CHAPTER 5.0
ALTERNATIVES DEVELOPMENT

Water quality can be improved by altering processes that affect nutrient levels in receiving waters. Decreasing the nutrient source within the watershed lowers the nutrient loading. Limiting irrigation or preventing runoff from reaching the receiving water reduces the transport of nutrients. Increases in biological and chemical processes increase removal of nutrients within the watershed also. It is possible to implement several combinations of restoration measures to decrease nutrient levels in receiving waters.

For the purposes of this restoration master plan, three main categories of restoration measures alternatives were developed and analyzed: Creek Restoration Alternative; Watershed Management Alternative 1—Structural BMPs; and Watershed Management Alternative 2—Source Control. Each category was modeled using methods described in Section 1.4. The Creek Restoration Alternative included restoration measures that improved water quality primarily through habitat restoration and creek flow modification. Watershed Management Alternative 1 included restoration measures that improved water quality primarily through trapping nutrients prior to entering the creeks (e.g., sediment trap, CDS units, and treatment wetlands/bioswales). Watershed Management Alternative 2 included restoration measures that improved water quality primarily through reducing nutrient loading at the generation source (e.g., recycled irrigation water use changes). Each of the three alternatives is further described in the sections below.

To provide a baseline for comparison, the nutrient loadings based on historical land use was also modeled. The Historical Land Use scenario and each of three alternatives were modeled for each of the three creeks.

5.1 HISTORICAL LAND USE

The Historical Land Use scenario was developed to represent the baseline nutrient loadings in the absence of human urban land uses, with atmospheric deposition being the only nutrient input to the watershed. Urbanization typically impacts the watershed characteristics and increases nutrient loadings associated with anthropogenic sources. By eliminating urbanization, this scenario establishes the natural baseline and identifies the maximum possible improvement that can be achieved for the watershed.

5.2 CREEK RESTORATION ALTERNATIVE

The Creek Restoration Alternative was developed to represent the effects of restoration opportunities in and along the creeks. The creek restoration opportunities addressed were erosion control, channel modifications, and wetland restoration (Table 5.1).

Table 5.1. Creek Restoration Opportunities

Restoration Opportunities	Stream Modifications
Erosion Control	Stabilize bank and channel
Channel Modifications	Cease vegetation clearing
	Remove concrete and rip-rap
	Stabilize banks with bioengineering techniques
	Remove or improve flow restrictions (e.g., weirs or culverts)
	Pull back banks
	Enhance floodplain
Wetland Restoration	Remove eucalyptus, vinca, tamarisk, and other exotics
	Create and restore riparian wetlands

Specific restoration actions for Las Virgenes Creek, McCoy Creek, and Dry Canyon Creek are identified in Figures 5.1, 5.2, and 5.3. Restoration measures include stabilizing the bank and channel, removing concrete banks, pulling back banks along the creek, removing concrete channels, and reestablishing soft bottom. Improvement of vegetative uptake due to wetland restoration was determined to be relatively localized and insignificant on a watershed scale; therefore, vegetative uptake improvements were not modeled. The nutrient uptake resulting from habitat restoration is insignificant compared to the other nutrient removal alternatives because the steep gradients of the creeks do not allow sufficient time for substantial nutrient uptake and the total area for potential restoration was small.

5.3 WATERSHED MANAGEMENT ALTERNATIVE 1—STRUCTURAL BMPS

Watershed Management Alternative 1 was developed to represent the effects of reducing nutrients from runoff by treating runoff on-site within the watershed using structural BMPs before the runoff reaches the creeks. Four general types of BMPs were identified to be applicable based on land use: detention basins, biofilters, infiltration basins, and pervious concrete. Detention basins capture runoff for treatment through sedimentation. Biofilters utilize vegetation to treat runoff and reduce surface runoff. Infiltration basins reduce surface runoff by increasing percolation into the ground and provide removal of contaminants. Similarly, pervious

