APPENDIX E

ALABAMA NONPOINT SOURCE MANAGEMENT PROGRAM

HYDROMODIFICATION









APPENDIX E

HYDROMODIFICATION

TABLE OF CONTENTS

HYDROMODIFICATION

Section E.1 Introduction

a. Overview

Hydromodification generally refers to a disruption or alteration of the natural flow of a water channel or drainage system that results in impaired water quality. Hydromodification processes have transpired over millennia while some impacts occur in more relatively recent times (e.g. decades, years, months, and even days). Nonpoint source pollution impacts are generally the result of anthropogenic (human causes or origin) land use activities (e.g. straightening, dredging, or relocation). As industrial, commercial and residential development continues to proliferate, increasingly competitive and mixed-use demands continue to be placed on the state's water quality and quantity resources. These demands can adversely influence stream flow volume, velocity and watershed equilibrium (e.g. physical, chemical and biological conditions and characteristics) and manipulate watershed form, function and ecological properties and processes.

Hydromodification is a major nonpoint source (NPS) pollution category identified on CWA Section 303(d) Lists of Impaired Waters (2012) as a probable source-group water quality stressor. This Appendix (Appendix E) is designed to present information relative to stream water quality and conditions in a natural setting and how the stream may be impacted by nonpoint source of pollution as a result of anthropogenic hydromodification activities. A range of environmentally protective NPS management measures and practices are presented herein to prevent or mitigate adverse impacts to watershed health and water quality. Recommendations generally focus upon human and environmental health, drinking water supplies, irrigation, navigation, hydropower, infrastructure, flood control, fish and wildlife habitat, and recreation and aesthetics.

Hydromodification processes have transpired over millennia while some impacts occur in more relatively recent times (e.g. decades, years, months, and even days). In order to prevent and mitigate NPS pollution problems, it is important to recognize the roles that duration, scope and scale of NPS impacts can have on watershed hydrology, geomorphology, and ecology. The use of the terms "stream" and "river" herein may be used interchangeably throughout this Appendix to describe surface water drainages of varying sizes that have channels of running water and which show evidence of fluvial geomorphic processes. Although several descriptive metrics are in use, the term "river" as used herein generally refers to a "large stream" where riparian vegetation cannot develop a closed canopy above the channel. Streams and rivers may include active and legacy channels (e.g. redirected, moved, ox-bows, or channels that flow only during or immediately after a precipitation event). Waterbodies may include flowing streams as well as lakes, reservoirs, wetlands, or Gulf waters.

Broad based resources from a multitude of entities, including but not limited to government agencies, public and private landowners, permit holders, and local volunteer, civic, and conservation groups must be leveraged to protect and restore the expanse of degraded waterbodies, streambanks and shorelines in Alabama. Nonpoint source management solutions should environmentally-protective and economically-sensible, locally-led, and as sensible and practicable, planning and implementation should be watershed management based. Sustained cooperation, coordination, collaboration, and communication are essential.

Many hydromodification activities are designed to promote human social, cultural and economic benefits and enhance communal quality-of-life values, including but not limited to:

- Protection of public safety and property (riparian zones)
- Mitigating flooding events (levees) and stabilizing channels (dikes)
- Producing electricity (hydroelectric dams)
- Establishing or maintaining commerce and economies (waterway shipping and travel corridors, infrastructure)
- Establishing or maintaining industrial, municipal, agricultural, and drinking water uses and supplies
- Enhancing recreational access and opportunities (boating, fishing, swimming)
- Preventing, reducing of abating stream bank or shoreline erosion, stream channel degradation, and stream head cuts (stabilizing slopes; establishing or enhancing natural native vegetation; installing engineered armoring)

- Protection or remediation of coastal beaches / dunes, wetlands, and estuary resources (attenuate wave energy and erosive processes)
- Protection or restoration of water quality and quantity relative to changes in landuse (environmental and economic impacts relative to increased development and impervious surfaces)

Hydromodification activities typically alters water flow patterns, velocity and volume; resulting in an increase or decrease in the usual quality and quantity of water that normally discharges along a stream channel to a receiving waterbody. Natural hydrology may be altered by anthropogenic engineered water diversions (e.g. culverts, gates and weirs) transportation corridors, withdrawals, impoundments, and construction and development (impervious surfaces) in the watershed. Water quality can also be altered beyond "normal" pre-development waterbody ranges (e.g. dissolved oxygen, organic enrichment, pH, temperature, sediment transport, etc.).

Unintended negative ecological consequences can result from good hydromodification intentions. For example, although levees can provide local flood reduction/protection benefit, those same levees may alter essential floodplain and riparian corridor functions and equilibrium; impair aquatic and wildlife diversity, populations, and habitat; and threaten wetlands that rely on sustainable flooding events. In addition, although man-made dams, locks, lakes and reservoirs provide a number of advantageous benefits (e.g. producing hydropower, modulating flows/flooding events, and enhancing drinking water sources, navigation, attenuation of treated pollutant discharge, irrigation, and recreational opportunities), engineered structures (including beaver dams that are a natural part of stream ecology) may impede fish migration, disrupt the natural transport of sediment downstream, and increase or degrade biological productivity. These environmental and economic issues can conflict with NPS water quality protection and restoration needs and wants at the interstate, state, watershed-based, and local community levels. Efforts to achieve societal "balance" can require significant water quality and water quantity management human and financial resources, technologies, education and outreach, and sound decision-making, science-based, environmental data and information. The causes of NPS pollution should be mitigated, projects implemented, and results measured relative to the cumulative impacts of all hydrological modifications in the watershed (e.g. impacts on both water quantity and quality).

The total input, cycling, and transport of sediment and nutrients to all waters of the state is not well documented; specifically the hydrologic impacts associated with normal streambank / river / reservoir erosion, sediment transport, and dams, and the intertwined and complex contributions of pollutants from nonpoint sources (construction, urban development, mining, agriculture, silviculture, etc.). In-stream transport of sediment, nutrients and other NPS pollutants can also be influenced by historic or "legacy" land and water resource relative to agriculture, "pre-law" mining, the construction of "mill dams" and the impoundment of sediment behind those and other dams. It is highly recommended that sound science-based assessment data be collected and thoroughly evaluated before stream restoration and protection, dam removal or snagging operations are initiated. In particular, adequate data should be collected to estimate the impacts that in-stream storage and transport of sediment and nutrients does/will have on downstream water quality and the threats that increasing impervious surfaces and stream bank erosion may have on water conveyance capacity and water quality protection.

The Alabama NPS Management Program presents a number of programs, technologies, and practices to mitigate nonpoint source pollution associated with hydromodification. Hydromodification activities should be planned, implemented and managed to protect water quality within the context of the watershed or subwatershed in which it is prescribed (e.g. a holistic, watershed-based management approach). Projects should be consistent with valid, science-based watershed health and water quality/quantity assessment data and prioritized and implemented according to well-defined nonpoint source management program goals and objectives. It is highly recommended that hydrologic modifications plans designed to restore legacy hydrologic conditions be incorporated as a component of a holistic and iterative nonpoint source watershed-based management plan.

b. Hydromodification and Nonpoint Source Management

Hydromodification is regarded by EPA as a major "category" of nonpoint source pollution. Nonpoint source pollution (NPS) does not originate from a distinctly-identifiable "point" source (i.e., an "end-of-pipe" discharge). When precipitation falls, it either infiltrates into the ground, is captured where it eventually transpires or evaporates, or flows down hill as stormwater runoff to a receiving waterbody. If stormwater runoff flows over the land surface, it may pick-up and transport NPS contaminates. These pollutants are not always visible to the naked eye. Although the rainfall runoff may appear to be clean and safe, it may contain dissolved, suspended or attached particles, substances, and chemicals that can cause significant environmental, economic and public health and safety impacts. Polluted runoff can alter the physical, chemical, and biological characteristics of receiving waters, degrade aquatic habitat; make coastal and inland beaches and rivers and reservoirs unsightly or unsafe to human health, impair beneficial uses (e.g. water recreation, swimming, fishing, tourism, economic vitality), and foster the loss of personal and community-level social and economic benefits, connections and values.

Nonpoint source pollution present significant water quality protection and restoration challenges to Alabama's rivers and streams, wetlands, lakes and reservoirs, coastal areas and estuaries, and watersheds. Polluted runoff can also increase drinking water resource protection and treatment costs, contaminate drinking water sources, irrigation wells and aquifers, and degrade aquatic habitat. Limited availability of adequate financial capital and resources needed to identify and properly and holistically mitigate known NPS stressors, protect and restore water quality, meet state water quality standards continues to be problematic. The AL NPS Management Program and CWA Section 319 grant program will continue to enhance statewide and local programmatic initiatives that present stakeholders with a voice relative to water quality protection and restoration, natural resource management, and NPS pollution reduction decision-making. The overall NPS management strategy is to ensure that public and private sector hydromodification activities are planned, implemented, and maintained to be protective of water quality and public health and safety while enhancing economic opportunities for all the citizens of Alabama.

A cooperative and coordinated NPS pollution prevention approach is highly recommended to proactively reduce stormwater runoff from threatening and degrading surface waters and groundwaters. Nonpoint source pollution management decisions require the participation and input of a multitude of federal and state agencies, officials, authorities, planners, landowners, developers, organizations, and private citizens. The AL NPS Management Program highly recommends that hydrologic modification decisions and processes take into account the cumulative water quality, human and ecological health impacts from all origins of nonpoint source pollution as opposed to singularly targeting and mitigating an individual threat or discharge of narrowly defined causes and sources. Adverse water quality impacts should mitigated holistically (preferably on a watershed-level), especially relative to the implementation of measures and practices to protect and restore drinking water sources, surface and groundwater hydrology, and sensitive and unique areas, species and habitat.

Temporal and long-term NPS programmatic measures and indicators of project success and water quality protection should be based on credible science and quality-assured trend data such as presented in the latest State of Alabama Water Quality Monitoring Strategy. Coordinating and leveraging technology transfer, technical assistance and financial resources, and facilitating public and private sector education and outreach are integral NPS management program components. Having clear NPS water quality goals is especially applicable because of strong beliefs by landowners in Alabama in private property rights and minimal government intrusion relative to land use. Iterative, voluntary, watershed-based planning and implementation processes will continue to be facilitated whenever, wherever and as expeditiously as practicable throughout Alabama to achieve NPS pollutant load reductions associated with hydromodification activities and to protect and restore surface water and groundwater quality.

Hydromodification activities can present challenging NPS water quality protection and restoration issues. For example, dam construction can provide significant benefits to local and state economies, but can also contribute to tensions and conflicts between proponents and opponents relative to environmental and human health, political interests; regulations and authorities; policy decisions; cultural and historical aspects; personal security and welfare, and communal societal and quality-of-life identity, values, concerns, and preferences (e.g. conflicts relative to

economic benefits verses environmental protection verses human health impacts tends). Successful NPS management conflict resolution requires a commitment to continued and amiable discourse from the earliest planning stage until all human and environmental health concerns are attenuated, and water quality is adequately protected and restored (physically, chemically, and biologically). In addition, the mitigation of adverse water quality impacts often depends on cooperative public /private sector partnerships and the implementation of innovative technologies and incentives.

Potential factors to preclude hydromodification conflicts include but are not limited to:

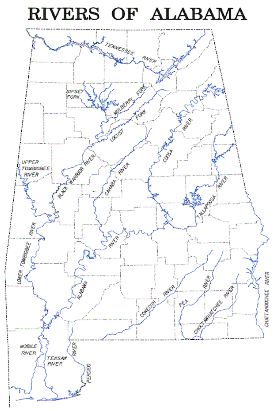
- Proactively identifying, addressing and overcoming oftentimes protractive, resource-wasteful, and expensive barriers that impedes open communication and working together as a mutually-respected, cooperative and sustainable partnership
- Using only science-based data to characterize impacts to water quality, base management decisions upon, and to focus NPS mitigation funding and other resources upon (preferably on a HUC-12 watershed protection basis)
- State or federal regulatory agencies and local authorities working closely with industry, consultants, academia, landowners, and the private sector to mutually identify and prioritize sites to target NPS mitigation funds and resources
- Establishing and maintaining a statewide partnership composed of agencies, industry, consultants, academia, landowners, operators and the private sector to set NPS priorities and implement NPS management processes and solutions to address current priorities and to resolve legacy issues
- Demonstrating new, emerging, innovative and environmentally-protective and cost-effective management methods, practices and technologies to protect and restore surface and groundwater quality from nonpoint sources of pollution
- Implementing conventional BMPs to treat, process, store, remove, or stabilize nutrients, sediment and other NPS pollutants associated with NPS water quality and water quantity issues
- Identifying, selecting, and implementing the most effective and efficient NPS management measures and practices (e.g. as applicable to a specific site or targeted pollutant; the design, types and numbers of measures/controls needed; performance characteristics and expectations; regulatory / compliance considerations, funding availability)
- Equitably addressing environmental justice (e.g. socio-economic and quality-of-life considerations and concerns)
- Facilitating and sustaining open lines of communication between the regulated and non-regulated sectors of society
- Developing and modifying standard operational practices to prevent or reduce NPS stormwater runoff, minimize waste production, and protect / restore natural hydrology and ecological integrity and benefits
- Facilitate opportunities to ensure that adequate NPS education and outreach reaches representative audiences and enhances public and private sector knowledge and awareness
- Publicly reporting science-based data and information in easily understandable and accessible formats

The AL NPS Management Program continues to support new initiatives while endorsing implementation of effective programs and projects to prevent, reduce or abate the causes of NPS water quality impairments. Particular efforts focus on watershed protection and public health (e.g. increased flooding; sloughing of streambanks resulting in loss of private and public land area, sedimentation and nutrient sources, loss of or reduced wetland benefits and groundwater recharge areas, etc.). Section 319 grant funding resources, as administered by ADEM, continues to target NPS water quality problems associated with legacy hydrologic modification if those activities are targeted as a component of an EPA Section 319 watershed-based management plan.

The AL NPS Management Program also endorses the establishment and sustainment of public and private sector partnerships to target NPS threats and impacts. Partners should continue to cooperatively address a range of hydromodification issues including but not limited to water quality protection and restoration and watershed-based planning; and leveraging of human and financial capital for research, monitoring and assessments, BMP demonstration and implementation, education and outreach, technical assistance, and technology transfer. Partnering opportunities and activities continue to evolve in Alabama relative to water quality. It is critical that everyone have a voice in NPS pollution management decision-making processes.

Public and private sector cooperation and input, such as that endorsed by the Alabama Clean Water Partnership, continues to promote and sustain environmental and economic accountability and provides an avenue for the public and private sectors to identify and express different values, talents, creativity and skills; build trust; negotiate and contribute to mutually beneficial solutions and outcomes; and provide a focus on funding, resources, authorities and schedules. Not working together in cooperative partnerships generally contributes to the misdirection or wasteful use of limited human and financial capital that could potentially have been better used to implement needed on-the-ground management measures. The implementation and demonstration of new, emerging, and innovative remediation, reclamation, and restoration techniques and technologies (including pollution prevention) also continues to be recognized by the AL NPS Management Program as key to achieving long-term environmental protection success and expeditiously meeting and sustaining state water quality standards.

Leveraging resources to implement the AL Nonpoint Source Management Program and target hydrologic perturbations is an environmental, economic, social, and public health and quality-of-life necessity. Continued public and private sector cooperation, coordination and collaboration are essential. Although the AL NPS Management Program endorses a voluntary approach as the primary NPS stormwater runoff pollution control strategy; enforceable regulatory "back-up" authorities are also essential programmatic elements. Addressing certain local, site-specific, or placed-based NPS issues in Alabama often requires statewide designated authorities. Each of the 67 counties in Alabama has their own elected legislative branch with executive authority (e.g., county commissions); however, all but seven counties (Jefferson, Lee, Mobile, Madison, Montgomery, Shelby, and Tuscaloosa) have little to no local home rule statutory (autonomous adoption, alteration, or repeal flexibility) authority. The Alabama Constitution (1901) requires most counties to seek state legislator sponsorship and statewide voter approval to address relatively ordinary locally-based matters. As of 2012, about 90 percent of the Alabama Constitution's length comes from its 856 amendments. About 75 percent of those amendments cover a single county or city; oftentimes resulting in the convoluted application of NPS pollution resolutions, inefficient opportunities to build and sustain public and private sector cooperative partnerships, and hampering cooperative efforts to equitably apply NPS water quality, economic, and human health protection and restoration resources efficiently and effectively. In addition, since water *quantity* is administered as a distinct lead state-agency (ADECA) programmatic issue, it is not generally presented herein as a primary NPS pollution management topic of discussion. This is in accordance with Section 319 grant guidelines to mitigate NPS pollution relative to the protection and restoration of water *quality*. The AL NPS Management Program recognizes that there are often a multiplicity of site-specific and project-level constraints and funding issues, as well as state and national agency and program requirements and variability relative to the design, selection, inspection and maintenance of NPS best management practices (e.g. technically sound, environmentally-protective, and economically-sensible). Local nonpoint source management measure and practice implementation decisions should be locally-led with input from both the public and private sectors, and applied using a watershed-based planning and implementation approach. In order to best protect and restore water quality and resources and expeditiously meet state water quality standards; input regarding issues and concerns relative to resource agency and local citizen thoughts, beliefs, values, and ideas should be encouraged. Sustained public and private sector communication and collaboration is highly recommended during all phases of NPS mitigation planning and implementation.

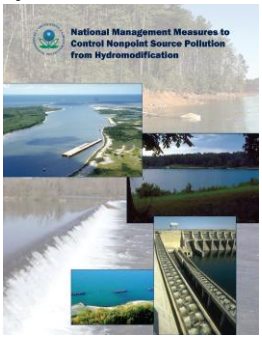


The AL NPS Management Program and the Section 319 grant guidelines recommends that the NPS impacts associated with hydromodification be addressed, as practicable, on a watershed-basis and as a component of a holistic EPA-defined 9-key element watershed-based management plan. The AL NPS Management Program continues to support efforts that proactively protect the environment using a combination of regulatory permitting authorities and voluntary private sector pollution prevention strategies. In general, the Section 319 grant as administered by ADEM will not fund the implementation of structural BMPs to mitigate problems associated with active hydrologic modification activities because those activities are considered NPDES permitted "point sources." A nonstructural Section 319 fundable NPS management practice for active" activities in a targeted NPS impaired watershed may involve education and outreach if it is an implementation component of a nonpoint source or mixed-

source TMDL or holistic watershed-based management plan. As resources allow, limited Section 319 grant funds may be available for stream restoration activities to help restore stream dimension, patterns and profiles to near pre-development functions. The AL NPS Management Program recommends the, National Management Measures to Control Nonpoint Source Pollution from Hydromodification (EPA 841-B-07-002. July 2007), and Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (EPA-840-B-92-002, January 1993) as reference resources for the design, selection, application, and maintenance of NPS hydromodification management measures and practices.

c. Hydromodification and Nonpoint Source Management Planning

Hydromodification site reclamation, remediation and restoration can be challenging in terms of economic costs, entail innovative techniques and technologies or suites of treatment solutions, and necessarily involve a mix of public and private sector interests, input, and expertise. Nonpoint source physical, chemical, and biological water quality concerns can cross and impact both private and public land boundaries and add to mitigation solution complexities and costs. Although the AL NPS Management Program recommends a voluntary approach to protect water quality from nonpoint sources, the EPA and ADEM issues NPDES permits for land disturbance activities, enforces national water quality standards, and recommends environmentally-protective effluent guidelines to both prevent and mitigate pollutant load reductions.



Implementation of management measures and practices should use the best NPS pollution control technology, be science-based, effective long-term, and result in measurable watershed health and water quality and human health protection and improvements. Plans to implement hydromodification structural measures should incorporate a schedule for inspections to monitor and measure implementation and maintenance effectiveness. Continued coordination, cooperation, collaboration and communication are key AL NPS Management Program mechanisms to achieve statewide programmatic goals and objectives and are highly recommended to minimize project prioritization and implementation conflicts, prevent duplication of efforts, and help to ensure that installed NPS pollution management measures are protective of water quality. Leveraging human and financial resources will greatly enhance water quality protection and restoration capabilities, technology transfer, sharing and exchange of information, and the potential for project success and water use benefits. Nonpoint source pollution impacts are particularly difficult to mitigate because of inadequate financial capital and other resources that are required to expeditiously and holistically mitigate the multitude and areal extent of sites that have undergone or is impaired by some type of hydromodification activity. The AL NPS Management Program and the Section 319 grant program endorses a cooperative and mutually beneficial public and private sector partnering and resource leveraging approach.

Estimating the financial needs and addressing all NPS water quality problems associated with hydromodification activities in Alabama is challenging. This is due in large part to the convoluted intricacies of mitigation including but not limited to:

- The type of activity that is causing or has caused an impairment
- The areal extent of the impact
- Inventory and assessment complexity, funding, and other resources
- Chemical, physical and biological characteristics relative to surface water and groundwater hydrology, precipitation / runoff events, erosion and sedimentation, and land use
- Management measure planning, design, implementation, maintenance, and other technical challenges
- Public and private sector land uses and boundary conflicts and priorities
- Insufficient spatial and temporal collection and analyses of monitoring and assessment data
- Diverse public and private sector interests, expectations, and perceptions
- Metrics and indices that measure long-term watershed health and water quality restoration and protection progress

The AL NPS Management Program and Section 319 grant program endorses prioritization approaches composed of relevant partners dedicated to mitigating nonpoint sources of pollution using the best available technical data and information and indicators to measure project success. Section 319 project hydromodification project-prioritization decisions relative to achieving NPS pollutant load reductions and restoring water quality should first consider the application of a watershed-based management approach whenever practicable. The watershed-based approach addresses a specific geographic watershed boundary dataset (preferably HUC-12) and uses public and private sector partnerships and resource leveraging to resolve NPS water quality problems and threats that affect watershed health. In general, hydromodification prioritization and NPS project targeting decisions should reflect, but are not limited to the following areas of concern:

- Watershed Health and Water Quality Protection and Restoration:
- Prevention, treatment or removal of chemicals, sediment, nutrients, and other NPS pollutants using focused efforts that address the highest prioritized concerns first
- Specific and clear goals and objectives of a watershed-based management plan or acceptable alternative water quality protection or restoration plan
- Threats to nearby surface and groundwater source water / drinking water supplies
- Protection or restoration of riparian areas and streambank integrity
- Sites impacting wetlands, aquatic and wildlife habitat and travel corridors, threatened and endangered species, and other sensitive areas
- Sites that drain to or result in an assessed impaired waterbody (CWA Section 303(d) lists)
- Sites that may impair Special Designated and Outstanding Alabama waters
- Sites that may impair recreational uses of waters of the state on public lands
- Cross-media transfer of pollutants (e.g. mercury and/or other particulate emissions to air, land and water)
- Landowner interest, participation and acquiescence of access to a targeted NPS mitigation project site

- Other Considerations Applicable to Achieving NPS Programmatic Goals and Objectives:
- Effectiveness and other expectations of NPS best management practices to be implemented
- Sensible measures and indicators of incremental progress and final project implementation success
- Education and outreach processes and products to enhance public and private sector knowledge and awareness
- Technology transfer and technical assistance and funding and delivery mechanisms
- Availability of, and opportunities to leverage, a mix of financial and human capital sources
- Sustaining existing partners, promoting new partnerships, and increasing volunteerism
- Stakeholder interest, input, commitment, and expectations
- Implementation of Federal and state agency water quality protection laws, authorities, statues, and guidance's
- Fosters new and innovative NPS pollution characterizations, monitoring, analyses, and remedial processes
- Defined project accountability and financial tracking measures and transparency (uncomplicated access, review, and input from and for the public)
- Implementation of a holistic and focused multi-year or phased-project approach as opposed to a resource wasteful or piece-meal approach
- Potential to recover some project costs or as valid real or in-kind grant or other project funding match
- Local community historical and cultural heritage
- Environmental justice (disenfranchised minority and low income population areas and concerns)
- Individual and community-based social, prosperity, livelihood and quality-of-life issues
- Aesthetics, tourism and recreational benefits

It is recommended that water quality protection and restoration issues be included as a component of an EPA-defined 9-key element watershed management plan. Nonpoint source mitigation strategies should correspond with non-EPA and EPA regulatory laws and executive orders, including but limited to the, Occupational Safety and Health Act, Comprehensive Environmental Response, Compensation, and Liability Act, Resource Conservation and Recovery Act, and the Emergency Planning and Community Right-to-Know Act. The following human health and safety factors may parallel prioritization and implementation of NPS water quality protection and restoration decisions:

- ➢ Public Health and Safety Protection from Physical Hazards:
- Incorporation of a risk-based priority ranking process supported by sound science
- Remediate expansive land disturbance areas by mitigating areas of highest human health and safety risks first
- Sites located near population centers, sites with high visitation rates, or impacts to recreational / public use areas
- Areas of increased human exposure to pollutant discharges
- Preventing or reducing the potential for risks of death or injury from hazards, accidents, or other incidents associated with unrestricted public access
- Proactively helps to assuage potential liabilities and litigation conditions

d. Water Quality Impacts

Hydromodification activities can impair water quality physical and chemical properties and alter stream flow rate, direction, duration and volume, velocity and pollutant toxicity and concentration. The degradation of surface water and groundwater quality and hydrology can occur any time anthropogenic activities disturb natural watershed topography, stream geomorphology, and land covers. Implementation of effective NPS management measures to prevent or control the extent, intensity and pollutant composition of stormwater runoff is critically important. Water quality data relevant to hydromodification impacts in Alabama is presented in **Table E.1.1** and is derived from the 2010 Water Quality Inventory Report.

Table E.1.1 Hydromodification as a Probable Source of Impairment

Probable Source	Size of Assessed Waters with Probable Sources of Impairment	
Hydromodification	Rivers and Streams*	Lakes, Reservoirs and Ponds
Flow regulation/modification)	39.4 miles	58,712.6 acres

Causes of Impairment	Rivers and Streams*
Flow Alterations	3.2 miles

*Total Miles = 77,242.0; Total Miles Assessed = 10,913.4

Hydromodification is a major nonpoint source (NPS) pollution category identified in **Table E.1.2** and **Table E.1.3** on the CWA Section 303(d) List of Impaired Waters (2012) as a water quality source group stressor.

