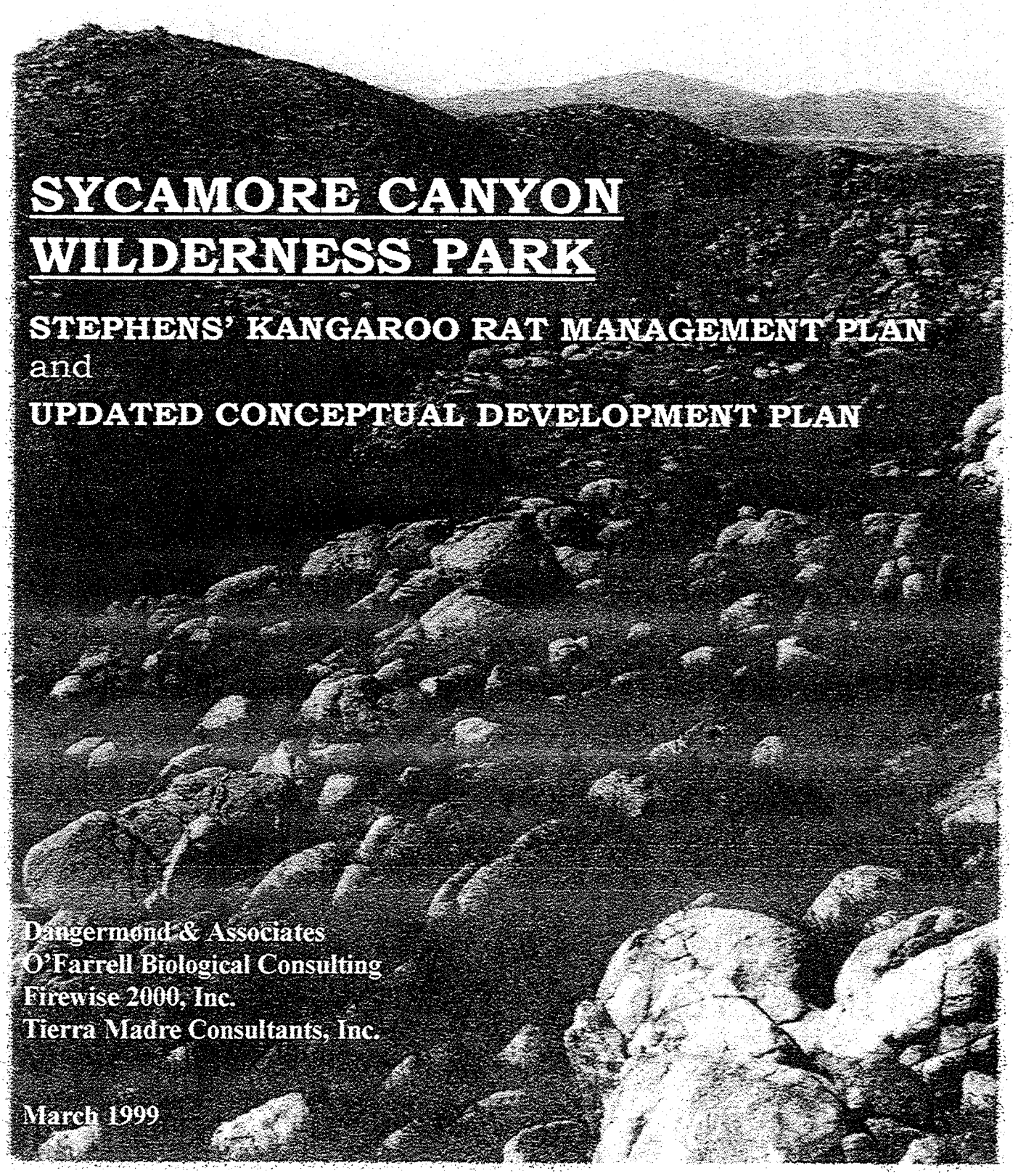

SYCAMORE CANYON WILDERNESS PARK

STEPHENS' KANGAROO RAT MANAGEMENT PLAN
and
UPDATED CONCEPTUAL DEVELOPMENT PLAN

Dangermond & Associates
O'Farrell Biological Consulting
Firewise 2000, Inc.
Tierra Madre Consultants, Inc.

March 1999

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March 1999

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SECTION 1.0
PROJECT SUMMARY

1.1 Executive Summary

1.1.1 Purpose for Report and Past History

The two fold purpose of this report is to update the City of Riverside's Sycamore Canyon Wilderness Park Conceptual Development Plan and to prepare a coordinated Maintenance/Management Plan for the endangered Stephens' kangaroo rat (SKR). Sycamore Canyon Wilderness Park (See Figure 1-1) has been designated as a core reserve by the Riverside County Habitat Conservation Agency in their Habitat Conservation Plan for the Stephens' kangaroo rat. The City is required under the Habitat Conservation Plan to prepare a Maintenance/Management Plan for this core reserve. Since the original Conceptual Development Plan for the Park was formulated prior to the 1988 federal listing of the SKR as an endangered species, necessarily, an update of the Park's Conceptual Development Plan must include a re-examination of the distribution and status of the SKR within the Park and the formulation of maintenance/management guidelines that will assist in both the day to day management of the Park and the long-term survival of the Stephens' kangaroo rat. Current findings indicate that approximately 338 acres within Sycamore Canyon Wilderness Park's 1500 acres are occupied with SKR.

Also within the Park are areas of Coastal Sage Scrub which could potentially serve as habitat for the Coastal California gnatcatcher, another endangered species. Thus a survey for the Gnatcatcher and an assessment of its potential nesting habitat was also performed at the Park as a part of this study. While only small amounts of coastal sage scrub habitat of any quality were found within the Park, designation of just under 600 acres of the site as potential habitat for the Coastal California Gnatcatcher is none the less recommended. Although only four reported sightings of nesting pairs have been observed within the area over the past four years, designation of Gnatcatcher habitat areas within the Park is intended to reinforce the "multi-species" concept for this preserve. The SKR and Gnatcatcher surveys, along with a vegetation survey, are found in Section 4.

Sycamore Canyon Wilderness Park encompasses approximately 1,500 acres of undeveloped open space park land, containing highly flammable native vegetation, surrounded by residential, commercial and industrial developed property. An important aspect of the maintenance/management plan is to provide fire management recommendations that coordinate fire management with the other objectives of the maintenance/management plan.

Fire is considered from two different viewpoints in this maintenance/management plan. The first viewpoint, control of wildland fire, recognizes the potentially detrimental effects that an *uncontrolled* wildland fire would have on the resources within the park as well as on the surrounding developed properties. The second viewpoint, the use of fire as a management tool, recognizes *controlled* burns as a means to achieve potentially positive results in the enhancement of habitat for the SKR. As a pilot program within a limited area, the controlled burning of designated habitat areas can enhance grasslands habitat for the Stephen's kangaroo rat.

Thus, two types of fire plans are provided in this report, one assesses wildland fire risks and the other provides fuel modification techniques that have been devised to be simultaneously beneficial to the SKR.

The final objective of the maintenance/management plan is the coordination of visitor/user needs with habitat preservation/enhancement functions. To achieve this end, a variety of alternatives for Interpretive Facilities, trail heads near "user established" access nodes, and edge treatments to control user access, are examined. The recommended siting alternatives for these facilities will avoid significant impacts to sensitive species habitat.

Despite a desire to promote the Park as a multi-species preserve, this report is not intended to be an exhaustive analysis of every type of flora and fauna species occupying the Park. Because of the close, yet inverse relationship of the Gnatcatcher vs. SKR habitats, it was determined at the onset of the project, that this diametric association of the two habitats necessitated an examination and evaluation of both. However, examination and research for the Stephen's kangaroo rat remains the priority of this plan. Surveying for Gnatcatcher presence and identification of suitable habitat for this species was intended solely to enhance the overall management strategies of the Park.

This document has been prepared as an update to the original Conceptual Development Plan for Sycamore Canyon Wilderness Park prepared by Cardoza, Dilallo, and Harrington (CDH) in 1988. Sections of the original Conceptual Development Plan were retained where the information contained in them did not require updating. Such sections are identified in this report with *(CDH)* following the section title. Except where otherwise noted, all other material in this report was prepared by the Dangermond & Associates project team. The organization of the sections in the original Conceptual Development Plan do not necessarily relate to the format of this report.

1.1.2 Proposed Management Units and Habitat Management Techniques

For the purpose of habitat management planning, the Sycamore Canyon Wilderness Park site has been divided into seven separate Management Units (See Figure 1-2). This will allow the Park's Reserve Manager, to look at the resources and management needs of the different segments of the park in a detailed manner.

The seven Management Units of Sycamore Canyon Wilderness Park are further detailed in Figures 3-6 through 3-12. These units range in size from just under 60 acres to a little over 775 acres. Each management unit contains a mix of vegetative and animal species, some more diverse than others. Dividing the site allows for multi-species monitoring and management on a scale that is more manageable than if one were to attempt to deal with the entire project area as a whole. The use of management units allows the Reserve Manager a method to track results in a variety of ecological conditions on a unit by unit basis.

Management Units were defined using geographical boundaries and natural features. Each management unit is diverse in its vegetative composition but is generally uniform in its topography, aspect and accessability. A key factor in determining management unit boundaries is their expected "burn" behavior and fire characteristics during a wildfire within that unit. Access, values at risk, public safety and fuel models were all considered in defining the boundaries of each management unit.

SYCAMORE CANYON WILDERNESS PARK

Conceptual Development Plan Revision- Park Boundary

Aerial Photo

Current Boundary

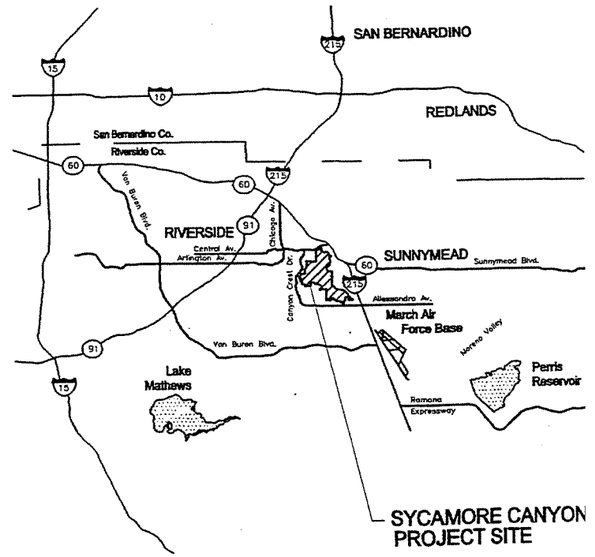
Figure 1-1

Dangermond & Associates
Recreation and Environmental Planning

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision

LEGEND

(#) Management Units



KEY PLAN
N.T.S.

Management Units

Figure 1-2

North

0 750 1500 3000

SCALE IN FEET

Dangermond & Associates
Recreation and Environmental Planning

Resource management techniques recommended within this report include but are not limited to the following:

1. Periodic monitoring of SKR population density;
2. Monitoring of the grassland habitat for density/forb content;
3. Management of the grassland habitat to reduce its density and enhance the diversity of forbs through:
   a. mowing of grassland habitat;
   b. strip and/or mosaic *controlled* burning of grasslands (Pilot Program);
   c. Grazing of grasslands by sheep or goats (Pilot Program);
4. Periodic inspection and monitoring of trails for negative impacts to resources;
5. Control population of feral and domestic cats;

For further details regarding the recommended resource management techniques, see Section 3.0.

1.1.3 Proposed Public Use Facilities

The basic policy for the management of public facilities, interpretation and trail use within Sycamore Canyon Wilderness Park will be to allow public access when and were such access is compatible with the protection of natural resources, which is the basic mission of the Park. This Policy recognizes the priorities that must be given to protection of endangered species (e.g. exclusion of the public from trails in and near gnatcatcher habitat during nesting seasons) and is intended to ensure the maintenance of healthy natural ecosystems upon which all visitor enjoyment of the Park should be based.

