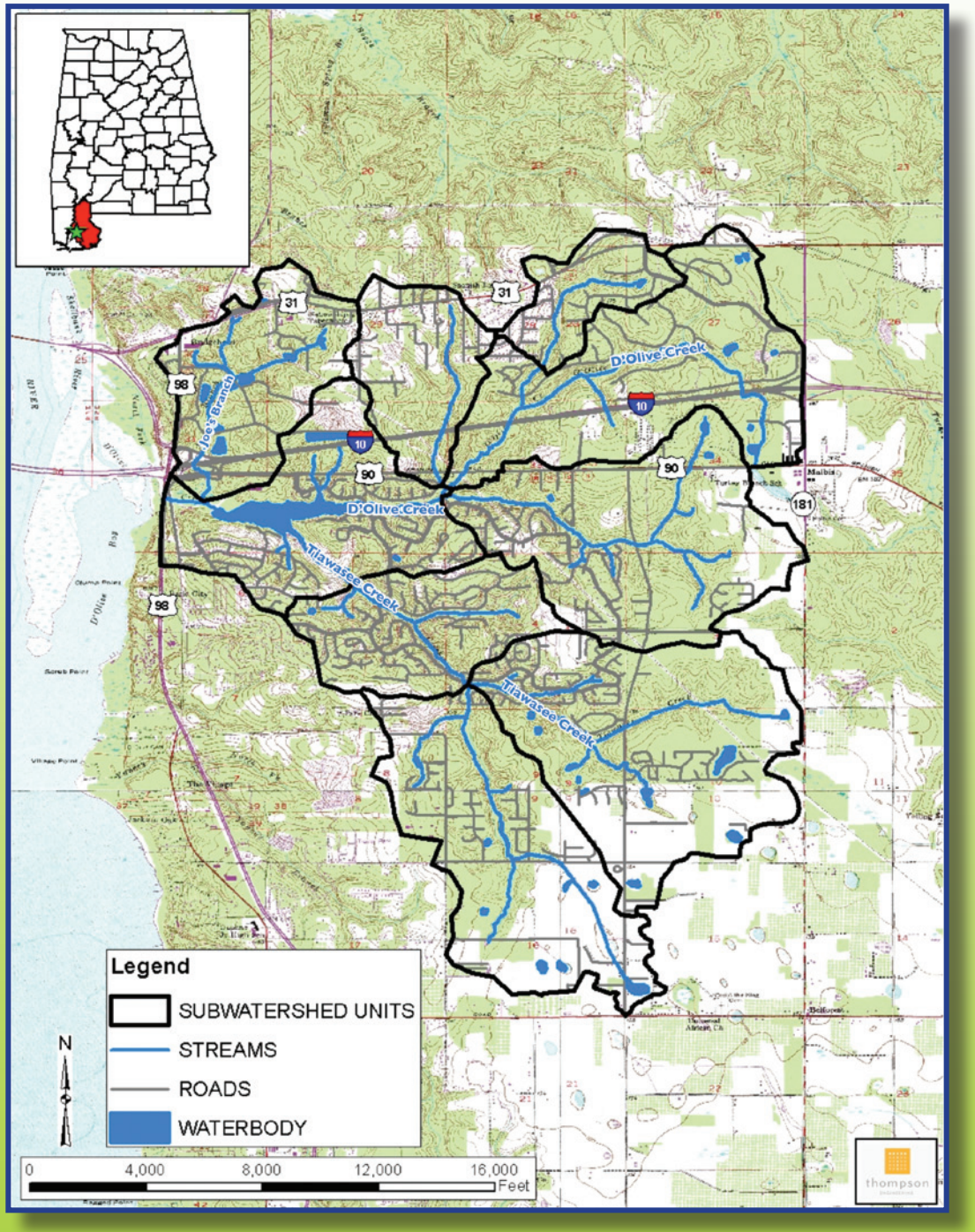
D'Olive Watershed

Path Toward Restoration



Water is the most critical resource issues of our lifetime and our children's lifetime. The health of our waters is the principal measure of how we live on the land.

– Lana Leopold

The D'Olive Watershed: A System in Peril

Excessive erosion and sedimentation have plagued the D'Olive Watershed since the 1970s, and ongoing urban development continues to intensify problems in each of the three principal drainage areas in the watershed. Lake Forest Lake, which drains 91% of the seven-square mile watershed, receives 7,800 tons of sediment per year – roughly 650 dump truckloads. This sediment not only impacts the lake, but some portion will pass through the lake and be deposited in D'Olive Bay and the Mobile Bay estuary.