Table E.1.2 Waterbodies Impaired by Dam Construction, Flow Regulation and Modification

Waterbody Name	Waterbody ID	Location	Probable Sources of Impairment	Acres
Alabama River (Claiborne Reservoir)	AL03150203-0703-101	From Beaver Creek To Rockwest Creek	Dam or Impoundment, Impacts From Hydrostructure Flow Regulation/Modification	467.2
Alabama River (Claiborne Reservoir)	AL03150203-0805-102	From Bear Creek To Frisco Railroad Crossing	Dam or Impoundment, Impacts From Hydrostructure Flow Regulation/Modification	358.4
Alabama River (Claiborne Reservoir)	AL03150203-0805-103	From Frisco Railroad Crossing To Pursley Creek	Dam or Impoundment, Impacts From Hydrostructure Flow Regulation/Modification	563.2
Alabama River (Claiborne Reservoir)	AL03150203-0805-104	From Pursley Creek To River Mile 131	Dam or Impoundment, Impacts From Hydrostructure Flow Regulation/Modification	627.2
Alabama River (Claiborne Reservoir)	AL03150203-0805-105	From River Mile 131 To Beaver Creek	Dam or Impoundment, Impacts From Hydrostructure Flow Regulation/Modification	128.0
Coosa River (Lake Neely Henry)	AL03150106-0204-101	From Big Wills Creek To City Of Gadsden Water Supply Intake	Impacts From Hydrostructure Flow Regulation/Modification	245.4
Coosa River (Lake Neely Henry)	AL03150106-0204-102	From City of Gadsden Water Supply Intake To Weiss Dam Powerhouse	Impacts From Hydrostructure Flow Regulation/Modification	1,897.4
Coosa River (Lake Neely Henry)	AL03150106-0309-101	From Neely Henry Dam To McCardney's Ferry	Impacts From Hydrostructure Flow Regulation/Modification	5,487.9
Coosa River (Lake Neely Henry)	AL03150106-0309-102	From McCardney's Ferry To Big Wills Creek	Impacts From Hydrostructure Flow Regulation/Modification	3,502.5
Coosa River (Lay Lake)	AL03150106-0810-102	From River Mile 89 To Logan Martin Dam	Impacts From Hydrostructure Flow Regulation/Modification	698.3
Coosa River (Lay Lake)	AL03150107-0301-102	From Southern Rr Bridge To River Mile 89	Impacts From Hydrostructure Flow Regulation/Modification	862.4
Coosa River (Lay Lake)	AL03150107-0503-110	From Lay Dam To Southern Rr Bridge	Impacts From Hydrostructure Flow Regulation/Modification	11,806.3

Coosa River (Logan Martin Lake)	AL03150106-0603-111	From Broken Arrow Creek To Trout Creek	Impacts From Hydrostructure Flow Regulation/Modification	1,450.3
Coosa River (Logan Martin Lake)	AL03150106-0603-112	From Trout Creek To Neely Henry Dam	Impacts From Hydrostructure Flow Regulation/Modification	820.4
Coosa River (Logan Martin Lake)	AL03150106-0803-100	From Logan Martin Dam To Broken Arrow Creek	Impacts From Hydrostructure Flow Regulation/Modification	14,415.7
Coosa River (Mitchell Lake)	AL03150107-0803-100	From Mitchell Dam To Lay Dam	Impacts From Hydrostructure Flow Regulation/Modification	5,400.3
Coosa River (Weiss Lake)	AL03150105-1002-102	From Spring Creek To Alabama-Georgia State Line	Impacts From Hydrostructure Flow Regulation/Modification	7,689.8
Tombigbee River (Aliceville Reservoir)	AL03160106-0308-101	From Bevill Dam To Alabama-Mississippi State Line	Dam or Impoundment, Impacts From Hydrostructure Flow Regulation/Modification	2,291.9

Table E.1.3 Specific Sources that make up the Hydromodification Probable Source Group in Alabama

Waterbody Name	Waterbody ID	Location	Probable Sources of Impairment	Acres
Coosa River	AL03150105-1003-200	From Weiss Dam Powerhouse to Weiss Dam	Impacts From Hydrostructure Flow Regulation/Modification	19.6
Tallapoosa River	AL03150108-1004-104	From ½ mile Upstream of Cleburne County Rd 36 to Cleburne County Road 19	Impacts From Hydrostructure Flow Regulation/Modification	3.8
Tallapoosa River	AL03150108-1004-113	From Dam At Cleburne County Road 36 To 1/2 Mile Upstream of Cleburne County Road 36	Impacts From Hydrostructure Flow Regulation/Modification	0.4
Tallapoosa River	AL03150109-0107-102	From Alabama Highway 77 To Cedar Creek	Impacts From Hydrostructure Flow Regulation/Modification	3.2
Watson Creek	AL03150107-0404-100	From Buxahatchee Creek To Its Source	Impacts From Hydrostructure Flow Regulation/Modification	12.4

Nonpoint source water quality problems associated with hydromodification activities are preventable or generally relatively easy to minimize. When/if NPS problems do occur, it is generally contributable to:

- Non-existent, insufficient, ineffective, or inadequately installed or maintained management measures
- Limited citizen knowledge and awareness relative to the characterization and mitigation of NPS pollution and associated impacts on watershed health and water quality protection
- Inadequate pre-project water quality protection and restoration planning
- Deficient project activity staging to meet changing site-specific, weather, social, and economic conditions
- Limited BMP inspections and compliance monitoring

e. Water Quality Protection and Restoration

The diverse complex of corporate and individual interests and the often inadequate and inconsistent investments of financial and human capital to address NPS pollution continue to impede sustainable water quality protection and restoration efforts in Alabama. It will require decades of focused and sustained public and private sector partnership support, funding, and other resources to adequately address and achieve hydromodification goals and objectives applicable to the AL NPS Management Program and ensure that water quality standards are met and sustained for all waters of the state. The AL NPS Management Program will continue to promote iterative water quality protection and restoration planning and implementation approaches using a cooperative partnership framework to target voluntary incentives, practices and processes; but supported by Federal and State regulatory back-up authorities. Sustained and enhanced public and private sector partnerships, expertise, programs, and resource leveraging continue to achieve programmatic expectations.

Strategies and action items are presented throughout this Appendix to identify, prioritize, and implement NPS management measures and practices to protect surface waters from excessive levels of NPS pollution. It is highly recommended that hydromodification decisions relative to protecting and restoring water quality (and quantity) integrate and sustain:

- Early input from a diverse mix of public and private sector entities

- Prioritized watershed-based and site-specific management measures and practices to holistically and concurrently address both environmental protection and economic suitability issues and concerns
- Clearly defined and understood goals, objectives, and milestones
- partnership roles and responsibilities
- Strong science-based pre- and post-project monitoring and assessment data
- Close project planning and implementation coordination and open communication
- Fiscal accountability and transparency when using public funds
- Indicators and measures that reflects stakeholder interests and input of human and financial capital

Nonpoint source pollution mitigation activities associated with hydromodification presented herein to improve water quality are designed to effectively, efficiently, and expeditiously achieve applicable statewide AL NPS Management Program goals and objectives and the state's CWA Section 319 grant funding priorities. Section 319 grant partners continue to work together to coordinate and leverage resources to restore designated uses of waters where elevated levels of NPS pollutants have been documented (e.g. Section 303(d) listed waters). Science-based water quality monitoring and assessment protocols continue to be used to indicate and measure pollutant load reduction success. It is highly recommended that partners continue to dedicate available NPS management funds and resources to proactively protect threatened and unimpaired waterbodies (i.e., Outstanding Alabama Waters, Outstanding National Resource Waters, and Treasured Alabama Lakes) to prevent them from becoming impaired. In addition, the environmental and economic benefits of point source and NPS water quality pollutant credit "trading" should continue to be considered as a component of a holistic hydrologic modification watershed restoration and NPS pollution management approach. The AL NPS Management Program and Section 319 grant program will continue to particularly support community-based NPS pollution management activities, NPS pollutant load reductions, and water quality protection and restoration efforts where equitable resources have not been historically targeted (i.e., environmental justice), such as underserved, low income or under represented racial / ethnic minorities who may benefit from NPS pollutant load reductions.

Political boundaries do not generally correspond with specific hydrologic, ecologic, and or physio-geographical aspects of watershed nor water quality and natural resource protection and restoration endeavors. And, while the regulatory approach must be relied on to make strategic hydromodification (e.g. water quality and quantity) protection and response decisions, it is not always the most efficient or productive forum through which NPS pollution management decisions should be addressed. Voluntary cooperative partnerships can be a very effective and useful mechanism to identify, prioritize, implement, and maintain management measures to protect and restore water quality. As practicable, NPS problems should be mitigated using a holistic watershed-based approach. Watersheds (preferably HUC-12 in Alabama) provide a useful areal extent and focused starting point to target NPS water quality protection and restoration resources. Science-based watershed-based data collection and analyses can provide clear evidence of the severity and magnitudes of NPS contaminate problems and enhance opportunities to effectively, efficiently and economically address NPS concerns on a "manageable" scale. The AL NPS Management Program and Section 319 grant program highly recommend the development and implementation of an EPA-defined 9-key element watershed-based management plan to mitigate NPS water quality problems. Having clear NPS water quality goals and local buy-in is especially significant because of a strong and inherent stance by many landowners in Alabama relative to private property rights and private land use.

The AL NPS Management Program and Section 319 grant program continues to address hydromodification issues by facilitating partnerships, leveraging resources, and applying both voluntary and regulatory water quality protection and restoration approaches. These complementary mechanisms continue to be instituted in order to align national, regional, and state NPS programs and priorities with local and specific actions and to meet mutual goals and objectives. The AL NPS Management Program and Section 319 grant program strive to meet state water quality standards and achieve beneficial uses of state waters by:

- Strategically focusing a mix of leveraged funds on specific, priority, water quality based programmatic goals and objectives so that NPS impaired waters are restored and unimpaired or threatened state waters continue to be protected
- Clearly articulating NPS goals and objectives and developing management plans and approaches to meet them

- Reflecting a balance between federal, state and local hydromodification priorities to ensure limited NPS funds and resources achieve measurable water quality protection and restoration results
- Aligning and setting priorities that make the best use of available human and financial resources to reduce NPS loadings and meet state water quality standards
- Tracking and reporting results to demonstrate incremental progress and document final successes and outcomes

Nonpoint source pollutants impair water quality as they are dissolved, suspended, transported and dispersed by stormwater runoff to waters of the state. The EPA and ADEM issues stormwater discharge permits under the National Pollutant Discharge Elimination System (NPDES) program to protect water quality from uncontrolled and untreated discharges associated with land disturbance activities. An NPDES stormwater permit issued by ADEM requires a Notice of Intent and the development of a best management practices plan. The plan provides an assessment of potential sources of stormwater runoff pollutants and the control measures that will be implemented to minimize the discharge of those pollutants from the hydromodification (land disturbance) site. Nonpoint source pollution control measures may include implementation and maintenance of structural erosion and sediment control measures as well as non-structural practices such as education, outreach and training, inspections, and the collection and reporting of water quality monitoring data to help resource agencies determine permit noncompliance.

The AL NPS Management Program continues to support a targeted, flexible, and iterative voluntary approach to address nonpoint sources of pollution in Alabama; however, it is recognized that regulatory back-up authorities (e.g. NPDES permit compliance) are also essential. This Appendix recommends several environmentally-protective and economically-sensible measures and practices to mitigate nonpoint sources of pollution using both approaches. The ***Strategies*** and ***Action Items*** presented in Attachment 1, herein, recognize that intertwined and sometimes contentious relationships exist among various sectors of society. Hydromodification and water quality protection and restoration conflicts do emerge and dialogue can sometimes be dynamic and contentious; however, continued communication is critical and should begin at the initial planning stage and continue through implementation, project completion, and long-term post-BMP maintenance. The AL NPS Management Program acknowledges that reasonable and mutually-beneficial NPS management programmatic solutions are best achievable through sustained public and private sector communication, collaboration, coordination, and cooperation. Water quality monitoring should be conducted prior to and during engineered hydromodification and continue until all land disturbance activities have ceased or NPS threats to water quality are attenuated. In addition, effective integration and leveraging of a wide array of programs and resources to support hydromodification education and outreach, research, training, and technology transfer and technical assistance is also essential.

f. Water Quality Monitoring

Water quality monitoring and assessments are critical to demonstrating and documenting NPS impacts and the effectiveness of BMP implementation. The Alabama Department of Environmental Management (ADEM) continues to use its established 5-year rotational river basin monitoring and assessment approach to ascertain various NPS pollution impacts to surface waters and groundwaters of the state. The ADEM integrated monitoring strategy is designed to provide science-based water quality data needed to identify and prioritize NPS issues and problems and to target programmatic solutions to protect and restore water quality. This statewide strategy provides definitive quality assured/quality controlled and fact-based data and information to both the public and private sectors using tangible watershed health and water quality measures and indicators. The data is useful in substantiating or repudiating public perceptions relative to water quality and human health impairments, conditions, or threats. In addition, the NPDES permit program also requires the submittal of discharge monitoring reports (DMR) and other forms to ADEM. The NPDES water quality monitoring data informs the public where, when and how much pollutants are discharged from the land disturbance site. The data is also used to apply enforcement actions to ensure compliance with Federal and state surface water and groundwater protection standards.

Each major river basin monitoring and assessment iteration conducted by ADEM uses standardized EPA-approved field collection and laboratory analyses methods to gather unbiased estimates of the condition of the state's rivers

and streams, lakes, wetlands, and coastal waters. This approach provides ADEM with valid science-based water quality data to help the public and private sectors evaluate the:

- NPS pollutant load reduction components of a watershed-based management plan.
- Extent of waters of the state that support healthy biological, physical, and chemical conditions
- Impacts on drinking water, public health, recreation, and aquatic and wildlife resources and habitat
- Success of investments of funds and other resources to protect and restore water quality and natural resources
- Status of whether state waters are healthy or are incrementally achieving state water quality standards
- Trends or changes in water quality over time including "water quality limited segments" under Section 303(d)
- Scope and scale of NPS impacts on watersheds and surface water and groundwater quality

As additional water quality data and information is collected and evaluated, the intertwined relationships relative to human activities and hydromodification impacts on the environment continue to be better documented and understood. The collection of reliable water quality data and heightened citizen knowledge and awareness are critical to NPS management decision-making processes (e.g. enhancing problem identification; prioritization and targeting of human and financial resources to address problems, etc.). Water quality data and information may be collected by ADEM concurrently or independently of Section 319 grant-funded projects to help the state holistically identify priorities, evaluate statewide NPS programmatic effectiveness, and assess BMP targeting and project implementation success. Water quality data is reported by ADEM biennially in the CWA Section 305(b) Integrated Report to Congress, and is also used to update the ADEM-compiled CWA Section (303) d List of Impaired Waters, as applicable. The data may also be used to develop EPA Section 319 success stories and to document NPS pollutant load reductions and update and closeout NPS projects in the EPA Grants Reporting and Tracking System database. Monitoring data is also critical to the development and implementation of Total Maximum Daily Load (TMDL) which is a primary water quality restoration mechanism used by EPA and ADEM to achieve CWA objectives and meet state water quality standards.

The ADEM evaluates the potential effects on the physical and chemical characteristics of surface waters that may occur as a result of proposed or completed Section 319 grant funded projects. Data collection and evaluations encourages planning and design of new projects to reduce undesirable NPS pollution impacts, and the operation and maintenance of existing efforts to improve the physical, chemical, and biological characteristics of waters of the state. The Section 319 grant program continues to sustain ADEM efforts to collect and analyze water quality data from NPS control projects and relevant hydromodification activities to help evaluate stream conditions (e.g. the health of a stream or system) and processes (functional attributes over time). The information is evaluated and used to document the extent of NPS pollution, target and leverage resources to mitigate problems, estimate pollutant load reductions, and support AL NPS Management Program accountability and transparency; including but not limited to the following processes and efficiencies:

- Protect and restore surface waters and groundwaters impaired by a nonpoint source pollutant or mixed pollutant sources for which TMDLs have been developed
- Bring together technical experts, program managers, policy makers, community leaders, and citizens at the federal, state, and local levels to leverage and integrate resources and prevent duplication of efforts
- Enhance NPS knowledge and awareness relative to hydromodification, water quality protection and restoration, human and aquatic organism health, BMP implementation and maintenance, and watershed management to various public and private sector audiences at workshops, conferences, and field days/tours
- Fill in hydromodification water quality data gaps, support research and technology, and advance relevant data collection quality assurance and control protocols
- Provide hydrologic information to public and private entities to enhance planning and implementation of NPS water quality protection and restoration management measures and practices
- Identify personal and community-based social and economic needs, character, and context to help enhance and sustain individual and community resiliency and sustainability

Given that Alabama does not have a dedicated source of sustainable funding to adequately manage all causes of NPS pollution, all waters of the state impaired by legacy hydromodification activities cannot realistically be expected to be restored expeditiously. The AL NPS Management Program continues to utilize inclusive partnerships to help deliver mutually beneficial management measure planning, prioritization, and implementation decisions and

strategies. To get the best bang for the NPS mitigation buck, mitigation scenarios should continue to strategically focus relevant hydromodification mitigation resources on improving water quality, setting priorities, clearly articulating goals and objectives and benefits, integrating and leveraging financial capital, and tracking and reporting implementation and water quality protection success. Water quality monitoring and assessment data collected by ADEM will continue to be made available to the public and private sectors to assess hydromodification impacts and to target implementation efforts and NPS mitigation activities for:

- Surface waters and groundwaters that serve as a drinking water supply or that require continued assessments
- Waters near geographic areas where rapid land use development is occurring
- Sites contributing high NPS pollution loads to downstream waters
- Waters where trend data indicates increasing water quality degradation
- High quality waters of the state
- Waters with unique, valuable, or threatened species or critical aquatic habitats and species
- Implementation effectiveness and maintenance of BMPs

Section E.2 Hydromodification and Nonpoint Sources

a. Overview of Causes and Impacts

Hydromodification activities can disturb extensive areas of streambanks and shorelines, eradicate natural vegetative cover, and contribute to substantial opportunities for NPS runoff to impair waters of the state. Inadequately designed rainfall runoff drainage conveyances can alter natural hydrologic patterns and processes, diminish ground infiltrative capacity, and threaten aquatic organisms and their habitat. Pollution prevention is a critical component of the AL NPS Management Program and the Section 319 grant program. These statewide NPS programs support the development and implementation of proactive, economically sustainable and environmentally-protective measures and practices that will ensure hydromodification activities are safe for everyone who lives nearby or benefits from its implementation. Preventive management measures must be designed to not allow the hydrologic modification activity to become a source of NPS pollutant runoff nor a future public health and safety liability or clean-up responsibility (thus the need to proactively develop NPS pollution prevention and clean up plans). Monitoring of discharges to waters of the state must be adequate and timely to properly assess NPS pollution prevention needs and success. Successful pollution prevention strategies requires continued communication, collaboration, cooperation, and coordination between relevant public and private sectors and is highly recommended by the AL NPS Management Program and for CWA Section 319 grant-funded projects. This is especially applicable relative to the development and implementation of NPS watershed-based management plans in which structural or nonstructural NPS measures to restore Section 303(d) listed impaired waters are targeted. Structural NPS pollution prevention BMPs include but are not limited to:

- Proper disposal of dredge and fill material
- Proper land grading, access road construction and stormwater runoff conveyance systems
- Hardened armoring or native vegetative covers to protect streambanks, shorelines, and riparian areas against erosion and slope failures
- Selecting and replanting native plants to establish/maintain evapotranspiration vegetative covers
- Posting signage to ensure public safety and prevent impacts to water quality that could result from the accidental release of NPS pollutants
- Water flow diversions to control velocity and volume
- Land contouring to control runoff velocity
- Retention areas and detention ponds
- Proper storage and disposal of certain chemicals, substances, and other materials that are used to construct or maintain hydrologic modification sites, structures and facilities. Measures should properly address the proper application, generation, and migration of potentially toxic substances such as concrete additives, petrochemicals, solid wastes, cement washout, pesticides and fertilizers.
- Application of nutrients that are applied at rates necessary to establish and maintain vegetation / ground covers without causing significant nutrient runoff to surface waters.

Non-structural pollution prevention practices may include but are not limited to easements, covenants, zoning, education and outreach, inspections, and reporting to prevent the degradation of water quality and to reestablish, maintain or protect hydrologic and ecological systems. Hydrology modification decisions should consider the water quality protection and economic benefits, potential pollution threats and characteristics, site conditions, health and safety liabilities, and performance indicators and measures. Water quality monitoring and ecological assessments should be continued to ensure that the implementation of structural measures and nonstructural practices are effective and are helping to meet state water quality standards.

The AL NPS Management Program highly recommends efforts to identify, establish and maintain cooperative public and private sector partnerships (e.g. resource agencies, academia, nonprofits, trusts, developers, planners, contractors, engineers, industry/corporations, advocacy groups/organizations, citizen volunteers, etc.). Collecting and dissemination timely and science-based data and information relative to nonpoint source pollution and water quality protection decision-making is essential. Close public and private sector alliances improve collaboration, coordination, and communication and can significantly accelerate progress in protecting and restoring water quality and helps to ensure efficient targeting and leveraging of NPS mitigation resources. Long-term improvements in water quality and NPS pollutant load reductions are often contingent on building and sustaining relationships with a mix of local entities that represent the many and varied environmental, economic, social and cultural character of the targeted mine land restoration site (e.g. Alabama Clean Water Partnership).

Continuing to facilitate opportunities to deliver technology transfer, technical assistance, and education, outreach and training enhances NPS programmatic effort to enhance citizen knowledge and awareness, minimize duplicative efforts, and reduce wasteful expenditures of limited human and financial capital. Implementation and demonstration of new and emerging innovations, measures, and practices under different conditions and site characteristics helps to ensure effective, efficient, and expeditious improvements in water quality. The AL NPS Management Program and Section 319 grant program continues to support the art and science of efforts to mitigate the adverse water quality impacts associated with hydromodification activities, and protecting and restoring waters of the state from nonpoint sources of pollution. It is highly recommended that water quality impacts and management measures be identified in holistic watershed-based management plans and closely coordinated with an appropriate federal and state agency, group, or academic institutions (e.g. technical, financial, research, education and outreach assistance, etc). As the AL NPS Management Program is updated over the next 5-year cycles, it is expected that more advanced tools will continue to emerge and be incorporated as a component of an iterative toolbox building process.

Unlike “point source” (i.e. end-of-pipe) pollution, nonpoint source pollution or “pointless pollution” originates from many and varied dispersed sources and is a significant contributor to impairment of waters of the state. Nonpoint source pollutants are picked up by precipitation (rainfall, snow) runoff and drainage and seepage waters and transported to receiving waters casing several adverse environmental, economic and human health problems. Atmospheric transport and deposition of some NPS pollutants (e.g. mercury, particulate matter) can also contribute to impaired water quality. As runoff flows over or through the ground, it can pick up contaminates such as trash and debris, soil particles, chemicals, oil and grease, and other pollutants and transport them to surface streams, rivers, lakes and to groundwaters. Increased volume and velocity of rainfall runoff can accelerate the rate of soil erosion, sedimentation, and turbidity and also the transport of litter and trash. Adverse NPS problems can also include intensified streambank, shoreline, stream channel and riparian area degradation. In addition, aquifer /drinking water source levels, supplies and quality can be threatened and diminished. The reduction and loss of trees and other natural vegetative covers and shading associated with hydromodification activities such as stream realignment or streambank armoring can result in changes in waterbody temperature (many aquatic plant and animals and habitats are very sensitive to changes in water temperature).

Inadequate or improper selection, implementation and maintenance of hydromodification measures may negate NPS treatment expectations or accelerate degraded surface waters and groundwaters conditions. Mitigating a particular environmental or human health threat can be a relatively intensive, expensive and time consuming endeavor; particularly when attempting to mimic or restore natural hydrologic patterns to near pre-land disturbance conditions.

In some instances, it is generally more efficient and effective to install a drainage system "train" of BMPs to holistically target multiple NPS causes and types of pollutant discharges. A series or "train" of management measures can efficiently, effectively and expeditiously treat pollutant runoff while reducing discharge flow volumes and velocity. Control strategies recommended by the AL NPS Management Program and Section 319 grant program to protect environmental and human health and safety associated with a modification of the natural hydrology include but are not limited to the following measures and practices:

- Coordination of a cooperative and inclusive public and private sector partnership approach
- Leveraging programs, authorities, and resources whenever allowable and prudent
- Implement regulatory compliance actions whenever the voluntary NPS management approach doesn't appear to be working in order to prevent, minimize and abate the causes of water quality degradation
- Ensure that the removal and transport of dredged soils are appropriately stored, treated, or reused to restore and stabilize streambanks, shorelines, beaches, wetlands, or riparian areas
- Install and protect native vegetative buffers and riparian areas to protect against erosion and to act as natural NPS pollution and stormwater runoff filters
- Remove and properly dispose of anthropogenic sources of pollution (e.g. discarded equipment, oil and chemical drums, trash and debris, etc.)
- Establish or re-establish native vegetation similar or equal to the composition and quality of natural vegetation of the pre-land disturbance area to create or sustain a diverse and permanent cover capable of self-regeneration and plant succession
- Properly and timely inspect and maintain stormwater runoff conveyances, retention areas and detention ponds to prevent untreated and unrestricted discharge of sediment, nutrient, chemical, or other pollutant laden waters
- Restrict needless and unauthorized public access to NPS pollution prevention and treatment sites and measures
- Restore streambanks, shorelines, wetlands, etc, with inert and non-polluting materials
- Prevent erosion from contributing to sedimentation and turbidity
- Restrict unauthorized human access and abuse of sites and measures that are properly protecting water quality
- Continue to research and implement management measures to minimize hydromodification impacts that may directly and indirectly effect threatened and endangered species or introduce invasive species

Common NPS impacts associated with hydromodification, how it can harm water quality, and steps that can be taken to mitigate NPS pollutant loadings and protect and restore water quality, may include:

b. Streambank and Shoreline Erosion

Streambank and shoreline erosion are natural processes; however, human activities along or adjacent to streambanks or shorelines can accelerate erosion, sedimentation, and transport and erosion of other nonpoint sources of pollution. Streambank erosion degrades stream, estuary, and impoundment shorelines and often is accelerated as a result of anthropogenic hydrologic modifications and activities; increased development and impervious surfaces that increase natural flow velocity and volume; and/or the loss of soil cohesiveness or "holding" capacity and properties of streambank and riparian vegetation. Eroded material (sediment, nutrients, and other pollutants) is often picked up, dissolved or suspended and transported downstream and re-deposited in the channel or reservoir bottom or as point bars along bends of a waterway. Shoreline erosion occurs in large, open waterbodies such as lakes, reservoirs and estuarine areas where the ebb and flow of waves and currents move sand and gravel in both directions along the shore and/or away from the area being eroded.

Erosion and sedimentation (siltation) is a primary cause of NPS water quality impairments associated with most hydromodification activities. Excessive erosion and sedimentation is generally a direct consequence of inadequate or ineffective design, installation, operation, or maintenance of NPS control measures. The spatial and temporal extent of hydromodification activities, topography, geology, vegetative cover, soil types, and other chemical, physical, and biological factors will influence the design, type and number of NPS management measures to be implemented to prevent, reduce or abate erosion and sedimentation problems. Sediment deposited in surface waters can result in severe acute and chronic water quality and human health problems. Too much sediment can smother benthic organisms, destroy or degrade aquatic habitat, clog fish gills, or alter dissolved oxygen levels and temperatures, resulting in fish kills or fish and shellfish consumption advisories. Increased sediment deposition from clearing and

grading may disrupt, fill in, and clog stormwater runoff conveyances; degrade drinking water sources and reduce storage volume; lead to expensive dredging, increase flooding, impair wetlands and sensitive areas, degrade or restrict recreational opportunities and resources, and create public nuisance and property owner and user liabilities. Total suspended solids such as silt and clays can cause receiving waters to become muddy or cloudy (turbid). Turbidity is a measure of water clarity and is a useful indicator of the effectiveness of BMPs in preventing, reducing, and treating NPS stormwater runoff from hydromodification activities. High turbidity levels generally suggest opportunities for installing preventive erosion control measures or revising maintenance procedures. The re-dissolution of contaminated sediments can be a long-term recurring source of pollution problems for a waterbody.