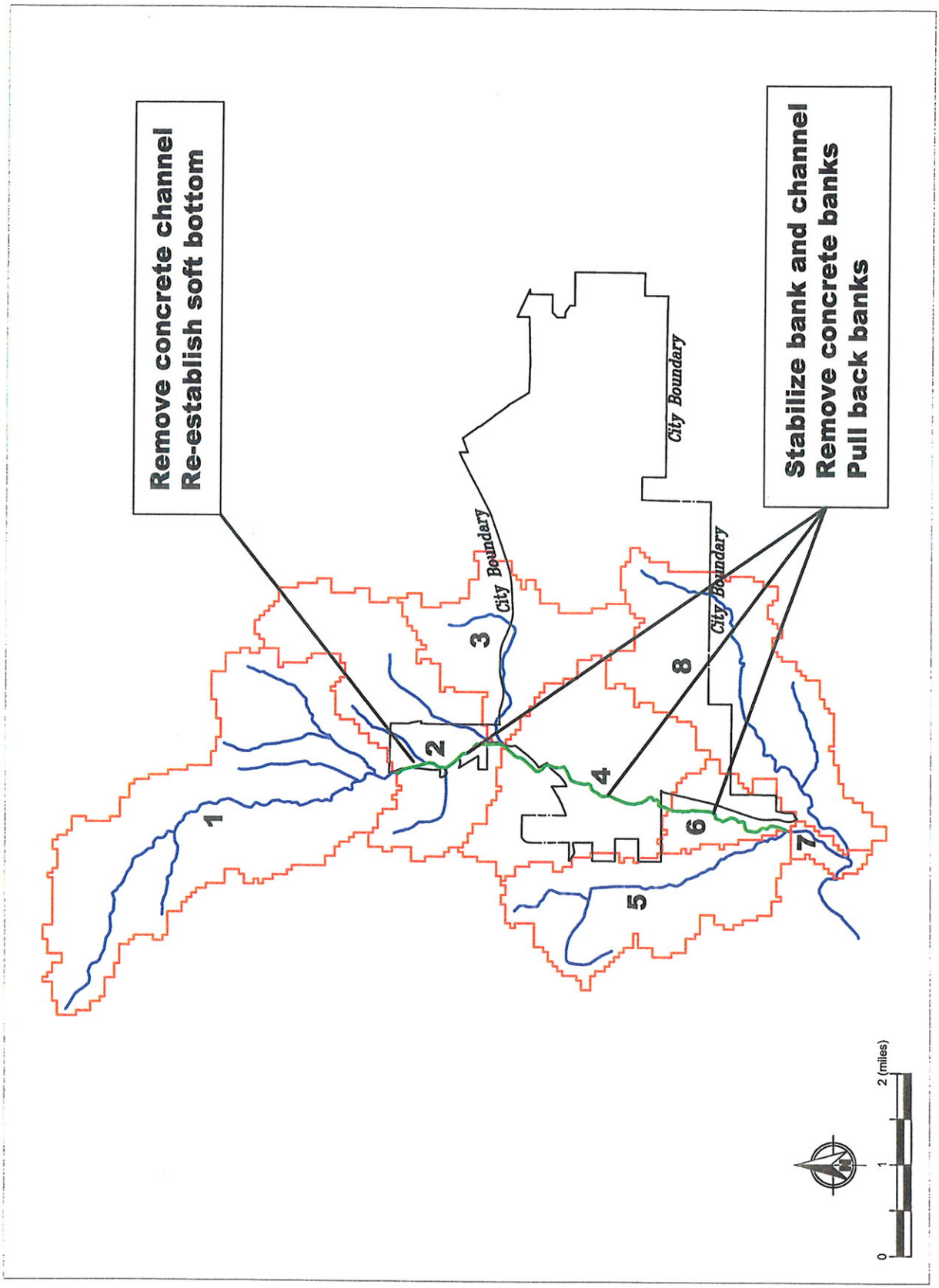

Figure 5.1
Creek Restoration Alternative for Las Virgenes Creek

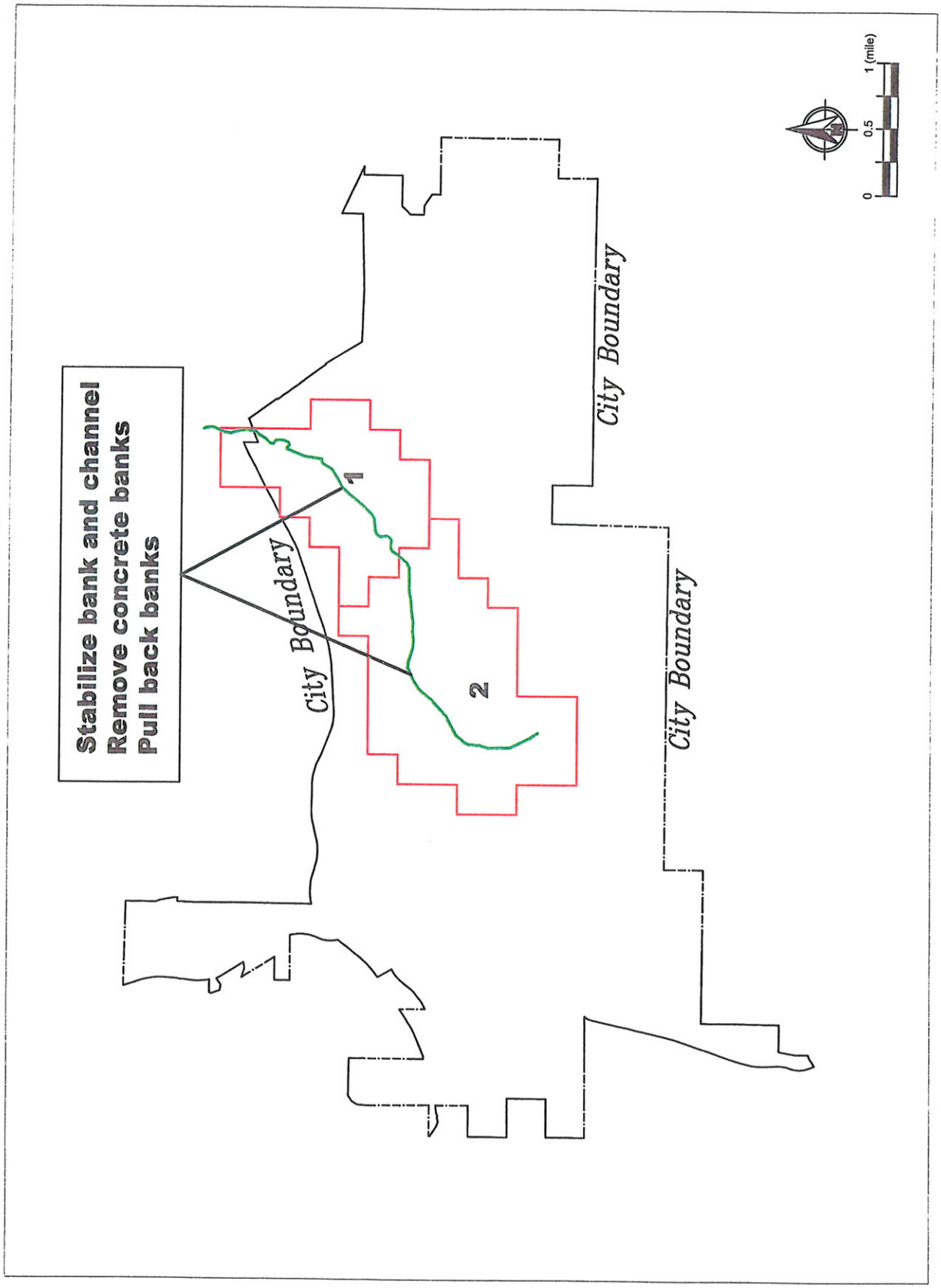

Figure 5.2
Creek Restoration Alternative for McCoy Creek

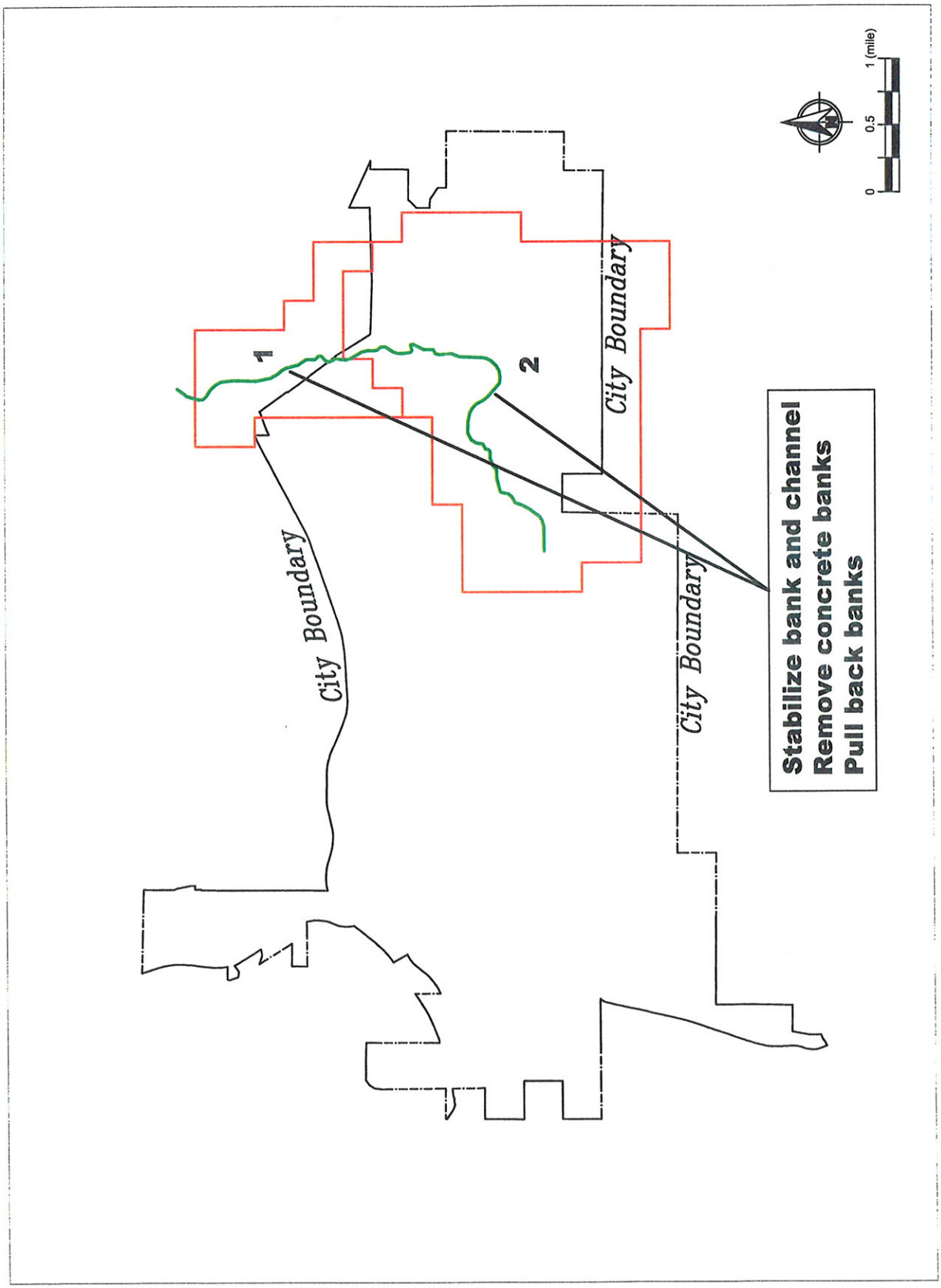

Figure 5.3
Creek Restoration Alternative for Dry Canyon Creek

concrete reduces the runoff from impervious urban areas by promoting infiltration and contaminant removal.

The removal efficiencies used in the modeling of Watershed Management Alternative 1 were calculated based on average literature values (Appendix A). To account for the potential range in runoff trapping and poor performance of some structural BMPs, two scenarios were developed to represent Alternative 1. Alternative 1A was based on the assumption that the structural BMPs were successful at treating 50% of the runoff, while Alternative 1B was based on the assumption that the structural BMPs were successful at treating 100% of the runoff.

