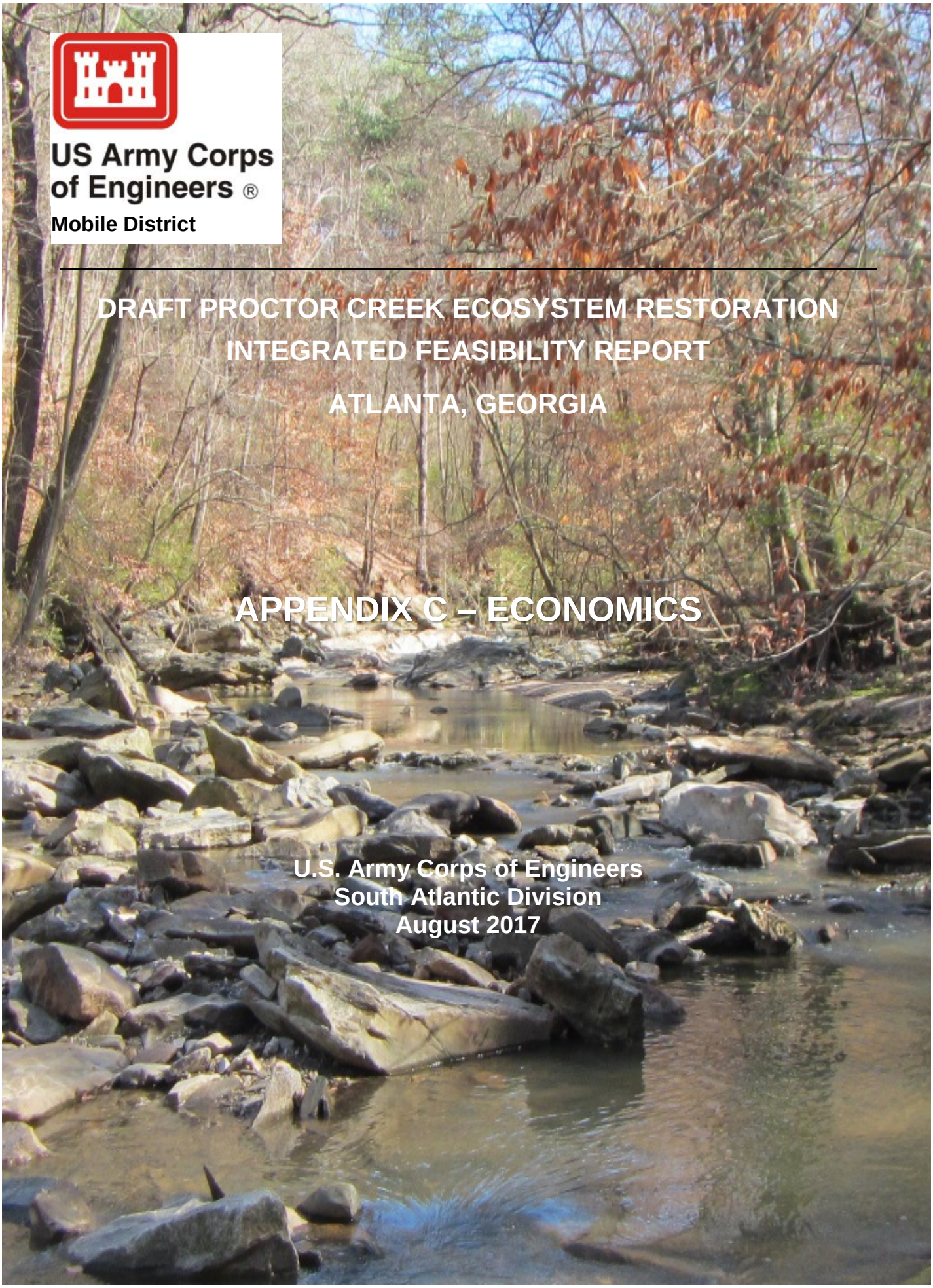

US Army Corps of Engineers ®
Mobile District

DRAFT PROCTOR CREEK ECOSYSTEM RESTORATION INTEGRATED FEASIBILITY REPORT

ATLANTA, GEORGIA

APPENDIX C – ECONOMICS

U.S. Army Corps of Engineers
South Atlantic Division
August 2017

APPENDIX C

ECONOMIC AND INCREMENTAL COST ANALYSIS

DRAFT PROCTOR CREEK ECOSYSTEM RESTORATION
INTEGRATED FEASIBILITY REPORT

ATLANTA, GEORGIA

APPENDIX C – ECONOMIC AND INCREMENTAL COST ANALYSIS

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1.1 ECONOMIC AND SOCIAL CONSIDERATIONS

This appendix presents the socio-economic issues related to the Proctor Creek Watershed project implementation.

The primary effects of the project are the costs of implementation (National Economic Development [NED] cost), and the environmental benefits (i.e. ecosystem restoration and improvements). These costs and benefits are incorporated into a Cost Effectiveness/Incremental Cost Analysis (CE/ICA) which is a main tool used in the socio-economic evaluation of an environmental restoration project.

The primary effects of the project include the costs of implementation as well as the ecosystem restoration and improvement benefits. Project implementation costs are monetarily expressed in terms of the net national project cost (NED costs). Project costs have regional impacts as expenditures on the project within the regional economy that could cause changes in local and regional earnings, sales, and employment. While the costs of implementation are expressed in traditional monetary terms, ecosystem improvement, the most significant beneficial effect of the project is not expressed in monetary terms. Ecosystem improvement is expressed in terms of National Ecosystem Restoration benefits in accordance with U.S. Army Corps of Engineers (USACE) policy. For ecosystem restoration projects, a plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the federal objective shall be selected.

The potential economic impacts of the alternative restoration plans are secondary consequences of the environmental improvements and hydrologic changes that are expected to result from the proposed structural and operational modifications to the project study area. These projected impacts are contingent upon the successful implementation and operation of restoration plans and subsequent outputs and therefore, subject to the uncertainties inherent in ecosystem restoration activities. Due to the challenges inherent in quantifying National Ecosystem Restoration (NER) effects or benefits, quantifying the resulting NED impact is also a challenge.

Nonetheless, there are methods for evaluating the economic efficiencies of producing these alternative restoration plans.

In order to evaluate the economic efficiencies of the span of project alternatives, an analysis of the NED costs and NER benefits of each alternative is undertaken. Specifically, a CE/ICA is utilized to determine the alternatives that provided the least unit cost per unit of benefits.

This appendix is responsible for considering a variety of social conditions relevant to the project. These social conditions are intricately interconnected with the economics of the project. They include elements such as population, water demand, recreation, environmental justice, and a variety of other considerations.

1.2 Elements of the Socio-economic Investigation

This investigation assesses the economic effects of the alternative ecosystem restoration plans formulated in the feasibility phase of the Proctor Creek Watershed project. The economic evaluation of the alternative restoration plans includes the elements discussed in the following sub-sections.