Erosion and sedimentation NPS problems are best prevented or minimized by proper BMP planning, implementation and maintenance. Eroded soils should be kept on-site and in-place as much as practicable. The AL NPS Management Program recommendations to prevent siltation / sedimentation and turbidity problems or to trap sediment after it has eroded includes but is not limited to on-the-ground management measures such as properly installing and maintaining silt fences and staked hay bales; and properly designing, inspecting, operating and maintaining retention areas and detention ponds. Stabilizing eroded areas with natural ground covers (e.g. native grasses, flowering plants, shrubs, and trees) is the preferred NPS management method to mitigate stream sedimentation problems. Vegetative buffers established and maintained along waterbodies can act as natural filters, moderate the volume and velocity of stormwater runoff, and prevent, treat, or infiltrate excess sediment and nutrients from nonpoint sources. Bioengineered (vegetative) controls may include but are not limited to appropriate mulching, seeding, sodding, and tree planting; preferably using locally native species (and to limit the spread of invasive species). Soils and vegetation should be minimally disturbed during site preparation and clearing. Individual" or a "train" of erosion and sediment mitigation measures may be required to successfully mitigate NPS pollution and protect water quality.

Pre-hydromodification ecological risk assessments should be conducted to identify erosion and sedimentation impacts, develop pollution runoff and remediation plans, and to assess the implementation of management measures. Nonpoint source problem areas should be stabilized to ensure that streambank and shoreline features and wetlands and riparian areas are adequately protected relative to water and land uses and achieving NPS pollutant load reductions. Sediment should be contained onsite to the extent practicable, during and after any hydromodification activity. All hydromodification activities should have an approved erosion and sediment control plan or similar land disturbance provisions prepared prior to project implementation. All project entities, especially on-site workers and managers, should be thoroughly familiar with all aspects of the pollution prevention and control plan(s). For example, nonpoint source management measures are usually best installed at, or very near to, the source and cause of the pollution problem. Regular and competent inspections and maintenance of control measures and prompt maintenance and retrofits, if needed, should be a continuing priority during all phases of hydromodification processes. Education and outreach and training to introduce effective and efficient measures and technologies to minimize environmental impacts should continue and be coordinated with NPS programmatic goals and objectives.

Entities involved in hydromodification activities must be knowledgeable of the applicability and effectiveness of NPS runoff control measures (i.e. the conditions under which BMPS must /will be implemented). The AL NPS Management Program and CWA Section 319 grant program endorses applicable hydromodification structural erosion and sedimentation mitigation measures presented in the, "Alabama Handbook for Erosion Control, Sediment Control, and Stormwater Management on Construction Sites and Urban Areas" (March 2009, or as updated) for both voluntary NPS mitigation and NPDES permit regulatory purposes and activities as applicable. This Handbook provides guidance for preventing and minimizing erosion, sedimentation and related stormwater quality problems. It can help users meet environmental and regulatory objectives and can be tailored for site-specific conditions and objectives. A companion "Field Guide" is available as a quick reference resource and presents 26 of the most commonly used erosion and sediment control practices contained in the "*Alabama Handbook*." In addition, the NRCS National Handbook of Conservation Practices and Alabama-specific Field Office Technical Guide; Alabama Cooperative Extension System, Alabama Low Impact Development Handbook; and the EPA documents, National

Management Measures to Control Nonpoint Source Pollution from Hydromodification (EPA 841-B-07-002. July 2007), Controlling Nonpoint Source Runoff Pollution from Roads, Highways and Bridges (EPA-841-F-95-008a, August 1995), and Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, Chapter 4 (EPA-840-B-92-002, January 1993) are also recommended erosion and sediment control (and other causes of NPS pollution) design, selection, application, and maintenance reference resources.

c. Total Solids

Total solids can harm aquatic life and make water resources unusable or expensive to treat for human consumption, irrigation, livestock watering, manufacturing and other beneficial uses. Total solids are composed of Dissolved Solids (e.g. chlorides, magnesium, sulfates, nitrates, phosphorus, carbonates, etc.) and Total Suspended Solids (e.g. silt and clay particles, plankton, algae, fine organic debris, and other particulate matter). High concentrations of total solids can result in decreased water clarity, low dissolved oxygen levels, and rapid and longer durations in excessive water temperatures. These physical impacts can adversely affect aquatic life that has adapted to clearer water and more moderated temperature conditions. In addition, while minerals and salts occur naturally in the environment, are essential to life, and are generally tolerated by plants and animals in specific ionic strengths; increased concentrations (conductivity) in a waterbody/stream can indicate water quality degradation. Over many years or decades, suspended solids can settle out and be deposited as sediment; thus decreasing storage capacity and other beneficial uses of a water source impoundment. Primary AL NPS Management Program management practice recommendations to address the impacts of high concentrations of Total Solids from hydromodification activities include sustained education and outreach to increase public awareness and knowledge; regular and competent inspections and maintenance of installed engineered management measures; and protecting, installing or maintaining natural native vegetative buffers and riparian areas to act as filters for NPS runoff. Nonpoint source education and outreach to introduce or increase the use of effective and efficient technologies to minimize environmental impacts should continue. Regular and competent inspections and maintenance of NPDES required control measures to mitigate construction stormwater runoff should also be a continuing priority and coordinated with NPS programmatic goals and objectives.

d. Dissolved Oxygen

Dissolved oxygen (DO) is a measure of how much gaseous oxygen (O_2) is dissolved in the water and is a good indicator of the "health" of a waterbody. Oxygen is dissolved in water by diffusion from the surrounding air, aeration (movement, mixing or agitation of stream flow), and aquatic plant photosynthesis. All aquatic life needs adequate levels of dissolved oxygen to survive. Adequate dissolved oxygen is also necessary for good water quality. The level of oxygen in a waterbody can also affect the odor, clarity and taste of a drinking water source. Rapidly moving water tends to contain higher levels of dissolved oxygen. Lower DO levels are generally associated with stagnant waters, sluggish flows or pools exposed to hot summer temperatures and little or no shading, and bacteria and microorganisms consuming dissolved oxygen as organic matter decays (e.g. biochemical oxygen demand). Excess organic material in streams, rivers, and lakes/reservoirs can also result in eutrophic conditions, especially during calm weather conditions and hot summer months. Primary AL NPS Management Program management practice recommendations to address low DO problems associated with hydromodification activities include sustained education and outreach to increase public awareness and knowledge relative to NPS pollution, water quality protection and restoration, and DO concentrations that can fluctuate seasonally as well as diurnally (daily). Nonpoint source education and outreach to introduce or increase the use of effective and efficient technologies to minimize negative physical, chemical and biological impacts should continue. Regular and competent inspections and maintenance of NPDES required control measures to mitigate construction stormwater runoff should also be a continuing priority and coordinated with NPS programmatic goals and objectives.

e. Temperature

Many fish and other aquatic animals are sensitive to rapid or prolonged increases of water temperature. Higher temperatures (warm waters hold less dissolved oxygen than colder waters) can also impair water quality. Waters can become too warm as a result of rainfall running off of barren land or impervious surfaces (e.g. pave roads, roof tops, sidewalks, parking areas, etc.). In addition, the absence of streambank and riparian vegetation and low flows can cause stream waters to heat up more rapidly on warm sunny days. Temperature ranges that are outside of the normal ecological and physiological range or requirements of an aquatic organism for too long can increase risks of disease and mortality. Warmer waters may also increase the toxicity of some NPS pollutants. The AL NPS Management Program recommends continued education and outreach to increase public awareness and knowledge. Best management practices such as least-disturbance or non-removal of overstory along streambanks, maintaining native groundcovers and re-vegetating disturbed areas as soon as practicable should be continued. Nonpoint source education and outreach to introduce or increase the use of effective and efficient technologies to minimize water quality impacts should also continue. Regular and competent inspections and maintenance of NPS control measures to mitigate precarious temperature aberrations and also in support of regulatory NPDES requirements should be a continuing priority and coordinated with NPS programmatic goals and objectives.

f. Trash, Litter, Debris, and Discarded Solid Waste

Garbage or refuse thrown or dumped along stream channels and roadsides is a common and unsightly NPS pollution problem in Alabama. Discarded household solid waste (e.g. paper and cardboard, furniture; glass, metal and plastic containers; construction/building waste, grass yard trimmings, etc.) can cause the appearance and quality of nearby waterways that provide recreational and other benefits to be quickly degraded. The transport of litter and trash along waterway channels is a major urban NPS stormwater runoff problem. Trash can degrade stream and wetland habitat and health and items such as scrap tires can hold water, thereby increasing mosquito and vermin problems. Nonpoint source best management practices include prohibiting streambanks and roadsides from becoming dumping areas for discarded appliances, batteries, vehicle parts, construction debris, leaves and yard litter, etc., or hazardous (e.g. toxic, flammable, corrosive) wastes. The AL NPS Management Program continues to recommend sustained education and outreach activities to increase public awareness and knowledge. Native vegetative buffers and riparian areas along waterbodies should be protected, installed and maintained to filter NPS stormwater runoff. Regular and competent inspections and maintenance of stream and wetland restoration sites and control measures should be a continuing priority. Fencing and other barriers may be installed to restrict unauthorized human access to installed hydromodification measures and projects designed to actively protect and restore water quality and ecosystem functions.

g. Color, Taste, and Odor Impacts

Not all hydromodification activities causes actual harm to water quality or human health; however, general public perceptions can play a significant role in planning and implementation decision-making processes, approval, and acceptance; especially if the activity will threaten or impact a drinking water source. Hydromodification activities can influence public opinions relative to human health by increasing public sensitivities relative to water color, taste and odor. The level of "acceptable" organoleptic (perceived by the senses) measures and indicators can often vary among individuals and communities; however, there is general agreement that negative sensory connotations relative to water quality impacts does contribute to negative economic and recreational benefits (e.g. swimming, fishing, tourism, etc). Reservoir or beach area water may appear to be "clear and clean" but in fact may not be safe for human body contact, consumption, or other beneficial use expectations. Color may be indicative of soil and water chemistry interactions, dissolved metals (iron and manganese), or siltation from erosion and sedimentation (turbid/muddy waters). Objectionable odor and taste problems can result from the presence of hydrogen sulfides (high iron and low pH) or spills (chemicals, oil, gasoline, etc.). Primary AL NPS Management Program best management practices include sustained education and outreach and training to increase public awareness and knowledge and to introduce and implement new and

innovative technologies; never disposing of anthropogenic wastes into or close to a waterbody or NPS runoff discharge conveyance (regardless of its location or use), regular and competent inspections and maintenance of NPS management measures, and installing and maintaining vegetative buffers and riparian areas to act as filters for NPS runoff.

Section E.3 Hydromodification Impacts

a. Overview

This Appendix is designed to provide information on the relationship between stream water quality in its natural setting and how a stream responds to anthropogenic watershed alterations and conditions and NPS pollution. A range of environmentally protective NPS management measures and practices are presented herein to mitigate the impacts of hydromodification. Recommendations are generally focused on human and environmental health, water supplies, irrigation, navigation, hydropower, waste disposal, infrastructure, flood control, recreation, aesthetics, and fish and wildlife habitat. In order to prevent and mitigate NPS pollution problems, it is important to recognize the role that different timelines, scope and scales, and watershed conditions may alter hydrology, geomorphology, and ecology of a stream channel or waterbody. The AL NPS Management Program recommends the, National Management Measures to Control Nonpoint Source Pollution from Hydromodification (EPA 841-B-07-002. July 2007), and Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (EPA-840-B-92-002, January 1993) to address NPS impacts to water quality relative to hydromodification impacts.

b. Channel Modification

Channelization refers to an engineered alteration of stream channels by humans and is generally initiated to provide local land use benefits and enhance local economies and commerce. Channel modification activities (mechanically straightening or deepening of natural stream channels) are generally conducted to provide for flooding and flow controls, protect infrastructure, enhance navigation, increase recreational opportunities, and promote land development. Channelization may also include the excavation of canals, marina basins or other practices that change the depth, width, or location of waterways or embayments. Human manipulation of natural channel sinuosity, riparian areas, and flood plains (e.g. straightening, widening, deepening, or relocating stream channels; clearing, snagging, or removing accumulated sediment and debris, etc.) typically results in a uniform channel cross section; however, poorly designed stream modification implementation and maintenance efforts can result in steeper and more erosive stream banks; reductions in certain aquatic species, diversity, and habitat; and even threats to human health and safety. In addition, many wetland and other stream functions and values can/have been lost (e.g. sediment transport, providing food and habitat to support aquatic life, degraded recreational benefits and aesthetics, etc.). When stream channels are hardened, lined, covered (e.g. rip-rap, culverts, piping, etc.) or re-located, resultant water quality, flows, and stream channel degradation can be so severe that the stream no longer ecologically or functionally supports or resembles (physically, chemically or biologically) its pre-modified appearance, value, or setting. The removal of vegetation can increase the exposure of shorelines to erosive wave action and currents and makes streambanks more vulnerable to erosion and sedimentation and stream headcutting.

Channelization and the management of nonpoint sources of pollution are interconnected. For example, stream channel modifications can alter the timing and delivery of NPS pollutants (that ultimately flows to a receiving water body) and increase the stream flow velocity and volume, potentially increasing the risk of stream bank failure, channel scouring, and bank overflows /flooding. Most legacy stream channelization activities in Alabama were

conducted to increase agricultural production. Regulatory requirements of the Clean Water Act and USDA-NRCS Farm Bill incentives ("swampbuster provisions") have all but ceased agricultural-based hydromodification / channelization activities in Alabama; however, riverine systems and canals continue to be dredged to provide socio / economic benefits such as providing corridors for local, state and interstate commerce (barges) and travel (boating / sailing), removal of contaminated sediment, creating or restoring habitat, harbor / marina access, beach nourishment, land increase the storage capacity of water supplies. The AL NPS Management Program recognizes the critical role that stable stream banks, canals, shorelines, beaches, and wetlands have in protecting and restoring water quality and ecosystems. The restoration of legacy channelization / dredging endeavors are permitted activities and not typically addressed by nonpoint sources funding or resources. The CWA Section 319 grant program may provide resources to help restore and maintain the chemical, physical and biological integrity of small stream banks and channels if NPS degradation is identified as a NPS priority in a watershed-based management plan or Total Maximum Daily Load (TMDL) document.

The environmentally-protective and economically-sensible advantages of all hydromodification technologies should be carefully considered before NPS management funds are expended to address nonpoint sources of pollution. Education and outreach and training to introduce effective and efficient technologies to minimize hydrologic impacts and to protect and restore water quality is critical and should continue as a statewide NPS management program and Section 319 grant program public and private sector knowledge and awareness initiative. In addition, regular and competent inspections to ensure proper installation and maintenance of NPS control measures should also be a continuing priority. The AL NPS Management Program promotes continued education and outreach to increase citizen knowledge and awareness and the implementation and maintenance of measures and practices to restore, enhance or mitigate wetland and coastal resources, streambanks, drainage channels and riparian areas to approximate pre-development hydrology and watershed conditions. The AL NPS Management Program endorses national relevant hydromodification (EPA 841-B-07-002, July 2007) measures to help ensure state water quality standards are met.

c. Dams and Instream Structures

Many streams and rivers in Alabama have barriers installed in them to manage water flow and reduce flooding, produce hydropower, enhance navigation, and to create ponds, lakes, and reservoirs to divert water for municipal, industrial, agriculture, aquaculture, recreation, and other public and private uses. Dams also create impoundments to concurrently capture, hold or treat NPS runoff (detention ponds) and to be featured as a residential area aesthetic attribute. Although benefiting multiple facets of economic, cultural, and social quality-of-life aspects in most settings, the installation of man-made dams and instream structures can negatively impact NPS loadings and degrade water quality and aquatic ecosystem health (e.g. alteration of temperature, dissolved oxygen levels, flow volume and velocity). Dams can also affect water quality by contributing to a buildup of sediment and nutrients behind the dam; altering the quantity, quality, and timing of downstream flows, and disrupting hydraulic residence times (i.e. the length of time water is stored and for NPS pollutants to settle out, decompose, or become nontoxic). The increased turbulence and velocity of water released downstream of a dam can significantly scour stream channels and erode stream banks. Aquatic species composition, populations, and migration, and habitat and aquatic ecosystem connectivity can also be drastically altered both upstream and downstream of instream structures. In addition, the accumulation of excess sediment can reduce the water volume holding capacity of pooled (e.g. drinking water reservoir) waters.

Alabama currently has no privately-owned, small impoundment dam safety program, nor a dedicated funding program to assist land owners with dam repairs, abandonment, or removal. The AL NPS Management Program endorses relevant nationally-recommended dam siting, construction, operation, maintenance, and removal measures associated with hydromodification (EPA 841-B-07-002, July 2007) to help ensure state water quality standards are

met. The AL NPS Management Program also endorses continued education and outreach and increasing state funding and staffing for a dam inspection program; and proactive dam design, construction, maintenance, inspections, ranking, and operation in accordance with other relevant interagency programs, processes, guidelines, directives, and authorities such as recommended by FEMA, the Department of Homeland Security (e.g. dam safety and emergency planning), and the U.S. Department of Agriculture (dam hazard classification - Technical Release No. 60) .

Dams and impoundments should be managed and maintained with human and watershed health and water quality protection in mind. Improperly designed, inspected, and maintained dams, shorelines, streambanks, and impoundments can present significant public safety and property risks and environmental hazards. Municipalities, neighborhood associations, and others that monitor and upkeep lakes and reservoirs should always be cognizant of the intertwined relationship between dam operations (water storage/ water withdrawal effects on water quality and quantity), NPS pollution, causes and sources of stormwater runoff, water quality and watershed health, aquatic and riparian habitat, aesthetic benefits, and human health protection. Maintenance should include periodic assessments to evaluate potential NPS pollution (at least annually). Establishing and maintaining NPS management measures may require increased public awareness about the ecological and economic purposes and functions of the dam, instream structure, and the impoundment.

Dams affect water quality by disrupting hydraulic residence times (i.e. the length of time water is stored and NPS pollutants may settle out) and the quantity and timing of downstream flows. Poor water quality (stagnation) and degraded habitat can result from reduced flows, mixing and circulation, calm weather conditions, low dissolved oxygen, high temperatures, and increased vegetative biomass. Eutrophic conditions can lead to algal blooms and/or an over abundance of floating leaved and submerged aquatic vegetation. Increased turbulence and velocity of water released downstream of a dam can significantly erode stream banks and scour stream beds and channels. In addition, improperly designed, inspected and maintained impoundments and dams can present significant public safety and property risks and environmental hazards. Periodic maintenance to maintain proper design, features, function, and environmental and economic benefits is essential to ensuring modifications to natural hydrologic conditions continue to meet state water quality standards and beneficial uses.

Dams and instream structures are installed for many beneficial purposes; however, at some point in time, the structures are no longer efficient, wanted, or needed (e.g., small dams such as those built to power textile mills, sawmills, grist mills, etc). In some cases, water resource managers may conclude that the economic benefits of dam removal outweigh the benefits of continuing to maintain or operate a dam (e.g. Columbus, GA / Phenix City, Alabama white water course on the Chattahoochee River). The AL NPS Management Program primarily endorses low-head dam removal from a science-driven NPS pollution mitigation perspective (e.g. improve water quality, protect human safety, improve benthic plant and animal species and communities, and restore aquatic ecosystem connectivity); and secondarily, from a local social, cultural, economic or recreational benefits perspective. The stream's ability and tendency to recover from water quality and ecological insults associated with dam removal can take many years or decades after a dam has been removed and the channel restored to near pre-hydrologic modification conditions. The State of Alabama does not provide funds to assist dam owners with repair or removal.

The Federal Energy Regulatory Commission (FERC) is responsible (since 19977) for licensing new hydroelectric industry construction projects, re-licensing (or exemptions from licensing), and providing oversight of existing project operations on streams and natural waterbodies that Congress has jurisdiction to regulate. The FERC is also responsible for conducting environmental monitoring to conserve and protect natural waterways and overseeing federal dam safety inspections. The State of Alabama is the only state in the U.S. that does not have a dam inventory, safety, or inspection program, although some progress has been made to address this issue.

d. Aquatic Habitat Modification

Habitat alteration is identified by ADEM on the Section 303(d) lists as a water quality impairment concern. Most watersheds (hydrologic unit codes) in Alabama experience varying degrees of human-caused activities that threaten or impair water quality, and hydrologic or ecological functions of a stream, river, lake, reservoir, or estuarine waterbody located therein. Hydromodification activities can significantly alter stream order and processes and conditions that constitute or support a stream ecosystem. Stream flows can vary widely and is generally a function of the watershed's landscape, variability in rainfall runoff amounts and patterns, surface and groundwater hydrologic patterns, vegetative covers, geology, and other ecosystem constituent relationships and processes. Anthropogenic hydromodification activities often adversely impact aquatic habitat by changing the amount, timing, and velocity of rainfall runoff reaching a stream; diverting flow through structural designed / armored channels and drainage conveyances, altering stream function, or totally relocating the location of a stream channel. Degraded physical and chemical (e.g., sediment, temperature, clarity, ambient light, dissolved oxygen, evapotranspiration, infiltration, etc.) and biological processes and conditions (e.g. abundance, richness, diversity of fish and benthic macroinvertebrates; algal biomass) are typical indicators of an impaired stream.

Most natural streams provide adequate and necessary cover, substrate, and hydraulic conditions to meet the reproduction and survival needs of a diverse population of fish and macroinvertebrates. Changes in water quality (and quantity) from hydromodification activities can threaten or exterminate aquatic biota and degrade habitats. The National Fish Habitat Partnership is a national program supported by the Office of Surface Mining and EPA where both federal and state partners identify, prioritize, and reclaim AMLs impacting fish and other aquatic life habitats. The Southeast Aquatic Resources Partnership is a southeastern U.S. regional initiative designed to protect, improve, and restore habitat for fish and other aquatic species. The AL NPS Management Program recommends the expansion of these partnerships to protect Alabama's freshwater and coastal marine aquatic resources from nonpoint sources of pollution. In addition, a multidisciplinary NPS pollution management approach is needed to enhance efforts in Alabama to identify, develop, and implement comprehensive aquatic habitat management programs to:

- improve the ecological health of freshwater and estuarine habitats
- coordinate invasive aquatic vegetation control activities with other agencies
- develop comprehensive NPS management programs for selected water bodies in coordination with public and private sectors
- restoring aquatic resources to benefit fish and wildlife resources
- Leveraging resources to enhance aquatic habitat using a priority NPS impaired watershed-based management plan approach.

The presence of man-made dams, levees, walls; armored streambanks; stream banks lacking vegetation; excessive streambank erosion and sedimentation; scouring and incision; extreme stream width to depth ratios; exclusion of normal stream-floodplain interactions, and degraded diversity, populations and habitat of aquatic organisms are symptomatic of poorly planned, implemented and maintained stream channel hydromodification activities. Stream alterations related to channelization, bridge construction, dredging, culvert and discharge pipe placement, and ditching discharges can also degrade benthic habitat. The AL NPS Management Program promotes continued education and outreach to increase public awareness and knowledge, and the implementation of relevant NPS pollution controls associated with hydromodification (EPA 841-B-07-002, July 2007).

Nonpoint source management measures associated with habitat alteration relative to hydromodification activities may include but is not limited to:

- Restoring / reclaiming legacy riparian areas and legacy wetland areas that were cleared or otherwise maintained for other purposes (agricultural, strip mining, impervious surfaces to green design/development, etc.)
- Preserving and maintain existing wetlands (high-quality and sensitive areas, species, and habitats; functions and values)

- Improving floodplain connectivity and hydrology (prevent/reduce stream incision/headcuts, streambank erosion and channel scour)
- Enhancing channel stability (vegetate/revegetate filter strips/buffer areas to help prevent lateral streambank instability)
- Improving /restoring habitat and diversity (enhance riffles/pool conditions and benthic substrates; prevent/reduce invasive species; etc,)
- Reflecting near pre-development and/or reference site physical, chemical, and biological indicators and measures

e. Streambank and Riparian Area Protection and Restoration

Engineered hydromodification activities such as dredging can cause streambank erosion and channel sedimentation, resulting in loss of stream channel form, function and integrity; and thus, nonpoint source pollution and degraded water quality. Human activities can adversely impact watershed hydrology and water quality, introduce or promote the spread of invasive species, alter physical and chemical conditions (e.g. pH, dissolved oxygen, water temperature, turbidity, flow velocity and volume, etc), and influence stream sedimentation rates and transport. In addition, aquatic and upland organism habitat can be degraded, stream bank vegetation reduced or eliminated, submerged aquatic vegetation smothered, fish and shellfish beds covered, riffle pools filled in, and the transport / delivery of excess levels of nutrients and other pollutants from NPS runoff increased. Nonpoint source protection and restoration management measures relative to stream and riparian areas should include an evaluation of the potential impacts of all hydromodification activities on watershed health and stream benefits and functions. Pre-planning of NPS management measures is essential to reduce undesirable hydrologic and water quality consequences.

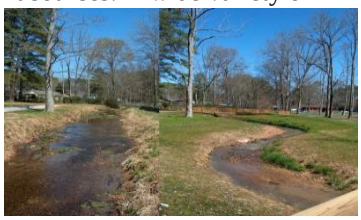
Riparian areas play an important role in aquatic habitat composition, suitability, abundance, and diversity. Anthropogenic (human caused) stream alterations (e.g., levees, channelization, dams, bridges, weirs, grade controls, culverts, etc.) often times disrupts or impairs water chemistry and biology, and stream flow, profile, form, pattern dimension, and functions. Riparian areas attenuate streambank overflows, capture and store excess sediment, chemicals, nutients, and other NPS pollutants; help stabilize stream channels by preventing stream bank failures, and provides food and habitat to support diverse species and populations of aquatic organisms. Riparian protection, causes and symptoms of degradation, and NPS water quality protection and restoration are best addressed proactively as a component of a holistic watershed-based management plan.

Riparian protection, nonpoint source causes and symptoms of degradation, and water quality protection and restoration are best addressed proactively as a component of a holistic watershed management plan. Riparian area protection is an important NPS pollution control mechanism in Alabama and Section 319 grant funds can be used for restoration activities as practicable and as resources allow to restore stream dimension, patterns and profiles to near pre-development functions. The AL NPS Management Program continues to recommend education and outreach to increase public awareness and knowledge and the implementation of relevant NPS pollution controls associated with hydromodification activities (EPA 841-B-07-002, July 2007) to meet state water quality standards

Streambank and riparian area protection and restoration are important NPS pollution management mechanisms in Alabama. Section 319 grant funds may be used for restoration activities as practicable and as resources allow to create or restore stable stream dimension, pattern, form and profile; enhance watershed health, and protect and restore water quality and aquatic and wildlife habitat to near pre-development functions. Efforts to protect and restore streambanks and riparian buffers (and wetlands), including ecological monitoring and assessments and success performance metrics, should be based upon mitigation / conservation bank criteria as relevant to the Regional Internet Banking Information Tracking System (RIBITS) of the USCOE - Mobile District Regulatory

Division, as well as other applicable federal and state agency-approved watershed or stream-specific reference site criteria, conditions and attributes.