The use of structural BMPs is limited based on land use. Table 5.2 shows the applicable land uses for each structural BMP. The areas within the subwatersheds of each creek in which BMPs can be implemented are shown in Figures 5.4, 5.5, and 5.6. In some cases, multiple BMPs can be implemented within the same land use. (For example, both detention basins and biofilters can be implemented for agricultural land uses.) For land uses with two applicable BMPs, the efficiency was calculated based on the assumption that the BMPs would be linked in series such that the efficiency of the second BMP was applied to the output of the first BMP.

Table 5.2. Applicable Land Uses for Types of Structural BMPs

Type of BMP	Applicable Land Use
Detention Basins	Agricultural and Husbandry
Biofilters	Agricultural, Husbandry, Residential, and Commercial
Infiltration Basins	Residential and Commercial
Pervious Concrete	Residential

5.4 WATERSHED MANAGEMENT ALTERNATIVE 2—SOURCE CONTROL

Watershed Management Alternative 2 was developed to represent the effects of reducing nutrient loading through reductions in sources. Based on information presented in Section 3.3 of Appendix A, the most significant nutrient sources in the watershed were determined to be atmospheric deposition, septic systems, reclaimed irrigation water use, golf course fertilization, and livestock. It was not considered feasible to reduce atmospheric deposition of nutrients in the watershed modeling analysis (Appendix A) because atmospheric deposition occurs on a regional basis, which is beyond the geographic limits (watershed) of the analysis. Septic systems within the Las Virgenes Creek watershed occur downstream of the area of interest (City limits); therefore, changes in septic systems were not addressed in the watershed modeling analysis since those changes would not have any effect on the portion of the creek that flows through the City. The remaining sources of nutrients in the Las Virgenes watershed that were analyzed for control

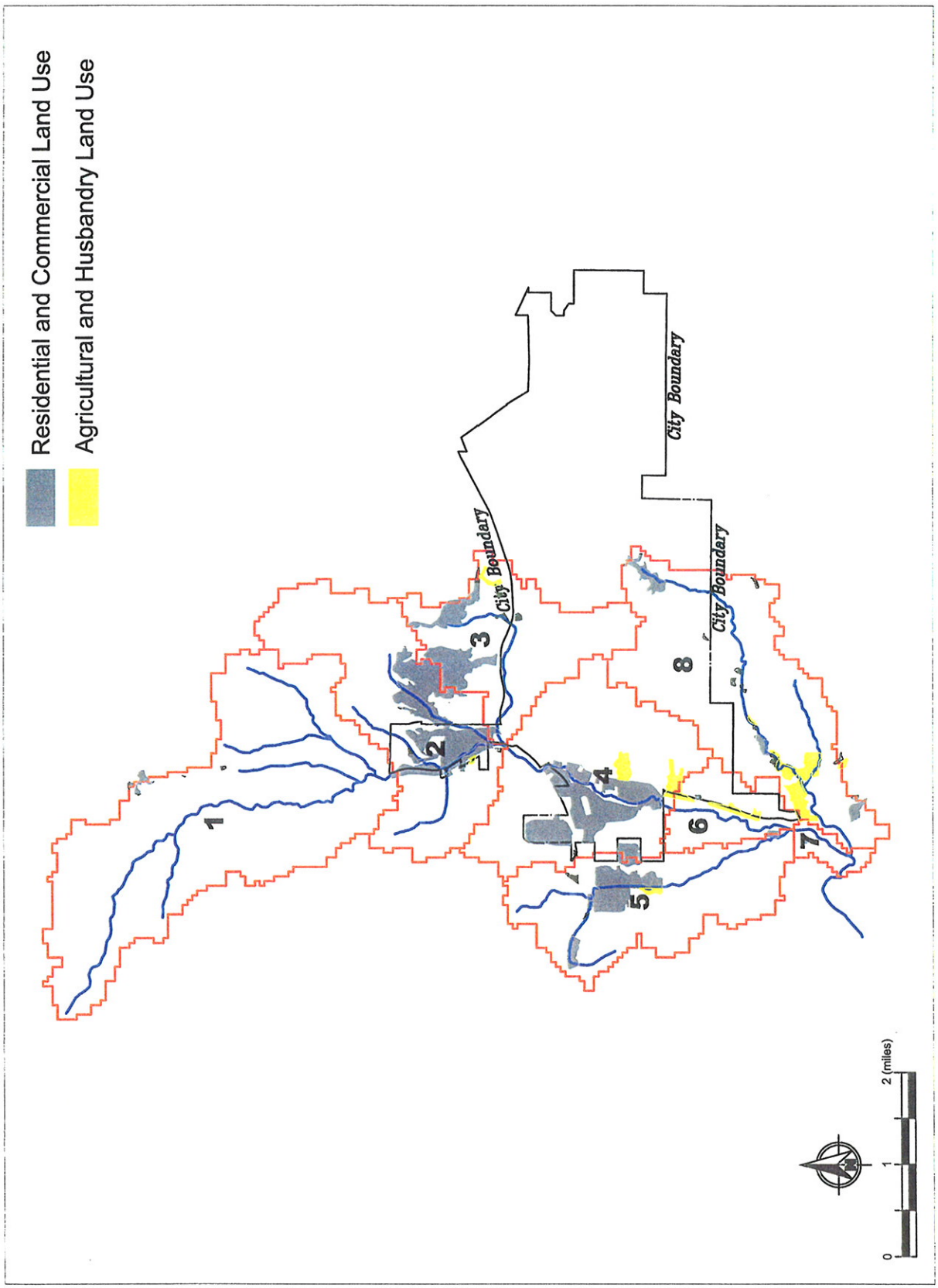

Figure 5.4
Watershed Management Alternative 1 - Structural BMPs for Las Virgenes Creek

