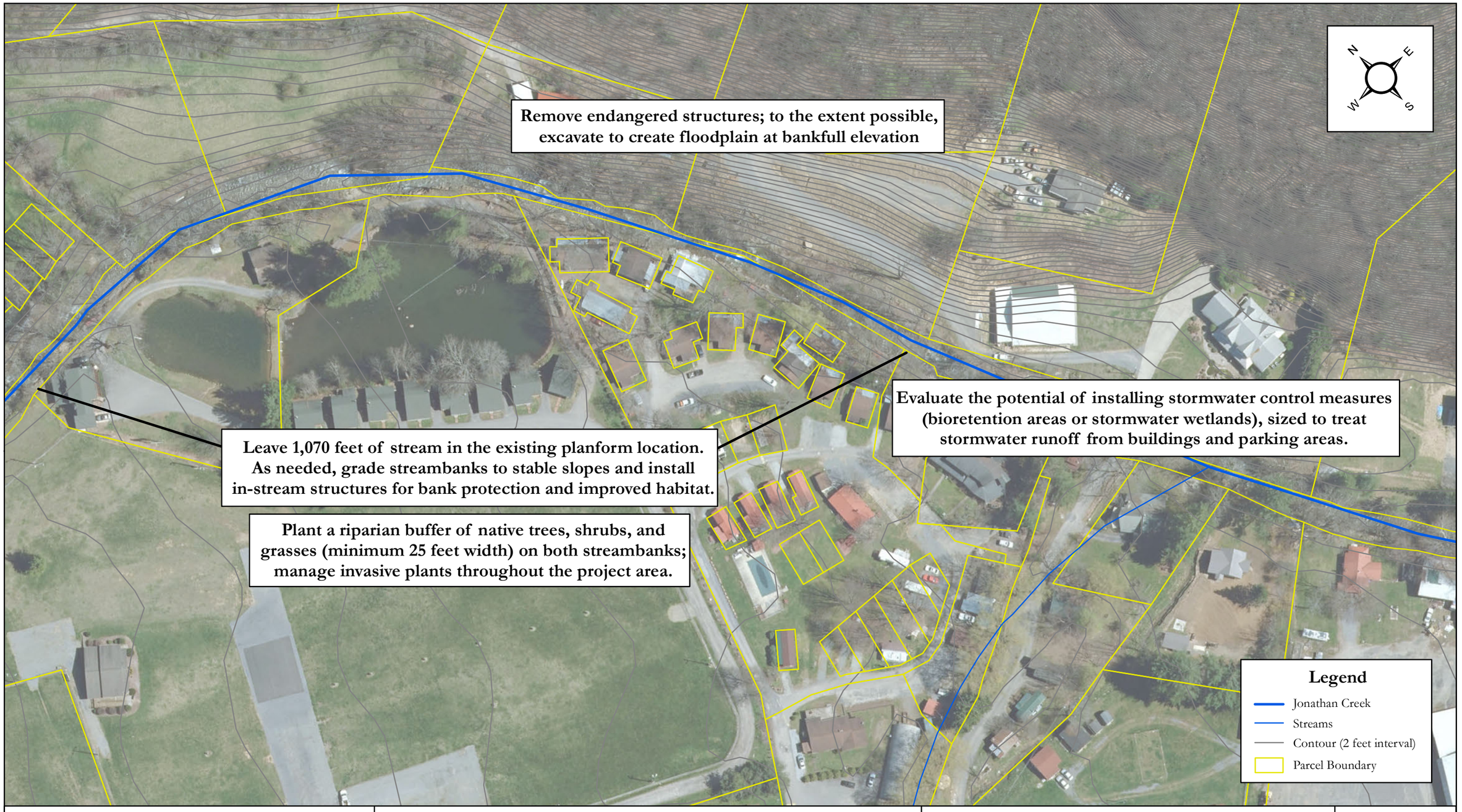
HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 7 (Clement Property)

0 50 100 200 300 400 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B8



Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 8 (Cottage Drive)

0 50 100 200 300 400 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B9

Within existing constraints, restore approximately 460 feet of the tributary with appropriate channel dimension, pattern, and profile. Install in-stream structures as needed for grade control, bank protection, and streambed diversification.

Ensure that the culvert under Soco Road is sized appropriately to minimize flooding. Routinely inspect culvert for excess debris and blockages.

If possible, remove or relocate sewer line to allow for unobstructed flood flow.

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on both banks of the stream; remove invasive vegetation within riparian areas.

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Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 9 (Twinbrook Lane)

0 25 50 100 150 200 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B10

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on the streambank and surrounding areas; remove invasive vegetation within riparian areas.