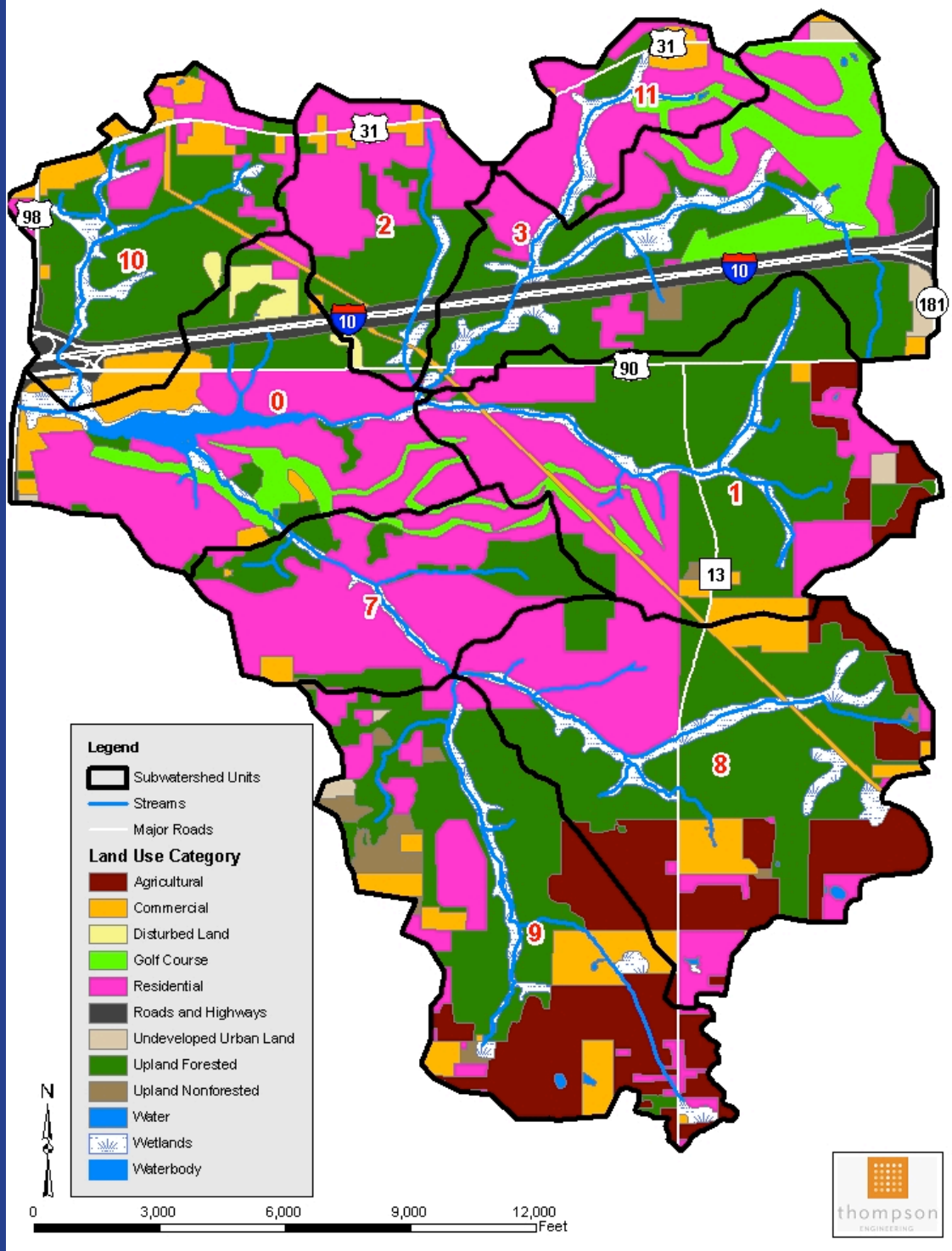
1974 NASA Skylab Imagery

Increased volume and velocity of stormwater runoff and changes to local drainage patterns have escalated concerns over erosion and sedimentation within the watershed stream network, Lake Forest Lake, D'Olive Bay, and Mobile Bay. Urban development transforms the natural landscape into hard surfaces (i.e. rooftops, roads, and parking lots), collectively referred to as "impervious cover." Based on the intense growth experienced in this region, a 100% "build-out" condition, with essentially all presently undeveloped land converted to commercial or residential land uses, could be reached by 2020.