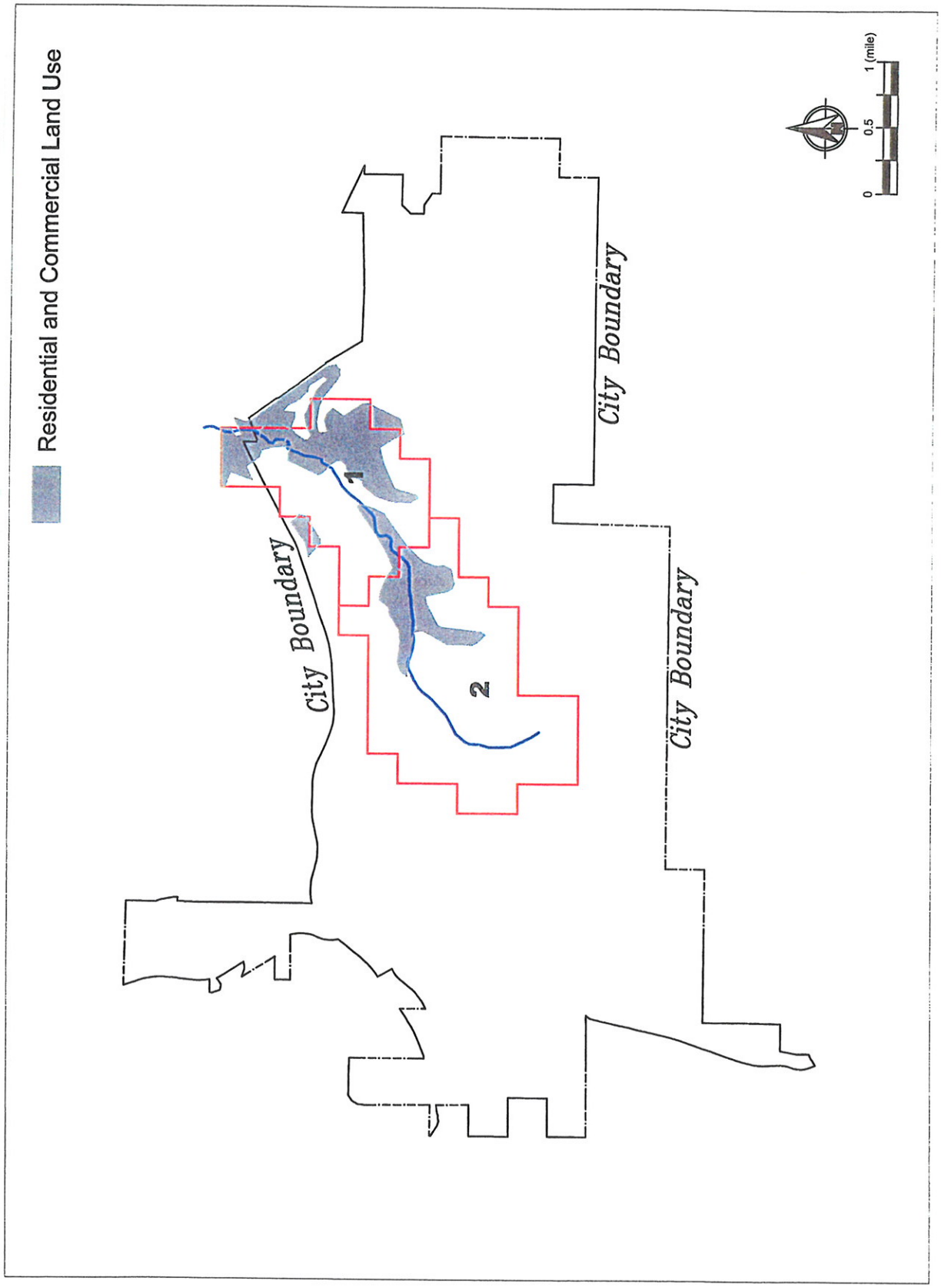

Figure 5.5
Watershed Management Alternative 1 - Structural BMPs for McCoy Creek

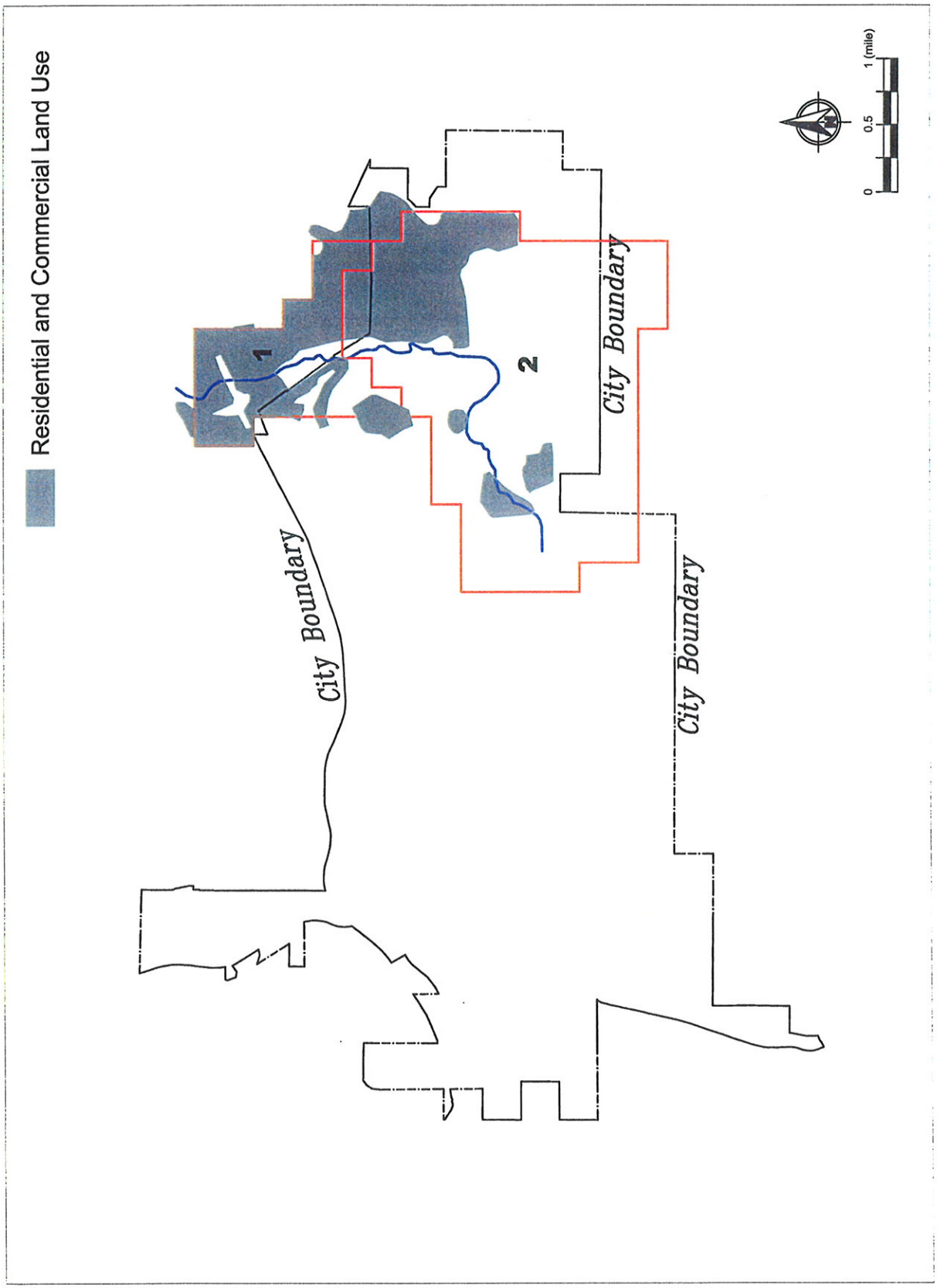

Figure 5.6
Watershed Management Alternative 1 - Structural BMPs for Dry Canyon Creek

as part of the watershed modeling analysis were reclaimed irrigation water use and livestock. In the McCoy and Dry Canyon Creek watersheds the sources of nutrients that were analyzed for control were golf course irrigation, and reclaimed water irrigation, with some discussion regarding septic systems.

A reduction factor in nutrient loading was applied for each of the controllable sources within each watershed. Figures 5.7, 5.8, and 5.9 show the nutrient source reductions that were applied to the subwatersheds of each creek.

Similar to Watershed Management Alternative 1, two scenarios were developed for the Watershed Management Alternative 2. Alternative 2A was based on the assumption that the source control measures would be effective in achieving a 25% reduction in reclaimed water irrigation and livestock sources. Alternative 2B was based on the assumption that the source control measures would be effective in achieving a 50% reduction in nutrients.

A summary of the watershed model alternatives is given in Table 5.3.

Table 5.3. Summary of Watershed Model Simulations

Alternative	Description
Historical Land Use	No urban land uses and sources; open space only
Creek Restoration Alternative	Implementation of all creek restoration opportunities
Alternative 1A	Structural BMPs – 50% Runoff
Alternative 1B	Structural BMPs – 100% Runoff
Alternative 2A	Source Control Measures – 25% Source Reduction
Alternative 2B	Source Control Measures – 50% Source Reduction