The public use facilities (See Figure 1-3) proposed in this Updated Conceptual Development Plan include the following:

- **Interpretive Center/ Day Use Area**
  Located at the terminus of the proposed Kangaroo Court at the east side of Sycamore Canyon Wilderness Park, the Interpretive Center/Day Use area will be the main visitation point for groups and first time visitors. This location was chosen because of its proximity to excellent viewing locations, minimal viewshed disturbance, and avoidance of any impacts by vehicular traffic on neighboring residential areas. The facility will consist of a 2,000 square foot visitor center, restrooms, administrative space, parking for 20 vehicles, bus loading area, overflow parking area, exterior interpretive plaza, and a picnic area within an existing olive grove.

- **Major Trailheads**
  Two major trailheads are planned at locations which can accommodate on-site parking areas. The first is at Central Avenue where public access is currently most frequently taken by Park visitors. This location will include the typical trailhead shade structure with benches and interpretive panels along with on-site parking for 20 vehicles. A second is proposed at Canyon Crest Boulevard near its intersection with Via Vista Avenue. Implementation of this trailhead will require the purchase by the City of

additional land adjacent to the roadway, and possible signalization and roadway improvements to facilitate safe ingress and egress. This trailhead will include the typical trailhead plaza along with on-site parking for 15 vehicles.

- **Minor Trailheads**
  Two minor trailheads are planned, one at the northerly terminus of Barton Street at the Park boundary and a second along Sycamore Canyon Boulevard about a block northerly of Alessandro Avenue. Both locations will include the typical trailhead shade structure and are sited in locations conducive to on-street parking.

1.1.5 Preliminary Opinion of Costs for Proposed Facilities and Management

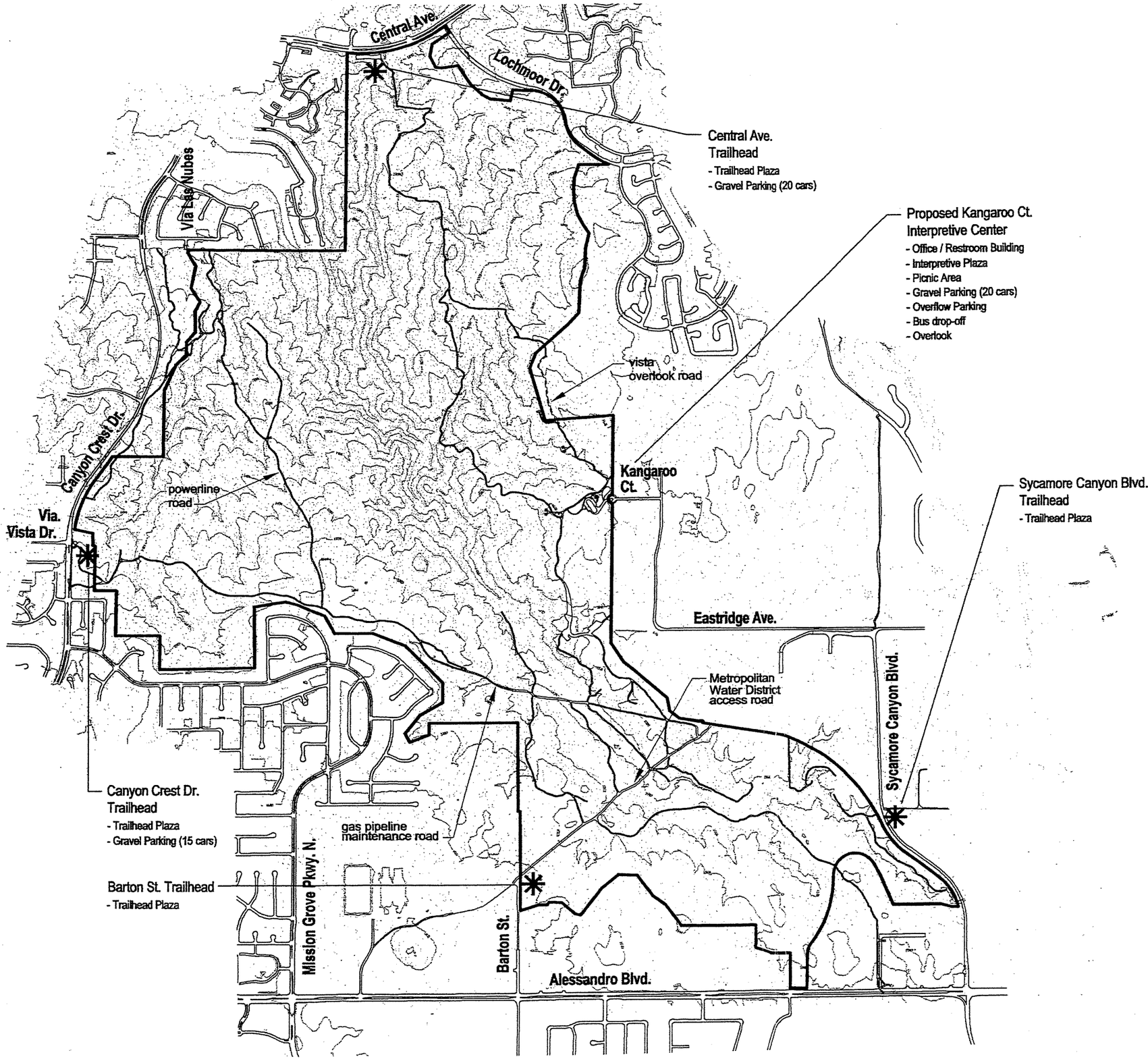
A. Proposed Facilities Cost Summary

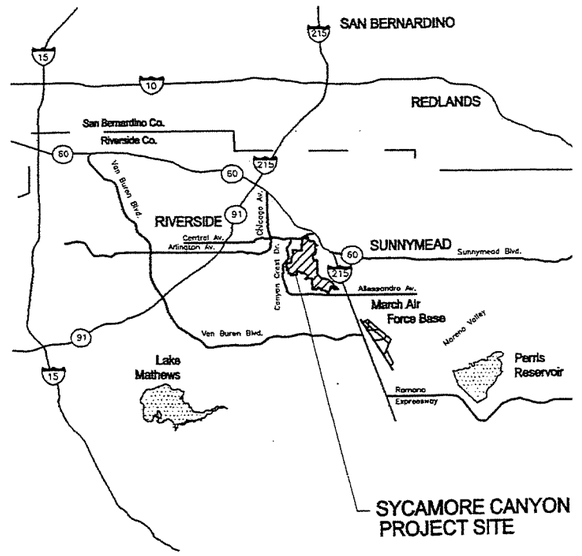
1. Interpretive Center/ Day Use Area		
at Kangaroo Court		$811,460
2. Trailheads		
a. Central Avenue		$ 64,025
b. Sycamore Canyon Boulevard		$ 45,775
c. Canyon Crest Boulevard		$ 78,035
d. Barton Street		$ 47,225
	Total	**$1,046,520**

B. Annual Maintenance/Management Cost Summary

1. SKR Management Cost Summary		$ 14,395
2. Fuel Modification Management Cost Summary		$ 6,175
	Total	**$20,570**

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision





KEY PLAN
N.T.S.

Proposed Visitor Facility Locations

Figure 1-3

North

0 750 1500 3000

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

Dangermond & Associates
Recreation and Environmental Planning

1.2 Plan Implementation

1.2.1 Habitat Conservation Plan Financing (Endowment)

The maintenance/management plan will be implemented using funds made available by the RCHCA which has established a $500,000 non-wasting endowment to assist the City of Riverside in financing ongoing monitoring, management and protection of SKR habitat at Sycamore Canyon Wilderness Park. (RCHCA, HCP, Section 5, p. 183) The non-wasting endowment was created from funds made available through a Stephen's kangaroo rat development mitigation fee (see also Section 2.2.2) imposed by the local jurisdictions on projects that require development permits within the HCP area. Mitigation funds are transmitted to the RCHCA for the purpose of implementing the terms and conditions of the HCP. A portion of these fundscomprise the non-wasting endowement for the SKR management activities at the Sycamore Canyon Wilderness Park. Use of the management funds is restricted to those activities that would insure the species persistence within the core reserves.

1.2.2 Roles and Responsibilities

The City of Riverside Park and Recreation Department will be responsible for the implementation of the Stephen's kangaroo rat Maintenance/Management Plan. The U.S. Fish and Wildlife Service and the California Department of Fish and Game will maintain responsibility for approval of land transactions, approval of incidental take within the Park as specified in the HCP, and provision of technical assistance in the development and evaluation of SKR management, monitoring and biological research activities. (RCHCA, HCP, Section 5, p. 175 - 178).

1.2.3 Summary of Recommendations Contained Within this Report

Section 3.2.2 C.	Recommends SKR habitat management techniques include a combination of mowing, grazing and controlled burning.	Page 19
Section 3.2.2 C.	Recommends review SKR monitoring results with the Reserve Managers Coordinating Committee prior to SKR habitat treatment.	Page 21
Section 4.4.2	Recommends existing trail access locations be formalized to minimize visitor confusion and possible volunteer reestablishment.	Page 110
Section 4.5.3	Recommends consideration be given to expand the Park boundary on the west to include the vacant residentially zoned land bordering Canyon Crest Drive.	Page 113

Section 6.3.1	Recommends that an emergency access gate be provided at Via Las Nubes.	Page 127
Section 6.8	Recommends future acquisition priorities are; (1)acquire the 5 acre parcel near the intersection of the Via Vista Avenue and Canyon Crest Boulevard and (2) acquire the residentially zoned property along Canyon Crest Boulevard between Via Vista Avenue and Country Club Drive.	Page 144
Section 6.10	Recommends that pavement materials be, where possible, decomposed granite or other natural material.	Page 145
Section 7.1.1	Recommends that the reserve manager be responsible for the overall coordination and administration of interpretation at the Park.	Page 152
Section 7.1.1	Recommends that the ranger/maintenance coordinator be capable of coordinating efforts with City Maintenance personnel, preserving peace, ensuring visitor safety, and protecting wildland property.	Page 152
Section 7.3	Recommends that endowment funds either be transferred from RCHCA to City to allow for more aggressive investment that will realize a growing endowment fund, or have County invest in a more aggressive manner to provide the same benefit?	Page 160
Section 7.3	Recommends that all SKR Maintenance/Management Techniques be implemented using funds other than Endowment for the first five years following transfer of funds from the RCHCA to the City to allow the endowment fund to grow.	Page 160

SECTION 2.0
PLANNING PROCESS

2.1 Project Team and Purpose of Planning Effort

This document is the result of two separate planning projects which have been brought together in this report. In 1988, the firm of Cardoza, Dilallo & Harrington (CDH), as a planning consultant to the City of Riverside Park and Recreation Deparment, was developing a Conceptual Development Plan (CDP) for the Sycamore Canyon Wilderness Park site to address open space and recreational issues. Near the end of that planning process, in 1988, the Stephens' kangaroo rat (SKR) was listed by the federal government as an endangered species, such that until a Habitat Conservation Plan for this species could be developed, CDH and the City were unable to complete and or implement the CDP. Now that the Riverside County Habitat Conservation Agency has completed and adopted their Habitat Conservation Plan for the SKR, an update of the Sycamore Canyon Wilderness Park's CDP is needed. The purposes of the current planning effort leading to the preparation of this report are to:

- Examine the current distribution and status of the SKR at Sycamore Canyon Wilderness Park;
- Develop a maintenance/management plan to insure the long-term survival of the SKR at the Park;
- Survey for the presence of the Coastal California gnatcatcher (CAGN) within the Park;
- Prepare a fire safety management plan for the Park; and,
- Update the previous CDP public use facilities plan to avoid any negative impacts to the SKR and CAGN.