Much information is available from federal, state and local agencies and organizations and institutions to address hydrologic impacts associated with streambank and riparian area protection and restoration, and to potentially provide human and financial capital to minimize water quality impacts from nonpoint sources. A wide variety of physical, chemical or biological treatment measures and practices are available to mitigate NPS pollutants from an impaired site. And, although NPS water pollution impacts may not yet be indicated, proactive prevention efforts may still be needed to prevent future hazards or threats. The AL NPS Management Program recommends the, National Management Measures to Control Nonpoint Source Pollution from Hydromodification (EPA 841-B-07-002. July 2007), and Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, (EPA-840-B-92-002, January 1993) as reference resources for the design, selection, application, and maintenance of NPS management measures. Additional recommended resources include the USDA NRCS Engineering Field Handbook, Part 650, Chapter 16, Streambank and Shoreline Protection (December 1996), as applicable to Alabama, Community-based Environmental Protection - A Resource Book for Protecting Ecosystems and Communities (EPA 230-B-96-003, Sept 1997), Stream Corridor Restoration – Principles, Processes, and Practices (The Federal Interagency Stream Restoration Working Group (Oct 1998;Rev. August 2001), and Applied River Morphology (David L. Rosgen, Wildland Hydrology). The USACOE (40 CFR Parts 325 and 332) and EPA (40 CFR Part 230) issued the, Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (CFR Vol. 73, No. 70); April 10, 2008) to provide national criteria and consistency relative to establishing, use, and operation of the compensatory stream mitigation approach (offset /compensate for unavoidable streambank/ riparian impacts associated with permitted hydrologic modification and applicable land disturbance activities). It is also highly recommended that resources continue to be targeted to enhance the art and science of natural channel design in Alabama and to encourage the implementation of stream restoration projects based upon natural channel design on appropriate streams; such as stream protection and restoration efforts of the Alabama Cooperative Extension System. The AL NPS Management Program and Section 319 grant program continues to promote hydromodification NPS category education and outreach opportunities to increase public awareness and knowledge, and the continued implementation of relevant management measures using cooperative partnership decision-making and resource leveraging approaches to expeditiously achieve healthy watersheds and meet state water quality standards.



f. Shoreline Protection and Restoration

Stabilized shorelines provide a range of important NPS functions, including but not limited to: erosion control, property protection, fish and wildlife habitat, and recreational opportunities. Shoreline degradation can be a natural and gradual process (e.g. storms, tides, wave action, rainfall runoff, loss of vegetative cover); however, anthropogenic activities associated with boating; barge traffic; piers, docks, boat ramps, and marinas; channel dredging, other construction and development, etc., can accelerate adverse impacts to natural resources, water quality, and property.

Prior to engaging in shoreline (and near shore or littoral zone) management activities, it is critical that significant and long-term adverse impacts of those activities be identified and the implementation of effective management measures are proactively pre-planned relative to watershed health and water quality protection. Engineered modifications designed to address shoreline integrity should be protective of the environment and human health, safety, and property. Poorly planned, implemented and maintained structural management measures can actually increase the rate of shoreline erosion, resulting in increased natural resource degradation, property loss and/or infrastructure damage. Management measures and practices decisions should reflect the long-term impacts and benefits relative to NPS pollution control and water quality protection areal extent, scope and scale.

Typical structural measures include rip rap/concrete revetments, groins/groin fields, gabions/gabion mattresses, bulkheads, and retaining walls. In general, natural "green" stabilization methods are preferred and include but are not limited to planting live grasses, flowering plants, shrubs and trees; and "soft-armoring" with logs, root wads, stumps, or vegetative mats. The protection and restoration of native shoreline vegetation is preferred and is vital to maintaining the natural health and value of coastal and inland water ecosystems, maintaining shoreline integrity and functions, enhancing NPS runoff filtration, and protecting water quality; and therefore, should remain undisturbed. A mix of hard and soft armoring measures may be more practicable and applicable. The USDA NRCS Engineering Field Handbook, Part 650, Chapter 16, Streambank and Shoreline Protection (December 1996) is recommended as a shoreline management measure reference document.

Shoreline development activities can have significant impacts on overall coastal wetlands and estuary ecosystem health including but not limited to: changes in chemical and physical conditions; reductions or elimination of floral and faunal populations, diversity, habitat, and connectivity; establishment and spread of invasive species; and adverse retention, transport or treatment of excess nutrient and sediment pollutant runoff from nonpoint sources. The EPA, ADEM, NOAA, Corps of Engineers, ADCNR, Alabama Power Company, Tennessee Valley Authority, and other public and private entities may issue permits for any or all modifications to a reservoir/lake shoreline, bottomlands lying below the ordinary high-water mark or above the water's edge, or for anthropogenic actions that may impact coastal wetlands, estuaries, or sand dunes and beaches. Activities that impact certain aquatic and upland species may require permits from the EPA, USFWS or ACDNR. Herbicide applications to control undesirable invasive species may require FIFRA applicator permits from EPA and ADAI. The AL NPS Management Program and Section 319 grant program continues to promote shoreline protection education and outreach opportunities designed to increase public awareness and knowledge. Management measures and practices decision-making should use a cooperative partnering and resource leveraging approach to expeditiously achieve healthy watersheds and meet state water quality standards.

g. Wetlands

An area is determined to be a wetland when three key parameters occur together on a site under normal circumstances and of sufficient duration: hydrophytic vegetation, hydric soils, and wetland hydrology (see the 1987 Corps of Engineers Wetland Delineation Manual and Regional Supplements). Wetlands provide flood protection, erosion control, recreation, aesthetics, and natural resource benefits. Unlike most other habitats, wetlands can directly improve water quality. Because of their natural "cleansing" benefits, wetlands may be considered a "natural" NPS pollution management measure. Wetland protection and restoration are important Alabama NPS Management Program implementation priorities, and with or without Section 319 grant funding, efforts should be increased to enhance wetland functions, values and benefits (e.g. watershed and water quality improvement, health and hydrology; aquatic and wildlife habitat/diversity/connectivity; shoreline protection/buffer; groundwater recharge; flood plain connectivity/flood protection, etc.).

Alabama has not adopted wetland-specific state water standards; however, the ADEM Water Division – Water Quality Program (Volume 1, Division 335-6) presents numeric and narrative water quality standards and criteria applicable to all state waters. Alabama's Antidegradation Policy (ADEM Admin Code 335-6-10-.04) does not directly address wetlands protection and restoration; however, its purpose and intent is to help protect, maintain and improve water and prevent or mitigate new or existing water pollution. Freshwater wetlands in Alabama occupy an estimated 3,600,000 acres. Alabama's coastal wetlands are estimated at 27,600 acres (National Wetland Inventory). Coastal Alabama also contains an estimated 610 square miles of estuaries and a coastal shoreline that is 337 miles long (includes Mobile Bay and island shorelines). Alabama's two coastal counties (Baldwin and Mobile) contain approximately 271,000 acres of wetlands and about 400,000 acres of streams and estuarine waters; representing about 12.5% and 18% respectively,

of the total geographic management area of the Alabama Coastal Nonpoint Pollution Control Program (ACNPCP). In addition, the 6th largest watershed in the United States drains into the Mobile-Tensaw River Delta, which is one of the best preserved major river deltaic and estuarine complex in the nation.

Wetlands provide a multitude of environmental, economic and social and quality-of-life benefits to the citizens of Alabama. Several wetland planning, implementation, and maintenance programs, projects and resources are dedicated to the protection, restoration, and enhancement of wetland resources and mitigation of adverse hydrologic modification and NPS impacts in Alabama, including but not limited to programs, processes and recommendations presented in **Table E.3.1**, below:

Table E.3.1 Wetland Hydrologic Modification Programs, Resources, Roles and Responsibilities

- The ADEM Coastal Programs and Coastal Area Management Program (ADEM Admin Code R. 335-8-x-.xx. Rev. May 28, 2013) provides oversight of consistency certifications and CWA Section 401 state water quality certification for coastal area project proposals. ADEM coordinates regularly with the USACOE on CWA Section 404 dredge and fill permit applications and wetland mitigation banking issues.

- The Alabama Coastal Nonpoint Control Program (ACAMP) is a joint effort of the Alabama Department of Conservation and Natural Resources - State Lands Division (SLD) and the ADEM Coastal Permitting Program. The SLD is responsible for planning and policy development while ADEM is responsible for permitting, monitoring and enforcement activities [ADEM Division 8 Coastal Programs Rules (ADEM Admin. Code R 335-8)]. The ACAMP recognizes the important role hydromodification impacts may have on coastal streams, wetlands, riparian areas, shorelines, recreation, habitat, drinking water sources and other environmental and economic benefits. This awareness of NPS impacts continues to encourage partnership efforts to develop and implement Alabama's Coastal Nonpoint Control Program (ACNPCP) projects that incorporate CZARA-Section 6217 (g) guidance management measures for ACNPCP program approval. ADEM coastal programs staff continues to participate in the development and approval of coastal wetland mitigation banks throughout the ACNPCP service area (approx. 1,900 wetland acres).

- The ADEM Wetland Program Plan (2011, as updated) and Wetlands Monitoring Program (Alabama's Water Quality Monitoring Strategy) presents planning and implementation goals and objectives for a comprehensive water quality monitoring and assessment program to protect and restore water quality. The document also serves as a guideline to ensure that state wetland monitoring meets CWA Section 106(e)(1) requirements.

- Coastal Counties Wetlands Conservation Plan (Final Draft, March 31, 2001) is a cooperative Coastal Counties Wetlands Working Group product developed in support of the Alabama Coastal Area Management Program by The Dauphin Island Sea Lab Coastal Policy Initiative for the ADCNR - Coastal Programs Section with NOAA funding. The Plan depicts concerns and potential management recommendations to achieve wetlands management objectives in coastal Alabama.

- Coastal projects that will potentially adversely impact waterbottoms or involve dredging or filling of wetlands requires the issuance of a permit and/or certification from ADEM Coastal Programs (Division 8 rules) and the U.S. Army Corps of Engineers (USACOE). In some instances, other project authorization is required from the State Oil and Gas Board and/or the ADCNR -State Lands Division. Some projects, such as the construction of residential piers and projects involving minimal wetlands impacts, may be permitted under a pre-certified USACOE General or Nationwide Permit and do not require further review by ADEM.

- Alabama's Coastal Nonpoint Control Program (ACNPCP), U.S. Fish and Wildlife Service, ADCNR, Mississippi Department of Marine Resources partnered with the U.S. Army Corps of Engineers - Mitigation Bank Interagency Review Team (MBIRT) to develop regionalized wetland functional assessment Hydrogeomorphic (HGM) Approach tools to help standardize wetland function assessments in the Alabama coastal zone. ADEM also coordinates through the ACNPCP to present best available wetland-related technologies in the form of technical studies, workshops, and conferences. In addition, the ACNPCP facilitated coastal *Wetland Rapid Assessment Procedure (WRAP) Workshops*, *coastal Wetland Plant Identification Workshops*, and regional *Alabama Stream and Wetlands Restoration Conferences*, in addition to an in-depth *Coastal Alabama Hydromodification and Wetlands Technical Update*. Funding is provided using CWA Section 319, and other federal, state and private resources. Outreach supports CZARA-Section 6217 and is offered to regulatory agencies, consultants, and the general public. The ADEM Coastal Program continues to work with other governmental entities to identify wetland and submerged aquatic vegetation status and trends. Color infrared digital ortho-quarter quads for Mobile and Baldwin Counties have also been produced to map wetlands and uplands.

- The ADEM, Corps of Engineers, and USEPA partners together to address the mitigation of wetland impacts relative to CWA Section 404 permitted dredge and fill projects and CWA Section 401 state water quality certification. The USEPA and the Corps of Engineers issued revised regulations governing compensatory mitigation for authorized impacts to wetlands, streams, and other waters of the U.S. under Section 404 of the Clean Water Act in 2008. The regulations are designed to improve the effectiveness of compensatory mitigation to replace lost aquatic resource functions and area, expand public participation in compensatory mitigation decision making, and increase the efficiency and predictability of the mitigation project review process. The Corps of Engineers also establishes an Interagency Review Team (IRT) to review and manage proposed mitigation banks or in-lieu fee programs. The IRT may consist of the Corps, USEPA, U.S. Fish and Wildlife Service, National Oceanic and Atmospheric Administration, Natural Resources Conservation Service, and other federal agencies, as well as representatives from state and local regulatory and resource agencies. The Corps of Engineers makes the final decision on whether or not to approve a proposed mitigation bank or in-lieu fee program.

- The EPA has established several policies, laws and regulations and technical guidance documents regarding wetlands. EPA also works in partnership with the USACOE to issue CWA Section 404 dredge and fill permits and ADEM on CWA Section 401 state water quality certifications.

- The EPA and Corps of Engineers utilize the 1987 Corps Wetland Delineation Manual and Regional Supplements to identify wetlands relative to the CWA Section 404 permit program. The USFWS National Wetlands Inventory also provides geospatial data for wetlands and surface water features.

- The EPA National Estuary Program (Mobile Bay - NEP) is a non-regulatory program that promotes wise stewardship of the water quality characteristics and living resource base of the Mobile Bay estuarine system. A Comprehensive Conservation Management Plan (CCMP) has been developed and provides a blueprint for conserving the estuary. Public input into the CCMP has resulted in the award of millions of dollars from federal court settlement plea agreements by BP/Transocean regarding the 2010 Deepwater Horizon oil spill to restore coastal estuaries, wetlands and other natural resources.

- As a result of federal court plea agreements, BP/Transocean settled some of the criminal charges related to the 2010 Deepwater Horizon oil spill in the Gulf of Mexico. The settlement directs $2.544 billion into the Gulf Environmental Benefit Fund. The Fund is administered by the nonprofit National Fish and Wildlife Foundation for projects aimed at restoring and enhancing natural resources along the Gulf Coast. Initial project funding includes $12.6 million to Alabama to develop a watershed management plan to restore the Fowl River Watershed in south Mobile County including restoring 8 acres of tidal marsh land at the tip of Mon Louis Island and to add 6 acres to restore the marsh area to its original size. Additional coastal restoration funds have been awarded to restore 600 acres of oyster reefs in Mobile Bay, Mississippi Sound and Bon Secour Bay, and continued restoration of the D'Olive Watershed in Baldwin County/Mobile Bay.

- The Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act) established a Gulf Coast Ecosystem Restoration Council. The governors from the five affected Gulf States', the Secretaries from the U.S. Departments of the Interior, Commerce, Agriculture, and Homeland Security as well as the Secretary of the Army and the Administrator of the U.S. Environmental Protection Agency comprise the Council which is chaired by the Secretary of Commerce. The RESTORE Act established the Gulf Coast Restoration Trust Fund for programs, projects, and activities that restore and protect the environment and economy of the Gulf Coast region. RestoretheGulf.gov is the official federal portal for 2010 Deepwater Horizon oil spill response and recovery and provides the public with information and links to federal, state and local partners.

- The EPA Gulf of Mexico Program, a non-regulatory consortium of five U.S. Gulf Coast states, is composed of federal, state and local agencies, commissions, districts, associations, and organizations and citizens working together to restore, protect, and maintain the Gulf of Mexico ecosystem in ways consistent with the environmental and economic well-being of the region.

- Land use activities may be subject to wetland protection and restoration provisions of the Agricultural Act of 2014, the USDA-NRCS Wetland Reserve Program, Wildlife Habitat Incentive Program (WHIP), and Executive Orders associated with No-Net-Loss and Migratory Bird Protection.

- The Geological Survey of Alabama and Alabama's Marine Environmental Sciences Consortium are instrumental in providing wetlands science-based, technical data and information and assistance and promoting and wetlands conservation initiatives.

- The Alabama Department of Natural Resources and Conservation (ADCNR) - State Lands Division purchased large tracts of the Mobile Delta using funding received from the Department of Interior's - North American Wetlands Conservation Act. Wetlands have also been purchased at the Weeks Bay National Estuarine Reserve. The ADCNR has also developed specific recommendations for protecting significant forest tracts that contain isolated wetlands, particularly in Mobile and Baldwin counties where development and sprawl are encroaching on these vital resources..

- The a U.S. Fish and Wildlife Service - Partners for Fish and Wildlife program engages partners to protect and restore wildlife habitat on private property by restoring and protecting 1 million acres of wetlands and restoring or enhancing 7,500 miles of streams important for Alabama's wildlife. The USFWS - National Wetlands Inventory Program produced a collection of wetlands maps of the State of Alabama. The maps are available to the public through efforts of the University of Alabama and the Geological Survey of Alabama. The USFWS also provides other wetlands inventory and geospatial data and information.

- The Wetlands Reserve Program in Alabama is a voluntary program administered by the Natural Resources and Conservation Service to landowners to protect, restore, and enhance wetlands on their property by providing technical and financial support. All of the tracts planted through this program have been previously used as either pasture or crop land. A conservation easement with the Wetlands Reserve Program is a legal agreement between a landowner and a land trust or government agency (NRCS) that limits the use of property to protect certain conservation values in order to restore and protect the wetland. These limits are for a specified period of time (30 year or permanently) and go with the property even if the property is sold. In addition, the 2008 Farm Bill targeted wetlands by making landowners who convert wetland acreage into agricultural tracts ineligible for agricultural subsidies for forests or crops planted in the converted wetland areas. Funding to enhance wetlands may be available through the 2014 Farm Bill-Voluntary Public Access and Habitat Incentive Program.

- The Alabama Forestry Commission conserves, manage and protect forested wetlands based upon guidelines and recommendation presented in the Alabama's Best Management Practices Manual for Forestry (Chapter 6).

- The Federal Emergency Management Agency (FEMA) develops detailed stream reach maps showing existing conditions, utilities, delineated wetlands, and existing 100-year floodplain boundary of waters of the U.S.

- The Alabama NPS Management Program continues to promote continued public and private sector interests and actions to establish and incorporate wetland mitigation or "credit" programs and projects throughout Alabama as viable and effective market-based NPS mitigation tools to offset /compensate for unavoidable wetland impacts associated with permitted hydrologic modification and applicable land disturbance activities. Regulations enforced by the USEPA and Corps of Engineers are designed to improve the effectiveness of compensatory wetland mitigation to replace lost aquatic resource functions and area, expand public participation in compensatory mitigation decision making, and increase the efficiency and predictability of the mitigation project review process.

h. Wetland and Streambank Mitigation

Compensatory wetlands, stream and riparian mitigation banking can play a significant role in restoring and enhancing the state's natural resources adversely impacted from hydrologic modification activities. The Alabama NPS Management Program continues to promote public and private sector interests and actions to establish and incorporate stream bank mitigation or "credit" programs and projects throughout Alabama as viable and effective market-based NPS mitigation tools to offset /compensate for unavoidable streambank/ riparian impacts associated with permitted hydrologic modification and applicable land disturbance activities. Mitigation banks in Alabama may be approved and/or administered by public agencies, including but not limited to the U.S. Army Corps of Engineers, U.S. Fish and Wildlife Service, U. S. EPA, Alabama Department of Conservation and Natural Resources, ADEM Coastal Programs , and the Alabama Department of Transportation. Several private sector entities in Alabama also design and operate federal and state approved mitigation banks. Unavoidable authorized adverse impacts to regulated natural resources such as wetlands, streams and riparian zones, flooding attenuation, or federally-listed species (ecological diversity) can be compensated /offset through the purchase of "credits" from an approved mitigation or conservation bank sponsor; rather than restoring, creating, or preserving resources on or near the permitted land disturbance / development activity. The environmental-based advantages of the compensatory "banking" approach include long-term conservation, restoration, enhancement, and management of watershed health, water quality, and habitat. Economic benefits relate to opportunities for continued growth and development and permittee time and costs savings and potential exception to certain liabilities.

Alabama has not developed statewide rules or regulations relative to wetland mitigation; however, the ADEM Coastal Area Management Program (ADEM Admin Code Chapter 335-8-2) requires entities seeking approval for coastal project permits or certifications to develop a wetland mitigation plan (e.g. creation, restoration or enhancement of existing degraded wetlands) for coastal wetland impacts (ADEM Admin Code Chapter 335-8-2-.03). Compensatory wetland mitigation may also be required for unavoidable impacts to jurisdictional wetlands, streams, and other waters of the United States (e.g. CWA Section 404 - discharge of dredged or fill material). Regulations providing national criteria and consistency relative to the compensatory stream mitigation approach (e.g. establish, use and purpose; compensation for lost aquatic resource functions and area, promote public participation, and streamline the project review process) have been developed by the USACOE (40 CFR Parts 325 and 332) and EPA (40 CFR Part 230) regulations are presented in the Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (CFR Vol. 73, No. 70; April 10, 2008). The ADEM generally defers wetland jurisdictional and mitigation issues to the USACOE. The number of wetland or stream mitigation bank credits may be determined using the Mobile District Corps of Engineers - Compensatory Stream Mitigation Standard Operating Procedures and Guidelines (SOP) manual. This SOP, a regulatory guidance and planning/performance criteria reference document, is dynamic and endorsed by the USACOE Compensatory Mitigation - Interagency Review Team, a collaborative federal and state agency partnership. Stream bank credits are generally purchased from a "third party" mitigation bank sponsor and are based on linear feet or functional assessment units. The "third party" (other than the permittee) assumes responsibility for compensatory mitigation and implementation success by ensuring protection in perpetuity through placement of a restrictive covenant or conservation easement. At a minimum, upland riparian buffers and wetland restoration and enhancement mitigation / conservation bank actions, ecological monitoring /assessment, and success performance standards should be based upon criteria presented by the Regional Internet Banking Information Tracking System (RIBITS) of the USCOE - Mobile District Regulatory Division, as well as applicable federal and

state agency-approved reference site criteria, conditions and attributes. It is also important to ensure that NPS mitigation planning, implementation, and maintenance processes (e.g. location, ecological performance, monitoring, financial assurances, etc,) are applied in a consistent, clear, and cooperative partnership manner, and preferably as a component of a holistic watershed-based management plan.

i. Hydraulic Fracturing

Hydraulic fracturing or "fracking" is a natural resource recovery process and technology in which high pressure fluids are injected underground to stimulate the release of highly dispersed or trapped natural gas and oil reserves in petroleum-bearing rock formations. Wells may be drilled hundreds or thousands of feet below the land surface to target selected coal beds, tight sands and shale formations; and may involve horizontal or directional borings extending more thousands of feet. There is increasing interest by federal and state government leaders and companies to expand this type of resource extraction process in Alabama. Hydraulic fracturing fluids commonly consist of water, sand, and chemical additives and are injected down a drilled well to create and hold open underground rock fractures. Once the injection process has been completed, the internal pressure of the rock formation causes the fracking fluid to return to the surface of the wellbore. This "produced water" may contain the injected chemicals plus naturally occurring materials such as total dissolved solids (brines), metals, and hydrocarbons. The produced water is typically stored on site in lined pits to be re-used, treated, and discharged. In some cases, produced waters may be injected underground for disposal. Drilling and underground injection well (e.g. Type II) activities associated with hydraulic fracturing in Alabama is under the statutory authority of the State Oil and Gas Board (OGB). Stormwater runoff pollutant discharges are regulated by both EPA and ADEM. The EPA and the OGB oversee Class II Underground Injection Control (UIC) wells in Alabama to protect surface waters, groundwaters and the land surface from pollutants associated with oil and gas production. The Safe Water Drinking Act (Section 1421(d) (1) exempts hydraulic fracturing operations from UIC regulations; however, entities that use diesel fuels to extract oil and gas during hydraulic fracturing (fracking) are subject to EPAs UIC program permitting guidance (EPA 816-R-14-001. February 2014). Actual and potential risks associated with hydraulic fracturing and drinking water / groundwater interactions could benefit from additional scientific research and understanding. Fracking operations are primarily regulatory in nature and as such, are not directly applicable to the AL NPS Management Program or Section 319 grant nonpoint source program. In general, the Section 319 grant as administered by ADEM will not fund the implementation of structural BMPs to mitigate problems associated with hydraulic fracking because those activities are considered NPDES permitted "point sources" of pollution. A nonstructural NPS management practice may involve education and outreach if it is an implementation component of a nonpoint source or mixed source TMDL or EPA-defined 9-key element watershed-based management plan and permissible under Section 319 grant guidelines.

j. Quarries and Open Mining Pits

Quarries yield essential noncoal, nonfuel, industrial mineral products to improve our standard of living. Uncontrolled and improper treatment of erosion and sedimentation can result in significant impacts to water quality. Quarrying may cause sinkholes (particularly limestone extraction), alter "natural" groundwater levels and disrupt stream hydrology (e.g. lower aquifer and drinking well-water levels; interrupt natural baseflow to streams and lakes, etc.). Recovery of aquifers and stream hydrology to near pre-quarrying conditions and associated ecological effects after operations have ceased can be long-term (years or decades). Depending on the quality of the water and economic benefits, inactive quarry pits may serve as a drinking water supply, as a water source for rural fire trucks and dry hydrants, or for recreational purposes. The locations of quarrying operations are authorized by locally-elected officials. The potential discharges of pollutants that may impact water and air quality are regulated by EPA and ADEM NPDES permits. Solid and hazardous waste threats to air, water, and land resources in Alabama may be subject to the Resource Conservation and Recovery Act of 1976 (RCRA), including the "Bevill Amendment" that focuses on low toxicity /high volume wastes. Stormwater runoff from industrial facilities including activities associated with crushed stones and sand and gravel are also regulated by NPDES permits. Because quarrying and open/borrow pits are primarily regulated activities , the Section 319 grant program in Alabama only indirectly focuses on this NPS activities; primarily the delivery of generic watershed and water

quality protection and restoration, NPS pollution, and stormwater runoff information education and outreach, and facilitating field days, tours, workshops, meetings, etc., relative to the implementation of a NPS or mixed (point/nonpoint) source TMDL or component of an EPA-defined 9-key element watershed-based management plan as allowable under Section 319 grant guidelines.

Section E.4 Management Measure Design

a. Overview

Significant sources of human and financial capital, new and enhanced technologies and innovations, general public education and outreach, and other resources are required to holistically protect water quality and restore NPS impaired watershed hydrology. Nonpoint source management measure planning and implementation processes applicable to hydromodification activities should be flexible, targeted, iterative, and broad-based to best meet state water quality standards and beneficial uses of both surface waters and groundwaters. Efforts should identify and integrate cooperative partnerships and leverage both public and private sector funds and resources as authorized, permissible and practicable. Nonpoint source management measures and practices presented herein do not supplant mandatory regulatory requirements specified by Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA), but rather complements the CZARA program and the state's coastal NPS program approval processes whenever possible or practicable. The AL NPS Management Program strongly encourages continuation of resource leveraging, technology transfer, technical assistance, research, and education and outreach as well as an increased emphasis on the design and adoption of effective NPS pollution prevention and source controls, as practicable. Sustaining voluntary, regular and competent inspections and maintenance of structural management measures is a NPS programmatic priority.

The AL NPS Management Program continues to support efforts to implement an integrated and inclusive partnering approach to systematically identify, prioritize, and mitigate NPS pollution sources and causes. Identifying and strengthening partnerships (coordination, collaboration, cooperation and communication) continues as funding and other resources allow. Implementation of environmentally-protective and economically-sensible on-the-ground measures continue to be at the forefront of NPS management efforts to reduce priority nonpoint source TMDL pollutants of concern and Section 319 grant guidelines NPS pollutant loadings (e.g. sediment, nutrients, chemicals, and other contaminates that may impair waters of the state or severely or irreparably threaten watershed hydrology and ecology, human health, or aquatic organism health and habitat). Section 319 grant resources continue to focus on implementing Section 319 grant guidelines, targeting TMDL and Coastal NPS pollutant load reductions, and restoring NPS impaired waters (e.g. Section 303(d) Lists). Water quality monitoring, partnerships, and continued development and implementation of holistic watershed-based management plans are integral programmatic elements. Statewide water quality data and information collected by ADEM is evaluated and then shared with the public and private sectors. In order for impaired waters to expeditiously meet state water quality standards, the ADEM uses NPS watershed monitoring and assessment data and information to help raise awareness relative to hydromodification management measure design, implementation and maintenance. Section 319 funded hydromodification education and outreach activities may include but are not limited to delivery of NPS information and data relative to watershed health and water quality protection and restoration, pollutant load reductions; and pollution prevention; and tours and training events to demonstrate hydrology management measures and controls designed to address NPS water quality impacts and threats.

b. NPS Management Planning and Implementation

The importance of developing a water quality protection and restoration plan cannot be overly stated; however, even "good" NPS planning efforts will most likely fail if the plan is not properly implemented. Hydrology assessment data and information needed to develop a quality water quality management plan to sufficiently address hydromodification activities typically requires extensive site visits and surface water and groundwater monitoring and flow measurements. Clearly designed plans should include appropriate maps and a detailed descriptive narrative about the site, pollution prevention options, and protection and restoration expectations. All elements of the plan must be verifiable and information made readily available to relevant plan approval and inspection/compliance agencies and authorities.