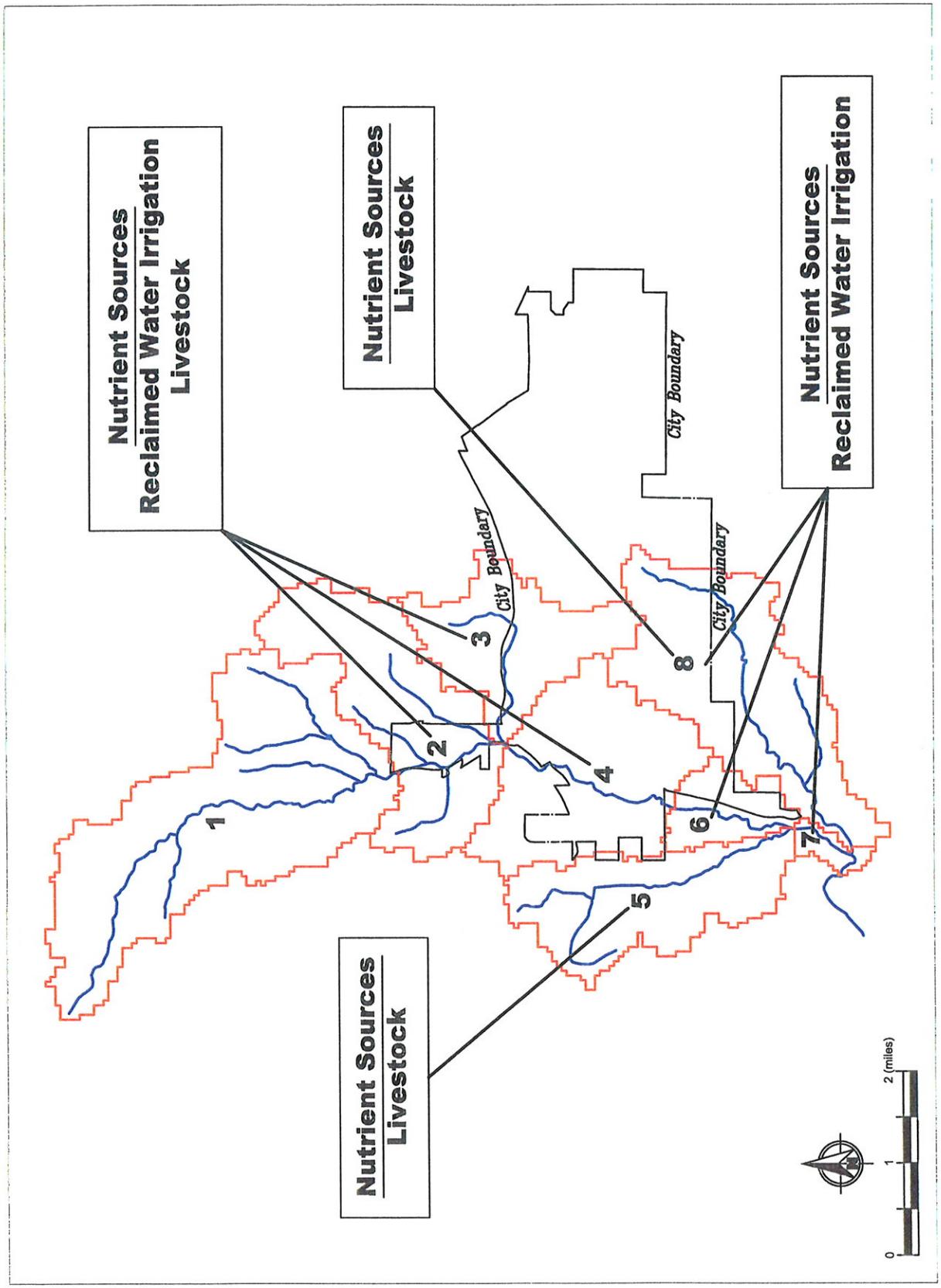

Figure 5.7
Watershed Management Alternative 2 - Source Control Measures for Las Virgenes Creek