Members of the Dangermond & Associates Project Team include:

Dangermond & Associates	**Recreation and Environmental Planners**
Pete Dangermond	Project Principal
Bill Havert	Senior Associate
Steven Musillami	Project Manager
Steven Nawrath	Junior Associate
Sara Schultz	Junior Associate
O'Farrell Biological Consulting	Biological Surveys and Consulting
Dr. Michael J. O'Farrell	Principal
FIREWISE 2000	Fire Management Planning
Richard Montegue	Principal
John Hatcher	Associate
Tierra Madre	Biological Surveys and Consulting
Larry LePre	Principal, Wildlife Biologist
Chet McGaugh	Wildlife Biologist
Stephen Myers	Biologist

Members of the1988 Cardoza, Dilallo & Harrington (CDH) Project Team included:

Cardoza-DiLallo-Harrington	**Landscape Architects & Planners**
Leslee A. Temple	Project Coordinator
Robert R. Cardoza, FASLA	Project Principal
Tomas Munoz	Senior Recreation Designer
Beth Temple	Research Coordinator
Mark Minnis	Recreation Designer
Robert W. Stone	Industrial/Private Developer Coordinator
Ron Yeo, FAIA	Architect
Dr. George Callison	Biology Professor, CSU, Long Beach
Michael L. Ahlering, MLA & Assoc.	Natural/Cultural Resource Manager
Dr. Ted Hanes	Biology Professor, CSU, Fullerton
Dr. Joel Weintraub	Biology Professor, CSU, Fullerton
Dr. Michael Schiffer	Anthropology Prof., University of Arizona, Tucson
Klaus Radtke, Geo, Safety, Inc.	Fire Management Consultant
Gary Wallace, Leighton & Assoc.	Geotechnical Engineer
Nora E. Lake-Brown, Williams, Kuebelbeck & Assoc., Inc.	Economist
James R. Bolton, RMG Engineering	Civil Engineer

2.2 Planning Process History

Western Riverside County is one of several areas in the nation where expansive growth is combined with relatively unique landscape conditions supporting numerous niche plant and animal species. The result of this combination has been the ongoing loss of significant portions of certain habitat types, and the prospect of further loss of habitat in the future. When the habitat of a plant or animal species is lost, either through total destruction or severe fragmentation, the survival of the species is jeopardized. As a means of reducing the impact of such habitat loss, the U.S. Fish and Wildlife Service is empowered to determine if a species is threatened with extinction such that protective measures need to be enacted. In such instances, the Service will list species as endangered or threatened to prevent further destruction of the both the species and its habitat under penalty of law.

2.2.1 Listing of Stephens' Kangaroo Rat

In 1988, the Stephens' kangaroo rat (SKR) was added to the federal and state listings of endangered species by the U.S. Fish and Wildlife Service and the California Department of Fish and Game. Found only in western Riverside and northern San Diego Counties, where the pressures of rapid urbanization combined with conversion of wild lands to agricultural uses has resulted in the extensive loss and fragmentation of its habitat, the SKR was listed so that "local governments could not approve land owner requests for any use of their property which might violate the Endangered Species Act, nor undertake any public activities which might harm the SKR" (RCHCA, Informational Brochure).

To allow land owners and local governments to proceed with development of lands containing SKR habitat, a Section 10(a) permit is required. The 10(a) permit allows for the incidental taking of a federally listed species in the course of otherwise lawful activities. However, before a Section 10(a) permit can be issued, a Habitat Conservation Plan (HCP) for the designated species must be prepared, and then must be submitted to and approved by the Fish and Wildlife Service.

Preparation of an HCP presented a significant road block to individual property owners, and to local governmental agencies interested in further development within western Riverside County. To avoid requiring individual land owners to address the issues raised by the Endangered Species Act (ESA), in June, 1990, the Riverside County Habitat Conservation Agency was formed to develop a regional solution to not only the immediate SKR problem, but to deal with possible future listings by the U.S. Fish and Wildlife Service of other threatened species within the region.

2.2.2 Formation and Responsibilities of the Riverside County Habitat Conservation Agency (RCHCA)

The RCHCA is a "Joint Exercise of Powers" agency formed in June 1990, by various local governmental agencies within western Riverside County. The purpose of the RCHCA is to:

> '...plan for, acquire, administer, operate, and maintain land and facilities for ecosystem conservation and habitat reserves to implement a habitat conservation plan for the Stephens' kangaroo rat and other listed or candidate threatened and endangered species.' (RCHCA HCP p. 3)

In the process of preparing the HCP for SKR, the RCHCA has designated a 'fee area' encompassing some 533,954 acres which correspond to the historic range of the SKR and comprise more than half of western Riverside County. Any development occurring within this fee area is subject to payment of an SKR development impact fee of $1,950 per acre. In addition, also as a part of the HCP, the RCHCA has established a series of core reserve areas totaling about 41,221 acres where "take" of the SKR will not permitted. With the approval of the HCP by the Fish and Wildlife Service, the RCHCA has been permitted to use the SKR impact fees to purchase known SKR occupied habitat within the boundaries of the various designated core reserve areas.

A. Memorandums of Understanding

- MOU Among RCHCA Member Agencies

In 1989, the City of Riverside, along with the cities of Hemet, Lake Elsinore, Moreno Valley, Perris and the County of Riverside (all the member agencies of the RCHCA) adopted a Memorandum of Understanding (MOU) addressing the conservation of the SKR. Through this MOU, to immediately allow further development within the city limits, the City of Riverside committed to acquire the Sycamore Canyon Wilderness Park site, using the City's own resources rather than any SKR impact fees. In addition the City agreed to operate and maintain Sycamore Canyon Wilderness Park '...in a fashion which shall not jeopardize SKR populations within its boundaries and which shall enhance the likelihood of the continued existence of SKR in the wild.'(RCHCA, HCP p. 180).

- MOU Between The RCHCA, U.S. Fish and Wildlife Service (USFWS),Bureau of Land Management (BLM) and the California Department of Fish and Game (CDFG).

This MOU, executed in 1994, defines a process by which a multi-species habitat conservation plan will be developed to cover biological resources in RCHCA member jurisdictions. The multi-species HCP is intended to proactively plan for the conservation of entire ecosystems in order to avoid the individual listing of species that might otherwise result and the accompanying issues and constraints inherent in the federal listing of a species. (RCHCA, HCP, p. 180) The Maintenance/Management Plan developed herein for Sycamore Canyon Wilderness Park is intended to work in conjunction with the proposed multi-species habitat conservation plan.

B. RCHCA Planning Grant for Preparation of SKR Maintenance/Management Plan

Pursuant to the Habitat Conservation Plan (HCP) page 183, the RCHCA will assist each core reserve in developing an SKR habitat management and species monitoring plan that will address specific issues at the individual reserves. Toward that end, RCHCA has granted the City of Riverside Park and Recreation Department $100,000 for the preparation of the SKR Maintenance/Management plan contained within this report.

2.2.3 California Department of Fish and Game, Sycamore Canyon Ecological Reserve

Between 1986 and 1993, a total of 131 acres of land along the southerly boundary of the Sycamore Canyon Wilderness Park (See Figure 1-1) have been purchased by the Wildlife Conservation Board (WCB), the capital improvement arm of the California Department of Fish and Game (CDFG). This land has been conveyed by WCB to the CDFG for management. CDFG in turn is currently negotiating with the City of Riverside to finalize an operating agreement that would essentially incorporate mangagement of this acreage into the City's day to day management of Sycamore Canyon Wilderness Park. Considered a high priority for purchase due to its potential for SKR habitat, in 1994, the State Fish and Game Commission designated this acreage as an Ecological Reserve and imposed regulations for management of the parcel.

A. Operating Agreement

The City of Riverside and the CDFG are currently preparing an Operating Agreement to facilitate the management of this Ecological Reserve by the City of Riverside as a part of the Sycamore Canyon Wilderness Park. The draft operating agreement provides for the preservation and protection of the natural resources, the support of public interpretation and the development of appropriate recreation. The City of Riverside plans to assume responsibility for the development and maintenance of the Reserve and will be responsible for any signage required. The CDFG will not be held liable for any loss or damage connected with the Park. As a prerequisite to execution of the Operating Agreement the management plan for Sycamore Canyon Wilderness Park must be approved by the State.

B. Sycamore Canyon Ecological Reserve Regulations

The CDFG regulations apply to the Sycamore Canyon Ecological Reserve and are included in Appendix 9.2.6 as a reference to assist the reserve manager in coordinating management activities proposed within the remainder of Sycamore Canyon Wilderness Park with those required/allowed within the CDFG ecological reserve.

2.3 Regulatory and Planning Context

The regulatory and planning context for this report is laid out in the *Habitat Conservation Plan for the Stephens' Kangaroo Rat in Western Riverside County*, developed by the RCHCA. The federal and state laws which apply to Sycamore Canyon Wilderness Park are the federal Endangered Species Act (ESA), the California Fish and Game Code (including the State ESA) and the California Environmental Quality Act (CEQA). Each of these components is described in more detail below.

2.3.1 Federal Endangered Species Act

The federal Endangered Species Act (ESA) prohibits the *"taking"* of any species listed as endangered. The term "taking" refers to any activity that would harm, harass or kill the species or negatively affect its habitat. When a species is listed as endangered by the federal ESA, a management plan must be developed and approved before permits regarding the take of that species may be issued.

Three sections of the federal ESA are relevant to the preparation of this plan:

- Section 9 prohibits the taking of species listed as endangered or threatened. The species listed as endangered at Sycamore Canyon Wilderness Park include the SKR, the CAGN, and possibly the Quino Checker-Spot Butterfly (QCB).
- Section 10(a) authorizes the issuance of incidental take permits and establishes standards for the content of HCP's.
- Section 7 requires U.S. Fish and Wildlife Service review of federal actions (including its own) that would affect a species listed as endangered or threatened, or would adversely modify critical habitat designated under the ESA for such species.

2.3.2 California Fish and Game Code

The California Fish and Game Code includes the state Endangered Species Act (ESA). The state ESA parallels the federal ESA and allows the CDFG to work together with the Fish and Wildlife Service to protect federally endangered species. (Fulton, p. 185) Key provisions pertaining to Sycamore Canyon Wilderness Park include:

- Section 2080 prohibits the taking of species which are either listed as endangered or threatened or are candidates for such listing
- Section 2081 authorizes CDFG to enter into agreements regarding the taking of candidate and listed species occurring for scientific, educational, or management purposes
- Section 2090-2097 covers the State process for reviewing projects with potential impacts to State listed species and for species like the SKR that are also federally listed.

2.3.3 California Environmental Quality Act

The California Environmental Quality Act (CEQA) requires agencies who are empowered to make discretionary decisions related to a given project to evaluate the environmental effects of the proposed project before rendering the discretionary decision. The evaluation process begins with an Initial Study to determine if the anticipated impacts of the proposed project would be potentially significant. If any significant impacts will occur, then either an EIR or a Mitigated Negative Declaration must be prepared by the "lead" agency (the project proponent). If the "responsible" agency (the agency exercising the discretionary decision) determines that no significant impacts will occur then a Negative Declaration is prepared by the "lead" agency. If a project affects a listed species, CEQA mandates that an EIR be prepared and that the "lead" agency for the project must submit the EIR to the State Clearinghouse.

2.4 Relevant Plans and Reports

2.4.1 Local Specific Plans

Two local specific plans relate to Sycamore Canyon Wilderness Park.

- *Sycamore Canyon Specific Plan/EIR*, prepared by Donald Cotton Associates, in July 1983. This specific plan was developed to ensure the preservation of open space and to guide orderly development within the Sycamore Canyon Specific Plan area , inclusive of the Wilderness Park. The specific plan includes a development plan, development standards, an implementation and phasing section and an environmental impact report.
- *Sycamore Canyon Buisness Park Specific Plan/EIR*, prepared by Beland Associates with Takata Associates in July, 1982. This specific plan was produced for the implementation of the 920 acre Industrial Park adjacent to Sycamore Canyon Wilderness Park. This specific plan includes a development plan, development standards and design criteria, a specific plan administration section and an environmental impact report.