Studies show that water quality impacts and stream channel instability begin when impervious cover within a watershed exceeds 10% of the surface area. When the level of impervious cover exceeds 25%, watershed streams typically will no longer support their designated uses, and the chance to pursue meaningful stream restoration is greatly diminished. As impervious cover increases above the 25% threshold, hydrologic restoration opportunities are reduced, volumes and velocities of stormwater runoff continue to increase, and streams lose the capacity to support a diverse biotic community becoming nothing more than conduits for stormwater. Currently, the percent impervious cover within the D'Olive Watershed ranges from 20-25%, and could approach 38% by 2020.

The D'Olive Watershed Working Group (a coalition of federal, state, and local agencies, property owners, developers, and commercial interests) recently completed a comprehensive watershed management plan (WMP) with assistance from Thompson Engineering, a local engineering and environmental consulting firm. The WMP includes measures for managing stream and wetland restoration, restoration of Lake Forest Lake, stormwater retention/detention, sediment trapping, and reducing stormwater volume/velocity. As well, the WMP includes recommendations for changes to local policies and regulations for stormwater management. **The cost of fully implementing this plan TODAY will be in the millions of dollars. However, the cost of doing nothing is exponentially greater;** reduced property values, loss of tax revenue, an increased need for infrastructure repairs, and continued disruption and damage to valuable ecosystem services will cost more in the long run.

Current Land Use in the D'Olive Watershed



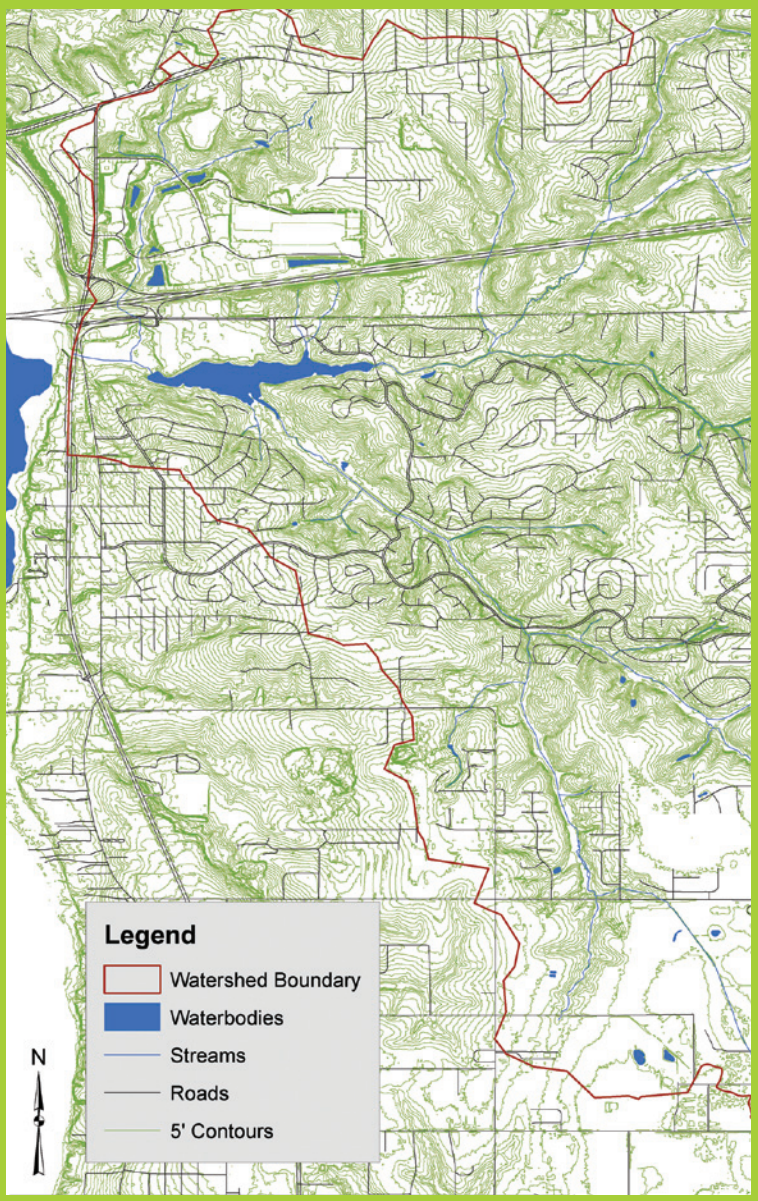
Urban land use currently comprises 47% of the watershed; while upland forest and agriculture areas cover 36% and nine percent, respectively; and wetlands and non-forested uplands cover an additional six percent and one percent. *Source: 2005 Baldwin County GIS database*