Planning measures presented below are intended to protect and maintain natural ecological conditions and surface and groundwater hydrology (water quality and quantity) to near pre-development conditions as sensibly and practicable as possible. It is highly recommended that NPS management plans address unavoidable NPS pollutant loadings to receiving waters as near to the source as possible. Plans should also ensure that pre-development runoff volumes and velocities are not significantly altered to the maximum extent practicable. Proactive water quality monitoring data and information should be collected and analyzed pre- and post-land disturbance/development to help ensure long-term human health and safety and to protect streambanks, shorelines, stream channels, riparian areas, wetlands, and aquatic habitat.

It is highly recommended that NPS management measures designed to mitigate hydromodification activities are:

- Clearly thought out to help eliminate the need for revisions during the plan approval process or once a required permit has been issued
- Based on sound scientific principles and water quality monitoring and assessment data
- Designed for watershed hydrology and site-specific conditions (place-based, appropriate and "workable")
- Realistic and provides detailed information to ensure that the plan can be properly and timely implemented
- Somewhat flexible to allow for "mid-stream" changes caused by unpredictable or unknown circumstances

A site-specific management plan should, at a minimum, incorporate detailed site assessment data and information sufficient to:

- Select an efficient and effective BMP, group of BMPs, or "trains" of BMPs to mitigate NPS pollution loadings
- Address various surface and ground water protection and hydrology changes and impacts
- Establish effective erosion and sediment, nutrient and other pollution management controls
- Protect pre-development biological, physical, hydrological and other ecological characteristics as much as possible
- Evaluate and select effective contaminated runoff treatment options
- Protect environmental and human health
- Assess economic feasibility and sensibility relative to land ownership, privacy issues, and land use and reuse options
- Coordinate relevant public and private sector resources, processes, procedures, and funding to protect or restore water hydrology

Hydromodification NPS category management measures and practices, particularly those funded by CWA Section 319 grant funds, should be designed, implemented and maintained to:

- Protect and restore surface waters and groundwaters using a mix of environmentally-protective and economically-sensible measures and education and outreach practices and options that ensure stakeholder buy-in, long term sustainability, and that meet statewide NPS programmatic and Section 319 grant program and project specific goals and objectives
- Target high priority (e.g. Section 303(d) and TMDL pollutants of concern), special designated or outstanding waters of the state
- Enhance environmental, economic, social, and cultural benefits, and communal health and quality-of-life
- Protect, enhance and restore sensitive areas (e.g. drinking water sources, wetlands, aquatic and other biota, wetlands, habitat, etc.)
- Abate or minimize NPS pollutant runoff by restoring impaired streams and watersheds to closely mimic pre disturbance hydrologic and aesthetic conditions (as practicable)
- Abate or minimize NPS pollutant loading impacts using pollution prevention
- Treat NPS stormwater runoff pollutants as near to the cause(s) as practicable using single measures or a "train" of treatment options
- Implement NPS hydromodification components of a watershed-based management plan whenever practicable and economically sensible

The AL NPS Management Program acknowledges that the design, type, and selection of appropriate hydromodification project measures can be site-specific and that NPS pollutant load reduction effectiveness and project implementation success may be variable in duration, scope and scale. Nonpoint source management measures and practices as presented throughout this document are not all-inclusive. The design, types and benefits are expected to expand as hydromodification activities, processes, and management technologies to treat adverse NPS impacts continue to evolve and mature. Implementation of new and innovative measures should continue to be diligently focused on achieving NPS pollutant load reductions, addressing programmatic water quality protection and restoration goals, and meeting state water quality standards. It is reasonable to expect that the public and private sectors will continue to apply enhanced technologies as they are developed and as they become reasonable and available for on-site demonstration or installation purposes.

c. Structural NPS Management Measures

The AL NPS Management Program and Section 319 grant program continues to support the implementation of effective structural measures designed to achieve NPS pollutant load reductions, mitigate NPS pollutant

composition, volume and velocity/peak flows, protect and restore watershed health and water quality, and for impaired waters to meet state water quality standards. The measures and practices presented herein are representative of the types of activities that can be applied successfully to achieve AL NPS Management Program (e.g. meet and sustain state water quality standards) and Section 319 grant-funded project (e.g. mitigate the causes of N, P, and sediment) water quality protection and restoration goals. It is recognized that there is site-specific variability and constraints relative to design, the selection of appropriate measures to intercept polluted runoff before it enters a receiving water (e.g. deposition, infiltration, absorption, filtration, biodegradation, and plant uptake), pollution mitigation effectiveness, as wells as economic considerations.

The importance of proper planning, design, implementation and maintenance of structural NPS pollution management measures cannot be overly stated. It is imperative that all structural measures be appropriately monitored pre-, during, and post-implementation in order to assess site-specific management measure implementation effectiveness (e.g. NPS pollutant load reduction efficacy and project success). Implementation of the "wrong" type, number, and location of a management measures can actually exacerbate NPS pollution problems. Installed NPS pollution control measures must be replaced or retrofitted if water quality does not appear to be improving, protected, or restored. Often, minimizing the extent of land disturbance activities offers the best NPS pollutant runoff mitigation solution (e.g. pollution prevention). In general, it is highly recommended that "treatment train" management systems and processes be implemented to synergistically and economically treat NPS pollutants. As practicable, strategies should address NPS pollution holistically (e.g., relative to the many and varied causes, sources and types of pollutants, areal extent, synergistic effects of multiple stressors or control practices, and the costs associated with treatment). It is acknowledged that multiple and unknown causes, historical loadings, changing land uses, and other anthropogenic alterations to pollutant composition and stream flows rates, velocity, and volumes may exacerbate efforts to definitively quantify NPS pollutant load reductions and program/project implementation effectiveness over time.

The AL NPS Management Program and Section 319 grant program highly recommends that structural measure decision-making processes methodically and deliberately embrace the following concepts:

- Feasibility (is it the right measure/practice or system of measures and practices at the right time and in the right place)
- Effectiveness (will the measure/practice achieve the intended project goal and NPS pollutant load reduction target)
- Costs (will the environmental benefits justify the financial aspects; is there an effective retrofit or less costly alternative or system of practices; are there any long-term maintenance concerns)
- Partnerships (is there adequate local "buy-in" and is all sources of human and financial capital identified and leveraged).

The NPS management measures addressed herein are not all-inclusive and do not preclude stakeholders from designing and implementing other technically sound practices. It is reasonable to expect the public and private sectors will continue to apply enhanced technologies as they are developed and become available for demonstration and installation. In all cases, however, the practice or set of practices that is selected needs to target priority NPS water quality protection and restoration goals and objectives and ensures that state water quality standards are maintained. Structural stormwater control measures typically endorsed by the AL NPS Management Program and Section 319 grant program in Alabama (and most commonly implemented in the southeastern U.S.) to stabilize land surfaces, convey and treat NPS runoff, and protect watershed and water quality health from hydromodification activities are presented in **Table E.4.1** and **Table E.4.2.**

Table E.4.1 Dams and Instream Structural NPS Management Measures

Nonpoint source water quality protection and restoration efforts recommended by the AL NPS Management Program for streambanks, shorelines, beaches, canals, etc., may include but are not limited to the following reclamation, rehabilitation and restoration management measures:

- Proper design, engineering, implementation and maintenance (dependant on hydromodification goals and site conditions):
- Impacts on upstream and downstream water quality and watershed health
- To meet multiple priority and predetermined uses and access to the targeted waterbody
- Ensure adequate flow, water quality and water exchange
- Help control NPS erosion and sedimentation (e.g. reduce turbidity, dredging, snagging, etc,)
- Treat stormwater from the immediate subwatershed or from multiple subwatersheds

- Prevent sloughing/bank failures (establish a 3:1 slope or flatter grade where possible)
- Reduce negative environmental effects of increased numbers of docks and lengthy retaining walls
- Protection of infrastructure and property
- Prevent flooding and attenuate flooding conditions
- Identify and restore riparian and instream habitat
- Routinely conduct management measure effectiveness and needs evaluations on an annual (minimum) basis

➢ Enhance riparian areas or extend and preserve intact buffers:
- Naturally mitigate NPS runoff and potential contamination of a receiving waterbody
- Help achieve priority Section 319 grant program and TMDL pollutant load reductions (e.g. nutrients, sediment and other)
- Trap trash and debris
- Reduce sedimentation to maintain storage capacity (e.g. drinking water source, recreation, irrigation, etc,)
- Provide or enhance food and habitat for littoral (close to the shore) and aquatic species
- Minimize the need for mowing, clearing, and the use of herbicides

➢ Preserve, properly establish and maintain native, natural upland and wetland vegetation as well as submerged aquatic vegetation:
- Enhance littoral zone and wetland area functions and benefits
- Reduce or abate runoff from nonpoint sources
- Protect watershed headwater sources and quality
- Enhance and protect aquatic and terrestrial habitat
- Prevent streambank degradation, sloughing and loss of property and beneficial uses
- Protect infrastructure
- Prevent or minimize eutrophication, algal bloom problems, or an excess of floating plants
- Cover barren areas and naturally protect land disturbance/reclamation areas
- Minimize or eliminate use of herbicides
- Enhance vegetated buffers if additional plantings are needed

Table E.4.2. Riparian Area, Streambank, Stream Channel and Shoreline Structural NPS Measures

Anthropogenic land disturbance activities often disrupt or contradict natural pre-development watershed hydrology. The implementation of structural NPS management measures to protect and restore water quality should try to mimic pre-development land form/contour and stream shape and functions as much as practicable. Nonpoint source water quality protection and restoration management measure recommendations that may be implemented, alone or in combination, to address specific riparian area, streambank or shoreline, stream channel, marine, estuarine and wetland threats and impacts are presented below. Structural management measures and systems should be designed to achieve the best environmentally-protective and economically-sensible NPS pollutant load reduction effectiveness and efficiencies as practicable, especially when public funds are involved. Typical structural measures to mitigate the adverse impacts and threats relative to hydromodification activities in Alabama include but are not limited to:

- Vegetated filter strips and buffer zones
- Filtration enhancements
- Bioretention areas
- Grassed swales or berms
- Rain gardens
- Phytoremediation
- Live staking (native tree species) and fascines
- Planting native grasses, shrubs, and tree species
- Live fascines / brush bundles
- Root wads
- Branch or brush packing, layering, or mattresses
- Permanent sodding and temporary or permanent seeding of bare areas
- Composting and mulching
- Natural fiber material rolls or matting and synthetic geotextiles
- Chemical stabilizers and polymers (soil binders and stabilizers)
- Physical clearing of debris blocking drainage ditches, discharge pipes, and other outlets/inlets
- Establish or re-establish bankfull bench
- Silt fences and hay/straw bale barriers
- Hand clearing of invasive species and underbrush
- Armoring (riprap, gabions, retaining walls, revetments)
- Cross-vanes, J-hook, W-weir
- Weirs, groins, levees and dikes
- Contouring, grading and excavation and deposition

- Liming, fertilizers, soil amendments
- Rock filters, dikes, flumes, check dams, rip rapped outlets
- Ditches, diversion ridges, culverts, drop inlets, cross drains
- Permanent and temporary stream crossings
- Dredging (coastal beach and sand dune re-nourishment)
- Constructed wetlands and enhancements to existing wetlands

It is important to proactively identify specific hydrologic restoration goal and objectives for the structural measures that will be designed and implemented to mitigate nonpoint sources of pollution. All entities involved in the implementation of structural management measures should possess an awareness and knowledge of project expectations relative to water quality improvement, priority NPS pollutant load reductions, and other environmental and economic benefits and outcomes; especially when the expenditure of public funds are involved. Hydromodification management measures to mitigate NPS pollution should be proactive (pollution prevention); however, it is important to implement adequate measures as expeditiously as possible to, wherever and whenever possible, halt ongoing impairments or to mitigate problems that are preventing self-sustaining and dynamic watershed, water body and water quality equilibrium.

A primary goal of the AL NPS Management Program is to restore impaired waters to state water quality standards. The AL NPS Management Program acknowledges that some NPS hydrologic restoration initiatives are unlikely to recreate or return a waterbody/stream/wetland to exacting pre-development conditions and functions (i.e. watershed health and ecological processes are naturally dynamic and urban development and population continues to expand); however; the implementation of structural measures is a critical component of state NPS programmatic and Section 319 grant resource efforts to mitigate the anthropogenic causes of physical, chemical, and biological impacts of NPS pollution and improving the quality of waters of the state. Structural NPS management measures should be designed to meet the hydrologic protection and restoration goals and objectives of a watershed-based management plan and:

- Holistically re-establish the structure and function of a watershed or ecosystem to near pre-development conditions and functions (restoration)
- Establish a hydrologically stable and healthy watershed after an anthropogenic disturbance (rehabilitation)
- Intercept polluted runoff before it enters a receiving water (e.g. deposition, infiltration, absorption, filtration, biodegradation, plant uptake)
- Mitigate an watershed or ecosystem impaired as a result of using or converting its natural resources to serve human purposes (reclamation)

d. Non-Structural NPS Management Measures

Non-structural stormwater controls can effectively manage NPS runoff associated with hydromodification activities and may sometimes be preferred (environmentally, economically, socially, and culturally) over more costly structural measures. The primary non-structural NPS management practice used in Alabama is education and outreach aimed at enhancing both public and private sector awareness and knowledge about NPS pollution, watershed health and water quality protection. The keys to successful programmatic implementation efforts are public and private sector cooperation, collaboration, coordination, and communication. Training, BMP demonstrations, technical assistance, and technology transfer activities continue to focus on:

- Strengthening partnerships and leveraging resources
- Delivery of science-based water quality protection and restoration data and information
- Developing and implementing Total Maximum Daily Loads
- Watershed-based management planning and implementation
- NPS pollution prevention
- Balancing the mining site footprint while preserving natural “green” areas
- Protecting and conserving coastal resources; wetlands; stream corridor function, form and hydrology; riparian areas; public lakes and reservoirs, wellhead protection and groundwater recharge areas, etc.
- Balancing hydromodification issues with environmental and economic sustainability, resilience and quality-of-life issues

The AL NPS Management Program and Section 319 grant program will continue to seek ways to strengthen partnerships and linkages between the public and private sectors. A variety of formal and informal mechanisms may be used to form and sustain partnerships, including memoranda of agreement / understanding, letters of support, cooperative projects, leveraging of funds and other resources, and meetings to exchange NPS data, information, perspectives, and opinions. The ADEM continues to facilitate opportunities to plan and implement effective NPS control measures. Interagency collaborative teams, NPS task forces, representative advisory groups, and program coordination and outreach efforts are effective mechanisms for accomplishing regulatory / non-regulatory linkages. Involvement from federal, state, interstate, regional, and local agencies, industry, academic institutions, landowners, concerned citizens, and others helps to ensure that national and statewide water quality protection goals are well integrated with local environmental, economic stability, and social and cultural goals. Although primarily a voluntary program, the AL NPS Management Program continues to integrate compliance authorities when required to ensure state water quality standards are met.

AL NPS Management Program and Section 319 grant resources continue to implement non-structural management practices to protect and restore water quality, including but not limited to the following practices:

- Strategic planning to protect watersheds and water quality and human health and safety (e.g. watershed-based management, erosion and sedimentation, and pollution prevention; protecting and establishing vegetative areas and stream buffers, etc.)
- Public and private sector partnerships (broad-based and targeted audiences)
- Signage, brochures, web-based media, floor and table top displays and models
- Research, conferences, meetings, and training workshops
- Incentives, recognition programs and awards
- Monitoring data and information collection and distribution to the public
- Permitting, compliance inspections and enforcement; licensing and certification
- Easements, set-backs, and buffer requirements
- Programmatic, project, and site-specific efficiency and effectiveness; accountability and auditing

Non-structural NPS stormwater control practices should:

- Be closely corresponding with a relevant hydrologic modification permit and should be addressed as a component of a holistic watershed-based management plan
- Enhance water quality protection and restoration awareness and knowledge that will hopefully lead to positive, quantifiable improvements in stakeholder NPS pollution attitudes and personal behaviors
- Address pollution prevention
- Be a component of inspection/compliance activities and maintenance
- Consider pollutant composition, management goals, site conditions, project scope and scale, sustainable pollutant removal efficiency and effectiveness, relevant social acceptance, values and interests, economic practicality, and pollutant mitigation success potentials
- Target and sustain management efforts designed to protect and restore watershed characteristics and systems (e.g. riparian areas, hydrology, sensitive areas, aesthetics, green spaces, surface waters, wellhead protection and groundwater recharge, etc.)
- Support efforts to mitigate NPS pollutant causes at or as close to the impaired site or pollutant source as possible
- Integrate management approaches to mitigate NPS water quality and quantity issues (e.g. pollutant discharge volume and velocity)
- Be coordinated with academic / institutional research, resources, and expertise
- Leverage human and financial resources of relevant federal, state and local governments, industry, municipalities, organizations, and others

e. Mechanical Equipment and Vehicle Maintenance

Hydromodification activities often require the usage of heavy equipment; sometimes within the stream channel during restoration, installing in-stream structures, or for permitted dredge and fill operations. Vehicle and equipment (e.g. drag lines, excavators, loaders, dozers, graders, compressor and pumping fluids, fuel storage tanks, etc,) spills and leaks can degrade water quality. The NPS measures presented below are examples of housekeeping measures that can prevent or reduce contaminated runoff. Prevention is generally more cost effective to implement compared to the costs to contain, collect, treat, and dispose of contaminated waste /spills. Frequent equipment inspections, process reviews, signage, a good spill prevention and response plan, and employee education and training can effectively prevent or reduce NPS pollution runoff and impacts to water quality. Examples of equipment and vehicle management measures to address NPS pollutant runoff include but are not limited to the following:

- Equipment waiting to be repaired can leak fuel, oil, hydraulic fluids, and other pollutants that can be picked up by stormwater runoff. Immediately clean up spills and properly dispose of cleanup materials and waste products. Some spills may be considered hazardous waste.
- Label, store and dispose of hazardous materials and fluids according to federal and state regulations.
- Design barriers or retrofit fueling stations with berms to contain accidental spills.
- Properly maintain haul vehicles, check often for leaks, and repair promptly.
- Do not pour waste fluids directly on the ground. Keep storage containers covered.
- Store hazardous materials in secondary containment areas. Protect from rain, and have an emergency spill prevention and response plan in place to keep pollutants from reaching a stream.
- Keep wastes types separated in order to increase recycling options and to reduce treatment and disposal costs
- Train employees about NPS pollution, storm water runoff, and water quality protection.

f. Section 319 Project Success Measures and Indicators

Section 319 grant funded projects may be presented as EPA Section 319 success stories and input to the EPA Grants Reporting and Tracking System (GRTS) database. Water quality data is collected and compiled by ADEM and is useful for NPS project prioritization and targeting, management measure effectiveness monitoring, and permit compliance actions. Water quality data collected by ADEM is publicly accessible in the CWA Section 305(b) Integrated Water Quality Report to Congress, ADEM Water Quality Reports, and Section 319 Grant Annual Reports. Hydromodification project successes in Alabama are directly related to an inclusive mix of partners at multiple public and private sector levels. The AL NPS Management Program continues to identify, build, and sustain cooperative partnerships; and as a result, substantial improvements in NPS pollutant load reductions and water quality protection and restoration are expected to continue.

Section E.4 Voluntary NPS Management Approach

a. Overview

The Alabama NPS Management Program continues to promote the implementation of voluntary NPS control measures and practices (e.g., incentives, technology transfer, technical assistance, education and outreach, etc.) to protect and restore water quality whenever practicable. Nonpoint source water quality impairments associated with hydromodification activities can seriously impact state and community-based environmental, economic, and societal perceptions, conditions and aspirations. The Clean Water Act (CWA) Section 319 nonpoint source grant is a major provider of NPS programmatic implementation resources in Alabama and helps to target impaired waters in meeting state water quality standards as effectively and expeditiously as possible. The voluntary NPS management approach continues to advocate sustained cooperative partnerships and leveraging of human and financial capital to optimally plan, implement, and maintain NPS management measures and practices. Voluntary NPS efforts continue to achieve priority NPS pollutant load reductions (e.g. nitrogen, phosphorus, and sediment) as reported in the EPA Grants Reporting and Tracking System database. The NPS components of legacy hydromodification activities (e.g. dam regulation; flow regulation / modification) addressed by a Total Daily Load may be targeted in using Section 319 grant funds in accordance with grant guidelines and EPA 9-key element watershed-based management plans, and voluntarily implemented relevant to achieving AL NPS Management Program goals and objectives.

Voluntary implementation of NPS measures and practices to protect water quality from NPS impacts associated with hydromodification activities requires proactive planning. The implementation of control strategies should be designed to conserve and restore natural hydrology and ecological benefits while concurrently mitigating water quality causes and threats associated with nonpoint source runoff. Controlling the impacts of NPS pollution from hydromodification activities is often convoluted and is best achieved by implementing control measures and practices that provide multiple environmental, economic, social, and health and safety benefits. The AL NPS Management Program highly recommends that stream and wetland protection and restoration efforts promote and sustain effective and efficient cooperation, coordination, coordination and communication processes among many and varied partners (e.g. agencies, governments, industry, owners, organizations, landowners, and citizens). Section 319 grant funded control measures should target priority pollutant load reductions (sediment and nutrients) and water quality restoration.

Volunteer management practices to protect environmental and human health include, but are not limited to: identifying NPS pollution causes; prioritizing sites for restoration, developing watershed-based management plans, water quality monitoring, education and outreach to enhance citizen awareness and knowledge, posting environmental protection/restoration awareness and public safety and hazards signage, and pollution prevention. Structural measures must be coordinated with federal and state regulatory agencies and local officials and authorities; but can involve volunteer input and resources to install a single NPS control measure or a "train" of infiltration, filtration, retention and detention elements to control NPS pollutant runoff. Additional NPS pollution management strategies are presented in **Table E.4.1**, below.

The human and financial resources required to holistically and successfully implement a statewide voluntary NPS management program to address all adverse hydrologic impacts and threats far exceeds the support that can be provided by any one state resource agency. An AL NPS Management Program priority is to leverage the available resources of all relevant agency, industry, community, academic institution, and site-specific NPS mitigation programs and processes to achieve state water quality standards for all waters of the state. The primary limiting factor continues to relate to inadequate NPS resources (dollars) to monitor and assess water quality and implement water quality protection and restoration projects. A primary source of volunteer incentive funding in is the federal dollars appropriated by Congress to EPA and to the state under CWA Section 319. The Alabama Department of Environmental Management (ADEM) obligates Section 319 funds to implement the AL NPS Management Program. Section 319 funds can be used to treat NPS runoff from "pre-law" abandoned mine lands; but generally only as a component of a watershed-based management plan designed to restore Impaired Waters (primary funding use) or to protect designated Special, Outstanding, and Public Water Supply waters of the state (secondary funding priority).

Table E.4.1 Voluntary NPS Action Items to Protect and Restore Waters Quality

The AL NPS Management Program continues to promote a cooperative voluntary partnership approach to protect and restore waters of the state impaired or threatened by hydromodification activities as follows:

a) Help citizens in areas impacted by hydromodification activities to connect or re-connect environmentally, economically, and socially with their rivers, streams, reservoirs, and other waterbodies, and to work to protect and restore them. Efforts should particularly focus on revitalizing communities that historically have been particularly and disproportionately, underserved or economically distressed (e.g. the Alabama Black Belt region. Efforts will continue to be made to develop and enhance NPS pollution and water quality-based education and outreach in order to progressively improve the personal and communal health, safety and "livability" intangibles (e.g. personal and corporate prosperity, comfort and satisfaction) from the impacts of NPS pollution.

b) Identify, establish, enhance and maintain strong and effective community-based partnerships. Several public and private sector resources are available in Alabama to help communities prevent or reverse neglect, energize partnerships, and programs to restore and protect surface waters and groundwaters.

c) Enhance opportunities to communicate NPS programs; coordinate technology transfer, innovations, and technical assistance; and provide incentives and resources to implement protective and beneficial actions. Collaboration, cooperation, communication, leveraging of resources and identifying local commitments, interests, and assets are important to volunteer sustainability and success and will promote early and sustained citizen interest and actions.

d) Protect and restore the environmental health and economic importance of NPS impaired waters and their watersheds. The primary aspiration of the AL NPS Management Program is to address NPS pollutant loadings to protect and restore water quality; however, it is recognized that local historical, social aesthetical, economic and recreational significances must also be acknowledged in order to ensure watershed, ecosystem, and community-based health and sustainability.

e) Address the physical, chemical and biological challenges of NPS degraded waters using a holistic watershed-based management approach, whenever and wherever doable and practicable. Incentives and education and outreach efforts should continue to be provided, leveraged, and coordinated to help the public and private sectors protect and restore water quality (and quantity).

f) Promote NPS programmatic efforts including incentives, education and outreach, BMP retrofits, emerging technologies, and innovations, technology transfer, and technical assistance.

g) Sustain NPS partnerships and leverage water quality and water quantity funding to promote NPS programmatic sustainability and success.

h) Protect and restore water quality and healthy ecosystems relative to economic competitiveness and job creation. Section 319 funded resources will continue to stress the importance of clean and safe waters to multiple and varied public and private sectors.

i) Sustaining strong and active partnerships is essential. Hydromodification priorities and plans should be systematically aligned and deliberation given to issues that may emerge as a result of shifts in population and urban sprawl (e.g. drinking water quantity and quality).

j) A strategic focus of the AL NPS Management Program is to increase, document, and evaluate statewide legacy hydromodification effects on water quality and to promote restoration performance and accountability. Progress indicators and success measures are designed to provide meaningful outcomes and include but are not limited to:

- Interim progress toward protecting and restoring water quality and hydrology
- Protection of high quality surface and groundwater/drinking water sources
- NPS pollutant load reductions
- Strategies and success of implementing new, emerging or innovative NPS structural controls

- Enhanced education to increase general public knowledge and awareness
- Programmatic support such as the development and implementation of watershed-based management plans
- Project and BMP-specific implementation tracking

k) Water quality monitoring, analyses, reporting, and data distribution and availability

l) Inspections and compliance actions (regulatory backup authorities to the volunteer NPS management approach)

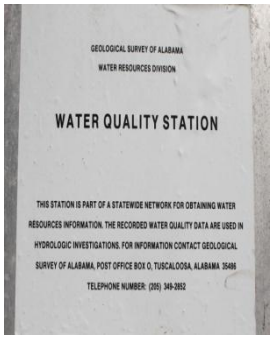
It is essential that water quality protection and restoration strategies to engage the public and private sectors (and implement the AL NPS Management Program) be clear, on target, and achieves local "buy-in." Watershed and water quality protection and restoration does not usually lend itself to a one-size-fits-all approach. In addition, hydromodification principals, standards, and ideals of various entities may differ between one another or from one area/community to another. In order to sustain active and significant volunteer participation and input, regular communication is essential and must continue through all phases of NPS water quality protection and restoration activities.