2.4.2 Riverside County Habitat Conservation Agency (RCHCA)

A. RCHCA Habitat Conservation Plan

Prepared in 1996, the Habitat Conservation Plan (HCP) developed by the Riverside County Habitat Conservation Agency establishes a permanent system of SKR Reserves in Western Riverside County. The goals of the HCP include:

- Provide information required for the Long Term Section 10 (a) permit from the U.S. Fish and Wildlife Service for the incidental take of SKR
- Provide information required for an agreement with the California Department of Fish and Game to authorize the management take of SKR
- Establish and provide for the long term management of seven permanent SKR reserves with opportunities to benefit other species.
  (RCHCA, HCP, Section 1, p. 1)

B. Reserve Managers Coordinating Committee (RMCC) Monitoring Protocol

The Reserve Managers Coordinating Committee (RMCC) was established by the RCHCA to ensure the overall management objectives of the HCP are met, to recommend regional SKR management goals and programs, to advise on future land acquisitions and to evaluate the ongoing management and biological monitoring of SKR habitat within the core reserves. The RMCC is made up of representatives from those agencies responsible for the management of lands within each of the SKR core reserves. The City of Riverside Park and Recreation Department as the agency responsible for Sycamore Canyon Wilderness Park is thus entitled to representation on the RMCC. During the preparation of this maintenance/management plan, the RMCC developed a SKR monitoring protocol (See Appendix 9.5) which will be implemented via a pilot program at the Lake Mathews - Estelle Mountain Reserve for two years to determine the costs and feasibility of the proposed calibrating methods contained within the protocol.

2.4.3 Other Plans

Other plans relevant to the creation of this report include:

- *Stephens' Kangaroo Rat Habitat Enhancement at Lake Mathews, Progress Report 1994, Dr. Michael J. O'Farrell*
- *Stephens' Kangaroo Rat Habitat Enhancement at Shipley/Skinner Reserve, Final Report 1997, Dr. Michael J. O'Farrell.*
- *Stewardship Task and Cost Evaluation for Sycamore Canyon Wilderness Park and Motte Rimrock Reserve in Western Riverside County*, prepared by the Center for Natural Lands Management.

SECTION 3.0
MAINTENANCE / MANAGEMENT PLAN

3.1 Maintenance/Management Objectives

1. Provide proper management of resources which ensure the preservation of all native plant and animal species with particular focus on preservation of SKR and its habitat (See Figure 3-1);
2. Preserve, maintain, restore and enhance the existing natural landscape for the benefit of the park visitor in a manner compatible with protection of the biological resources;
3. Preserve, maintain and enhance the existing archeological sites;
4. Protect existing viewsheds and provide for optimum view opportunities within the site;
5. Encourage repeat visitation.

3.2 Management Unit Methodology

For the purpose of habitat management planning, the Sycamore Canyon Wilderness Park site has been divided into seven separate Management Units (MU's) as shown in Figure 1-2. These units range in size from just under 60 acres to a little over 775 acres. Dividing the site into MU's allows the Reserve Manager to evaluate the resources and management needs of the different segments of the Park in a more detailed manner.

3.2.1 Management Unit Defined/Descriptions

MU's were defined using geographical boundaries and natural features. Each MU may be diverse in its vegetative composition but is generally uniform in its topography, aspect and accessibility. A key factor in determining unit boundaries is their expected "burn" behavior and fire characteristics during a wildfire within that unit. Fire related concerns, including access, values at risk, public safety and fuel models, were all considered in defining the boundaries of each MU. The MU's recommended in this report were selected to be compatible with the management objectives for the listed species the Park is intended to preserve. The rationale for specific species management techniques are discussed in Section 3.3 of this document.

3.2.2 Reserve Management Strategies

A. General

Endangered species, public use and wildland fire can harmoniously exist with properly prioritized management techniques and a monitoring system with adequate checks and balances. Two key environmental conditions which affect SKR populations include the ratio of annual forbes to introduced annual grasses and the percentage of aerial shrub cover within the grassland. An increase in the density of introduced annual grasses has been shown to be detrimental to SKR populations by reducing food supplies. Aerial shrub cover greater than 10% is perceived as shrub land by the SKR and they tend to reduce habitation within such areas. As described below there are many techniques to manage grasslands for the benefit of SKR.

B. SKR Monitoring Techniques

The establishment of management units with designated permanent monitoring plots (Figure 3-2) provides the basis for annual monitoring of SKR habitat and population trends. Initial baseline data, recorded in Table 4-1, has been collected for each of these designated plots as a part of this study to allow for future comparison.

Habitat conditions and population levels of SKR must be periodically monitored to provide sufficient information to assess changes in conditions and to recognize trends. The two most important parameters for monitoring the condition of SKR habitat have been found to be the ratio of grass to forbes (G/F ratio) and aerial shrub cover (O'Farrell, 1997b). Monitoring for SKR density (# individuals/ha) in the fall will provide the peak population estimate, since the fall is the end of reproductive recruitment.

The current designation of monitoring plots provides a minimal but adequately dispersed basis for assessment of habitat and population trends, and will allow monitoring costs to remain within the reach of the City's annual endowment budget. Monitoring of all plots should occur twice each year. Vegetation transects should be conducted in the spring, at the peak time for flowering. Active burrow count transects should be conducted in the fall, at the end of juvenile recruitment. Exact times will vary from year to year and will be dependent upon the amount of precipitation and temperature patterns. To be able to visually locate all active burrow entrances that otherwise could be masked by surface vegetation, burrow count transects must be performed prior to the start of the fall/winter rainy season.

C. SKR Habitat Management

The three SKR habitat management techniques recommended for Sycamore Canyon Wilderness Park are mowing, grazing and controlled burning. The SKR Management Flow Diagram (Figure 3-3) outlines the critical path for determining if treatment is required and the type of treatment needed for each MU.

Due to the unknown existence and locations of other threatened species near the SKR management areas, focused USFWS protocol habitat surveys for the Coastal California gnatcatcher, Least Bell's verio, southwestern willow flycatcher and Quino checkerspot butterfly must be completed and habitats mapped to evaluate the potential "harassment" or "take" of these species prior to the initiation of any SKR management treatment. The City and the USFWS shall review the survey results to determine the need for, and agree to a mitigation plan if required.

Mowing:
In an early examination of the effects of different techniques for habitat enhancement at Lake Perris, mowing appears to provide sufficient opening of the ground surface to result in population increases of SKR (O'Farrell, unpublished data). For the majority of Sycamore Canyon Wilderness Park, when monitoring results indicate the need for treatment, selective mowing with a walk-behind brush mower in the Spring (February through March) is the recommended SKR management technique. The reduction in seeds and above ground biomass serves to limit future contribution to the seed bank of unwanted grasses and assists in short term limitation of surface clutter that limits SKR movements. This management technique allows for treatment of grasslands at a rate of approximately 1 acre/hour, while maintaining Coastal Sage Scrub and other sensitive plant species.

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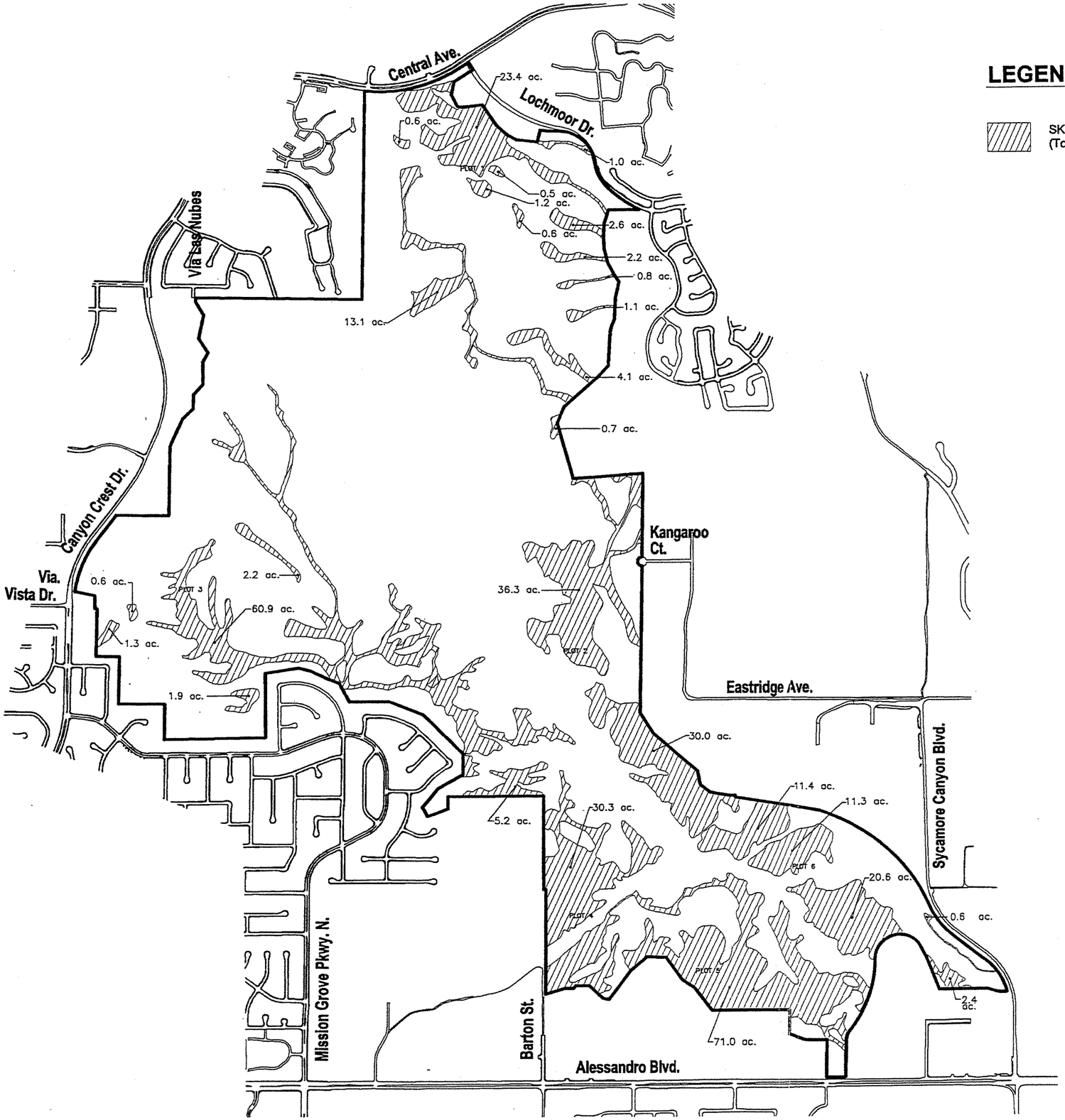
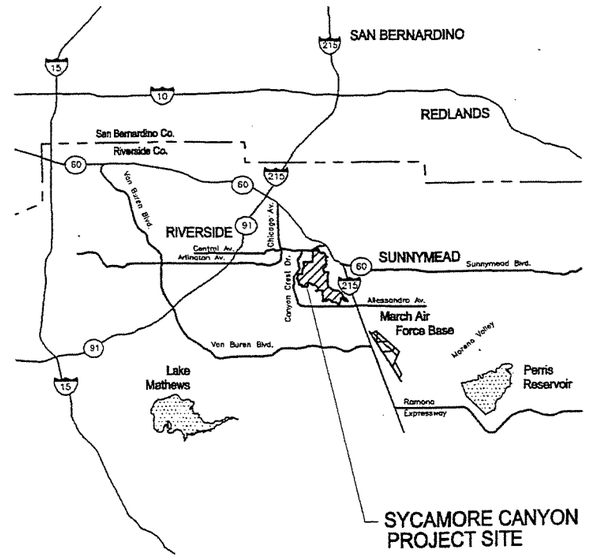


LEGEND

SKR Occupied Habitat
(Total: 337.7 acres)



KEY PLAN
N.T.S.