1.2.1 Evaluation of Project Costs

Project costs include all expenditures required to implement the alternative plans. The federal government and the State of Georgia would share these costs. Proctor Creek Watershed project costs include those for initial construction; lands; relocations; rights of way; rehabilitation, replacement, and repair; and operations and maintenance (O&M) (including the costs of post-construction monitoring and adaptive management).

1.2.2 Regional Economic Development Effects

The potential Regional Economic Development (RED) effects of the Selected Alternative Plan (SAP) include changes in income, employment, or economic output of the region.

1.2.3 Other Social Effects

The potential social effects of the SAP include effects on minority, elderly, and disadvantaged groups, population displacement, and effects on community cohesion.

1.3 Methodology

A number of factors were considered prior to developing the methodologies used to evaluate the economic effects of the alternative restoration plans. These factors include: available analytical tools, economic theory, federal policy, obtainable data, and time and budgetary constraints. These factors are discussed in the sections to follow.

1.3.1 Without-Plan and With-Plan Conditions

Proper definition of the without-plan and with-plan conditions is critical to the planning process. The without-plan condition is the most likely condition expected to exist in the future in the absence of a proposed project. The future without plan condition is the benchmark against which alternative future with-plans are evaluated. National and regional socio-economic parameters considered include income, employment, population and other aggregate projections such as land use trends, water supply and water demand. Comparisons of conditions with the implementation of alternative plans to future without-plan conditions were performed to identify the beneficial and adverse effects of the proposed plans. Depending on the alternative and the type of economic impact changes resulting from implementation of a restoration plan, it may be desirable or undesirable when compared to the future without-plan condition. For example, alternatives that include modifications to the current system to provide additional drainage areas may result in fewer economic losses associated with urban flood damage. This would be a desirable ancillary benefit of restoration.

1.3.2 Economic Analysis Methodology

Consistent with USACE guidance, neither a traditional benefit-cost ratio nor a net NED analysis is required for NER plans. For ecosystem restoration projects, a plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the federal objective shall be selected. The methodologies used to conduct economic analysis studies for the project were based on a combination of factors, including: economic theory, USACE's ecosystem restoration

and economic evaluation policies, and the characteristics of methodologies used by economists to value ecosystem benefits. For this study, the alternative restoration plans were compared using information in monetary and non-monetary units. The economic analysis of the Proctor Creek Watershed alternative restoration plans include: (1) the NED costs (in monetary terms), (2) the anticipated environmental benefits resulting from restoration measures (in non-monetary terms), (3) the positive and adverse regional economic effects (RED) and social effects resulting from project implementation.

This section of the report addresses the above items. The economic basis for making policy decisions about whether to invest public funds in ecosystem restoration for the Proctor Creek Watershed project is comparing monetary costs and non-monetary benefits in order to determine whether the expenditure is justified. The costs of ecosystem restoration projects include: initial construction costs; major rehabilitation and repair costs; O&M costs; post construction monitoring costs; and adverse NED effects, if any (not anticipated). Typically, these costs can be expressed in monetary (i.e., dollar) terms.

The principal challenge of ecosystem restoration economics is estimating the value of restoration benefits. The primary purpose of each alternative plan is ecosystem restoration. The benefits of ecosystem restoration are usually expressed by ecologists in non-monetary units, such as acres of specific habitat created, indices of biological productivity associated with habitat improvement, or increased abundance and/or diversity of particular species of plants or animals.

Expressing the costs and benefits of alternatives in a common, monetary metric would facilitate selection of the best restoration plan for a given site. However, calculating the monetary value of environmental amenities is both difficult and controversial. Environmental amenities are public goods that are generally not exchanged in the marketplace. For marketable commodities (i.e., items that people buy and sell), the demand and prices paid for these goods can be used as "proxies" for determining their value to consumers. In the absence of data on consumers' expenditures for environmental amenities, resource economists have attempted to develop techniques that can be used to estimate their value using indirect indicators of consumers' "willingness to pay" for ecosystem restoration. For goods and services that are not purchased in the marketplace, non-market valuation approaches must be used to infer their value to the public. There are direct and indirect use values for these goods and services. Use values refer to the value consumers obtain from using a good that is related to an environmental amenity.

Non-consumptive use values refer to the value obtained by a user in cases for which the good remains to be used by others in the future, such as catch-and-release fishing or bird watching. It is reasonable to expect that the alternative restoration plans will generate additional use values to the public. Non-market activities that would benefit from restoration plans include recreational fishing, subsistence activities, and a variety of eco-tourism related activities (e.g., bird watching, hiking and canoeing).

Non-use values include the values the public obtains from simply knowing that the good or resource is available, even if they have not used it previously. Individuals may value a good simply from knowing it exists (existence value) or because they may want to have the opportunity to use it at some future time (option value).

Again, it is reasonable to expect that the alternative restoration plans will generate additional non-use values to the public. The tremendous interest in and support for ecosystem restoration, not just in Georgia but throughout the Nation is an indication that a broad segment of society values the ecosystem, even though most have never experienced the area first hand.

As specified in USACE's ecosystem restoration policy (EC 1105-2-210: Ecosystem Restoration in the Civil Works Program), ecosystem restoration projects are not subject to traditional benefit-cost analyses. An ecosystem restoration proposal must still be justified by comparing the monetary costs and non-monetary benefits of restoring degraded ecosystems. USACE ecosystem restoration evaluation procedures focus on the non-monetary benefits of restoration, comparing these benefits to monetary costs using CE/ICA procedures.

2.0 POPULATION AND ECONOMY

The sections that follow evaluate the economic impacts of the alternative restoration plans.

The people who live in the study area, and the economic activity, in which they are engaged, comprise important components of the area's total environment.

Any course of action forthcoming from this study will have effects throughout an economic system as well as the natural ecosystem(s), the health and sustenance of which are the impetus for this investigation. The economic system is connected with the natural ecosystem and in general is ultimately dependent upon it for survival. This connection is especially strong in the study area.

Adverse changes in the health and condition of the natural system can cause severe negative impacts on the economic system, particularly in the study area for this feasibility study. Conversely, in this study area, beneficial changes to the natural system are expected to have a strong positive effect on the economic system. It is significant, therefore, to describe and understand the general economic and social environment within which such changes could take place. Although the main focus of economic impact evaluation efforts undertaken for this study has been to describe the economic impacts and benefits of alternatives being considered for implementation, describing the broader context for these evaluation efforts is also necessary and important.

Competition for regional water resources has intensified with the increase in population and industry growth. This places a strain on existing resources, which will eventually surpass the readily available sources. When the needs of the natural system are then factored in, demands become greater and conflicts among competing water users would become even more severe. While most people recognize the need for a healthy ecosystem to support the region's economy and jobs, many people are concerned that restoration projects could displace businesses, limit development, reduce available water supply and reduce job opportunities. By contrast, continued degradation of the Proctor Creek ecosystem would adversely affect lifestyles in and around the study area.