Repair eroding banks by grading to the lowest feasible slope. As needed, use toe wood revetment, vegetated geolifts, and in-stream structures for bank protection.

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Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 10 (Taylor Property)

0 25 50 100 150 200 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B11

Stabilize eroding banks by grading to the lowest feasible slope. As needed, use toe wood revetment, vegetated geolifts, and in-stream structures for bank protection.

To the extent feasible, remove concrete and similar materials from streambank and riparian areas.

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on the streambank; remove invasive vegetation within riparian areas.

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Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 11 (50 Sourwood Road)

0 25 50 100 150 200 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B12

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on the streambank and surrounding areas; remove invasive vegetation within riparian areas.

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Repair eroding banks by grading to the lowest feasible slope. As needed, use toe wood revetment, vegetated geolifts, and in-stream structures for bank protection.

To the extent feasible, move parking and other facilities away from the streambank.

Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 12 (Mountain Retreat RV Park)

0 25 50 100 150 200 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B13

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Relocate existing sewer line crossing to eliminate channel blockage and barrier to flood flow.

Repair streambanks by grading to the lowest feasible slope. As needed, use toe wood revetment, vegetated geolifts, and in-stream structures for bank protection.

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on the streambank and surrounding areas; remove invasive vegetation within riparian areas.

Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 13 (Sewer Crossing near MVC)

0 15 30 60 90 120 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B14

Restore Big Spring Branch within MVC as a step-pool stream with appropriate channel dimension, pattern, and profile. Install in-stream structures as needed for grade control, bank protection, and streambed diversification.

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on both banks of the stream; remove invasive vegetation within riparian areas.

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Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

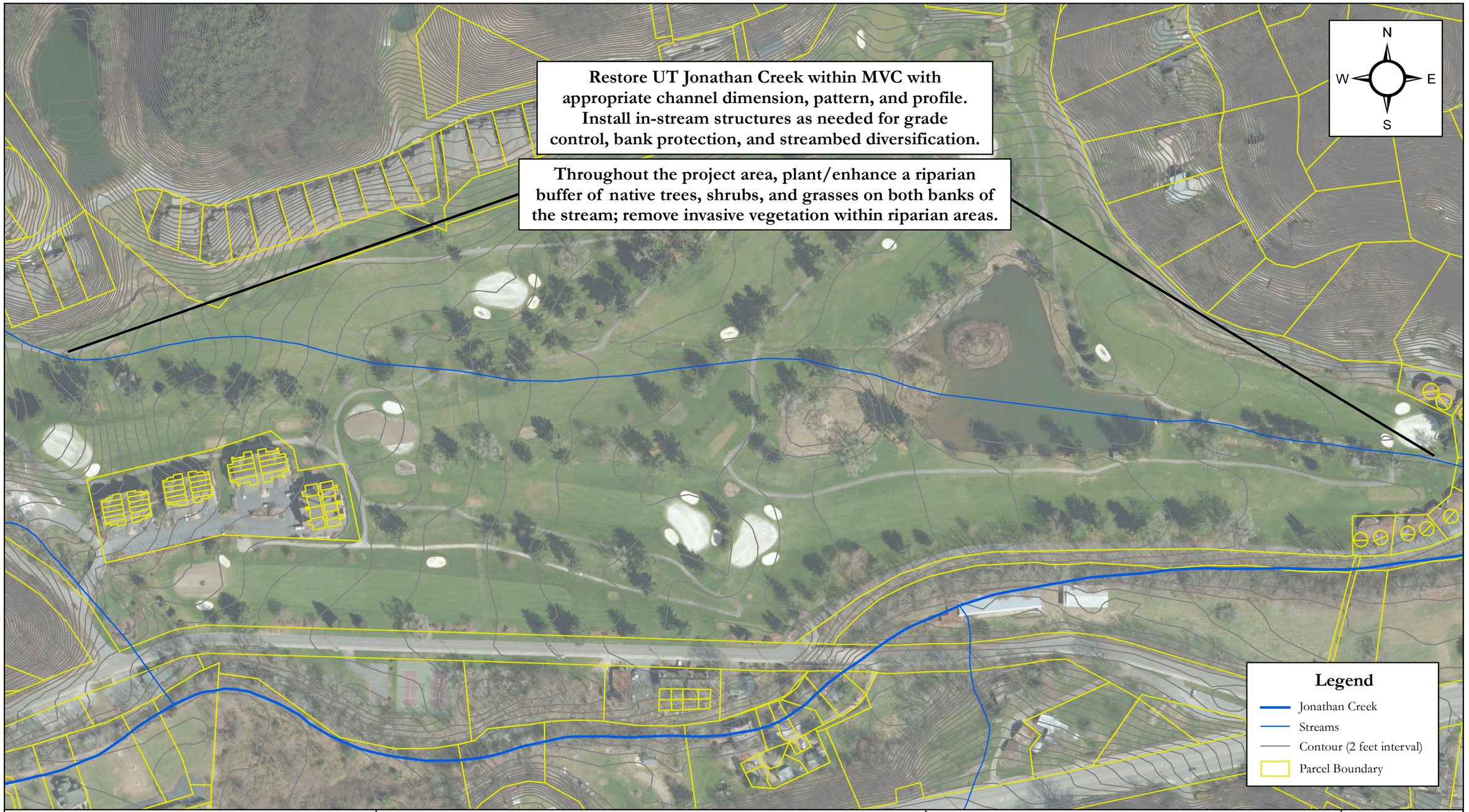
HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 14 (Big Spring Branch at MVC)