Watershed Characteristics

The D'Olive Watershed, located in Baldwin County, Alabama and draining an area of over 7,700 acres, consists of three principal streams: D'Olive Creek, Tiawasee Creek, and Joe's Branch. Governmental control over the watershed is shared by Baldwin County and the Cities of Daphne and Spanish Fort. D'Olive Creek and Tiawasee Creek flow into Lake Forest Lake, with Joe's Branch joining D'Olive Creek downstream of the lake. **The entire D'Olive Watershed empties into Mobile Bay** through a small embayment known as D'Olive Bay.

A study of sediment loadings in the D'Olive Watershed conducted by the Geological Survey of Alabama during 2007-2008 revealed that **D'Olive Creek supplies approximately 83% of the total sediment load** delivered to Lake Forest Lake, with Tiawasee Creek providing most of the remainder. Data indicate that at least **70% of the total capacity of Lake Forest Lake has been filled with displaced sediments** since it was constructed in 1973.

Stream bank erosion accelerated by a debris jam of uprooted trees in D'Olive Creek



Depiction of 5-foot topographical contours within the D'Olive Creek Watershed. Lines that are very close together appear to be shaded and represent steeper slopes or gradients.

Of the four principal factors that influence erosion and sedimentation – topography, climate (rainfall), soil characteristics, and vegetation (land cover) – humans, through their choice of land use activities, only have control over the land cover factor. The other three factors – extreme and rolling topography, over five feet of hard rainfall annually, and highly erodible soils - create an almost "perfect storm" of stormwater runoff and erosion in the watershed. As the WMP was being prepared, 47% of the D'Olive Watershed was characterized as "urban" in land use, with most of the remaining undeveloped land zoned for residential development and a small percentage targeted for commercial use.

Impacts on the Watershed – Wetlands, Lake Forest Lake and Streams

Sediment discharge in the D'Olive Watershed is a problem because of deeply eroded stream valleys, steep slopes, numerous tributary segments, highly erodible soils, and the inherent instability of exposed sediments. Extreme volumes and velocities of stormwater runoff from hardened urban landscapes exacerbate stream instability problems and contribute to high sediment loads. Almost **23 miles** of streams flow through the D'Olive Watershed, including over **two miles** that have already been substantially degraded by stormwater runoff and sediment accumulation; **four miles** that are currently being degraded; and **six miles** that have the potential to experience degradation in the future. **Due to excessive sedimentation and habitat alteration, streams within the Watershed have been placed on the State of Alabama 303(d) List of impaired water bodies.**

Wetlands within the D'Olive Watershed are also being degraded by sedimentation and/or hydrologic problems that have altered stream channel characteristics. Principal wetland impacts in the watershed are associated with Joe's Branch and D'Olive Creek and their tributaries, but have also occurred in the Tiawasee sub-watershed. Wetlands impacted by excessive sedimentation offer opportunities for invasive, exotic plant species to become established. These plants cannot provide the same natural food source or shelter as the original vegetative community, which can lead to the destruction of valuable habitat for aquatic and land animal species.

Typical erosion associated with power line rights-of-way

Sedimentation in wetlands of a tributary to Joe's Branch upstream of Town Center Avenue