2.1 Project Area

The existing land use within the study boundary is predominately urban, mixed residentially and light commercial, at 16 square miles in Western Atlanta, Fulton County

Figure 2.1-1 illustrates the location of the watershed and Figure 2.1-2 illustrates the Census tracts within the watershed.

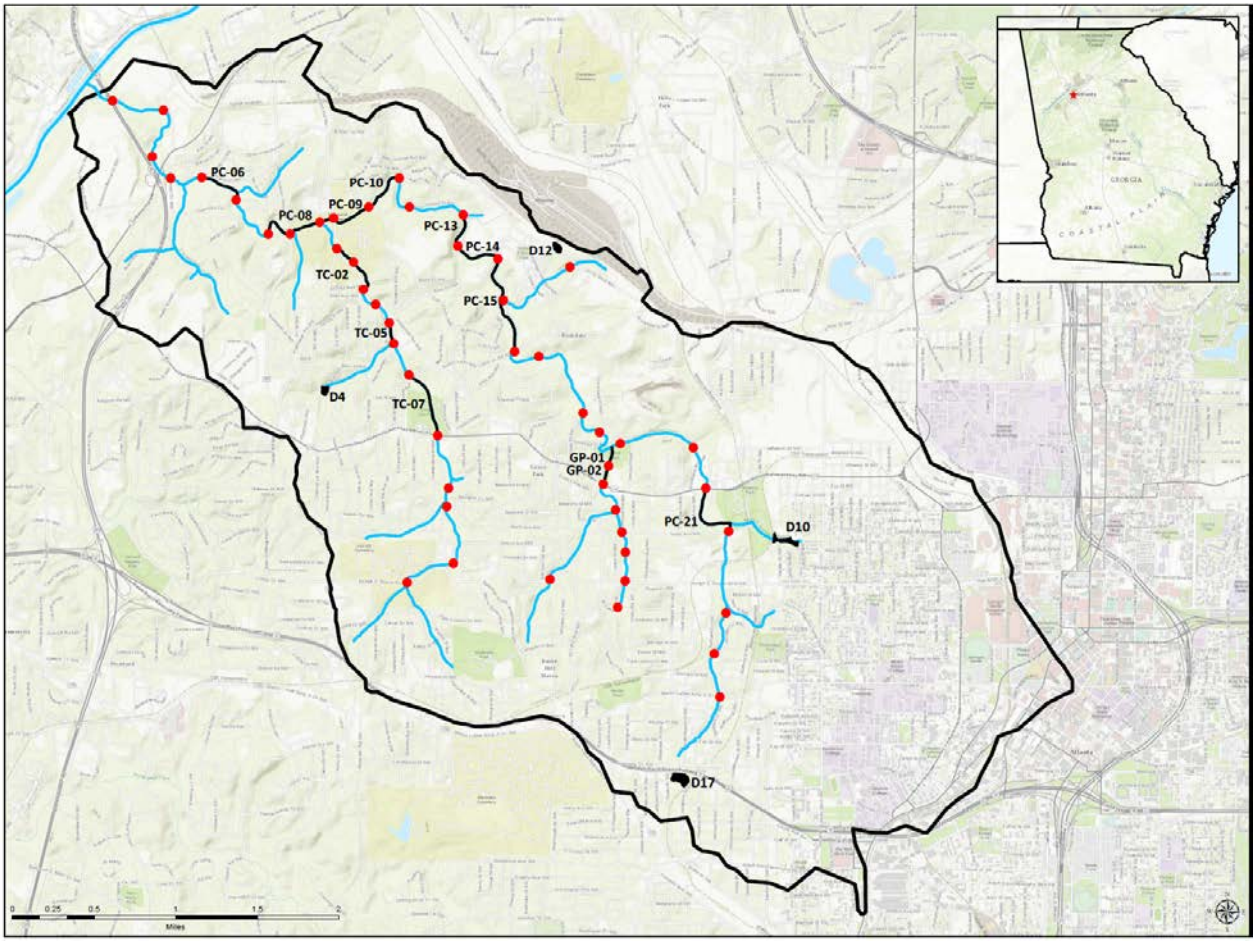

FIGURE 2.1-1: MAP OF PROCTOR CREEK WATERSHED STUDY AREA

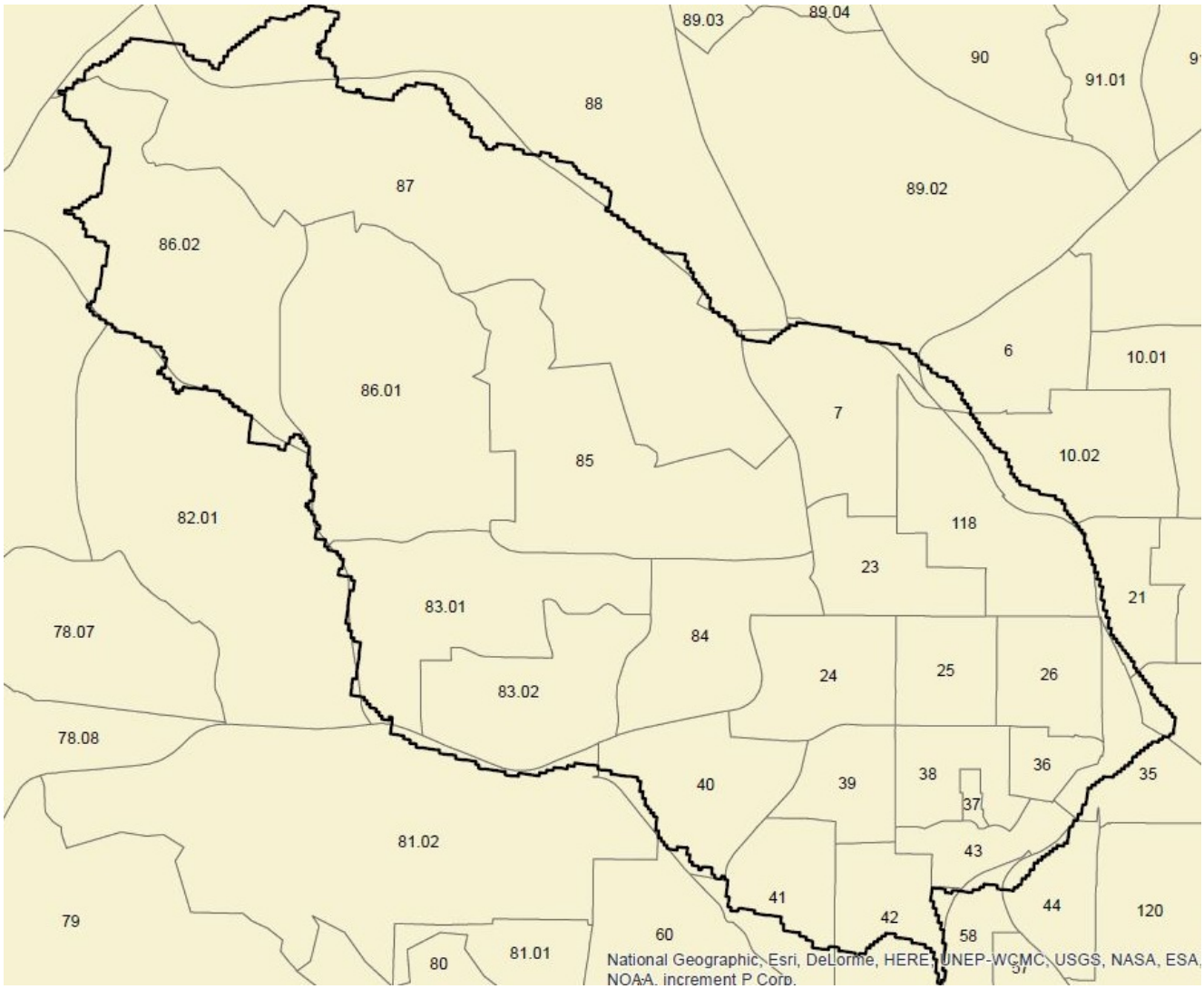

FIGURE 2.1-2: MAP OF CENSUS TRACTS IN THE PROCTOR CREEK WATERSHED STUDY AREA

2.2 General

Typical socio-economic and demographic data for the Proctor Creek Watershed study area indicate lower than average income when compared to the rest of the state. Georgia's economy is generally characterized by strong wholesale and retail trade, government and technology sectors. Georgia's temperate climate attracts vacationers and other visitors and helps to make the State a significant destination for people from all over the country. Easily developed land, accessible water supply, abundant natural resources, and the aesthetic beauty of the region are the fundamental building blocks of the local economy. Relative to the national economy, the manufacturing sector has played less of a role in Georgia, including the study area. However, high technology manufacturing has begun to emerge as a significant sector in the state over the two decades.

2.3 Population

This section includes a description of the local economy and demographics of the study area. This descriptive information provides insight into the study area's socio-economic characteristics, and provides part of the basis for different facets of the economic impact evaluation work in the rest of this document.

The following Tables 2.3-1 through 2.3-3 represent the existing and trending population, gender, ethnic, and age profiles of the Proctor Creek Watershed study area.

Table 2.3-1. Proctor Creek Watershed County Population Profile, 2010

Tract Number	Sq Miles	2000	2010	Percent Change	Density per sq mile/2000	Density per sq mile/2010
7	0.67	3,551	2,794	-21.3	5,300	4,170
23	0.43	2,714	1,476	-45.6	6,312	3,433
24	0.52	2,467	2,273	-7.9	4,744	4,371
25	0.34	1,981	1,904	-3.9	5,826	5,600
26	0.37	1,378	914	-33.7	3,724	2,470
36	0.15	1,502	1,207	-19.6	10,013	8,047
37	0.03	1,432	0	-	47,733	-
38	0.32	3,705	3,967	7.1	11,578	12,397
39	0.32	2,426	1,331	-45.1	7,581	4,159
40	0.62	3,166	2,231	-29.5	5,106	3,598
41	0.49	2,565	1,862	-27.4	5,235	3,800
42	0.48	2,493	2,212	-11.3	5,194	4,608
43	0.24	2,770	2,421	-12.6	11,542	10,088
83.01	1.01	3,844	2,903	-24.5	3,806	2,874

Table 2.3-1 (cont'd). Proctor Creek Watershed County Population Profile, 2010