0 100 200 400 600 800 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B15



Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 15 (UT Jonathan Creek at MVC)

0 100 200 400 600 800 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B16

Evaluate retrofit opportunities to treat stormwater runoff from school buildings and parking areas, including cisterns, rain gardens, stormwater wetlands, and vegetated swales

Install an appropriately-sized bioretention area or stormwater wetland to treat runoff (feature as drawn = 10,200 square feet)

Along the left bank of Jonathan Creek, widen and enhance the riparian buffer with native trees, shrubs, and grasses (minimum 25 feet width); manage invasive plants throughout the project area.

Leave Jonathan Creek in the existing planform location. As needed, grade streambanks to stable slopes and install in-stream structures for bank protection, fishing access, and improved habitat.

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Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Design Elements

- Riparian Vegetation Enhancement
- Stormwater Treatment Area

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 16 (Jonathan Valley Elem. School)

0 50 100 200 300 400 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B17

To the extent feasible, move parking and other facilities away from the streambank.

Repair eroding banks by grading to the lowest feasible slope. As needed, use toe wood revetment, vegetated geolifts, and in-stream structures for bank protection.

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on the streambank and surrounding areas; remove invasive vegetation within riparian areas.

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Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 17 (Winngray Campground)

0 100 200 400 600 800 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B18

In agricultural areas, install BMPs as needed for water quality and habitat improvement:
- -Streambank stabilization
- -Riparian buffer
- -Livestock exclusion fencing
- -Heavy use area stabilization
- -Livestock watering system
- -Farm road stabilization and stream crossing
- -Culvert replacement for aquatic organism passage
- -Debris removal

W S N E

Restore Garrett Creek between Compromise Drive and US Highway 276 with appropriate channel dimension, pattern, and profile. Install in-stream structures as needed for grade control, bank protection, and streambed diversification.

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on both banks of the stream; remove invasive vegetation within riparian areas.

Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 18 (Garrett Creek 1)

0 200 400 800 1,200 1,600 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B19

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Restore Garrett Creek downstream of US Highway 276 with appropriate channel dimension, pattern, and profile. Install in-stream structures as needed for grade control, bank protection, and streambed diversification.

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on both banks of the stream; remove invasive vegetation within riparian areas.

Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

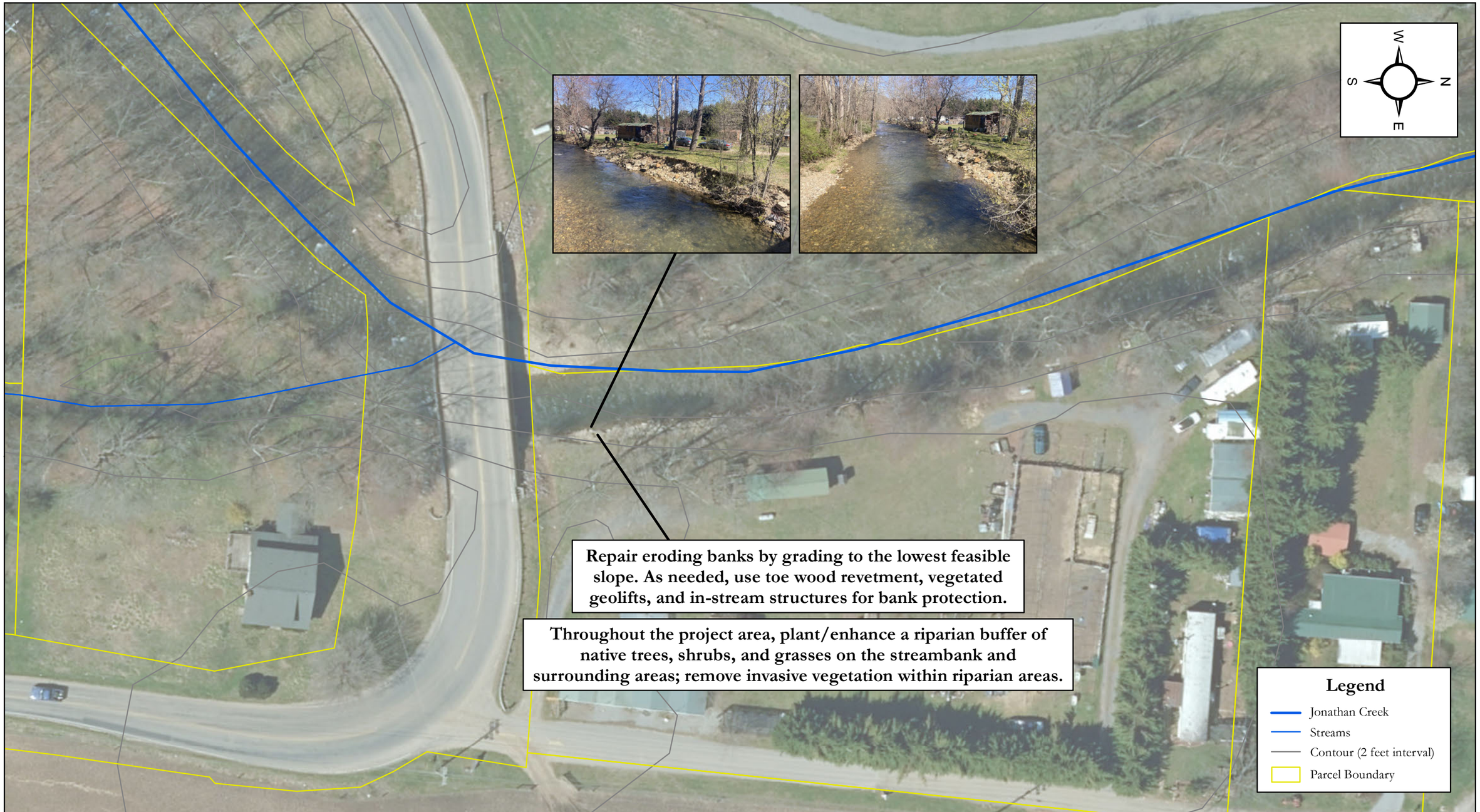
HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 19 (Garrett Creek 2)

0 50 100 200 300 400 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B20



Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 20 (Grindstone Road Bridge)

0 25 50 100 150 200 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B21

Remove endangered structures; to the extent possible, excavate to create floodplain at bankfull elevation

As needed, realign stream channel and/or grade both streambanks to stable slopes and install in-stream structures for bank protection and improved habitat.

Plant a riparian buffer of native trees, shrubs, and grasses (minimum 25 feet width) on both streambanks; manage invasive plants throughout the project area.

Evaluate opportunities to retrofit pond inlet and outlet structures to promote improved water quality

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Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 21 (Dogwood Lakes)

0 100 200 400 600 800 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B22

Plant a riparian buffer of native trees, shrubs, and grasses (minimum 25 feet width) on both streambanks; manage invasive plants throughout the project area.

Install a single arm boulder vane to protect streambanks and direct flow under bridge

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Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 22 (Jonathan Creek FD)

0 25 50 100 150 200 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B23

In agricultural areas, install BMPs as needed for water quality and habitat improvement:
-Streambank stabilization
-Riparian buffer
-Livestock exclusion fencing
-Heavy use area stabilization
-Livestock watering system
-Farm road stabilization and stream crossing
-Culvert replacement for aquatic organism passage
-Debris removal

Restore Leatherwood Branch between Qualla Road and the confluence with Jonathan Creek with appropriate channel dimension, pattern, and profile. Install in-stream structures as needed for grade control, bank protection, and streambed diversification.

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on both banks of the stream; remove invasive vegetation within riparian areas.