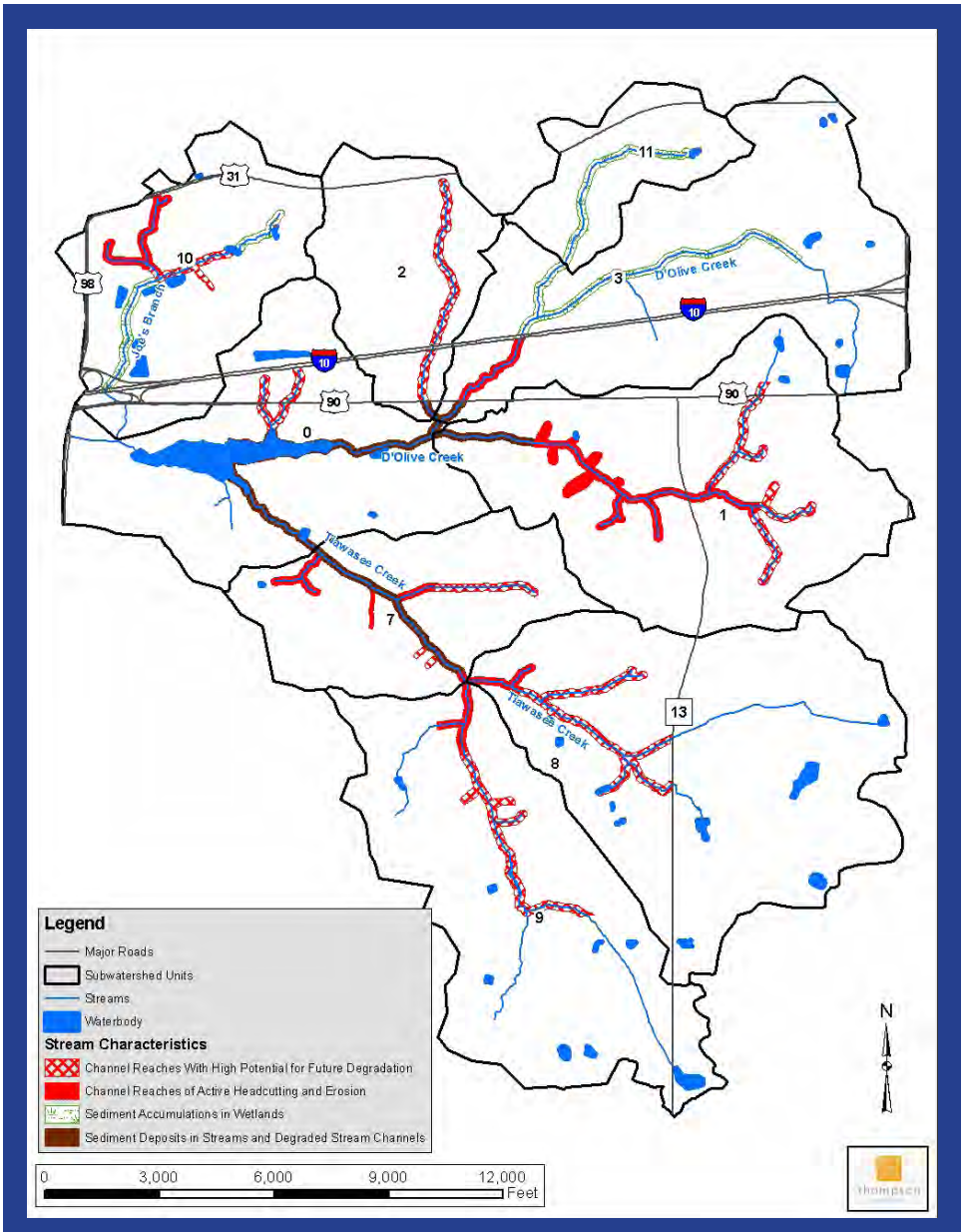
Watershed Management Goals and Objectives

Four **primary** objectives guided the development of the conceptual measures addressed in the WMP:

- **Reduce upstream sediment inputs** into the Lake Forest Lake/D'Olive/Tiawasee system
- **Reduce outgoing sediment loads** into D'Olive Bay and the Mobile Bay estuary.
- **Remediate past effects** of sediment loading, including the restoration of Lake Forest Lake.
- **Mitigate future impacts** of development in the watershed, where feasible.

Secondary objectives that influenced the formulation of management measures included:

- Develop data and improved management measures necessary to establish total maximum daily loads (TMDLs) for sediments entering water bodies.
- Maintain the percentage of impervious cover in the watershed at levels not greater than 25%.
- Restore natural watershed hydrology to the extent feasible.
- Mitigate the effects of in-stream erosion caused by urban development in the watershed.
- Remediate/restore waterways, wetlands, and floodplains that have been adversely affected by sediment deposition and accumulation.
- Establish more effective standards and criteria for runoff retention and erosion control.
- Reduce the amount of public funds that could be required to repair degraded streams in the future.



Stream and wetland degradation problems in the D'Olive Watershed

Watershed Management Measures

Without more effective stormwater management, the projected level of growth within the watershed will continue to worsen stream conditions, and greatly constrain potential future stream restoration efforts. Because ongoing stream channel degradation problems are made worse by each significant rain event, **timely action is critical**. By successfully addressing excessive stormwater runoff and the sedimentation that it causes, the long-term health of the streams, wetlands, and bays will be recovered.