Tract Number	Sq Miles	2000	2010	Percent Change	Density per sq mile/2000	Density per sq mile/2010
83.02	0.73	2,813	2,000	-28.9	3,853	2,740
84	0.69	5,410	3,181	-41.2	7,841	4,610
85	1.46	4,798	3,774	-21.3	3,286	2,585
86.01	1.74	5,811	4,917	-15.4	3,340	2,826
86.02	1.78	3,625	1,285	-64.6	2,037	722
87	2.98	4,411	4,372	-0.9	1,480	1,467
118	0.72	NA	2,655	NA	NA	3,688
Total	**16.09**	**62,862**	**49,679**	**-21.0**	**-**	-
Fulton Co	534	817,145	920,481	12.6	1,530	1,724
Atlanta	133.2	421,323	422,806	0.4	3,163	3,174

Source: US Census Bureau, State and County QuickFacts, 2010

Table 2.3-2. Age and Gender Profile, Proctor Creek Watershed, 2010

Area	Population	Male	Female	U5	U18	65 +
National	308,745,538	151,781,326	156,964,212	20,201,362	78,620,099	40,267,984
Georgia	9,687,653	4,729,171	4,958,482	686,785	2,633,897	1,032,035
Fulton County	920,581	448,267	472,314	62,581	233,136	83,424
Census Tract	-	-	-	-	-	-
7	2,794	2,273	521	81	211	53
23	1,476	777	699	80	282	175
24	2,273	1,097	1,176	148	598	293
25	1,904	960	944	136	477	153
26	914	426	488	68	233	56
36	1,207	621	586	45	146	129
37	0	0	0	-	-	-
38	3,967	2,463	1,504	19	795	27
39	1,331	661	670	98	324	164
40	2,231	1,066	1,165	133	542	350
41	1,862	926	936	130	499	174
42	2,212	1,027	1,185	138	412	416
43	2,421	526	1,895	93	1,043	39
83.01	2,903	1,383	1,520	222	822	410
83.02	2,000	952	1,048	117	485	432
84	3,181	1,411	1,770	196	869	408
85	3,774	1,821	1,953	337	1,131	491
86.01	4,917	2,202	2,715	614	1,807	595
86.02	1,285	544	741	102	405	108
87	4,372	1,835	2,537	460	1,348	506
118	2,655	1,445	1,210	125	584	111

Source: US Census Bureau, State and County QuickFacts, 2010

Table 2.3-3. Ethnic Profile, Proctor Creek Watershed, 2010

Area	White	Black or African American	Native American	Hispanic
National	223,553,265	38,929,319	2,932,248	50,477,594
Georgia	5,787,440	2,950,435	32,151	853,689
Fulton County	409,697	405,575	2,259	72,566
Census Tract				
7	710	1,969	6	95
23	47	1,399	2	43
24	73	2,155	3	23
25	50	1,787	6	50
26	21	859	0	24
36	95	1,044	0	49
37	0	0	0	0
38	26	3,840	7	133
39	34	1,266	7	17
40	48	2,149	2	29
41	69	1,674	12	62
42	82	2,071	15	28
43	135	2,188	6	61
83.01	50	2,795	9	46
83.02	13	1,957	1	21
84	59	3,055	2	42
85	86	3,613	2	54
86.01	51	4,804	8	57
86.02	65	1,179	0	24
87	192	4,061	6	99
118	289	2,192	5	77

Source: US Census Bureau, State and County QuickFacts, 2010

2.4 Economy

Generally, a strong wholesale and retail trade, government and service sectors characterize Georgia's economy. Georgia's temperate weather and piedmont and mountains attracts vacationers and other visitors, and helps make the state a significant destination for people all over the country.