Legend
- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

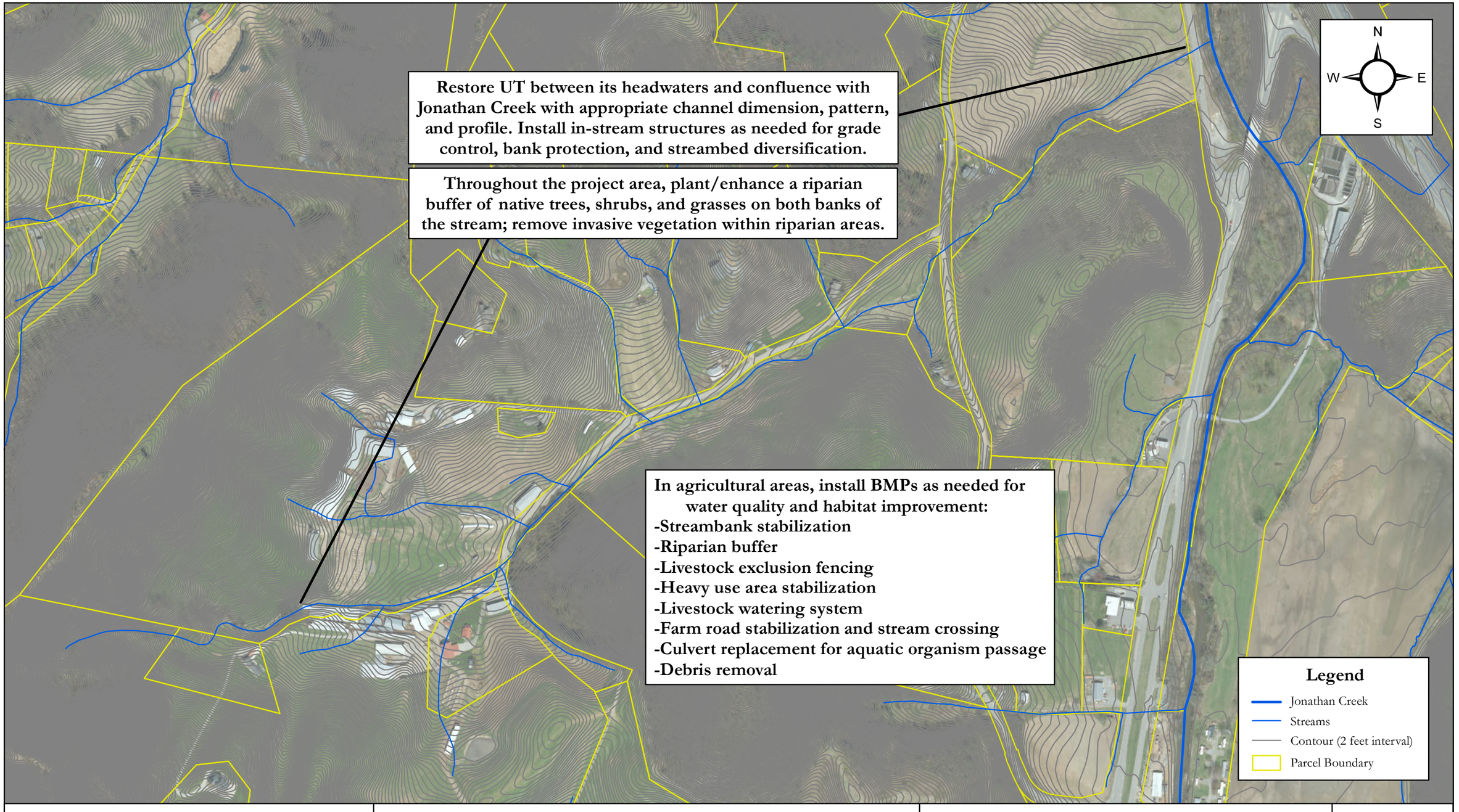
HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 23 (Leatherwood Branch)

0 200 400 800 1,200 1,600 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B24



Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 24 (UT Jonathan Creek)

0 200 400 800 1,200 1,600 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B25

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on the streambank and surrounding areas; remove invasive vegetation within riparian areas.

Repair eroding banks by grading to the lowest feasible slope. As needed, use toe wood revetment, vegetated geolifts, and in-stream structures for bank protection.

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Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 25 (White Oak Road)

0 25 50 100 150 200 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B26

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Repair eroding banks by grading to the lowest feasible slope. As needed, use toe wood revetment, vegetated geolifts, and in-stream structures for bank protection.

Throughout the project area, plant/enhance a riparian buffer of native trees, shrubs, and grasses on the streambank and surrounding areas; remove invasive vegetation within riparian areas.

Legend

- Jonathan Creek
- Streams
- Contour (2 feet interval)
- Parcel Boundary

Jennings Environmental

HAYWOOD SOIL & WATER CONSERVATION DISTRICT

HAYWOOD WATERWAYS ASSOCIATION

Overview: Project 26 (Few Property)

0 25 50 100 150 200 Feet

Jonathan Creek Watershed Plan
Haywood County, North Carolina

Sheet B27