Section E.5 Regulatory NPS Management Approach

a. Overview

Hydrologic modification activities and maintenance of existing structures and features such as stream bank restoration, stabilizing eroding shorelines, beach and sand dune renourishment, dredging canals and marinas, dam construction and instream flow controls, etc., may require a federal, state, and/or local permit, certification or authorization to conduct a hydromodification activity that will impact water quality. The following component is not comprehensive, but attempts to categorize the overall functions of several relevant federal and state agencies and is intended only as a quick reference for specific hydromodification and water quality impact issues. All entities implementing projects that may contribute to NPS pollution loadings and impair water quality must ensure that the activity is in compliance with applicable hydromodification rules, regulations, programs, and guidelines - some that may continue to evolve (e.g. EPA/US Army Corps of Engineers "waters of the U.S." Clean Water Act jurisdictional rulings, Federal Energy Regulatory Commission hydroelectric dam re-licensing; AL/GA/ FL "tri-state water wars", USDA-NRCS Farm Bill incentives, federal and state aquatic species protection, environmental justice, irrigation, water supply protection, coastal zone management and coastal permitting/programs , etc.).

Stormwater runoff associated with hydromodification activities are regarded as a discernable and potential "point source" of pollution (CWA Section 502(14). Point source discharges are regulated by EPA and ADEM under the National Pollutant Discharge Elimination System (NPDES) permitting program. Federal and state regulations regarding effluent and stormwater discharges operators to apply for and obtain NPDES permit coverage prior to conducting land disturbance activities (such as stream restoration)). As of February 1, 2013, operations less than 5 acres in total land disturbance are permitted by ADEM under a General Permit (i.e., no longer registered under ADEM Administrative Code r. 335-6-12 or "Chapter 12"). Registration does not authorize land disturbance activities in the coastal areas of Baldwin and Mobile counties until coastal consistency certification or permit coverage is obtained per ADEM Administrative Code Chapter 335-8-1 and Chapter 335-8-2. Activities greater than 5 acres are required by EPA and ADEM to obtain and implement an Individual or General NPDES construction stormwater permit. The permit requires the operator to implement effective best management practices designed to ensure that stormwater runoff discharged from the permitted site does not degrade surface waters and groundwaters. Non-complying activities are subject to EPA and ADEM regulatory actions and processes. In some instances, alleged water quality standard's violators may choose to reach an agreement to resolve a regulatory enforcement action by voluntarily agreeing to implement an environmentally beneficial Supplemental Environmental Project (SEP) in exchange for direct monetary payment of the violation penalty.


GEOLOGICAL SURVEY OF ALABAMA
WATER RESOURCES DIVISION

WATER QUALITY STATION

THIS STATION IS PART OF A STATEWIDE NETWORK FOR OBTAINING WATER RESOURCES INFORMATION. THE RECORDED WATER QUALITY DATA ARE USED IN HYDROLOGIC INVESTIGATIONS. FOR INFORMATION CONTACT GEOLOGICAL SURVEY OF ALABAMA, POST OFFICE BOX O, TUSCALOOSA, ALABAMA 35486
TELEPHONE NUMBER: (205) 349-2852

If voluntary NPS pollution management strategies do not appear to be effectual (as indicated by science-based water quality monitoring and assessment data), statuary mechanisms provide ADEM with enforceable back-up authorities to ensure clean and safe waters. The State of Alabama is authorized by EPA to administer federal environmental

laws and compliance mechanisms at the state level. State oversight is consistent with legislative intent of the state's Administrative Code (Division 335-1) that created ADEM. Section 301(a) of the Clean Water Act (33 U.S.C. Section 1311) prohibits the discharge of pollutants by any person (excepting compliance with Sections 302, 306, 307, 318, 402, and 404). Section 402 (33 U.S.C. Section 1342) established the National Pollutant Discharge Elimination System (NPDES) permit program. A facility that will discharge or have the potential to discharge stormwater is required to obtain an NPDES permit issued by ADEM or EPA. The ADEM enforces applicable provisions of the NPDES permit program to control both point source and nonpoint sources of pollution to surface waters and to groundwaters. Storm drains, pipes, and ditches that collect or convey stormwater runoff to waters of the state (or the U.S.) must obtain an NPDES Individual or General Permit. All stormwater permits require structural and nonstructural control measures to reduce pollutant loads to the maximum extent practicable to protect water quality. A General Permit requires a Storm Water Pollution Prevention Plan (SWPPP) to be developed and implemented that prohibits or reduces unavoidable polluted runoff. The ADEM construction stormwater General Permit requires the development and implementation of a Construction Best Management Practices Plan (CBMPP) in accordance with the Alabama Handbook for Erosion Control, Sediment Control and Stormwater Management on Construction Sites and Urban Areas. The AL NPS Management Program highly recommends the coordination and integration of applicable components of a SWMPP with the development and implementation of a 9-key element watershed-based management plan as required by Section 319 grant guidelines; and as applicable, CZARA (CWA Section 6217) NPS management measures prescribed in Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (EPA 840-B-92-002 January 1993). An overview of environmental requirements, self-audit checklists, and resources that may be helpful for land disturbance activities associated with the hydromodification activities is presented in Managing Your Environmental Responsibilities: A Planning Guide for Construction and Development (EPA/305-B-04-003, EPA Office of Compliance. April 2005).

In addition to enforcing Alabama Environmental Regulations and Laws, the ADEM administers other federal programs aimed at preventing, diminishing, or abating stormwater runoff from nonpoint sources. Integration of the CWA Section 303(d), Section 319, TMDL, Drinking Water, and Groundwater programs is essential to protecting and enhancing water quality and environmental and public health. Coordination of compliance inspections, enforcement and corrective actions programs (e.g. RCRA, CERCLA, UIC processes) also continues to strengthen the effectiveness of the AL NPS Management Program.

The Alabama NPS Management Program and Section 319 grant program supports a holistic, coordinated stormwater runoff and water quality protection approach. The intent is to address all phases of hydromodification activities including:

- Pre- and post-hydrologic and ecological studies and monitoring
- Identifying local site-specific and broad-based watershed environmental and economic impacts
- Planning, design, implementation, operation and maintenance of structural controls
- Planning and implementation of nonstructural practices
- Retrofitting existing or failing and inadequate control measures
- Evaluating the performance of structural measures and nonstructural practices and implementation success
- Measuring and assessing NPS pollutant load reductions and meeting state water quality standards
- Meeting quantifiable environmental and economic indicators and measures of success
- Ensuring NPS programmatic accountability in terms of on-the-ground actions and water quality protection

A complementary Section 319 funded regulatory/voluntary NPS management approach is particularly appropriate for hydromodification activities from which contaminated runoff may discharge to waters of the state that are listed as impaired on CWA Section 303(d) lists, impact the implementation of a nonpoint source TMDL, threaten Outstanding Alabama Waters (ADEM Administrative Code 335-6-10-.09) and/or waters assigned a special designation in accordance with ADEM Administrative Code 335-6-10-.10. In addition, the AL NPS Management Program and the Section 319 grant program will continue to coordinate the planning and implementation of coastal zone / marine resource extractive activities (e.g. dredge and fill; sand and gravel mining, wetland protection, etc.) as applicable to CZARA (CWA Section 6217) management measures prescribed in Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (EPA 840-B-92-002 January 1993).

The U.S. Army Corps of Engineers (COE) requires all land disturbance operations that discharges or deposits overburden, dredged, or fill material into a "navigable" body of water, including streams and wetlands, to obtain a CWA Section 404 permit. This regulatory requirement is designed to ensure that the permittee evaluates the effects of dredged disposal on different streams within the permit boundary and that the discharge of fill does not degrade threaten or endangered species and habitat; does not violate state or federal water quality standards, nor contributes to the significant degradation of waters of the United States. The Corps has also compiled an inventory of dams in Alabama.

The State Lands Division (SLD) of the Alabama Department of Conservation and Natural Resources provides oversight of hydromodification activities conducted on instream / state-owned lands. The SLD (Administrative Code Chapter 220-4-x) also manages state-owned submerged lands including navigable water bottoms, coastal bays and offshore state waters.

Active and abandoned surface mining operations (e.g. land disturbance, mining land relocation of streams, slurry holding ponds and dams, acid mine drainage, etc.) can have significant impacts on the hydrology of a watershed. The Alabama Surface Mining Commission (ASMC) is the state's lead Title V *regulatory* authority (Administrative Code of Alabama 1975. Chapter 880-X-x) for administering active coal mining operations in Alabama. The Alabama Mining and Reclamation Division (AMRD of the Alabama Department of Labor (ADL) is the state lead agency for administering the Title IV *abandoned* mine lands (AML) program (i.e. mitigating hazards associated with "pre-law" coal mines abandoned before 1977).; administering "non-fuel" state ore and mineral surface mining site permits and overseeing the development and implementation of comprehensive reclamation plans to ensure that disturbed sites are properly reclaimed in accordance with the Alabama Surface Mining Act of 1969 (Act 99-579, as amended) and Open Pit and Quarry Safety Rules of Alabama (ADL Administrative Code Chapter 480-3-4) regulations. The ASMC and AMRD partners with the Mid- Continent Region - Birmingham Field Office of the U.S. Department of Interior: Office of Surface Mining, Reclamation and Enforcement (OSM) to protect citizen, health and safety and the environment from pollution impacts as surface coal mining operations progress and as surface coal mined lands are reclaimed (30 CFR Chapter VII; Title 30 Part 901). The OSM also has authority and responsibility for overseeing the reclamation of abandoned coal mining lands and impacts of coal mining such as acid mine drainage. Federal OSM abandoned mine land reclamation activities do not extend to addressing instream sand and gravel mines, clay pits or ore and mineral mining and quarries. The OSM also enforces federal laws and regulations, provides oversight (e.g., Directives REG-8, AML-22, REG-23, INE-35), and offers guidance to the State relevant to the Surface Mining and Control and Reclamation Act of 1997 (SMCRA or Public Law 95-87).

The Federal Energy Regulatory Commission (FERC) is responsible (since 1977) for licensing new hydroelectric industry construction projects, re-licensing (or granting exemptions from licensing), and providing oversight of existing project operations on streams and natural waterbodies that Congress has jurisdiction to regulate. The FERC is also responsible for conducting environmental monitoring to conserve and protect natural waterways and wildlife, and regulating the interstate transmission of energy sources (oil, natural gas, electricity). Whereas FERC oversees *federal* dam safety inspections; the State of Alabama has no formal state dam inventory, safety, or inspection program, although the Geological Survey of Alabama (in partnership with ADCNR and NOAA) has made some progress to address with the, Dam Inventory and Inspection, Mobile and Baldwin Counties, Alabama: A Project Summary (Open-File 0705.) report in 2007. The design, construction and maintenance of surface mining dams and impoundments (and stream re-location) are provided by the Office of Surface Mining Dam Safety Program and Department of Labor - Mine Safety and Health Administration.

Hydromodification and NPS water quantity issues relative to surface waters, groundwaters and redirected flows are under the authority of the Alabama Office of Water Resources; road and bridges for vehicle conveyance is under the purview of the Alabama Department of Transportation and Federal Highway Administration. The ADEM responds to releases of hazardous material spills and emergencies in partnership with EPA and the U.S. Coast Guard.

Concerns relative to activities that may impact endangered or threatened species or impair critical habitat should be directed to the U.S. Fish and Wildlife Service, National Park Service, U.S. Forest Service, and the Alabama Department of Conservation and Natural Resources.

b. Local Requirements and Permitting

In addition to federal and state agency statuary authorities, some counties or municipalities in Alabama may develop local regulatory/compliance conditions relative to hydromodification projects; for example, the City of Auburn's stream buffer ordinance and the City of Opelika's stormwater management and source water source protection ordinance for the Saugahatchee Watershed. Local set-back, monitoring and other development requirements are generally designed to:

- Protect and restore natural hydrology or diminish legacy impacts of surface and/or groundwaters
- Protect drinking waters from airborne and surface water runoff threats or on-going contamination
- Prevent or reduce land disturbance NPS runoff (areal extent and severity)
- Improve upon BMP design, inspections, and maintenance or new and retrofit management measures
- Protect and restore sensitive ecological areas (wetlands, beaches/coastal areas, estuaries, etc.)
- Protect and restore natural flora and fauna (populations and habitat) and prevent the spread of invasive species
- Promote local quality-of-life issues (human health and safety, noise abatement, economic sustainability, etc.)
- Ensure effective and timely inspections and implementation of NPS management measures

The AL NPS Management Program supports a voluntary approach to protect and restore water quality; however, local authorities may opt to develop and enforce local hydromodification activities; especially if the project may adversely impact or threaten a drinking water source. It is highly likely that local authorities will need to obtain local approval through the state wide legislative approval process. The AL NPS Management Program recommends that EPA model ordinances language and templates be considered by local authorities to help them make locally-specific environmental and human health protection and safety decisions relevant to, but not limited to: stormwater operation and maintenance, ground and surface water protection, aquatic buffers, erosion and sediment control, and illicit discharges. County and other local governing units in Alabama may develop their own language and compliance mechanisms and processes, but doing so does not relieve them from being subject to federal and state hydromodification activity statues, enforcement actions and oversight.

c. Supplemental Environmental Projects

The Supplemental Environmental Project (SEP) program administered by ADEM is designed to enhance environmental quality and increase environmental protection awareness. It provides an opportunity for a respondent in an enforcement action to negotiate an SEP in return for a reduction in an administrative penalty. Selected projects must minimize risks and improve public health and the environment beyond that which is required by being compliance with applicable statutes. In addition, there must be a relationship between the underlying enforcement action and the human health or environmental benefits that will result. Key project categories that may qualify as a SEP include pollution prevention and reduction, planning, and preparedness (see **Table E.5.1**). Approved SEP projects may be narrowly focused or include a mix of activities and practices.

Table E.5.1 SEP Activities that Support AL NPS Management Program Goals and Objectives

• Purchase monitoring kits or replenish supplies for volunteer water quality monitoring programs and funding opportunities for citizens to receive certification training
• Restore natural stream function and hydrology, water quality, and aquatic habitats
• Install or retrofit measures to reduce NPS runoff velocity and volume to protect streambanks
• Install vegetation/ forested areas to help restore an impaired streambank or riparian area and to treat/filter contaminated stormwater runoff
• Reduce erosion and stream bank sloughing/failures to enhance aquatic species population, diversity and habitat
• Purchase, donate, develop or restore lands for public parks and natural green space areas
• Remove litter, garbage and solid waste from streams, roadsides, and environmentally-sensitive areas
• Develop, restore or enhance constructed wetlands and biofiltration areas to collect and treat contaminated runoff
• Provide water quality protection and restoration classroom materials and training to teachers and students
• Develop or enhance school outdoor environmental study areas and learning centers
• Fund teacher/student field trips to observe active and passive hydrology and water quality protection and restoration measures

- Provide funds, protective clothing, or equipment for hazardous material safety, use, and spill training
- Provide funding to increase public awareness and knowledge of environmental laws, regulations, rules, and programs
- Sponsor an award program to publically recognize outstanding protection and restoration efforts
- Help restore a "brownfields" site for use as a publically safe and healthy recreational-use area

Section E.5.1 Nonpoint Source Management in Alabama's Coastal Zone

The Coastal Nonpoint Pollution Control Program describes *enforceable* polices and mechanisms to implement NPS pollution controls. The program was established by Congress in 1990 under the Coastal Nonpoint Pollution Control Program (Section 6217). It is jointly administered by the National Oceanic and Atmospheric Administration (NOAA) and the Environmental Protection Agency (EPA). The Alabama Coastal Area Management Program is jointly administered by ADEM and the Alabama Department of Conservation and Natural Resources (State Lands Division - Coastal Section) to mitigate NPS pollution impacts to estuaries, beaches, the Gulf of Mexico, and marine resources along coastal Alabama (Baldwin and Mobile counties). Section 6217 requires states and territories with approved Coastal Area Management Programs to develop state Coastal Nonpoint Pollution Control Programs. Coastal NPS pollution management measures must conform to those illustrated in EPA Guidance (EPA 840-B-92-002 January 1993) and must address agriculture, forestry, urban areas, marinas, hydromodification (shoreline and stream channel modification), and loss of wetlands and riparian areas. Implementation of NPS management measures include permitting programs, zoning, enforceable water quality standards, and other general environmental laws and regulations. Voluntary measures must be backed up by appropriate enforceable compliance regulations.

The Alabama Coastal Area Management Program (ACAMP) was approved and has been in effect since 1979. It is designed to comprehensively promote, improve and safeguard coastal zone lands and waters while preservin g, enhancing, and develop ing coastal natural resources. The enforceable policies of the program are used to regulate various activities on coastal lands and waters seaward of the contiguous 10-foot contour in Baldwin and Mobile Counties. The ACAMP is a joint effort of the Alabama Department of Conservation and Natural Resources - State Lands Division (ADCNR-SLD) and the ADEM Coastal Programs. The ADCNR-SLD is responsible for planning and policy development and ADEM is responsible for permitting, monitoring and enforcement activities (ADEM Division 8 Coastal Programs Rules: ADEM Admin. Code R 335-8).

A primary function of ADEMs coastal program includes issuing state water quantity certifications and ascertaining federal coastal consistency for projects and activities requiring federal permits to conduct dredge and fill/disposal activities (e.g. sand dredging to restore eroded beaches and dunes, maintaining canals, channels, marinas, etc.) and infrastructure (e.g., transportation corridors, dams, levees; piers, bulkheads, instream sand and gravel mining, natural resource exploration and production, etc.). The U.S. Army Corps of Engineers (Mobile District) and EPA (Region 4) may prohibit coastal projects or place restrictive conditions on a permit (e.g. CWA Section 404). In addition, ADEMs Coastal Program rules require review, permitting, or certifications of coastal zone activities including:

- Siting of buildings and other facilities
- Dredging and filling of state water bottoms and wetlands
- Beach and dune construction projects
- Drilling and operation of groundwater wells with a capacity of 50 gpm or greater
- Development and subdivision of properties greater than five (5) acres in size
- Other activities which may have an impact on coastal resources

The Coastal NPS Program is inextricably linked to the ADEM Alabama Coastal Programs, statewide Alabama NPS Management Program, the state's CWA Section 319 nonpoint source grant program, and the EPA Healthy Watershed Initiative (2011 as revised or amended). As applicable to local conditions and needs, coastal NPS management measures and programmatic activities are at least equivalent to those endorsed by the statewide AL NPS Management Program. Efforts are mutually coordinated and leveraged by ADEM staff to ensure programmatic coordination, sustain partnerships, and to implement NPS control measures. Enforceable authorities to implement the CZARA 6217 coastal program are provided by ADEM Coastal Area Management Program (Division 8) rules. In addition, a variety of voluntary management program strategies are used to indicate progress and success, including but not limited to: watershed-based management plan development and implementation, agency, industry, and private sector partnerships, volunteer groups and programs, education and outreach, pollution prevention, financial incentives, environmental monitoring and tracking, and local regulations and ordinances.

Local, state, and federal coastal zone entities continue to partner together to enhance the ecological and economic health and benefits of the Gulf of Mexico. Multi-state and multi-agency coastal NPS management partners include EPAs - Healthy Watersheds Initiative (within Mobile Bay National Estuary Program framework),the Gulf of Mexico Alliance, and the Gulf of Mexico Initiative. Of significant relevance to coastal protection and restoration is the Resources and Ecosystems Sustainability, Tourist Opportunities, and Revived Economies of the Gulf Coast States Act of 2012 (RESTORE Act), a federal response to the 2010 Deepwater Horizon oil spill. The RESTORE Act established a Gulf Coast Ecosystem Restoration Council composed of the governors from five Gulf States, the Secretaries from the U.S. Departments of the Interior, Commerce, Agriculture, and Homeland Security as well as the Secretary of the Army and the Administrator of the U.S. Environmental Protection Agency. The Council is chaired by the Secretary of Commerce. The RESTORE Act also established the Gulf Coast Restoration Trust Fund for programs, projects, and activities aimed at restoring and protecting the environment and economy of the Gulf Coast region. Response and recovery information and links to federal, state and local partners is provided at RestoretheGulf.gov, the official federal portal for the 2010 Deepwater Horizon oil spill. The AL NPS Management Program, CZARA 6217, and Section 319 grant-funded coastal NPS management efforts benefit from these partnering opportunities by leveraging resources to effectively and efficiently monitor and assess, plan, implement and manage applicable NPS coastal water quality protection and restoration goals, objectives, measures, and practices. Public and private sector coordination of adaptable, integrated, and system-based approaches should help to ensure that NPS control measures are appropriately selected, installed and maintained. Integral to long-term NPS programmatic implementation success is continued and effective communication, collaboration, and cooperation. Establishing and maintaining inclusive public and private sector partnerships, achieving priority pollutant load reductions, and meeting state water quality standards will continue to provide long-term measures and indicators of coastal hydromodification impact and restoration success.

Of particular importance are Alabama Coastal Nonpoint Pollution Control Program efforts to address NOAA and EPA Interim Decision Document recommended actions. Efforts included the *Coastal Alabama Hydromodification, Wetlands and Riparian Areas Technical Update* (March 2009) in support of Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters - 1993); the *Coastal Counties Wetlands Conservation Plan* (Final Draft, March 31, 2001) - a cooperative Coastal Counties Wetlands Working Group product developed in support of the Alabama Coastal Area Management Program by the Dauphin Island Sea Lab Coastal Policy Initiative for the ADCNR - Coastal Programs with NOAA funding, and which depicts concerns and potential management recommendations to achieve wetlands management objectives in coastal Alabama; and *Alabama's CNPCP IDD Response and Strategy for Final Program Approval: Chapter VIII: Wetlands, Riparian Areas, and Vegetated Treatment Systems* (May 11, Draft) that is used to identify and implement opportunities to address problems in wetlands/riparian areas that are not covered under existing permit authorities. These documents are available through the ADEM Control Programs /Alabama Coastal Area Management Program.

The management of coastal zone hydromodification threats and impacts should continue to be linked to the vision, guiding principles, goals and objectives of the Healthy Watersheds Initiative National Framework and Action Plan 2011 (EPA-841-R-11-005). The Plan is a living document that the public and private sectors use to help meet applicable coastal zone goals and objectives of the FY2011 - 2015 EPA Strategic Plan.

Many of the same NPS management measures and practices that are appropriate for statewide hydromodification activities are also conducive to coastal zone management. Coastal NPS management should use an integrated approach of applying a combination of both natural vegetative and hard-engineered measures, including but not limited to the following site-specific characteristics and conditions:

- Protection of infrastructure and personal property and human health and safety
- Upstream/downstream, reservoirs, wetlands, estuary, bays, and marine and other water resource environmental and economic impacts
- Improving on the traditional trapezoidal shape of armored stormwater drainage systems
- Grading back steep and highly erodible banks and planting native vegetation as protective covers
- Installing or enhancing a natural or constructed wetland
- Establishing vegetated bankfull benches (on at least one side of a stream bank)
- Connecting canals and drainage systems so that they do not terminate at a dead end in order to improve water flow, water circulation, and dissolved oxygen
- Not conducting dredge and fill operations during fish and shellfish migration periods or near nesting and habitat areas for waterfowl, sea turtles, beach mice, sensitive ecological areas, etc.
- Reducing velocity, volume and shear stress on streambanks and channels from excessive storm flows
- Restoring stream channels to improve water quality and to connect floodplains and flood prone areas (also to establish and enhance fish and wildlife travel corridors and connectivity)
- Increase channel width with respect to channel depth in order to reduce shear stress and erosion and sedimentation

Section E.6 Drinking Water, Groundwater and Well Head Protection

Many people in urban areas assume that adequate supplies of high quality drinking and commercial use waters are always available. Drinking water supplies (e.g. surface water impoundments, groundwater aquifers, and private wells) may be susceptible to NPS pollution (e.g. sedimentation, nutrients, chemicals, etc.) associated with hydromodification activities and therefore, source waters supplies and groundwater recharge areas must be diligently protected for public health and to promote and sustain economic growth and development. The AL NPS Management Program and the Section 319 grant program share common water quality protection and restoration goals with the ADEM Drinking Water and Groundwater programs. The Clean Water State Revolving Fund and the Drinking Water State Revolving Fund as administered by ADEM may provide loans at below market interest rates to address source water protection. Examples of fundable CWSRF water quality projects include mitigation of nonpoint sources of pollution (e.g. brownfield contamination cleanup; protection and restoration of sensitive ecological areas such as wetlands and estuaries). In addition, the EPA encourages states to consider the effects of climate change on drinking water quality and availability. The EPA Office of Ground Water and Drinking Water and associated websites and links are recommended sources of information regarding drinking water source protection. Although drinking water protection are primarily "point source" regulated programs, the CWA Section 319 grant program may provide resources and promote opportunities to facilitate cooperative point source/nonpoint source program partnerships between federal and state agencies, public water supply entities, and other public and private sectors targeting nonpoint t sources of pollution associated with hydromodification activities. Sustained communication, coordination, and collaboration are essential NPS hydromodification category watershed health and water quality protection and restoration elements.

Section E.7 Resources for Section 319 Project-Specific Best Management Practices

Section 319(b) (2) of the CWA requires states to include a list of BMPs in their NPS management programs that will:

a) Be implemented to reduce NPS pollutant loads from each NPS category and sub-category; and,
b) Contribute to significant NPS pollutant load reductions to navigable waters or prevents waters from meeting water quality standards and goals of the Clean Water Act.

The ADEM obligates Section 319 grant funds to implement NPS pollution management measures and practices to restore impaired waters of the state to state water quality standards, use classifications, and beneficial uses. Hydromodification projects may apply one or more structural measures or non-structural control practices relative to

NPS pollutant cause, site location, site condition, pollutant characteristics, and NPS priority pollutant load reduction target. Typical implementation of NPS mitigation measures and practices include education and outreach, attenuation of runoff velocity and volumes, protection and restoration, and demonstration of new and improved water quality technologies. These efforts help to ensure that:

- Chemical, physical and biological integrity for waters of the state are adequately protected, restored and maintained
- Programmatic goals and objectives of the *voluntary* statewide AL NPS Management and *regulatory* Coastal NPS Management programs are effectively, efficiently, and economically achieved and sustained
- State water quality standards and beneficial uses continue to be met
- Economic growth, human health, and social/environmental quality-of-life aspects that are impaired or threatened by nonpoint sources of pollution are improved

The hydromodification resources listed below are recommended to help the public and private sectors plan, install, and maintain NPS management strategies and techniques to protect waters of the state. Any mention of trade names, products, or services in these resources does not convey EPA or ADEM approval, endorsement, or recommendation. Federal and state agency rules, regulations, laws, guidelines, recommendations, and permit requirements may be applicable and will supersede voluntary processes and references listed below.