The unemployment rate for Georgia is 5.3 percent (2015, BLS Average), while the unemployment rate for the Proctor Creek Watershed is 18 percent, which represents 4,310 persons over the age of 16 that are in the labor force.

Personal per capita income in Georgia is $26,000 (2015), but is somewhat higher in the Atlanta MSA, at $58,733. However, the study area's median household income is lower than that of the Atlanta MSA, at $27,914. It is important to note that the higher than state average household income can be attributed to more affluent neighborhoods in tracts which abut more affluent areas.

2010 Census data reports seem to indicate a lower than state average household occupancy rate, at 2.5 persons per household in the study area while the state average household sizes is 2.73. In 2015 it was reported that 17.0 percent of Georgia's population lived below the poverty level, while 16.0 percent of residents in Fulton County were below the poverty level. However, for the study area, those living at or under the poverty threshold make up some 42 percent of the populace. Nationally, the poverty level was 13.5 percent in 2015. Table 2.4-1 and 2.4-2 contains updated income and poverty statistics for the study area and MSA.

Table 2.4-1. Income and Poverty Profile, Proctor Creek Watershed

Area (Census Tract)	Median Household Income 2015	Median Household Income as a % of MSA Average	% of Persons Below The Poverty Threshold
Atlanta MSA	$ 58,733	-	13.6
7	$ 64,507	109.8	73.91
23	$ 21,146	36.0	48.31
24	$ 37,259	63.4	24.69
25	$ 28,669	48.8	20.97
26	$ 19,768	33.7	35.96
36	$ 21,860	37.2	39.12
37	$ 10,322	17.6	95.93
38	$ 31,702	54.0	36.42
39	$ 23,946	40.8	33.87
40	$ 28,909	49.2	39.4
41	$ 34,791	59.2	40.69
42	$ 25,996	44.3	31.81
43	$ 42,236	71.9	35.69
83.01	$ 33,413	56.9	35.29
83.02	$ 27,234	46.4	39.03
84	$ 20,503	34.9	44.81
85	$ 30,274	51.5	29.82
86.01	$ 21,224	36.1	47.62
86.02	$ 15,448	26.3	59.66
87	$ 24,285	41.3	45.14
118	$ 22,709	38.7	54.94

Source: US Census Bureau, State and County QuickFacts, Partial 2015

Table 2.4-2. Employment Profile, Proctor Creek Watershed

Area	Civilian Labor Force	% in Civilian Labor Force	Unemployed Civil Labor Force	% Unemployed Civilians
Atlanta MSA	2,846,134.5	2,684,068.0	162,066.5	5.7
7	544	19.3	127	23.3
23	518	48.9	171	33
24	1179	57.6	256	21.7
25	1134	64.2	202	17.8
26	702	76.8	133	18.9
36	933	71.5	71	7.6
37	14	25.9	0	0
38	1477	38.6	271	18.3
39	860	63.7	245	28.5
40	1148	58.9	214	18.6
41	908	63.4	113	12.4
42	1152	58.1	98	8.5
43	1623	62.1	290	17.9
83.01	1169	65.2	227	19.4
83.02	955	55	192	20.1
84	1297	46.5	280	21.6
85	1381	59.2	278	20.1
86.01	1741	54.9	430	24.7
86.02	520	57.8	61	11.7
87	2399	65.5	389	16.2
118	1307	52.5	262	20

3.0 RECREATION

The plans are limited to the project footprints and the tributaries of the Proctor Creek Watershed. Recreation features are included in the project as an incidental benefit. Features should be appropriate in size and scale. Recreation benefits cannot justify a plan, nor impact the primary purpose of ecosystem restoration (CECW-A 1999). Due to the incidental effect of these recreation elements, a determination of acceptable design to meet Corps standards has not been completed at this time.

All potential features will be compatible with the environmental purposes of the study; recreation will not detract from the project generated environmental or socioeconomic benefits. Recreation features will enhance and build upon the proposed ecosystem restoration project.

Project recreation may include non-invasive recreation forms. Specific features and public access structures will be described in forthcoming documents. Demand for regional recreation will be assessed through the Georgia State Comprehensive Outdoor Recreation Plan (SCORP) and collaboration with the Georgia Department of Natural Resources (GADNR) and the various state and federal agencies involved in the planning process.

3.1 Potential Changes in Value of Recreation

The Proctor Creek Watershed project can add outdoor recreation in the Atlanta and Fulton County area. Based on the recent adverse effects related to environmental degradation it may be concluded that improving the environmental quality of the ecosystem could potentially support local recreation-based businesses. Given the potential levels of expenditures and consumer surplus in the future, a small percentage increase in the quantity or quality of project-related recreation could represent an increase in recreation value.

4.0 PLAN FORMULATION

Alternatives are combinations of management measures, to address the problem suite identified at each of the sites, and to address site-specific objectives. Environmental benefits derived from implementation of an alternative are defined as the increase in Average Annual Functional Units gained from that alternative, when compared to the No-Action Alternative. Costs used for alternatives comparison all done to the same level of detail, and differ from those that are shown for the TSP, due to refinement of the details associated with the TSP, and the final results of the Cost-Effectiveness/Incremental Cost Analysis.

4.1 Results of Plan Formulation

The results of plan formulation can be found in the Main Report.

5.0 PLAN SELECTION

The following sections compare the combinations of site alternatives presented in the previous section using cost-effective/incremental cost analysis (CE/ICA). First, CE/ICA was performed on the array of alternatives for each site, and the results were used to select a single alternative from each site for further consideration. Another CE/ICA was then performed on this final array of alternatives. These results, in combination with a comparison of alternatives in Section 5.2 using the four (4) accounts (national economic development, environmental quality, regional economic development, and other social effects), was used to establish the National Ecosystem Restoration plan (NER) as presented in Section 5.3.

5.1 Cost-Effectiveness/Incremental Cost Analysis (CE/ICA)

The environmental benefits and costs presented in the previous section were the inputs for a CE/ICA. The purpose of the analysis was to evaluate the effectiveness and efficiency of the site alternatives at producing environmental outputs. Guidance on the conduct of CE/ICA is in IWR Report #95-R-1, USACE, May 1995. The end product of a CE/ICA is the identification of a set of *best buy* plans. Best buy plans are the alternatives that provide the greatest increase in environmental output for the least increase in cost. Initially, all cost-effective alternatives (a cost-effective alternative is one where no other alternative can achieve the same level of output at a lower cost, or greater level of output at the same or less cost) are arrayed by increasing output to clearly show changes in cost (i.e., increments of cost) relative to changes in output (i.e., increments of output) of each cost-effective alternative plan compared to the without-project condition. The plan with the lowest incremental costs per unit of output of all plans is therefore considered the first best buy plan. After the first best buy plan is identified, all larger cost-effective plans are compared to the first best buy plan in terms of increases in (increments of) cost and increases in (increments of) output. The alternative plan with the lowest incremental cost per unit of output (for all cost-effective plans larger than the first best buy plan) is the second best buy plan. This process is continued until all the best buy alternative plans are identified.