Stephen's Kangaroo Rat Occupied Habitat

Figure 3-1

North

0 750 1500 3000
SCALE IN FEET

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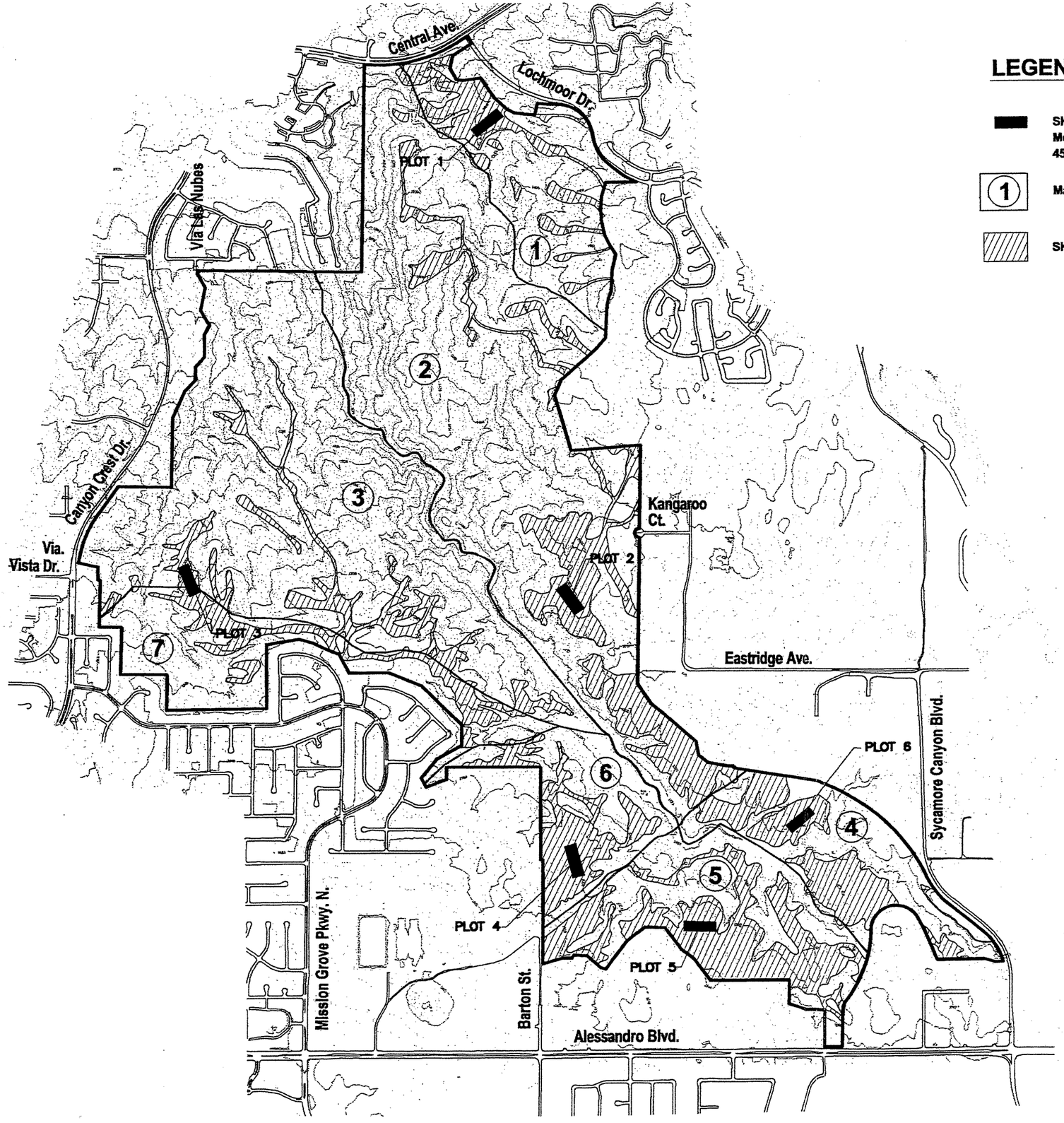
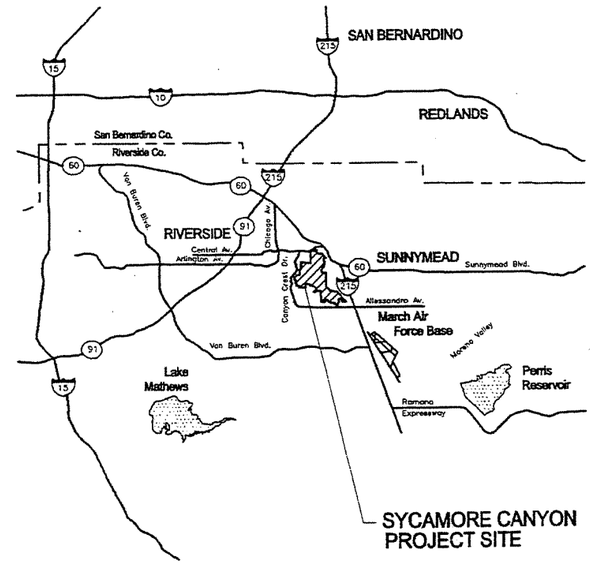


LEGEND

- SKR Habitat Monitoring Plots 45 meters x 135 meters
- 1 — Management Units
- SKR Occupied Habitat



KEY PLAN
N.T.S.

SKR Monitoring Plots

Figure 3-2

North

0 750 1500 3000

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

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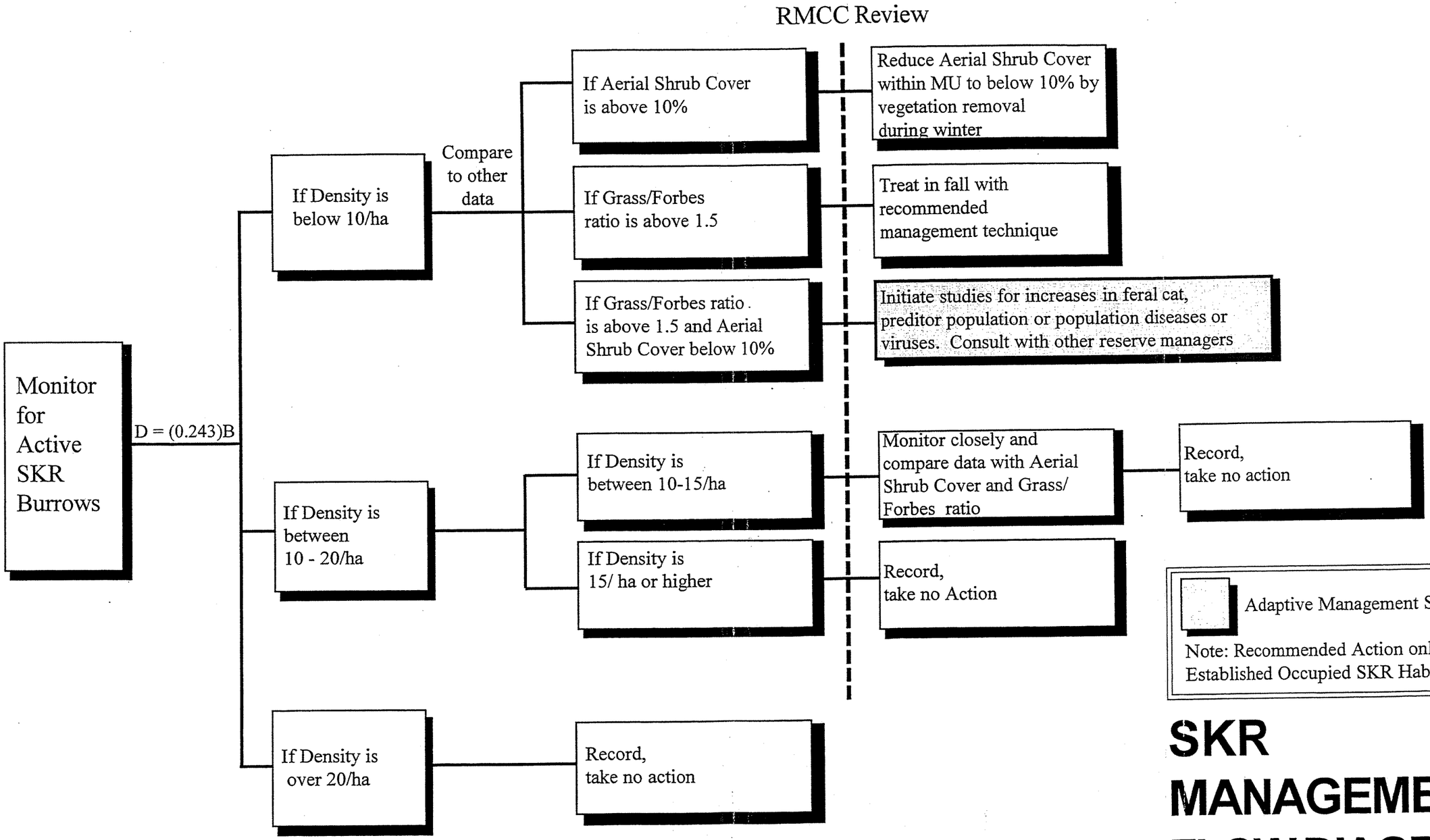
Recreation and Environmental Planning



SKR MANAGEMENT FLOW DIAGRAM

FIGURE 3-3

Burning:
The general effectiveness of burning as a means of enhancing habitat for SKR was demonstrated during the Shipley/Skinner Reserve study (O'Farrell, 1997b), and the application of the same experimental protocol on 40 plots at Lake Mathews provided greater clarification in support of this finding (O'Farrell, 1994). At Lake Mathews, the change in density of SKR due to burn treatments was significantly higher than from the other treatments. The greater clarity in treatment effect was likely due to the difference in pre-existing conditions between the two study sites. The Shipley Reserve had very high densities of SKR due to preceding grazing activities and drought conditions. Lake Mathews, on the other hand, was historically under cultivation for dry land grains and had been managed for fire-suppression since the formation of the lake. Thus, surface vegetation was dominated by dense brome grasses and oats and the distribution of SKR was sparse and at very low densities. Any treatment that provided enhancement for the animal was magnified under these depauperate conditions. As a pilot management program, only when monitoring results determine treatment is required, "controlled low intensity burns" are recommended within MU-4 for implementation in winter (December through early January). The maximum area that would be treated by controlled burning within MU-4 equates to approximately 80 acres. This technique is recommended only as an alternative pilot technique due to its controversial nature regarding habitat impacts, air quality and sensitive plant species effects. Monitoring of this pilot technique and its results should be submitted to the RMCC for evaluation and consideration as a possible cost effective solution to management of large areas of occupied SKR habitat (Figure 3-1).

Grazing:
As documented at Protero Creek (O'Farrell, 1990), grazing should be explored as a cost effective alternative to mowing or burning. As a pilot management program, only when monitoring results determine treatment is required, limited controlled grazing by sheep or goats is recommended for implementation during the spring (February-March) within MU-6. Limited and controlled are key issues in the implementation of this management technique. The areas to be grazed must be bounded by secure temporary fencing and monitored closely by the reserve manager and Shepard to assure that no habitat impacts occur. If the entire MU-6 were to be treated, the limited controlled grazing could encompass approximately 43 acres. Much like control burns, this technique is recommended only as an alternative pilot technique due to unresolved issues regarding habitat impacts and sensitive plant species effects. Monitoring of this pilot technique and the results should be submitted to the RMCC for evaluation and consideration as a possible cost effective solution to management of large areas of occupied SKR habitat (Figure 3-1).