Hydromodification and stream restoration measures using Section 319 grant funding should be implemented and maintained as applicable and practicable, in accordance with the following guidelines, principles, techniques, and technologies. The following measures, education and outreach and training resources may also be useful to Section 319 project partners to help identify, develop and plan watershed, water quality, and NPS protection and restoration practices and activities. Nonpoint source programmatic recommendations include but are not limited to:

National Management Measures to Control Nonpoint Source Pollution from Hydromodification – a reference resource for the design, selection, application, and maintenance of NPS management measures (EPA 841-B-07-002. July 2007)
Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters, (EPA-840-B-92-002, January 1993) describes management measure performance expectations for the coastal zone management program as prescribed by Section 6217(g) of the Coastal Zone Act Reauthorization Amendments of 1990 (EPA 840-B-92-002, January 1993)
Hydromodification Chapter Factsheets (EPA) -discusses management measures for coastal nonpoint sources
Section 6217(g) of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) (EPA 840-B-92-002, January 1993) - addresses nonpoint pollution problems in coastal waters
Clean Water Act (CWA) Section 319 and Section 319 grant guidelines – provides for federal leadership to help focus state and local nonpoint source efforts
Handbook for Developing Watershed Plans to Restore and Protect Our Waters - (EPA 841-B-08-002, March 2008) - handbook to develop and implement watershed plans to meet water quality standards and protect water resources
1987 Corps of Engineers Wetland Delineation Manual and Regional Supplements - hydrophytic vegetation, hydric soils, and wetland hydrology
Community-based Environmental Protection - A Resource Book for Protecting Ecosystems and Communities (EPA 230-B-96-003, Sept 1997) – presents broad based options and recommendations from other parts of the country
Managing Your Environmental Responsibilities: A Planning Guide for Construction and Development (EPA/305-B-04-003; EPA Office of Compliance; April 2005) - an overview of environmental requirements, self-audit checklists, and resources that may be helpful for hydromodification land disturbance activities
Stream Corridor Restoration – Principles, Processes, and Practices (The Federal Interagency Stream Restoration Working Group (Oct 1998; Rev. August 2001) -guidance to enhance the art and science of natural channel design in Alabama
Applied River Morphology (David L. Rosgen, Wildland Hydrology) - highly recommended reference resource to enhance the art and science of natural channel design in Alabama
Compensatory Mitigation for Losses of Aquatic Resources; Final Rule (CFR Vol. 73, No. 70; April 10, 2008) - USACOE (40 CFR Parts 325 and 332) and EPA (40 CFR Part 230) - provides national criteria and consistency relative to establishing, use, and operation of the compensatory stream mitigation approach
Regional Internet Banking Information Tracking System (RIBITS) - upland riparian buffers and wetland restoration and enhancement mitigation / conservation bank actions, ecological monitoring /assessment, and success performance standards and criteria
Alabama Low Impact Development Guidebook - (ACES) provides recommendations for professionals seeking to plan, design, construct, plant, and maintain stormwater control measures
USDA-NRCS Field Office Technical Guides (FOTG) Sections 1-5: General References, Soil and Site Information, Conservation Management Systems, Practice Standards and Specifications, and Conservation Effects (Alabama-specific)
Alabama Handbook for Erosion Control, Sediment Control, and Stormwater Management on Construction Sites and Urban Areas (Soil and Water Conservation Committee) - provides voluntary and regulatory guidance for preventing and minimizing erosion and sedimentation and related stormwater runoff water quality problems
Controlling Nonpoint Source Runoff Pollution from Roads, Highways and Bridges (EPA-841-F-95-008a, August 1995) - management of hydrologic impacts associated with transportation corridors

The EPA National Estuary Program (National Estuary Program - Mobile Bay - a non-regulatory program that promotes wise stewardship of the water quality characteristics and living resource base of the Mobile Bay estuarine system. A Comprehensive Conservation Management Plan has been developed and provides a blueprint for conserving the estuary.
Alabama Environmental Regulations and Laws (ADEM) - compliance inspections, enforcement and corrective actions aimed at preventing, diminishing, or abating nonpoint source and strengthening the effectiveness of the AL NPS Management Program
CWA Section 303(d), TMDL, Outstanding Alabama Waters, Outstanding National Resource Waters, Treasured Alabama Lakes, Drinking Water, Groundwater, CERCLA, RCRA, UIC, Water Quality Inventory Report (ADEM) - programs protecting and enhancing water quality and protecting environmental and public health.
Coordination of compliance inspections, enforcement and corrective actions programs (e.g. also continues to strengthen the effectiveness of the AL NPS Management Program.
EPA model ordinances and Emergency Planning and Community Right-to-Know Act - help local authorities make locally-specific environmental and human health protection and safety decisions
Pollution Prevention - Laws and Policy (EPA) – preventing or reducing NPS pollution at the source
Alabama Clean Water Partnership – public and private sector entities who cooperatively protect and preserve the state's water resources and aquatic ecosystems
FEMA and the Department of Homeland Security (dam safety and emergency planning);U.S. Department of Agriculture (dam hazard classification - Technical Release No. 60); Federal Energy Regulatory Commission licensing / relicensing hydroelectric industry construction projects
National Stormwater Calculator - a desktop tool that estimates the annual amount of rainfall from a specific site based on local site conditions, slope, land cover and historical rainfall record
National Stormwater BMP Database - an American Society of Civil Engineers website dedicated to BMP effectiveness information
Water Quality Research - this EPA website presents water quality BMP research and development technologies and systems
Agricultural Act of 2014 (Farm Bill Wetland Reserve Program and Wildlife Habitat Incentive Program (WHIP) and Executive Orders associated with No-Net-Loss and Migratory Bird Protection - land use activities subject to wetland protection and restoration provisions
Alabama's Best Management Practices for Forestry (Alabama Forestry Commission) - guidelines and recommendation to manage and protect forested wetlands
Alabama Coastal Programs (ADEM) and Coastal Area Management Program (Alabama Dept. of Conservation and Natural Resources)
Center for Watershed Protection, American Society of Civil Engineers, and the American Water Resources Association provide objective and scientifically-sound BMP information relative to water resources management, and research and education

Section E.8 Nonpoint Source Partners and Resources

Several public and private sector entities involved in hydromodification activities continue to provide technical assistance, technology transfer, education/extension, and financial resources to mitigate the causes of NPS pollution, reduce pollutant load reductions, and protect and restore water quality in Alabama (see **Section E.1,** above). Relevant statewide and coastal NPS programmatic goals, objectives and annual milestones of the Alabama NPS Management Program continue to be targeted to achieve programmatic water quality protection and restoration goals by:

a) Leveraging program and project resources to achieve mutually beneficial water quality improvement objectives
b) Supporting the development and implementation watershed-based management plans
c) Improving partnership collaboration, coordination, cooperation, and communication between a mix of programs, agencies, industry, landowners, organizations and others
d) Improving the connection between hydromodification activity planning, implementation of management measures, water quality protection, and reclamation /restoration after project operations have ceased
e) Demonstrating adaptive management measures and new and innovative technologies and techniques
f) Concentrating mitigation resources to priority "focus areas" based on multiple criteria
g) Enhancing public and private knowledge and awareness, accessibility, comments, and participation

To help ensure that NPS water quality problems relative to hydromodification are addressed in a cost-effective and timely manner, ADEM continues to leverage Section 319 grant-funded human and financial capital to:

a) Develop, demonstrate, and integrate processes to identify and prioritize NPS water quality impairment causes, problems and solutions
b) Deploy available resources in a timely fashion to address those priorities, including but not limited to the protection of human health, drinking water supplies, and aquatic biota and habitat
c) Employ appropriate programmatic and financial systems to ensure that NPS mitigation dollars are used efficiently and consistently with legal intent and obligations and maximizes water quality improvement benefits
d) Target funding to complement the technical and financial assistance available from other federal, state, and local sources

Section E.9 State Agency NPS Partners and Programs

E.9.1.a Overview

Developing and sustaining public and private sector partnerships and leveraging resources is standard practice and essential to successfully achieving relative hydromodification category goals and objectives of the AL NPS Management Program. Cooperative NPS partnerships facilitate efforts and leverage resources to expeditiously achieve water quality restoration and NPS pollutant load reduction strategies including, but not limited to:

- Building relationships of trust and fostering collaboration and cooperation to address hydromodification projects, activities, concerns, issues of mutual interest
- Formalizing working relationships and leveraging resources to accelerate identifying, prioritizing, and cleaning-up impaired sites and improving water quality
- Providing forums to express knowledge and receive input relative to environmental, economic, health, safety and social issues
- Expressing and implementing applicable hydromodification laws, regulations, guidelines, and compliance authorities
- Enhancing planning and implementation of on-the-ground environmentally-protective management measures to cooperatively mitigate nonpoint source human health and safety issues
- Encourage input for NPS management planning decisions and early and consistent involvement of stakeholders

State agencies continue to partner together to leverage NPS mitigation resources and coordinate efforts to plan, design, implement and maintain management measures and practices to prevent, reduce, or abate the causes of NPS pollutant runoff, protect and enhance drinking water sources, human health, and aquatic habitats and sustain environmental, economic, social and other communal quality-of-life benefits. The Alabama NPS Management Program and Section 319 grant program promotes a flexible, targeted, and iterative voluntary management approach whenever and wherever practicable to best ensure that state water quality standards and water quality benefits are effectively and expeditiously met as resources allow. Nonpoint source state agency partners and resources targeting adverse impacts of hydromodification activities, environmental and human health threats, and water quality protection and restoration may include, but is not limited to:

E.9.1.1 Alabama Department of Environmental Management (ADEM)

- Protect and improve the quality of Alabama's environment and the health of all its citizens
- Protect and restore natural resources which provide significant social, economic, and environmental benefits and opportunities for the citizens of Alabama.
- Develop air, water, and land environmental policy, permits, administrative orders and variances and enforces environmental rules and regulations
- Administer the CWA Section 319 grant and facilitates implementation of the statewide AL NPS Management Program
- Administer CZARA Section 6217 and State Coastal NPS Management Programs

E.9.1.2 State Revolving Fund (SRF) (ADEM)

Clean Water State Revolving Fund (CWSRF) program provisions authorizes low-interest loans to fund a variety of drinking water quality protection and restoration projects addressing nonpoint source runoff, and protection and restoration of wetlands and estuaries (as well as NPDES permitted point source" treatment systems). Federal and state contributions provide project or program set-up capital and then those assets are used to make low-interest loans to qualified entities to protect water quality. Loan repayments are recycled to fund other water quality protection projects. Community groups, individuals, nonprofits and other entities are eligible to apply to ADEM for CWSRF loan consideration.

E.9.2 Agricultural and Conservation Development Commission (ACDC)

- Established in 1985 by Alabama Act 85-123 for the purpose of making available General Fund cost-share grant money through the State Soil and Water Conservation Committee to each Soil and Water Conservation District

- The only agricultural assistance appropriation provided by the State of Alabama
- Funding is provided to encourage soil conservation, water quality protection, and forest improvement

E.9.2.a State of Alabama Soil and Water Conservation Committee (SWCD)

- Created in 1939 by the State Soil and Water Conservation District Act to carry out the administrative functions of the state's 67 District (county) programs
- Assists and advises District supervisors, disseminates information between SWCDs and partners with state and federal resource agencies and other public and private sector partners
- Provides statewide BMP implementation expertise to mitigate adverse hydrologic impacts

E.9.2.b Soil and Water Conservation Districts (SWCD)

- Focuses soil and water protection and conservation decision-making at the local level
- Coordinates NPS technology, education, and funding to address soil erosion, water quality, flood control, drainage, recreation, fish and wildlife, and open land preservation
- Provides county-level BMP implementation expertise and coordination
- Administrative resources are provided by the SWCC and local units of governments

E.9.3 Alabama Department of Conservation and Natural Resources (ADCNR)

- Acquires and manages state lands, parks, lakes, stream beds, and other state-owned properties
- Administers natural resource grants and conducts research
- Partners with federal agencies such as NOAA, EPA,USDI, USFWS, Commerce, and Homeland Security to promote wise stewardship of the state's natural resources
- Partners with the USFWS to implement the Endangered Species Act (Traditional Section 6) conservation projects for listed and at-risk species
- Partners with ADEM to implement the CWA CZARA 6217 coastal nonpoint source program
- Provides partial oversight of project's to restore coastal resources from injuries sustained by the *Deepwater Horizon* oil spill.

E.9.4 Alabama Department of Public Health (ADPH)

- Fosters, promotes and provides information on seafood and shellfish health by partnering with state and federal agencies, industries, and academic institutions
- Provides technical assistance, permits, investigations and enforcement of solid waste, unauthorized dump, and vector control programs
- Develops and enforces human safety rules and regulations

E.9.5 Geological Survey of Alabama (GSA)

- Gathers geological, hydrological, and biological science-based data and information to best manage, develop, and conserve state water resources
- Provides surface and groundwater quantity and water quality assessment information, metrics and data to provide resource managers and community planners with information to balance natural resource benefits with resource protection and hydrologic impacts
- Conducts water quality, biological, coastal, and aquatic resource research

E.9.6 Alabama Department of Economic and Community Affairs (ADECA) / Alabama Office of Water Resources (OWR)

- Administers the Alabama Water Use Reporting Program that details surface and ground water use and trends
- Administers programs to assess and manage water quantity; develop and conserve water resource supplies; provide data and information regarding instream flows, prepares flood maps, and conducts research and education and outreach
- Partners with agencies and the private sector on water quantity resource and economic and quality of life issues

E.9.7 Alabama Department of Transportation (ALDOT)

- Establishes and manages state intermodal environmental programs and strategies to protect air, land and water resources
- Implements NPS management measures and provides highway and bridge construction, maintenance planning and response mechanisms to mitigate adverse hydrologic impacts
- Provides support, assistance, and expertise to preserve natural resources and enhance environmentally-protective and economically-supportive intermodal systems

E.9.8 Alabama Rural Water Association (ARWA)

- Provides community and town water and wastewater systems with technical, financial, administrative, management, education and outreach, and training assistance
- Helps protect drinking water sources by providing assistance to develop local wellhead and groundwater (aquifer) protection plans to address adverse hydrologic impacts
- Partners with ADEM, ADECA, Emergency Management Agency, Department of Homeland Secretary, and the USDA-Farm Service Agency regarding water quality issues

E.9.9 Alabama Forestry Commission (AFC)

- Provides resources and technical assistance to establish, re-establish, conserve, and sustain wetland forest resources and benefits
- Partners with ADEM to implement Alabama's Best Management Practice for Forestry to help improve air quality, protect and restore surface water and groundwater quality, and mitigate the causes of soil erosion and stream siltation
- Partners with the public and private sector to address forest management, phytoremediation, recreation, invasive species, greenhouse gases, carbon storage, easements and land trusts, and general quality-of-life issues
- Facilitates research, training, and education and outreach designed to increase public awareness and involvement in finding the right balance between to adverse hydrologic impacts and forestland benefits, protection and sustainability

Section E.10 Academia Institutions, Partners, Programs and Resources

Several higher education programs and resources provide interdisciplinary instruction, research, processes and innovations, technologies, technical assistance and technology transfer expertise to protect and restore watershed health, water quality, and community water supplies impacted or threatened by hydromodification activities. Enhancing land owner, permittee, facility operator, and general public knowledge and awareness relative to hydromodification impacts is essential. Academic institutions are key scientific, technological, business, and economic data and information compilation, analyses and delivery entities. Academic community partnerships are fundamental to statewide efforts to manage nonpoint sources of pollution and minimize adverse environmental, economic, and social impacts in Alabama. Partners and resources to protect and restore water quality from nonpoint sources of pollution include but are not limited to:

E.10.1 Alabama Cooperative Extension System (ACES)

- Delivers Alabama land grant institution (Alabama A&M and Auburn University) research-based technical assistance, technology transfer, and education and outreach
- Partners with federal and state resource agencies and other public and private sector entities to help them make informed, research/science-based environmentally-protective and economically-sensible decisions
- Provides social, cultural and communal quality-of-life outreach

E.10.2 Auburn University Water Resources Center (Alabama Agricultural Experiment Station)

- Brings together faculty and resources from several academic departments and programs to address a myriad of complex water resource problems and issues
- Facilitates opportunities to enhance public and private sector communication, cooperation, and collaboration

- Enhances water-related instruction, research and outreach efforts to protect and restore waters of the state

E.10.3 Alabama Water Resources Research Institute (Auburn University)

- An interdisciplinary research, education and outreach, and training program based at Auburn University
- Seeks solutions to on-going water quality and quantity problems and emerging issues and threats
- Coordinates, provides funding, and implements a broad spectrum of natural resource protection programs

E.10.4 Auburn University Environmental Institute (Auburn University)

- Facilitates an integrated and cohesive environmental instruction, research, and extension strategy to promote coordination, collaboration and communication between the university's inter-disciplinary programs
- Provides resources and implements programs and activities to address local, state and national environmental education and outreach, leadership, and research issues and needs

E.10.5 Center(s) of Excellence for Watershed Management (Auburn University and Alabama A&M)

- An interagency and interdisciplinary academic project planning and implementation program
- Provides university research-based outreach and assistance to resolve strategic water quality, quantity, and availability issues
- Assists ADEM in developing and implementing watershed-based management plans that meet Clean Water Act Section 319 grant guidelines

E.10.6 Center for Environmental Research and Services (CERS) (Troy University)

- Facilitates and conducts natural resource research, education and stewardship services
- Partners with academic institutions, resource agencies, and the private sector including the Choctawhatchee, Pea and Yellow Rivers Watershed Management Authority, Wiregrass RC&D Council, and Alabama Water Watch.
- Influenced the establishment of the Environmental Education Association of Alabama, the Alabama Water Watch Program and the Alabama Water Watch Association.

E.10.7 Dauphin Island Sea Lab (DISL)

- Alabama's marine science education and research laboratory serving 22 four-year colleges and universities
- Primarily focuses research on near-shore and estuarine processes of the Mobile Bay watershed
- Offers educational workshops, designs projects, and coordinates and facilitates studies including but not limited to wetland protection, restoration and acquisition
- Advises a variety of agencies on sustainable development through the Coastal Policy Center

Section E.11 Federal NPS Partners and Programs

Federal partners help state agencies, non-governmental groups, non-profit organizations, and other NPS entities identify and resolve NPS pollution problems and protect and restore water quality. Resources and financial incentives may be provided for research, education and outreach, and enforcement of rules and regulations. Federal partners help to mitigate nonpoint sources of pollution associated with all aspects of hydrology and hydrologic modification activities. In addition, federal partnerships, compliance programs, and reporting help to ensure transparency and accountability of the state's NPS protection and restoration efforts that use public funds.

E.11.1 U.S. Environmental Protection Agency (EPA)

- Protects human and environmental health by developing and enforcing rules and regulations based on laws passed by Congress
- Provides annual appropriations of CWA Section 319 grant funds to ADEM to implement statewide and coastal zone NPS management measures to protect and restore water quality
- Partners with the Corps of Engineers to enforce CWA Section 404 dredge and fill permits and with ADEM relative to CWA 401 state water quality certifications.

- Partners with NOAA to implement NPS management components of the Coastal Zone Act Reauthorization Amendments of 1990 (i.e., CZARA Section 6217)

E.11.2 National Oceanic and Atmospheric Administration (NOAA)

- Co-federal lead (with EPA) to assure that NPS hydromodification activities are in conformance with Section 6217 of the Coastal Zone Act Reauthorization Amendments of 1990 (CZARA) and Guidance Specifying Management Measures for Sources of Nonpoint Pollution in Coastal Waters (EPA. 840-B-92-002 January1993)
- Requires the state to develop coastal nonpoint pollution control programs that ensures the implementation of management measures in the coastal management area reflects circumstances relevant to differing land uses and conditions, and provides technical information to the public and private sectors to make informed decisions
- Provides agencies, private sector groups, and individuals with NPS pollution control measure guidance and information in accordance with the Coastal Management Act (1972, as amended)

E.11.4 National Estuary Program - Mobile Bay (NEP)

- Administered through and funded by the EPA to respond to environmental challenges to the Mobile Estuary through implementation of a Comprehensive Conservation Management Plan
- Conducts hydrologic assessments, identifies stressors and promotes protection and restoration of coastal water quality, wetlands, estuaries, and marine resources
- Uses a non-regulatory programmatic approach to partner with federal, state, interstate, and local agencies; municipalities, businesses, environmental organizations; and academic institutions to address air and water quality, wetlands, stormwater runoff, population growth and land uses, floral and faunal habitat, and other coastal zone issues
- Provides science-based education and outreach to enhance environmental, communal, social, cultural, and economic well-being and to provide citizens with local sense-of-ownership

E.11.5 United States Department of Agriculture (USDA)

Conservation provisions of the Agricultural Act of 2014 (Farm Bill) provides opportunities to address hydrologic impacts of farm and ranch land activities in Alabama. Several USDA conservation initiatives and special emphases programs are designed to target water quality and water supplies. The USDA facilitates several natural resource assessment strategies and policies applicable to rural areas and communities. These efforts provide the public and private sectors with technical resources and financial incentives to make informed environmental stewardship decisions.

E.11.5.a Natural Resources Conservation Service (NRCS - Alabama)

- The technical agency of the U.S. Department of Agriculture (USDA) responsible for conserving and protecting natural resources in Alabama
- Administers incentive programs and provides technical assistance to the public to protect and conserve soil, water, and air resources including protecting and restoring stream banks and wetlands and reforestation and phytoremediation
- Partners with USACOE through joint guidance to conduct wetland determinations applicable to the Food Security Act of 1985 and Section 404 of the Clean Water Act
- Works in close partnership with the State Soil and Water Conservation Districts and the USDA - Farm Service Agency in Alabama to control erosion and sedimentation, protect and restore drinking water quality and resources, and protect the environment

E.11.5.b NRCS Technical, Planning, and Financial Assistance Programs in Alabama:

- **Emergency Watershed Protection (EWP):** Provides funding to address emergencies as a result of natural disasters and to mitigate hazards to life and property from floods and erosion created by sudden impairments. Funding may be used to protect roads and bridge abutments, remove debris from streams, and control gullies that threaten infrastructures such as homes, gas and power lines, and road ways.

E.11.5.c Gulf of Mexico Initiative (GoMI)

- Provides financial and easement assistance along the Gulf Coast (e.g., Alabama, Florida, Louisiana, Mississippi, and Texas) to improve water quality
- Promotes sustainable management systems to mitigate NPS runoff and transport to coastal waters and to prevent saltwater intrusion into drinking water supplies and sensitive natural resource areas
- Focuses multi-agency partnership efforts on improving water quality in the Weeks Bay (Fish River) and Escambia River watersheds in Alabama (and Florida)

E.11.5.d "StrikeForce" Initiative (USDA)

- A partnership of USDA agencies (NRCS, FSA, and Rural Development), local and state governments, and organizations to rebuild and revitalize communities in targeted areas
- Leverages resources in persistent-poverty communities to promote economic development and job creation

E.11.6 U.S. Forest Service (USFS)

- Directs compliance with required CWA permits and State regulations
- Requires the implementation of BMPs to control NPS pollution to meet applicable water quality standards and other CWA requirements on USFS leased lands in Alabama
- Develops and implements measures to prevent soil loss or damage and to protect water quality on the four national forest lands in Alabama

D.11.7 National Park Service (NPS)

- This Department of Interior agency partners with federal, state, and non-government entities to inventory, characterize, and prioritize natural resources for protection and restoration and maintain critical wildlife habitat.
- Provides oversight the National Wild and Scenic Rivers System of which the West Fork River (Sipsey Fork) is designated in Alabama
- Works with local partners through the Rivers, Trails, and Conservation Program to protect watershed resources (e.g. Dog River Scenic Blueway/Dog River Clearwater Revival, Cahaba River/Alabama Nature Conservancy, Chattahoochee Valley/City of Valley)

E.11.8 Resource Conservation & Development Program and Councils (RC&D)

- Administered by the USDA-NRCS and governed by a multi-county, membership-based nonprofit RC&D Council
- Promotes environmental protection and economic sustainability in designated areas through collaborative strategic planning processes and partnerships
- Identifies, plans, develops, and implements conservation and economic projects through wise and efficient use of human and financial capital and natural resources
- Promotes voluntary community-based environmental protection approaches

E.11.9 U.S. Fish and Wildlife Service (USFWS) / Ecological Service Field Office, Daphne, Alabama

- Conserves, restores, and protects fish, wildlife, and plant habitat and populations by enforcing federal natural resource laws
- Conducts environmental investigations and provides technical support to protect and restore natural resources
- Promotes healthy habitats for fish and wildlife

E.11.10 U.S. Army Corps of Engineers (COE) / USACOE -Mobile District

- Constructs, maintains and operates water resource infrastructure to enhance economic and environmental health and human safety and quality of life

- Partners with EPA and ADEM to issue nationwide (CWA Section 404) dredge and fill and state water quality certification (CWA Section 401) permits
- Provides planning and other environmental services to analyze, formulate, justify and document hydrologic and natural resource protection and restoration projects
- Promotes environmentally sustainable designs, engineering, and construction protocols to restore and protect streams, rivers, wetlands, other water bodies, and riparian areas degraded by drainage from abandoned and inactive non-coal mines
- Demonstrates management measures and innovative and alternative treatment technologies to minimize or eliminate adverse environmental effects to jurisdictional waters
- Assesses, plans, and implements water supply, storage, withdrawal and release, and flood control and drought contingency operations and projects
- Develops and reviews environmental assessments, environmental impact statements, and project plans to protect and balance the many purposes and demands placed on natural resources by hydromodification activities

E.11.11 U.S. Geological Survey (USGS) / Alabama Water Science Center

- Provides a wide range of scientific expertise to help minimize and, where possible, eliminate the adverse environmental effects hydromodification activities
- Partners with ADEM, ADOT, GSA, USACE, Homeland Security, communities, industry and others to collect and disseminate scientific knowledge (stream flow, water quality, water quantity, and groundwater monitoring and assessment data and information) needed for hydromodification activities planning and implementation.
- Develops natural resource and watershed management plans to enhance environmental and economic benefits
- Provides high resolution imagery for mapping and develops maps
- Develops standardized methods to evaluate environmental health and natural resources

E.11.12 Tennessee Valley Authority (TVA)

- Promotes environmental and economic development and sustainability to improve quality of life and economic prosperity
- Partners with other federal and state and local entities to strengthen relationships; expand collaboration; improve communication; and provide education to many and varied audiences
- Assesses, protects, improves, restores and manages natural resources in order to meet state and federal regulations and standards; uses an integrated river system management process to assesses reservoir and land-uses; provides for public land recreational opportunities, assesses environmental conditions and problems, and facilitates the implementation of relevant management strategies
- Uses an integrated environmental management system approach to strengthen policies and programs to manage and enhance air, land and water quality and other natural resources, protect public health, discourage wasteful consumption, and proactively prevent pollution problems from occurring

E.11.13 Office of Surface Mining Reclamation and Enforcement (OSM)

- An Office of the DOI, the OSM implements the Surface Mining Control and Reclamation Act of 1977 (SMCRA). Title IV of SMCRA provides for the restoration of lands mined and abandoned or left inadequately restored before August 3, 1977 with priority given to projects that alleviate dangers to public health and safety
- Designated by Congress as the Federal authority responsible for addressing environmental impacts of surface coal mining; including but not limited to relocation of stream channels, retention and detention basins, and acid mine runoff impacts on stream hydrology

E.11.14 U.S. Department of Transportation (USDOT)

- Develops and coordinates mechanisms to support the national transportation system with due regard for need, the environment and national defense
- Administers policies and programs to protect and enhance the nation's transportation systems, security, and services

- Provide funding to enhance quality of life, environmental protection and economic sustainability

E.11.15 EPA Office of Homeland Security (OHS)

The Alabama Nonpoint Source Management Program and CWA Section 319 grant program recommends and presents reasonable and practicable science-based technical measures to protect surface waters and groundwaters from nonpoint sources of pollution. Dedicated and stable sources of funding are needed to proactively address real and potential environmental and human health, economic, and social threats and challenges. Examples of NPS management threats and impacts applicable to OHS interest and involvement include drinking water safety and security, human health issues, and chemical releases and spills.