The results of the initial analysis conducted to compare alternatives at each project area are presented in Tables 5-1 and 5-2, and 5-3. These tables display the incremental costs and benefits for the best buy plans at each of the sites (with the exception of the No Action Alternative, which is always a Best Buy Plan), and are illustrated in Figures 5-1 and 5-2. IWR Planning Suite software was used to conduct the CE/ICA.

Evaluation of the best buys from the initial analysis identified an array of best buy alternatives for comparison over the entire watershed. The PDT compared the best buys from each project area to determine whether the incremental environmental benefits justified the incremental costs. Based on this comparison, a single best buy alternative was selected from each project area, which was then used to create watershed-wide alternatives.

Table 5-1. Watershed Measures

Reach ID	Brief description of restoration alternative	Project cost ($K)
PC08.01	In-channel structures accompanied by riparian planting and extensive right bank invasive species management	889.5
PC08.02	Right bank weir structures with bank reshaping, riparian planting, and extensive invasive species management accompanied by minor reshaping of the confluence with Terrell Creek	960.3
PC08.03	No action	0
PC09	Installation of a small rock ramp at a sewer crossing that is causing a fish movement barrier	493
PC10	Minor right bank structures with extensive invasive species management and riparian planting (right bank)	936
PC13	Installation of rock and wood weir structures with invasive species management and riparian planting on the left bank	625
PC14	Installation of rock and wood structures	505
PC15	Large reach with rock and wood weir structures, in-channel structures, and excavation and planting of a large left bank wetland complex	1,353
PC21	Rock and wood bank protection with extensive invasive species management and riparian planting along with excavation and planting of a large right bank wetland complex	1,542
D17	Inline flow attenuation structure upstream of I-20	550
TC02.01	No action	0
TC02.02	Minor bank protection with extensive invasive species management and riparian planting along with excavation and planting of a large right bank wetland complex	915
TC05	Installation of a rock ramp fish passage structure at a sewer crossing along with bank protection, invasive species management, riparian planting, and installation of a small left bank wetland complex	662
GP01	Installation of log vane channel structures with minor riparian planting	660
GP02	Stream daylighting with extensive channel reshaping, in-channel structure construction, and riparian planting	926

Table 5-2. Watershed-wide Combinations

Plan Number	AAHU (ft)	PC08.01	PC08.02	PC09	PC10	PC13	PC14	PC15	PC21	D17	TC02.02	TC05	GP01	GP02
No Action	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	6,785	0	0	**1**	0	0	0	0	0	0	0	0	0	0
66	9,340	0	0	**1**	0	0	0	0	0	0	0	0	0	**1**
410	10,394	0	0	**1**	0	0	0	0	0	0	0	**1**	0	**1**
1,600	10,673	0	0	**1**	0	0	**1**	0	0	0	0	**1**	0	**1**
4,401	10,888	0	0	**1**	0	0	**1**	0	0	**1**	0	**1**	0	**1**
9,385	11,371	0	0	**1**	0	0	**1**	**1**	0	**1**	0	**1**	0	**1**
15,979	11,610	0	0	**1**	0	0	**1**	**1**	0	**1**	**1**	**1**	0	**1**
22,626	11,840	**1**	0	**1**	0	0	**1**	**1**	0	**1**	**1**	**1**	0	**1**
25,629	12,253	**1**	0	**1**	**1**	0	**1**	**1**	0	**1**	**1**	**1**	0	**1**
28,918	12,467	**1**	0	**1**	**1**	0	**1**	**1**	0	**1**	**1**	**1**	**1**	**1**
31,414	12,664	**1**	**1**	**1**	**1**	0	**1**	**1**	0	**1**	**1**	**1**	**1**	**1**
32,453	12,776	**1**	**1**	**1**	**1**	0	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**
32,718	12,866	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**	**1**

Table 5-3. Preliminary costs and benefits from possible alternatives in Proctor Creek

PROCTOR CREEK AVERAGE ANNUAL COSTS, @2.875% ($1,000), 50 YEAR PROJECT LIFE														
Plan	**No Action**	**5**	**66**	**410**	**1,600**	**4,401**	**9,385**	**15,979**	**22,626**	**25,629**	**28,918**	**31,414**	**32,453**	**32,718**
Construction Cost	$0.0	$193.4	$716.9	$989.0	$1,161.3	$1,343.5	$2,113.0	$2,571.0	$2,948.6	$3,425.2	$3,728.5	$4,158.7	$5,009.2	$5,246.7
Real Estate	$0.0	$1.1	$5.1	$31.6	$56.7	$80.5	$137.4	$165.2	$265.8	$297.8	$304.4	$393.1	$473.8	$517.5
PED	$0.0	$113.9	$276.5	$404.0	$516.5	$629.0	$822.8	$970.6	$1,112.9	$1,262.0	$1,390.8	$1,537.2	$1,735.1	$1,859.8
Construction Management	$0.0	$16.4	$64.1	$88.6	$103.6	$120.0	$186.8	$227.7	$261.8	$302.7	$328.6	$368.1	$443.1	$464.9
Construction Period (months)	0	1	8	8	8	8	8	8	8	8	8	8	8	8
Interest During Construction	$0.0	$2.7	$8.8	$12.6	$15.3	$18.1	$27.1	$32.7	$38.2	$44.0	$47.8	$53.7	$63.7	$67.3
Total First Costs	$0.0	$327.5	$1,071.5	$1,525.7	$1,853.4	$2,191.1	$3,287.1	$3,967.3	$4,627.3	$5,331.7	$5,800.1	$6,510.8	$7,725.0	$8,156.2
Average Annual Costs	$0.0	$12.4	$40.7	$57.9	$70.3	$83.1	$124.7	$150.6	$175.6	$202.3	$220.1	$247.1	$293.1	$309.5
O&M	$0.0	$6.3	$13.3	$21.1	$29.5	$35.9	$45.6	$78.3	$88.0	$95.0	$113.7	$122.2	$101.2	$108.5
Total Average Annual Costs	$0.0	$18.7	$54.0	$79.0	$99.8	$119.0	$170.4	$228.9	$263.6	$297.4	$333.8	$369.3	$394.4	$418.1