D. Coastal Sage Scrub Management

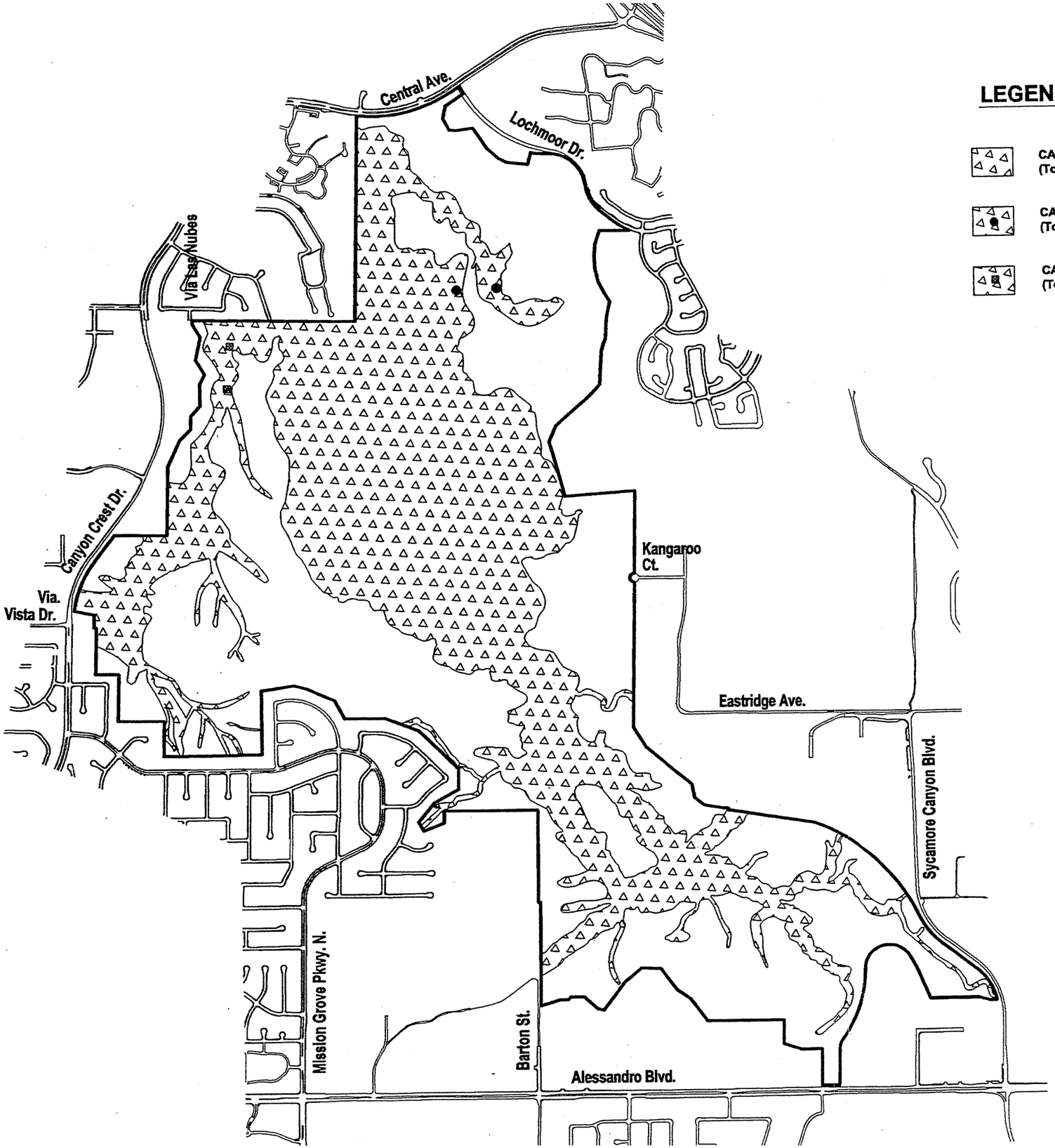
Management of Coastal Sage Scrub (CSS) includes monitoring the effects of wildfires on the ecosystem by surveying and recording the intensity and distribution of the wildfire along with the rate of recovery of the species. Management shall include fire control measures to minimize the potential of a high intensity wildfire from damaging the existent CSS in the Park.

For the purposes of this study, the use of the riparian vegetation by the CAGN for foraging and protection has lead to the inclusion of these areas as a part of the total potential habitat for this species. This addition of acreage may appear to cause a discrepancy in the calculation of total potential CAGN habitat within a particular Management Unit however, it is very possible that the total acres of potential CAGN habitat can exceed the total acres of sagescrub by the addition of the riparian vegetation areas within a particular Management Unit.

The potential for a pro-active CSS management strategy involving low intensity limited control burns conducted within small 3-5 acre plots between December and January will only be considered after sufficient data on the recovery of CSS from wildfire in this region has been collected and analyzed by the USFWS. The lack of sufficient data in this region on the recovery of CSS following different intensities of wildfires stresses the need for monitoring by the Sycamore Canyon Wilderness Park Reserve Manager of such occurrences.

E. Annual Management Guide

To assist the reserve manager in annual management treatments, an Annual Management Guide (Figure 3-5), is included as a part of this maintenance/management plan. Due to the inconsistent seasonal weather conditions, this guide will serve to simply block out periods of a yearly schedule and identify tasks which are which should occur during these general blocks of time. This guide also identifies which management units are to receive each type management treatment. For detailed information pertaining to each MU, refer to Section 3.2.3.



LEGEND

- CAGN Potential Habitat (Total: 680.4 acres)
- CAGN 1997 occurence (Total: 18.3 acres)
- CAGN 1994-1995 occurence (Total: 4.8 acres)

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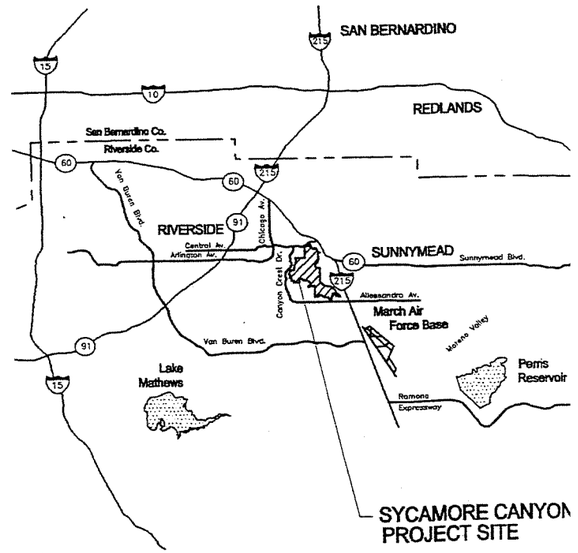

KEY PLAN
N.T.S.

California Gnatcatcher Potential Habitat

Figure 3-4

North

0 500 1000 2000

SCALE IN FEET

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SYCAMORE CANYON WILDERNESS PARK
ANNUAL MANAGEMENT GUIDE

TASK	MU	December	January	February	March	April	May	June	July	August	September	October	November
POTENTIAL PRESENCE, BREEDING AND NESTING SEASONS of LISTED SPECIES		CAGN *nesting season* Breeding Season											
		Larval Stage		*Adult stage*							*Larval Stage*		
			Quino	Checkerspot	Butterfly								
							Potential	willow	flycatcher	presence	Typically gone from U.S.		
						Potential	Least Bell's	vireo	presence				
PERFORM FUEL MODIFICATION ACTIVITIES (if required) *1. Structure Protection* *2. Fire Access Road Maintenance* *3. Exterior Road Boundary Risk Abatement* *4. Riparian Protection*	All												
PERFORM SKR HABITAT VEGETATION MONITORING	1-6												
REVIEW RESULTS OF FALL AND SPRING MONITORING WITH RMCC	N/A												
CONDUCT SKR MANAGEMENT (if required) *1. Mowing (walk-behind mower)* *2. Limited control Burns (pilot program)* *3. Sheep or Goat Grazing (pilot program)*	All			Mowing Control Burns Grazing									
PERFORM SKR BURROW COUNT TRANSECTS	1-6												

Figure 3-5
Annual Management Guide

F. Fuel Modification Management

Fuel modification recommendations within the Fuel Modification Management Plan address each of the MU's individually. Some recommendations continue from one MU to the adjoining MU. It is important to look at each of the recommendations as being a vital link in the overall fuel modification plan. No one recommendation can stand alone without seriously affecting the other recommendations.

Prior to the initiation of any fuel modification treatments, the City must coordinate with the USFWS to determine if a 10(A) permit will be required to proceed. The vegetation modification plan should include the amount of CSS to be affected along with potential impacts, identified from the focused and habitat surveys conducted for the Coastal California gnatcatcher, the Least Bell's verio, southwestern willow flycatcher and Quino checkerspot butterfly.

The existing utility service access roads within the Park are essential in providing the necessary fire department access to the strategically placed fuel modification areas. These service roads provide the principal interior sub-unit fire containment lines. The utility service access roads must be maintained for 2-wheel drive Type 3 Fire Engine access. Maintenance should be scheduled so that these defacto "fire roads" are fully accessible during the months of May through late November. Since most of the soils are decomposed granite, a well maintained compacted dirt surface with a pine pitch based soil binder application is all that would be needed for the high ground clearance fire engines.

Within Sycamore Canyon Wilderness Park, limited and judicious grazing by sheep or goats may provide reduction of surface vegetation to reduce fire hazard. Grazing is recommended as the preferred fuel modification technique along those portions of the Park boundary where housing is adjacent. Grazing should be used only under strict confinement to these specific areas so that no appreciable negative effect on overall diversity or recovery of native vegetation will occur. The areas in question are already heavily vegetated by introduced grasses, present an extreme fire hazard, and are not good candidates for other treatments due to deeply dissected topography. It is also reasonable to expect, based on observations at Potrero Creek (O'Farrell, 1990), that sheep grazing would allow SKR colonization of any suitable soil within this perimeter strip.

The Fuel Modification Management Map (Figure 3-7) depicts all areas recommended for fuel modification treatment within and adjacent to the Park. The symbols on the map define the "polygons" (fuel modification treatment areas) where various fuel modification management techniques are recommended. The first number in the polygon designation indicates the MU within which the polygon is located. The second number describes the Wildland Fire Protection Zone:

1. Service Road Zone
2. Exterior Boundary Risk Abatement Zone
3. Riparian Protection Zone
4. Structure Protection Zone

The letter following the second number indicates the fuel treatment option:

Option "A" - Stubble Management
- Mowing: Options for mowing techniques include 1) by a walk behind power mower (the preferred option), or 2) by tractor.
- Animal Grazing (sheep or goats)
- Strip burning

Option "B" - Fire Retardant Application or Weed-Whipping

Where there are more than one polygon recommending the same treatment within an MU, a dash line followed by a number is displayed. An example of a polygon numbering sequence is as follows:

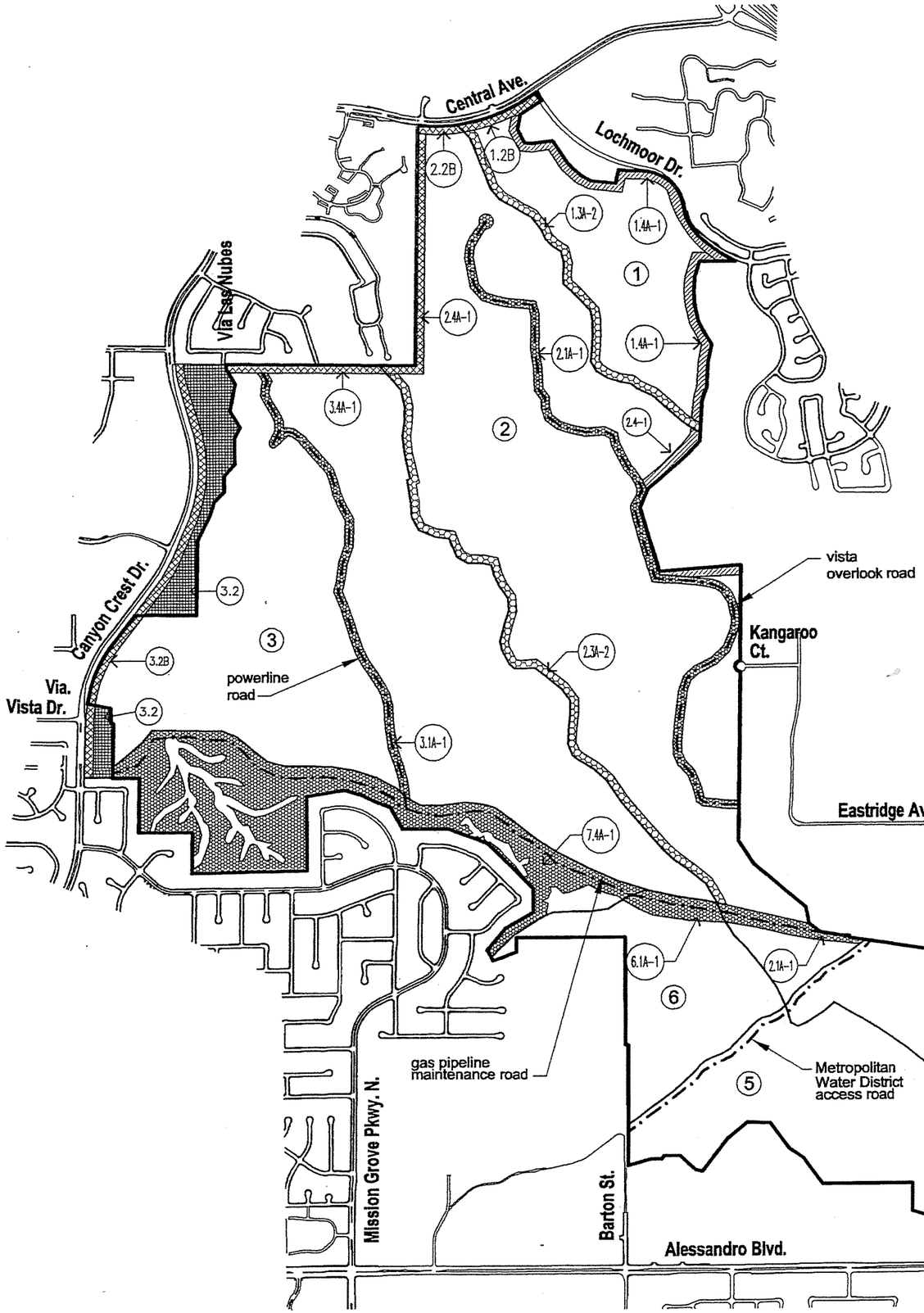
2.3A-1 or 2.3A-2 indicates that these two polygons (treatment areas) are located in MU-2, are in a Riparian Protection Zone, and the recommended fuel modification treatment is one of the Stubble Management options. The last letter (-1 or -2) indicates that it is one of two treatment areas within this management unit.