Gullied ditch along Highway 31 in Spanish Fort

The management measures recommended in the WMP include restoration or mitigation of past environmental impacts, policy and regulatory changes, and opportunities to employ "cutting-edge" technologies for "Green Infrastructure" and "Low Impact Development." In addition to large-scale restoration and water management measures, property owners, property owner associations, developers, and governmental institutions can take steps to better manage stormwater runoff on a smaller scale, such as adjacent to the buildings and other impervious surfaces where stormwater flow is generated.

Rain water harvesting with rain barrel

The WMP consists of three components that should be implemented concurrently:

1. **Repair Immediate Problems** – restoration of streams and wetlands and Lake Forest Lake.

2. **Strengthen Regulatory Controls** – additional requirements for stormwater best management practices, land development regulations (zoning ordinances), potential "overlay districts" for stormwater quality improvement

3. **Restore Watershed Hydrology** –

- Stormwater retrofits of existing developed areas
- "Smart Growth" concepts for new developments
- Land use planning
- "Green Streets" concepts
- Forest preservation
- Rainwater harvesting (cisterns, rain barrels, rain gardens)
- Bio-retention areas
- Regional stormwater facilities
- Preservation of green space
- Preservation/restoration of riparian buffers
- Alternative vegetation management

Cost Estimates and Financing Options

Although preparation of detailed cost estimates was not part of the WMP, the **costs of correcting the significant hydrological and sedimentation problems affecting the D'Olive Watershed are anticipated to range between $22 million and $44 million**. Doing little or nothing will result in deferred costs that will escalate as the environmental deterioration continues. Implementing the measures in the WMP will require a significant, steady stream of funding.

Fourteen **alternatives for funding and financing stormwater improvements** in the D'Olive Watershed are discussed in the WMP:

- Water use service fees (i.e. stormwater utility fees)
- Property, sales, or other taxes paid into general funds
- Federal grants, loans, and revenue sharing
- "Green" stimulus funding
- Funding from non-governmental organizations and other private sources
- Mitigation banks
- Impact fees
- Special assessments
- System development charges
- Environmental tax shifting
- Municipal bonds
- Capital improvement cooperative districts
- Alabama improvement districts
- Tax increment financing districts

Re-stabilized reach below I-10

Community Outreach

A **Community Outreach** and **Public Education Plan** has been developed to promote the importance of implementing the management measures outlined in the WMP to:

- improve environmental quality;
- enhance the quality of life; and
- sustain property values throughout the watershed into perpetuity.

The support of all stakeholders – including residents and those with commercial interests in the watershed – will be needed in order to implement the measures recommended in the WMP.

First Steps

Baldwin County, Spanish Fort, Daphne, the Alabama Department of Environmental Management, and the Mobile Bay National Estuary Program have established an inter-governmental "Watershed Restoration Task Force" to guide the implementation of the actions outlined in the plan. The task force is charged with developing strategies to:

- Adopt a set of management measures (through local ordinance, resolution, and permitting) that will ensure that future development is conducted to minimize further alteration of watershed hydrology.
- Enforce management measures to ensure long-term protection of the waterways and critical habitats throughout the watershed.
- Engage citizens in managing stormwater runoff on a community scale.
- Procure the resources necessary to stem further environmental degradation and to improve stormwater volume and velocity management throughout the watershed. Initial efforts are underway to restore the Joe's Branch sub-watershed through combined efforts of the Alabama Department of Transportation, Alabama Department of Environmental Management, the City of Spanish Fort, the City of Daphne, Baldwin County and the Mobile Bay National Estuary Program.

Incised reach of tributary to Joe's Branch undergoing bank mass wasting

D'Olive Watershed Working Group

Alabama Department of Conservation and Natural Resources, State Lands Division, Coastal Section

Alabama Department of Environmental Management

Alabama Department of Transportation

AT&T

Baldwin County

City of Daphne

City of Spanish Fort

Coastal Alabama Clean Water Partnership

Cypress/Spanish Fort LLP

Geological Survey of Alabama

Lake Forest Improvement Committee

Lake Forest Property Owners Association

Malbis Properties

Mobile Bay National Estuary Program

Natural Resources Conservation Service

State Representative Randy Davis

Tonsmeire Properties

U. S. Army Corps of Engineers

U. S. Fish and Wildlife Service

U. S. Representative Jo Bonner