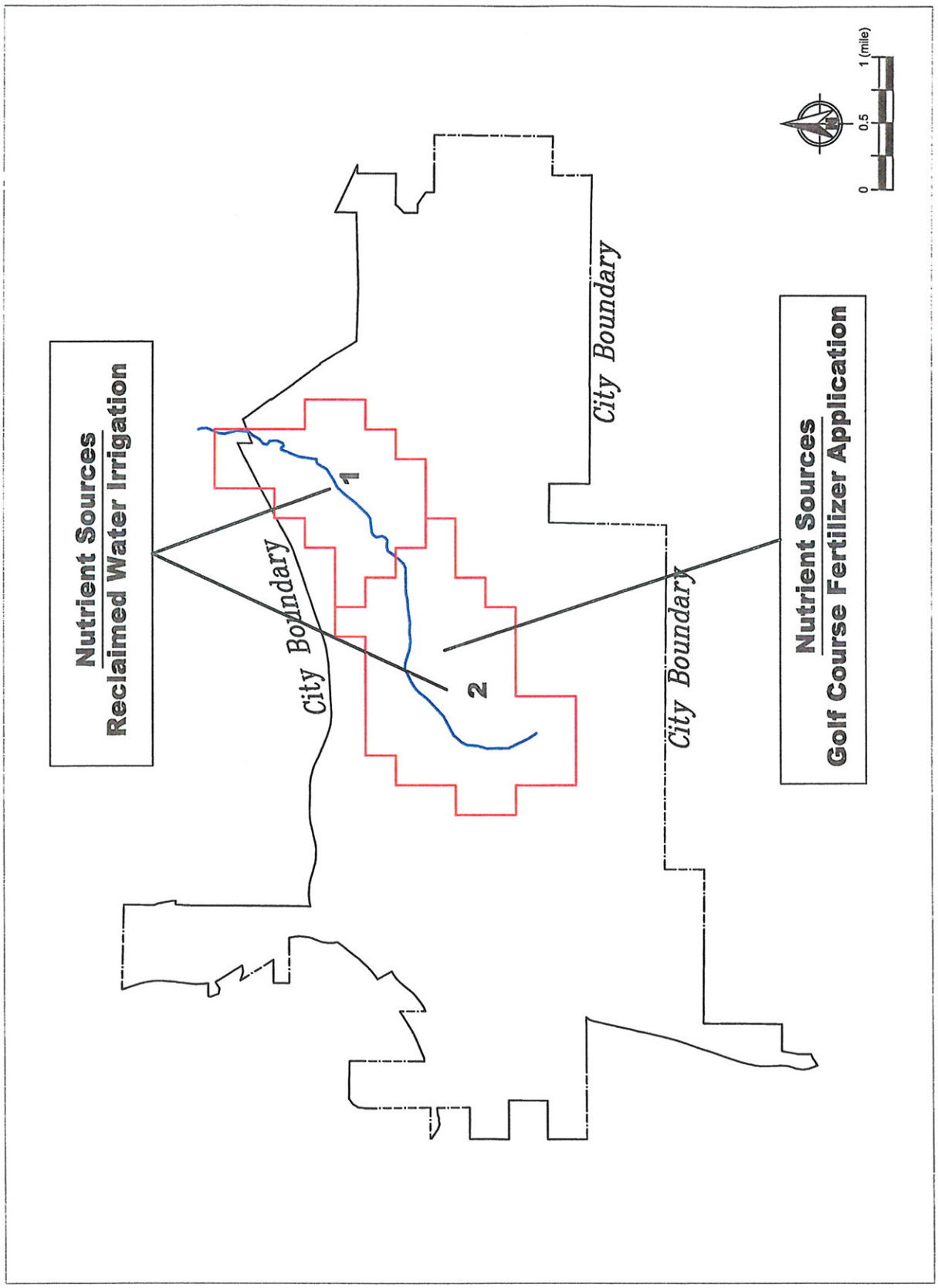

Figure 5.8
Watershed Management Alternative 2 - Source Control Measures for McCoy Creek

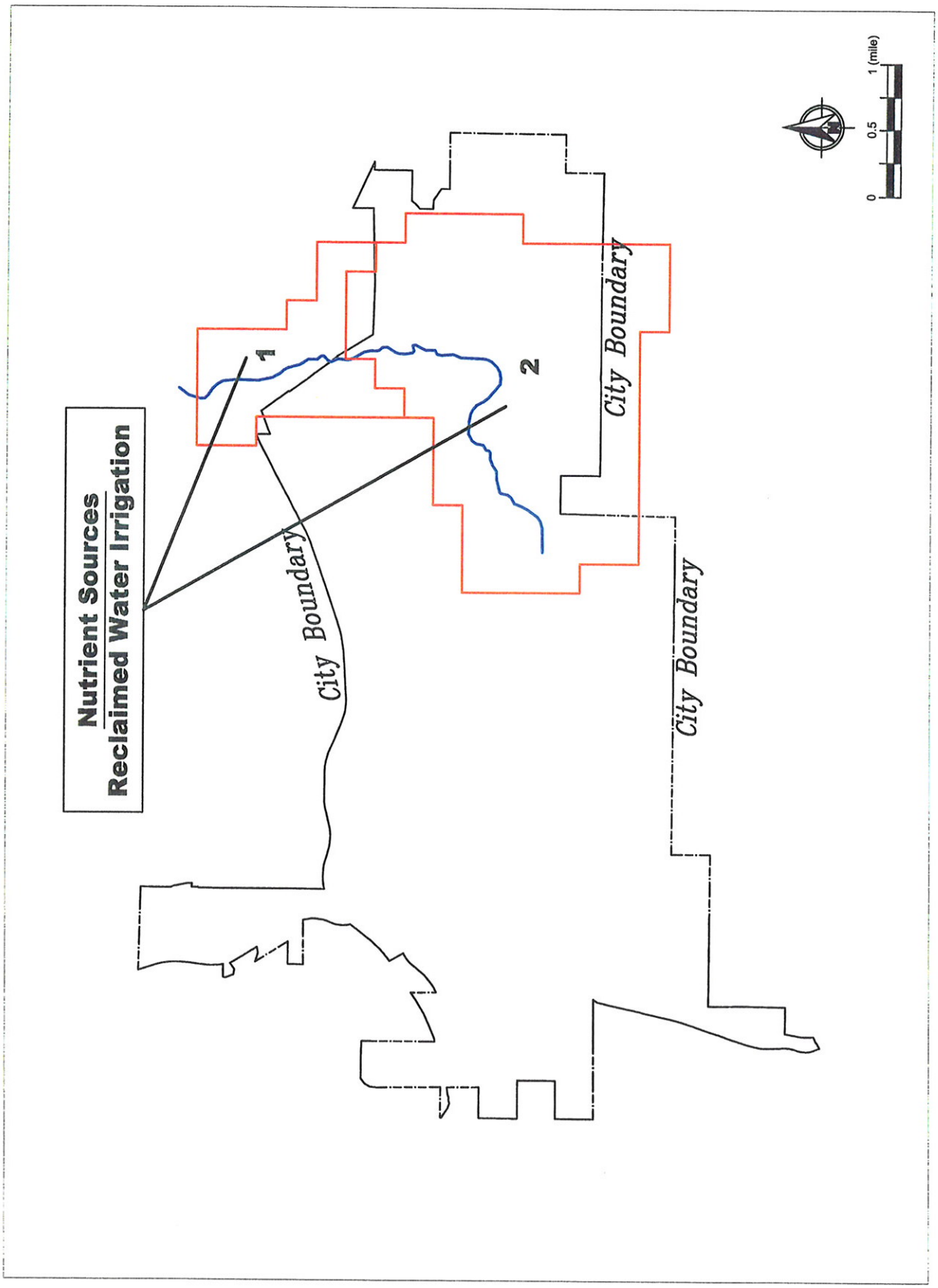

Figure 5.9
Watershed Management Alternative 2 - Source Control Measures for Dry Canyon Creek