G. Adaptive Management Strategies

If SKR populations decrease while the monitoring indicators, such as grass/forbes ratio and aerial shrub cover, are within acceptable limits, the following adaptive management strategies for the management of SKR habitat are recommended:
- Consult with RMCC.
- Initiate studies of predation from feral and/or domestic cat populations and institute notifications to surrounding residents of the need to control their animals.
- Institute a trap and release program for feral and/or domestic cats found within the Park.
- Survey populations of other potential predators to establish a baseline which can be used to determine whether such populations are rising with time.
- Institute trapping of SKR to determine if population diseases or viruses are present.

3.2.3 Individual Management Unit Techniques

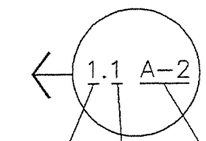
The following section takes the management rationales found in Section 3.3 and applies them to each of the MU's by providing a detailed and specific description of each of the recommended management techniques for that unit, placing them in context within the individual MU's.



LEGEND

- (1) Management Units
- - 75' wide strip each side of road (to boundary in Management Unit 7)
- - 100' wide strip
- - 100' wide strip
- - 30' wide strip
- - Encourage participation in exterior boundary risk abatement
- —·— Emergency/Fire Vehicle Access Route

SYMBOL KEY



Management Unit

Fuel Treatment Options

A. Stubble Management
1- Mow
2- Strip Burn
B. Fire Retard or Weed Whip

Protection Zones

1. Service Road
2. Boundary Risk Abatement
3. Riparian Protection
4. Structure Protection

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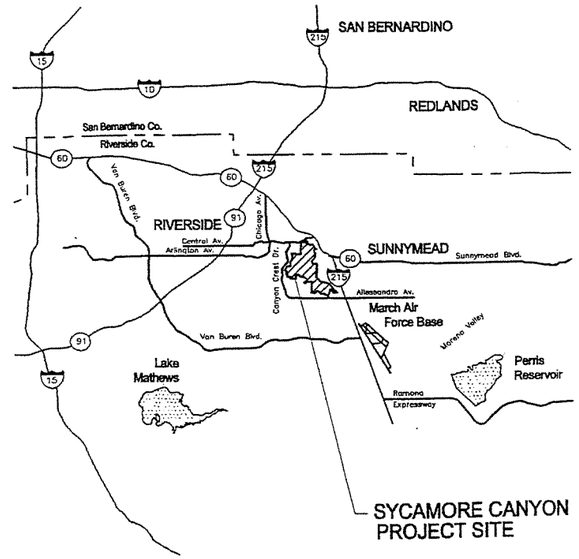

KEY PLAN
N.T.S.

Fuel Modification Map

Figure 3-6

North

0 750 1500 3000

SCALE IN FEET

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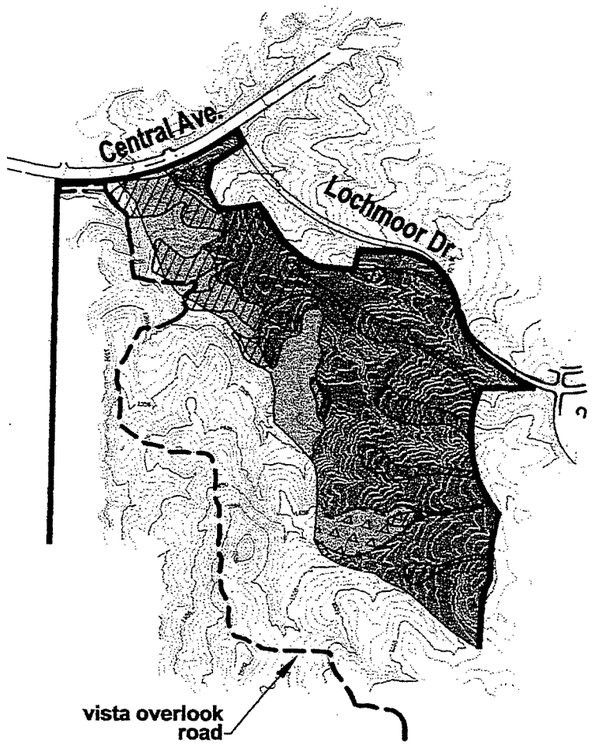
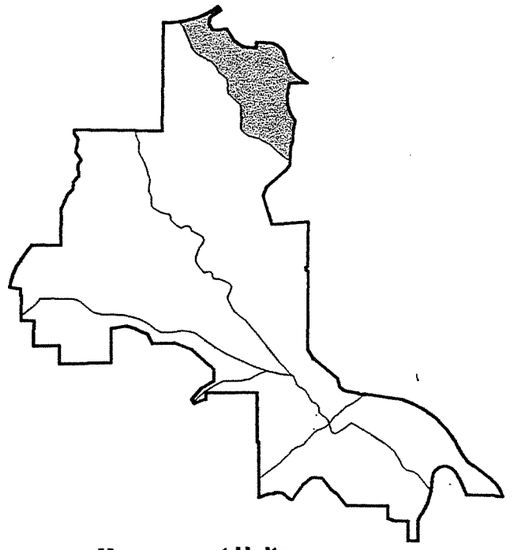


MU-1 LEGEND

- SKR Habitat (Total: 31.0 acres)
- CAGN Potential Habitat (Total: 5.4 acres)
- Grassland (Total: 88.9 acres)
- Sagescrub (Total: 27.3 acres)
- Riparian (Total: 0 acres)
- Trails



Management Units Key Map

N.T.S.

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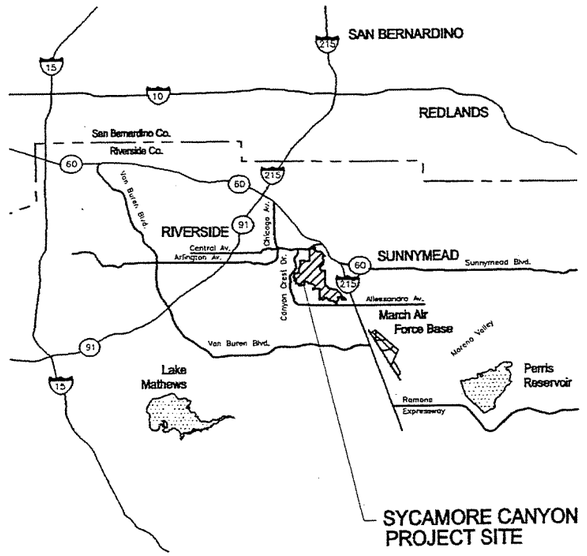

KEY PLAN

N.T.S.

Management Unit 1

Figure 3-7

North

0 600 1200 2400

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

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A. Management Unit #1

Located in the northeast corner of the Park (See Figure 3-7), this MU is bounded on the north by Central Avenue and both existing and proposed residential development on the east. The majority of the MU's topography includes slopes less than 30% and has a northwest aspect. Total acreage of this MU is approximately 116 acres, one of the smallest MU's in the Park. The breakdown of vegetative types in this Unit is:

Riparian	0 acres
Grassland	88.9 acres
Sage scrub	27.3 acres

With the grassland the dominant vegetation, to maintain a healthy vegetative mosaic within this MU the management strategy should be to maintain the current distribution of grassland and sage scrub and attempt to improve the quality of the sage scrub for Coastal California gnatcatcher habitat.

1. SKR Habitat Management, MU-1

There are approximately 31 acres of occupied SKR habitat in this MU mostly originating off site, extending from the easterly property line, which is planned for medium density residential development. Due to the proximity of this MU to medium and high density residential areas, monitoring should be conducted for possible feral/domestic cat predation impacts on populations.

a. SKR Monitoring, MU-1

The monitoring plot within this MU, located in the northern end of the MU and near the residential boundary, should be surveyed twice a year, in the spring to determine grass/forbes(G/F) ratio and in the fall to determine population count of SKR. The spring vegetative survey must be conducted at peak flowering of forbes and grasses, usually sometime between the beginning of March through the end of April, depending on weather conditions. The fall survey for SKR population densities must be conducted following juvenile recruitment (when the juvenile SKR are accepted by the above ground population and become a part of the general population) and before the fall/winter rainy season. This usually occurs, between the beginning of September and the end of October, depending on weather conditions. The following conditions should be surveyed:

Survey for active burrows, dust baths, scat, runways and tracks, calculate the density (# SKR/ha)[1] using the equation:
D = (0.243) B (see Section 3.3.1)

b. SKR Management Treatment, MU-1

The following conditions and management actions are recommended:

i. Determine G/F ratio, if over 1.5, schedule mowing during that spring. If G/F ratio is below 1.5, record findings but do not treat.

ii. During the course of the spring scheduled grassland vegetation monitoring determine if aerial shrub cover exceeds 10%, if so schedule selective removal of shrubs to return to an aerial cover of less than 10%. If aerial cover is below 10%, record but do not treat.

---

[1] One (1) hectare equals 2.55 acres

iii. If density is below 10-20/ha, treat all occupied habitat mapped within this MU by mowing that spring. If density is within 10-20/ha, but consistently near the 10/ha range, record and monitor closely, compare with aerial shrub cover data and G/F ratio data, but do not treat.

c. **SKR Adaptive Management Strategies, MU-1**
If the SKR population does not respond favorably to the above treatments, the reserve manager may consult with the RMCCor other SKR specialists to determine the possible causes for the decline. These might include increases in feral/domestic cat and/or other predator populations, or possible diseases or viruses.

2. **Coastal California gnatcatcher Habitat Management, MU-1**
At present approximately five acres of suitable Coastal California gnatcatcher habitat occurs within the 27.3 acres of CSS in this unit; the remaining 22 acres are of insufficient density and quality to support Coastal California gnatcatcher. A goal for this MU would be to increase the suitable Coastal California gnatcatcher habitat acreage within the CSS area. This can be accomplished by controlling uncontrolled wildfire and minimizing disturbance of germinating CSS species. Management shall consist of minimizing, through wildfire control, the destruction of existing CSS within defined CSS/CAGN potential habitat.