Table 5-4. Best Buy Analysis of Final Plans

Proctor Creek Best Buy Plans-All Features							
Plan Number	IWR Plan	Output	Cost ($1,000)	Avg Cost ($1,000)	Incremental Cost ($1,000)	Incremental Output	Incremental Cost Per Output
1	No Action Plan	0.00	0.00	0.00	0.00	0.00	0.00
5	C	6,784.78	18.72	0.0028	18.7236	6,784.7764	0.0028
66	AT	9,340.10	53.85	0.0058	35.1285	2,555.3249	0.0137
410	IV	10,393.54	78.96	0.0076	25.1065	1,053.4411	0.0238
1600	AGS	10,672.76	99.84	0.0094	20.8790	279.2191	0.0748
4401	CBG	10,888.15	119.01	0.0109	19.1714	215.3861	0.0890
9385	EQV	11,371.06	170.35	0.0150	51.3400	482.9161	0.1063
15979	HIZ	11,784.42	228.86	0.0194	58.5122	413.3559	0.1416
22626	JKA	12,023.81	263.60	0.0219	34.7377	239.3887	0.1451
25629	KDB	12,253.20	297.35	0.0243	33.7548	229.3944	0.1471
28918	KRW	12,467.08	333.80	0.0268	36.4415	213.8729	0.1704
31414	KZQ	12,664.62	369.31	0.0292	35.5118	197.5435	0.1798
32453	LBV	12,775.67	394.35	0.0309	25.0457	111.0468	0.2255
32718	LCA	12,866.29	418.05	0.0325	23.6986	90.6215	0.2615