Section E.12 Non-Governmental Organization Partnerships

The AL NPS Management Program and Section 319 grant program encourages non-governmental organizations (NGO) to continue to partner with relevant federal, state and local community entities to help protect and restore water quality in Alabama. Private sector citizen-based volunteer partnering is a key element of NPS programmatic efforts to deliver hydromodification data and information, technology and technical assistance, and financial incentives. Volunteer activities are critical to effective planning and implementation of environmentally-protective and economically-sensible watershed-based management plans and other measures and practices to achieve NPS pollutant load reductions in Alabama. It is strongly advised that the private sector / citizen volunteers collaborate, cooperate, coordinate and communicate hydromodification activities that may adversely impact water quality with relevant regulatory and resource agencies and authorities. This will also help to enhance protection from potential legal vulnerabilities relative to EPA "Good Samaritan" guidelines and principals.

In general, NGO activities to address nonpoint sources of pollution and protect and restore water quality in Alabama may include, but are not limited to:

- Identifying and reporting adverse hydromodification impacts and concerns to appropriate regulatory and resource agencies
- Facilitating management plan development and BMP implementation including assisting with environmental studies and on-the-ground management measure implementation and maintenance
- Monitoring sites to ensure appropriate signs are posted and barriers and gates are intact and functional
- Cleaning up debris, trash, and litter along roadways and waters of the state
- Conducting water quality monitoring using EPA-approved protocols (e.g. Alabama Water Watch)
- Providing administrative support to resource agencies

Consultants, researchers, industry, the academic community and others that design or develop new or innovative hydromodification technologies and techniques are encouraged to share information and to demonstrate their products and processes with relevant AL NPS Management Program partners (e.g. using field days, tours, workshops, meetings, etc.). The Section 319 grant program may fund BMPs, provide education and outreach, and demonstrate various technologies if relative to implementation of an EPA-defined 9-key element watershed-based management plan and applicable to grant guidelines.

E.12.1 Alabama Clean Water Partnership (CWP)

- Partners with ADEM to protect and restore water quality and develop and implement watershed-based management plans
- Links federal and state, and local agencies, communities, and watershed stakeholders to put best management practices "on-the-ground"
- Provides a neutral, targeted, and iterative forum to identify environmental problems and tries to find cooperative solutions to mitigate those challenges
- Promotes improved communication, coordination and collaborative decision-making processes to protect and restore water quality using a voluntary (non-regulatory) management approach

E.12.2 Alabama Water Watch (AWW)

- A statewide water quality monitoring program composed of trained and certified citizen-volunteers who tests certain physical, chemical, and biological conditions of waterbodies using standardized EPA-approved monitoring protocols
- Combines the resources and expertise of citizen groups, a university-based program, and a non-profit association to collect credible water quality data and information
- Provides training and certification to help volunteers collect, analyze, and understand their water quality data
- Identifies pollutant sources and tracks long-term trends to improve water quality and water policy

E.12.2.a **Alabama Water Watch Association (AWWA)**

- A 501(c)(3) tax-exempt organization that supports AWW efforts to help identify, monitor, and seek solutions to impaired water quality problems and protect unimpaired waters
- Provides training, education and outreach, and motivation to improve water quality through citizen-based monitoring and water policy actions

E.12.3 Alabama Natural Heritage Program (ALNHP)

- A conservation action and stewardship program of the Environmental Institute (Auburn University)
- Provides science-based biological diversity information to resource agencies and the private sector to protect sensitive flora and fauna and to ensure sound stewardship of land and water resources
- Identifies plants, animals, and natural communities of concern for protection and consolidates that information into a comprehensive database
- Promotes sound natural resource protection and conservation actions within the state and also throughout the Southeast.

E.12.4 The Nature Conservancy (TNC) / TNC - Alabama

- Works to preserve, protect and restore natural resources and areas in Alabama
- Administers projects to conserve and improve species biodiversity; create, protect and restore upland and aquatic habitats; mitigate invasive species, and protect rare and declining species
- Promotes and provides environmental research, education and outreach, and hands-on field experiences to increase citizen awareness and knowledge relative to environmental sustainability and economic growth

E.12.6 Cooperative Ecosystem Study Units (CESU) Network (Auburn University - Office of Vice President for Research)

- A collaborative and interdisciplinary national consortium composed of federal agencies, academic institutions, state and local governments, nongovernmental conservation organizations, and other partners
- Works to support informed public trust and stewardship of natural resources for varied bio-geographical regional levels (i.e., Piedmont, South Atlantic Coast and Gulf Coast)
- Provides contemporary biological, physical, social, and cultural sciences and resource management research
- Provides technical assistance, education and outreach, and capacity building for long-standing priorities

E.12.7 Alabama Power Company (APC)

- One of the largest water managers in the state with 11 company-owned lakes and 14 hydroelectric dams
- Manages nearly a third of the standing water in Alabama that provides drinking water, recreation, wildlife and fish habitat. Releases of water from APC reservoirs support commercial navigation and mitigates impacts of droughts and floods
- Conducts water quality monitoring
- Sponsors the Renew Our Rivers cleanup campaigns on rivers, lakes and creeks across four Southeastern states

APPENDIX E

HYDROMODIFICATION
NONPOINT SOURCE POLLUTION MANAGEMENT

ATTACHMENT E-1: SECTION 319 GRANT PROJECT-SPECIFIC STRATEGIES AND ACTION ITEMS

Overview:

Project-specific Strategies and Action Items are essential and fundamental NPS pollution management tools to demonstrate reasonable CWA Section 319 grant progress toward achieving Programmatic Goals and Objectives of the Alabama NPS Management Program. The following adaptive NPS management mechanisms provide *project-level guidance* to plan and implement focused water quality protection and restoration activities using a collaborative, cooperative and coherent public and private sector partnership approach.

Structural management measures (on-the-ground) and nonstructural practices (education and outreach) presented herein:

- Are outcome-based, as applicable and practicable
- Do not compromise landowner land use and citizen privacy issues
- Places an emphasis on achieving S. 319 grant priority and EPA Grants Reporting and Tracking System (GRTS) reportable NPS pollutant load reductions (e.g. sediment) and priority Total Maximum Daily Load (TMDL) pollutants of concern (e.g. pH, metals, low dissolved oxygen, degraded aquatic habitat, etc.)
- Supports statewide efforts to expeditiously meet state water quality standards and sustain water quality benefits
- Integrates and leverages human and financial capital of national, regional, state and local programs, projects and authorities
- Aligns multiple project planning and implementing processes using a holistic NPS watershed-based management approach as practicable
- Enhances local "ownership," project implementation transparency and funding accountability
- Supports a flexible, targeted, iterative, and holistic NPS management programmatic implementation approach
- Enhances motivation, causes and opportunities for entities to mutually reach a consensus and achieve a desired NPS management program goal, objective and outcome

The AL NPS Management Program recognizes that Federal and state resource and regulatory agencies, local governments, landowners, environmental groups and others all play a role in mitigating nonpoint sources of pollution associated with hydromodification activities. Effective management requires frequent, extensive, and clear communication and sustained efforts to identify and improve cooperative partnerships. This NPS management program is designed to work within the context of existing voluntary principles and regulatory back-up authorities and approaches. It also focuses NPS resources, tools, and expertise on efforts that advance water quality improvements and fiscal accountability and responsibility. The following Strategies present a coherent and accessible means for hydromodification entities to effectively, efficiently, and expeditiously achieve state water quality standards and maximize water quality benefits. Action Items are elemental strategic-support components that address single, multiple, or mixed NPS pollution causes, conditions and pollution mitigation needs regardless as to whether the outcome is statewide, coastal, watershed or community-based, or site-specific.

Strategy E.1 **Achieve State Water Quality Standards, Use Classifications and Other Beneficial Uses.**

Action Item E.1.1 **Continue to enhance water quality and watershed health as agency and community authorities, guidelines, criteria, and resources allow:**

- Implement the NPS components of a TMDL to accelerate restoration of Section 303(d) listed impaired waters
- Continue to facilitate collaborative studies to develop and demonstrate science-based predictive tools and develop metrics and values to quantify adverse hydromodification impacts and/or water quality benefits and prioritization of NPS program/project mitigation targets

- Develop, update and revise monitoring protocols to best determine how stormwater control projects and programs relative to hydromodification activities improves or degrades water quality and meets targeted priority Section 319 pollutant and TMDL pollutant of concern load reductions
- Bring together technical experts, program managers, policy makers, community leaders, and citizens at the federal, state, and local levels to advance the science of an integrated water quality assessment approach aimed at protecting surface waters and groundwaters, particularly to ensure safe drinking water sources
- Continue to collect data to characterize both watershed scale and site-specific water quality impacts and trends over time to identify emerging problems, prioritize and direct BMP efforts; assess, target and measure BMP effectiveness; and respond to urgent situations such as spills or threats to environmental and human health
- Target workshops/conferences composed of both public and private sector audiences to enhance NPS knowledge and awareness relative to water quality, aquatic health and habitat protection; BMP implementation; holistic NPS pollution control management; and community and land re-use, resilience and sustainability
- Document NPS watershed and water quality conditions by measuring temperature, turbidity, organic enrichment, pH, low dissolved oxygen, and other NPS threats to water quality
- Continue to document NPS control management efforts to help protect and restore aquatic species, stream habitat, riparian areas, wetlands, estuaries, streambanks, shorelines, and other sensitive areas using strong science-based water chemistry, hydrology, and land use assessment and monitoring data and information
- Partner with communities and individuals to protect groundwaters and drinking water sources (e.g. public water systems; water supply, wellhead capture zones, private drinking water wells)
- Focus available resources to protect high quality and unimpaired waters (e.g., Outstanding Alabama Waters, Outstanding National Resource Waters, Treasured Alabama Lake, or future designations)
- Support and leverage resources and efforts of the Gulf of Mexico Alliance, CWA S. 6217, and other multi-state and multi-agency NPS pollution management programs to help protect and restore coastal water quality
- Facilitate the compensation of "unavoidable" water quality impacts through wetland and stream restoration "mitigation banks" (e.g. cooperative federal and state agency and private sector partnerships)
- Promote voluntary NPS pollution programmatic approaches but apply statutory, regulatory and administrative "back-up" authorities and interventions to achieve state water quality standards when voluntary management measures and practice efforts, strategies, and incentives do not appear to be working (as determined by science-based water quality monitoring, assessment, and analyses/evaluations)
- Implement and assess the success of setback requirements to protect and restore priority waters, sensitive areas, wetlands and public health
- Engage federal, state and local partners to continuously deliberate frameworks and metrics to best measure water quality restoration and protection and beneficial use success
- Coordinate with relevant agencies, governmental officials/authorities, planners, developers, local organizations, and others to cooperatively develop and implement EPAs nine (9) element Section 319 watershed-based management plans to expeditiously protect and restore surface water and groundwater quality

Strategy E.2 Implement Management Measures to Protect and Restore Surface Waters, Groundwaters, and Natural Resources

Action Item E.2.1 Continue to holistically integrate programs, financial incentives, technology transfer, and technical assistance with a focus on consensus to meet the desired environmental outcome:

- Facilitate public and private sector partnerships to support the development of stakeholder design and planning manuals and to reduce uncertainties associated with preparing and implementing clean-up / reclamation plans
- Identify and address hydromodification concerns and management measures in EPA-defined 9 key element watershed-based management plans
- Identify and implement a large-scale watershed-based management (e.g. HUC 12) plans to demonstrate protection and restoration prioritization, planning, and implementation success (especially technology transfer)
- Facilitate partnerships (i.e., increase interaction) between federal and state agencies; land-grant universities, and others to align, leverage, and deliver cutting-edge, innovative, environmentally-protective, and economically-sensible measures to mitigate anthropogenic impacts and to establish clean-up / reclamation performance expectations

- Expand hydrological modeling capabilities for very small and/or intermittent stream flows. Continue to develop tools and techniques to extrapolate surface water and groundwater flows and interactions, including predictive modeling
- Identify existing techniques and develop new remote or non-intrusive instrumentation and methodologies to monitor, characterize, and provide guidance on specific water quality constituents, meet project objectives, or evaluate remediation and restoration methods.
- Target and leverage Section 319 grant funds to address relevant NPS hydromodification priorities
- Research and promulgate new or improved BMP technologies, guidelines, standards, and practices
- Enhance greater collaboration with a full spectrum of partners to accelerate research, innovation and new technologies to address NPS pollution challenges and meet state water quality standards
- Target Section 319 grant funds to address adverse hydromodification impacts on a HUC-12 subwatershed level as feasible and practicable
- Coordinate federal and state programs that provide landowners/users with various incentives to voluntarily install NPS pollution management measures
- Target NPS pollution management measures based on site-specific conditions and location, land use, pollution extent, economics, health and safety protection effectiveness, and maintenance considerations
- Consider both environmental and economic sustainability aspects when designing, retrofitting, or implementing structural solutions, singularly and in combination, in order to get the "best bang for the NPS buck"
- Leverage NPS mitigation resources to best address site-specific pollutant causes and extent (e.g. Section 319 pollutant load reductions, TMDL pollutants of greatest concern; concentration/toxicity, proximity to a water of the state, aquatic species and habitat, sensitive areas, etc.)
- Target Section 319 grant guideline and NPS programmatic priority pollutant load reductions (e.g. sediment / siltation, nutrients, etc.) and nonpoint source TMDL pollutants of concern (e.g. pH, low dissolved oxygen/nutrient enrichment, metals, aquatic habitat alteration, etc.)
- Devise alternative control strategies and criteria that emphasizes the restoration of natural drainage patterns to near pre-land disturbance conditions
- Facilitate incentives and opportunities to improve and strengthen cultural, social and economic conditions, especially near disenfranchised and disadvantaged communities
- Coordinate efforts to minimize or abate NPS pollutants from leaching to groundwaters (e.g., drinking water sources, recreational use waters, outstanding resource water, etc.)
- Continue to facilitate opportunities to leverage public and private sector resources to protect worker health and safety
- Coordinate efforts to prevent or diminish atmospheric transport of NPS pollutants (e.g., mercury; particulates)
- Coordinate stormwater runoff control efforts to prevent or restrain the spread of invasive species

Strategy E.3 Achieve Nonpoint Source Pollutant Load Reductions

Action Item E.3.1 Continue to monitor and assess on-the-ground best management practices designed to address NPS pollution management challenges:

- Form partnerships with relevant Federal and state agencies with the objective of combining resources to collectively address adverse NPS pollution problems associated with hydromodification activities
- Continue to identify, streamline, and evaluate on-going protection and restoration measures and practices in order to identify the "best attainable" improvements in water quality, evaluate the success rate of existing treatments, and to provide updated guidance to avoid future impacts and threats
- Facilitate collaborative research, information exchanges, training opportunities, and technology development to establish hydromodification project performance standards and to better predict impacts and risks to human and ecological health
- Facilitate NPS management tools to monitor, characterize, and evaluate transport, fate, and treatment and remediation technologies of stream, riparian, reservoir, wetland, and estuary contaminates
- Coordinate hydromodification projects and restoration priorities with CWA Section 319, 303(d), CZARA Section 6217/coastal NPS programs; NPDES permits, and TMDL programs
- Identify existing techniques and develop new or innovative remote or non-intrusive instrumentation methodologies for NPS impaired site characterization and monitoring

- Continue to provide training, guidance and manuals to measure specific NPS water quality parameters, meet mitigation objectives, evaluate protection and restoration methods, and document project success
- Continue to collect valid, science-based water quality and pollutant loading data and information using federal and state agency-approved quality assurance project plans and monitoring protocols
- Evaluate current data and historical water quality trends to target NPS management measures and practices needed to protect and restore waters of the state
- Estimate NPS pollutant load reductions using science-based water quality monitoring protocols and computer-modeled (STEPL) data, as practicable and applicable.
- Partner with the Alabama Water Watch Program, Alabama Clean Water Partnership, government agencies and academic institutions to monitor water quality to help identify and prioritize NPS impaired sites; implement NPS measures and practices, and to evaluate pollutant load reduction success
- Track and report Section 319 watershed projects to document improvements in land, water, and air quality
- Report both pre- and post-project Section 319 project results to the public using federal and state websites, databases, and other programmatic and project-specific media outreach options
- Coordinate interagency reporting and input of NPS data and information relative to pilot projects, research, costs, and qualitative and quantitative pollutant load reduction indicators and measures
- Promote the development of local ordinances that incorporate NPS pollution best management practice planning, design, implementation, maintenance and effectiveness monitoring requirements (pre-, during, and post-hydromodification project phases)
- Continue to promote pollution prevention practices whenever and wherever practicable

Strategy E.4 Provide and Enhance NPS Pollution and Water Quality Education and Outreach (E&O)

Action Item E.4.1 Continue to facilitate the production and distribution of environmentally-protective and economically-sensible information to the public and private sectors:

- Leverage Federal and state agency resources to effectively and efficiently deliver land, water, and air E&O to local agencies, authorities, organizations, groups, citizens, industry, project coordinators, volunteers, etc.
- Develop, update or revise and disseminate relevant guidelines, plans, reports, and manuals to reflect new or changing regulatory requirements, strategies, and technologies relative to NPS stormwater runoff controls, land use / land-reuse and aesthetics, and ecological and global climate changes and concepts
- Continue to develop and populate a central web-based database / clearinghouse relative to technology, management measures, demonstrations, and project areas/sites, other mitigation activities, agencies dealing with AMD, and successes, failures and lessons learned in order to increase the knowledge base and confidence of the private sector in agency environmental, economic, and public health and safety decision-making processes
- Facilitate NPS training and increase hydromodification awareness and knowledge (shorten the learning curve) by enhancing the private sector's access to agency data and academia / researcher expertise
- Expand the use of GIS and mapping software development to characterize impacts and threats at the watershed and site specific levels
- Develop audience-specific visual information delivery systems to help convey complex hydromodification data and information
- Ensure that programs, services, and incentives are accessible to a diverse mix of citizens and targeted audiences
- Continue to develop or revise NPS manuals, practices, technologies, standards, guidelines, etc., to enhance E&O delivery and leadership
- Partner with various entities to increase the number of Qualified Credentialed Professionals to enhance delivery of programs and services
- Continue to facilitate the delivery of NPS pollution control training, technology transfer, and technical assistance using various venues; including but not limited to the Annual Alabama NPS Conference, Alabama Clean Water Partnership, CZARA, and BMP demonstrations, tours, roundtables, websites, desktop tools, etc.
- Use available EPA resources to increase the public and private sectors' hydromodification/ecological impact knowledge and awareness
- Develop and implement protocols to scientifically quantify private sector interests, perceptions, and responses
- Implement E&O activities designed to best prevent, compensate, ameliorate or adapt to climate change impacts

- Integrate the E&O resources of a variety of federal, state, and local agencies and programs to enhance NPS programmatic goals and objectives (e.g. communication, collaboration, coordination, and cooperation)
- Incorporate various presentation formats to achieve broad based outreach (e.g. newspaper articles, magazines, television, radio, websites, signage, videos, posters/displays, fact sheets, newsletters, brochures, conferences, meetings, seminars, training, tours, advisory committees, work groups, etc)
- Develop and publish hydromodification / NPS pollutant load reduction "success-stories"
- Characterize the ecological and economic benefits, capabilities, and performance of traditional, innovative or unique NPS water quality protection and restoration approaches (structural or non-structural) at the watershed or project-specific scope and scale. Compile successful results as adaptable Alabama-specific case studies, guides, and decision-making tools.
- Recognize exemplary public and private hydromodification / water quality protection and restoration activities (e.g., recognition awards and incentives)
- Enhance minority, low income, and/or non-English speaking stakeholder resources and outreach efforts

Strategy E.5: Develop and Sustain Public and Private Sector NPS Pollution Management Partnerships

Action Item E.5.1 Continue to improve coordination with governmental agencies, private sector interests, and citizen groups at the state and watershed level:

- Integrate and align resource programs and project implementation plans to make the best use of limited NPS resources (i.e., prevent, compensate, mitigate, and adapt to both potential threats and real problems)
- Clearly articulate NPS programmatic goals and continue to develop mechanisms and implement projects to achieve them
- Engage hydromodification activity and restoration project partners early-on in the planning phase to help build long-term trust
- Engage the public and private sector through regular outreach meetings and incentives
- Conduct surveys and interviews to assess citizen NPS knowledge, awareness and attitudes relative to hydrologic changes and water quality protection and restoration and quality and quantity
- Ensure that all NPS mitigation resources targets a prioritized and measurable water quality protection and restoration outcome
- Align AML reclamation benefits to address under-served communities and individuals
- Facilitate the development and use of institutional decision-making tools to target local socio-economic factors and to improve personal/corporate behaviors
- Partner with academic institutions to educate and train knowledgeable hydrologic process practitioners
- Partner with voluntary citizen water quality monitoring groups, who have developed EPA-approved quality assurance and control monitoring protocols, to identify NPS pollution threats, prioritize sites, and to focus BMP implementation
- Partner with multiple stakeholders to develop and implement a 9-key element watershed management plan (e.g. EPA Section 319 grant guidelines) to holistically address hydrology changes and challenges on a 12-HUC watershed level
- Balance NPS program staffing, partnership resources, and BMP planning and implementation approaches to deliver measurable water quality protection and restoration results and more protective, resilient, and sustainable private and community-based environmental, economic and quality-of-life benefits
- Collaborate with Federal and state agencies acting or preparing to act on potential environmental, economic, and public health/humanitarian risks posed by climate change
- Develop and update applicable Memorandums of Agreement or Memorandums of Understanding
- Advance AML restoration efforts to protect and restore waters of the state from NPS pollution through community engagement, scientific processes and principles, and research and technology in order to enhance economic and environmental quality-of-life for landowners and community residents
- Develop and enhance voluntary NPS management strategies and techniques depending on the unique character, perspectives, needs, and requests of the impacted community

Strategy E.6 Target Specific Programmatic Goals and Objectives of the Alabama NPS Management Program

Action Item E.6.1 As resources allows and to the maximum extent feasible and practicable, leverage Section 319 resources to protect and restore water quality and maintain beneficial uses of state waters:

- Continue to coordinate, cooperate, communicate, and collaborate with Federal and state resource agency and local community partners and their associated projects and programs to protect and restore surface waters and groundwaters (e.g. Alabama Clean Water Partnership, advisory groups, citizen groups, etc.)
- Continue to leverage NPS resources of federal programs on a national, regional, interstate, state, river basin or other geographically defined hydrologic unit to holistically manage hydromodification threats and impacts
- Continue to cooperatively identify and prioritize waters in need of restoration (e.g. TMDLs, drinking water supplies, wetlands, etc.) as well as unimpaired waters for protection (e.g., Outstanding Natural Resource Waters, Outstanding Alabama Waters, Treasured Alabama Lake, etc.)
- Continue to refine processes used to assign and progressively address BMP planning, design, implementation, and maintenance priorities
- Continue to examine new and innovative ways to increase public awareness by demonstrating effective planning, design, and implementation approaches that promote partnerships, cooperation and resource leveraging
- Continue to develop Alabama-specific environmental monitoring and data reporting protocols to characterize the performance of hydromodification measures and practices to control NPS pollution
- Develop and maintain a comprehensive clearinghouse and website/database for Alabama-specific BMP information; particularly field scale design, performance, and cost-comparison data
- Develop and implement hydromodification components of an EPA-defined 9-key element watershed-based management plans (as practicable and as human and financial capital allow)
- Continue to periodically (minimum every 5 years) revise hydromodification category Strategies and Action Items as necessary to reflect progress or problems encountered in achieving AL NPS Management Program goals and objectives
- Continue to adopt iterative, adaptive NPS management approaches to meet and maintain state water quality standards and water quality benefits as expeditiously as practicable
- Continue to incorporate a variety of formal and informal mechanisms to sustain partnerships (e.g. memorandum of agreement, letters of support, cooperative projects, leveraged funds, meetings to share information and ideas)
- Continue to ensure that the goals and objectives AL NPS Management Program are well integrated with the economic stability and social and cultural goals at the state, county, and local community levels
- Continue to make strong sustained efforts to coordinate, integrate and leverage the resources of ADEM programs for eligible NPS management program activities
- Continue to review, update and achieve applicable hydromodification category annual milestones of the AL NPS Management Program and communicate those efforts in annual reports and the EPA-GRTS database as applicable
- Continue to incorporate the "latest and greatest" hydromodification project planning, implementation, and maintenance measures, practices and processes to protect and restore streambank, shoreline, reservoir, wetland, estuary, and riparian resources. The AL NPS Management Program and Section 319 grant program recommendations include, but are not limited to:

Federal:

EPA - Region 4

- River Corridor and Wetland Restoration
- 5-Star Restoration Program
- Natural Channel Design - Review Checklist (EPA 843-B-12-005) (EPA and USFWS)
- Stream Assessment and Mitigation Protocols: A Review of Commonalties and Differences (EPA 843-S-12-003. May 2010)
- Surf Your Watershed
- EnviroMapper web site index
- Watershed Academy
- Mobile Bay National Estuary Program

USDA - NRCS

- Environmental Quality Incentives Program (EQIP)
- Wildlife Habitat Incentive Program (WHIP)
- Wetland Reserve Program (WRP)

- Emergency Watershed Protection Program (EWP)

USDA - Farm Service Agency
- Conservation Reserve Program (CRP)
- Continuous CRP (Forestry and Wildlife Programs)
- CP21 - Filter Strips
- CP22 - Riparian Forest Buffer
- CP31 - Bottomland Timber Establishment on Wetlands

USACOE:
Clean Water Act Section 404

Department of Interior:
Office of Surface Mining and Enforcement

Tennessee Valley Authority

U.S. Geological Survey - Alabama

U.S. Fish and Wildlife Service
Partners for Fish and Wildlife
Private Individual Grants

State:
- Alabama Department of Environmental Management
- Alabama Department of Conservation and Natural Resources
- Alabama Forestry Commission
- Alabama Department of Economic and Community Affairs - Office of Water Resources
- Alabama Soil and Water Conservation Committee
- Alabama Association of Conservation Districts
- Geological Survey of Alabama

Academia / Education and Outreach
- Alabama Cooperative Extension System (ACES)
- Auburn University Environmental Institute
- School of Forestry and Wildlife Sciences
- The Center for Forest Sustainability
- Auburn Marine Extension and Research Center
- Department of Civil Engineering
- Department of Civil Engineering, Environmental Engineering
- Alabama Natural Heritage Program
- University of Alabama
- Troy University-Center of Environmental Research and Services
- Dauphin Island Sea Lab

Organizations:
- Alabama Clean Water Partnership
- Adopt-a-Stream Foundation
- The Association of State Wetland Managers
- Center for Watershed Protection
- American Rivers Library
- The Association of State Wetland Managers
- Conservation Technology Information Center (CTIC) Wetlands Information Network: Know Your Watershed
- The Gulf of Mexico Program
- Brownfields and Land Revitalization
- Institute for Wetland and Environmental Education and Research
- The Low Impact Development Center
- The National Wildlife Federation
- NatureServe: Natural Heritage Programs in the United States
- River Network
- Alabama Environmental Council
- Alabama Rivers Alliance
- National Estuarine Research Reserve System (Weeks Bay)
- Weeks Bay Foundation

- Alabama Coastal Foundation
- Land Trust Alliance
- Black Warrior--Cahaba River Land Trust
- Cahaba River Society
- The Nature Conservancy
- Alabama Water Watch
- Discovering Alabama
- Choctawhatchee, Pea, and Yellow River Watershed Authority
- Alabama Resource Conservation and Development Councils