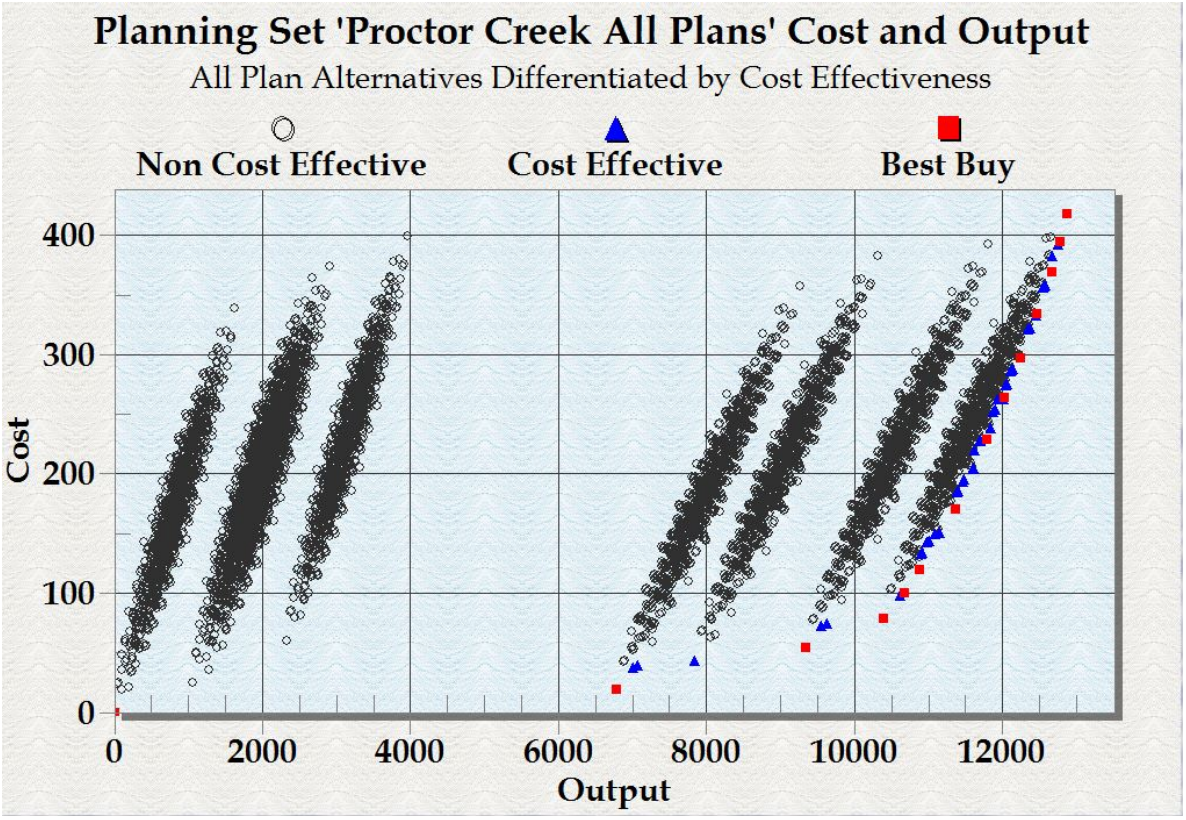

Figure 5-1. All Watershed Plan Analysis

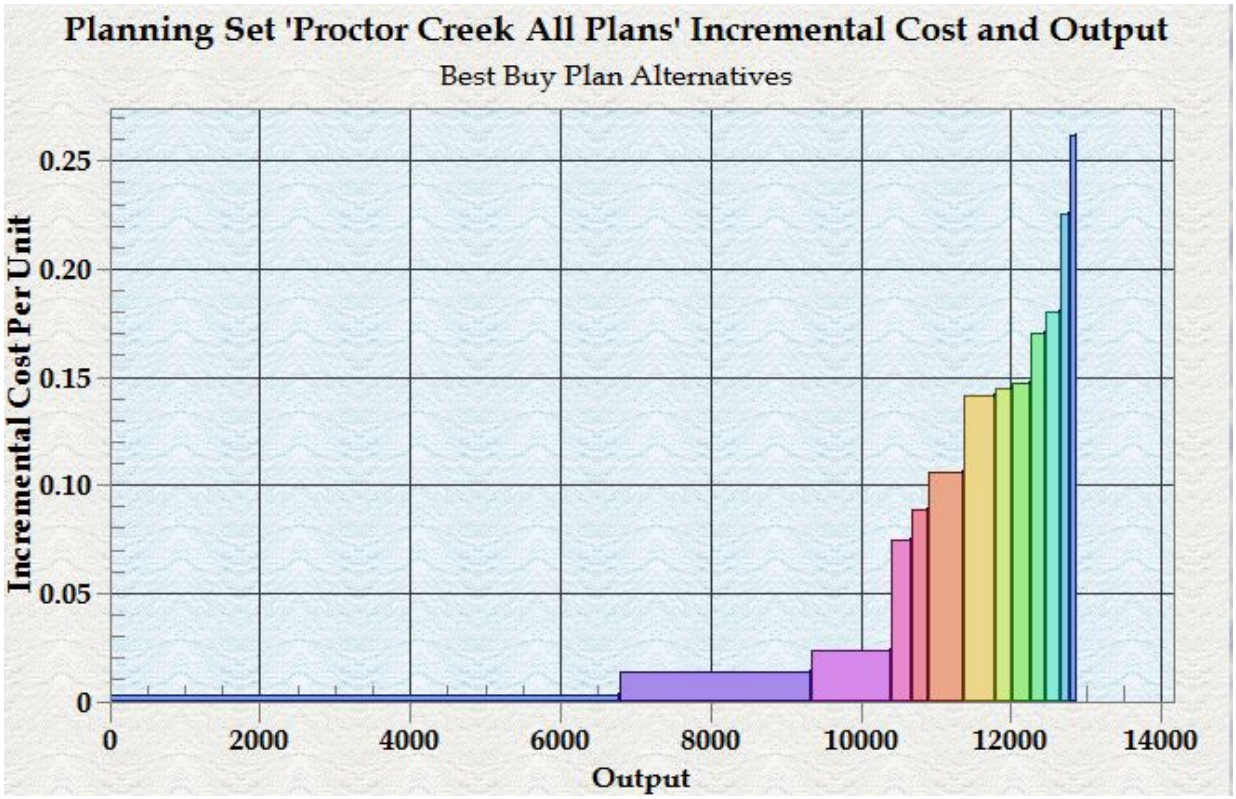

Figure 5-2. Final Watershed Best Buy Alternatives

6.0 REGIONAL ECONOMIC IMPACTS

The following regional economic impacts will be addressed based on the interest of the local sponsor and the surrounding Fulton County. Local governments seek to preserve the tax base and encourage the growth in overall property values, to create stability in the labor force and the employment of the labor force. The steady growth of the local community and surrounding region is considered a worthy goal by the state and local governments.

6.1 Employment Stability

Recreation is highly valued as a source of employment and income. Increased recreation visitation may improve the income of service industries in the surrounding study area. Gains or losses in income or employment are considered regional impacts.

6.2 Displacement of People and Businesses

Implementation of damage reduction measures under consideration is not expected to displace people or businesses.

7.0 OTHER SOCIAL EFFECTS

The OSE account considers the effects of alternative plans in areas that are not already contained in the NED and RED accounts. The categories of effects contained within the OSE account include:

- Urban and community impacts
- Life, health, and safety factors
- Displacement

7.1 Potential Urban and Community Impacts

An urban and community impact is the principal category of potential OSE impacts associated with the alternative restoration plans. This category of impacts includes effects on income distribution, employment distribution, population distribution and composition, and quality of community life. Some urban and community impacts have previously been addressed in this appendix. For example, regional income effects and fiscal impacts were discussed in the RED analysis. The OSE assessment of urban and community impacts considers both the potential for exposure to the effects of the alternative restoration plans and the degree of vulnerability to potential impacts. Exposure refers to whether an individual or community is subject to the OSE of the alternative plans. Vulnerability refers to the ability of that individual or community to respond or adjust to those effects.

Potential urban and community impacts of the alternative restoration plans could result from: land acquisition and potential relocation of populations for project construction features and construction activity associated with plan implementation. In general, construction activity is considered to have positive impacts. At the local scale, construction and O&M activities associated with the alternative restoration plans can have positive effects to local residents and communities by providing jobs, increasing local wages, increasing local sales, increasing tax revenues and generally benefiting the local economy. There are a variety of social and economic factors that are

important determinants of an individual or community's ability to cope with adversity. One of the most important economic factors in the ability of individuals and groups to respond is the number of employment alternatives available locally. The ability to find another job depends on the education and training of the work force as well as the needs of local economic concerns, such as other farms, agricultural-related services, or some other local business. The socio-economic makeup of the community is also an important consideration of the ability of individuals and the community at large to cope with the adverse effects of large- scale agricultural land conversion. Some groups in society are recognized as having less opportunity to respond to adversity. These groups include ethnic and racial minorities, the elderly, and the poor. Tables 2.3-2, 2.3-3 and 2.4-1 presents a socio-economic vulnerability profile for the local counties. This profile contains information that indicates the ability of the county population to respond to social and economic adversity. It is important to recognize that the county scale may not accurately reflect the ability of any given community or groups within a community to accommodate potential changes associated with the alternative restoration plans.

Table 2.3-2 contains the 2015 racial/ethnic mix of each county in the study area, as well as population over 65 years of age, unemployment, 2015 median household income, and the expected changes in employment and income.

7.2 Other Social Effects

The Other Social Effects (OSE) account considers the effects of alternative plans in areas that are not already contained in the NED and RED accounts. The categories of effects contained within the OSE account include:

- Urban and community impacts
- Life, health, and safety factors
- Displacement, long-term productivity
- Energy requirements and energy conservation

The Proctor Creek Watershed alternative plans could result in beneficial and adverse OSE within the study area. An urban and community impact is the principal category of potential OSE impacts associated with the alternative restoration plans. This category of impacts includes effects on income distribution, employment distribution, population distribution and composition, and quality of community life. There are several possible social effects that the Proctor Creek Watershed project could impact. The project has the potential to raise property values in the surrounding area, increase attractiveness to the community, increase recreational opportunities, and improve environmental health such as water and air quality among other impacts. All of these factors could change the surrounding demographics of the community. It may or may not affect Environmental Justice issues. A major social impact is the change in land available for development. Urban sprawl may have led to this land being used for residential or commercial development. This could reduce the available housing opportunities and possibly raise housing prices. At the same time, since there would be no development on the project site, it could decrease energy demand and improve environmental quality. The footprints of the projects would determine to what extent these impacts could occur.

8.0 ENVIRONMENTAL JUSTICE

Executive Order (E.O.) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires the Federal Government to achieve environmental justice by identifying and addressing high, adverse and disproportionate effects of its activities on minority and low-income populations. E.O. 12898, Environmental Justice, states that the proposed action would not result in adverse human health or environmental effects. Any impacts of the action would not be disproportionate towards any minority or low-income population. The activity does not (a) exclude persons from participation in, (b) deny persons the benefits of, or (c) subject persons to discrimination because of their race, color, or national origin. The activity would not impact "subsistence consumption of fish and wildlife." It requires the analysis of information such as the race, national origin, and income level for areas expected to be impacted by environmental actions. It also requires federal agencies to identify the need to ensure the protection of populations relying on subsistence consumption of fish and wildlife, through analysis of information on such consumption patterns, and the communication of associated risks to the public.

The Proctor Creek Watershed has a large percentage of people that claim minority ethnicity. Of the residents in the basin during the year 2010, over one half are of minorities. In the watershed the African-American population is, which makes up percent of the county's population. The study area has a population that is percent Hispanic. The Native-American population of the study area represents less than one percent of the aggregate population of the study area.

These environmental benefits provide quality of life improvements to all people and primarily to people in the communities within the study area. By the nature of design, restoration will improve environmental quality. This would improve the quality of human life as well by providing increased wildlife activity; a positive attribute for those who appreciate seeing increases in wildlife near an urban setting. This logically translates to the increased benefits in enjoyment, aesthetics, and economics for recreational activities.

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