3. **Fuel Modification Management, MU-1**

The following recommendations can be found in Figure 3-7, the Fuel Modification Management Map. As mentioned previously, the intent of these recommendations is to protect sensitive habitat, improve or maintain habitat and provide a line of defense to bordering residential areas from wildfire.

a. **Fuel Level Monitoring, MU-1**
The only fuel level monitoring that is required for this MU is covered in Polygon 1.3A below.

b. **Fuel Modification Management Techniques, MU-1**
The following recommendations can be found in Figure 3-6, Fuel Modification Map. As mentioned previously, the intent of these recommendations is to protect sensitive habitat, improve or maintain habitat and provide a line of defense from wildfire to bordering residential areas.

Polygon 1.2B Exterior Boundary Risk Abatement Zone: - ***Treat Annually***
For a strip of at least 30-feet in width along the southern edge of Central Avenue (City right-of -way) an environmentally approved long-term fire retardant should be applied or the strip should be weed whipped.

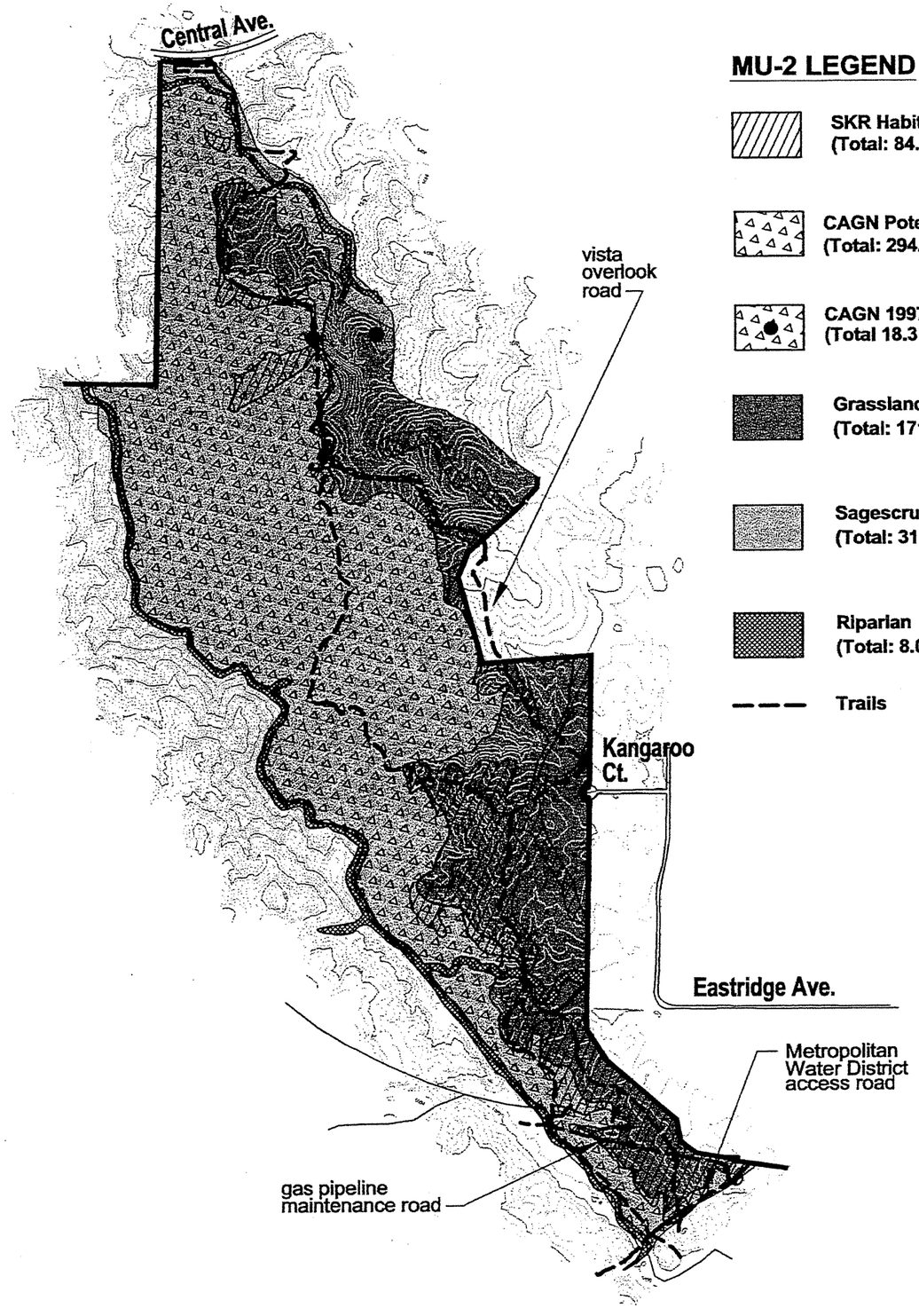
Polygon 1.3A Riparian Protection Zone: - ***Treat Every 5 Years, or as Needed***
Mow or burn a 100 feet wide strip along the eastern edge of the riparian area between MU-1 and MU-2 every five years or so, depending on dead fuel buildup. The purpose of this treatment is to provide a low fuel volume vegetative strip for protection of the riparian area against a north or east wind-driven wildfire. The triggering element for determining the frequency of the next treatment is when this 100 feet wide strip becomes more than 50 % Coastal sage scrub type vegetative cover over 24 inches in height.

Polygon 1. 4A Structure Protection Zone: - ***Treat Annually***
Annually animal-graze or mow a 100-foot wide strip along the Sycamore Canyon Wilderness Park boundary near the newly constructed subdivision road and development tract.

4. **Public Use Management, MU-1**
Within this MU a major trailhead with off-street parking for about 20 to 30 vehicles and a trail head structure are proposed along Central Avenue (See Figure 6-3 and Section 6.5.1). Extending from this trailhead is the most extensively used trail in the northern portion of the canyon. The following are recommendations for public use management in MU-1;

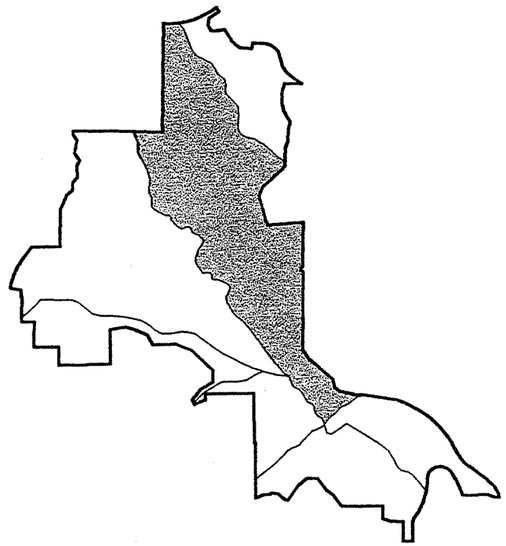
   a. **Visitor Use Monitoring, MU-1**
   With potentially heavy use at this site, illegal parking should be closely monitored and citations promptly issued. This trailhead should be closed at dusk and regularly patrolled by the ranger on duty. Informal monitoring, possibly via volunteers, for nesting Coastal California gnatcatcher should be conducted along this main trail and it should be closed if nesting pairs are found within 100 feet of the edge of the trail.

   b. **Public Use Management Strategies, MU-1**
   Management should include regular investigations to assure no "volunteer" entrance trails are established through sensitive habitat. If this occurs, such trails should be blocked with brush or other suitable material and signed as "closed" until vegetation recovers completely.



MU-2 LEGEND

- SKR Habitat (Total: 84.0 acres)
- CAGN Potential Habitat (Total: 294.2 acres)
- CAGN 1997 occurence (Total 18.3 acres)
- Grassland (Total: 171.7 acres)
- Sagescrub (Total: 310.8 acres)
- Riparian (Total: 8.0 acres)
- Trails



Management Units Key Map

N.T.S.

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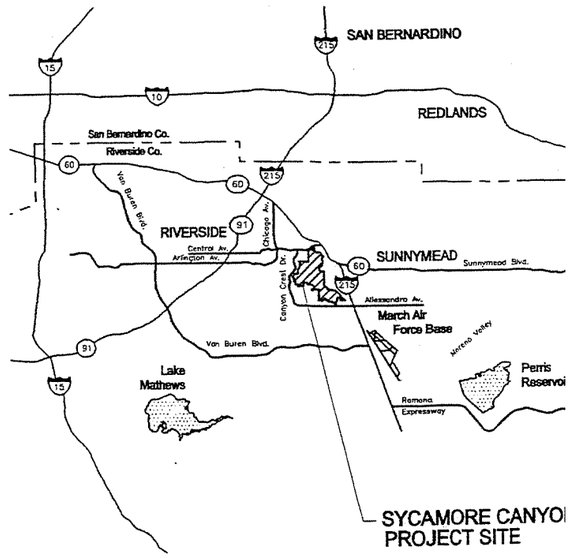

KEY PLAN

N.T.S.

Management Unit 2

Figure 3-8

North

0 600 1200 2400

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

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Recreation and Environmental Planning

B. Management Unit #2

At approximately 490 acres, MU-2 is the largest unit in the Park (See Figure 3-8). This MU is bounded on the north by Central Avenue, on the east by MU-1, future residential properties and the Sycamore Canyon Business Park, on the west by the main flowline within Sycamore Canyon and on the northwest by medium to high density residential development. Sharing the deepest section of the canyon with MU-3, the unit provides the most dramatic views as well as sense of seclusion from urbanization. Much of the topography in the unit is over 31% and with a west aspect. The breakdown of vegetative types are as follows:

Riparian	8 acres
Grassland	171.7 acres
Sage scrub	310.8 acres

The riparian vegetation areas within this MU were combined with the sage scrub calculations of potential CAGN habitat as referenced in Section 3.2.2.D.

1. SKR Habitat Management, MU-2

Due to shallow soils and extremes in topography, only a small portion of MU-2 is currently occupied by SKR (approximately 84 of the 490 total acres in this MU). Nonetheless, MU-2 contains the largest total of currently occupied habitat in any single MU. Many of the ridges, where they coincide with trails and overlooks, are occupied habitat. The following SKR habitat management techniques are recommended for this MU. The monitoring plot within this MU is located within a large area of occupied habitat south of the proposed Interpretive Center site near Kangaroo Court.

a. SKR Monitoring, MU-2

The monitoring plot should be surveyed twice a year, during spring to determine grass/forbes(G/F) ratio and fall to determine population count of SKR. The spring vegetative survey must be conducted at peak flowering of forbes and grasses usually sometime between the beginning of March through the end of April, depending on weather conditions. The fall survey for SKR population densities must be conducted following juvenile recruitment (when the juvenile SKR are accepted by the above ground population and become a part of the general population) and before the fall/winter rainy season. Usually this occurs between the beginning of September and the end of October, depending on weather conditions. The following conditions should be surveyed:

Survey for active burrows, dust baths, scat, runways and tracks, calculate the density (# SKR/ha) using the equation: **D = (0.243) B** (see Section 3.3.1)

b. SKR Management Treatment, MU-2

The following conditions and management actions are recommended:

i. Determine G/F ratio; if over 1.5, schedule mowing during that spring. If G/F ratio is below 1.5, record findings but do not treat.

ii. During the course of the spring scheduled grassland vegetation monitoring determine if aerial shrub cover exceeds 10%, if so schedule selective removal of shrubs to return to an aerial cover of less than 10%. If aerial cover is below 10%, record but do not treat.

iii. If density is below 10-20/ha, treat all occupied habitat mapped within this MU by mowing that spring. If density is within 10-20/ha, but consistently near the 10/ha range, record and monitor closely, compare with aerial shrub cover data and G/F ratio data, but do not treat.

c. **SKR Adaptive Management Strategies, MU-2**
If the SKR population does not respond favorably to the above treatments, the reserve manager should first consult with the RMCC, then initiate studies into other possible causes for the decline. These might include increases in feral/domestic cat and/or predator population, or possible diseases or viruses.

2. **Coastal California gnatcatcher Habitat Management, MU-2**

This MU includes extensive areas of potential Coastal California gnatcatcher habitat, including the riparian corridor at the bottom of Sycamore Canyon, and encompasses the area where sightings of Coastal California gnatcatcher occurred during the survey for this report (see Section 4.1.1). The quality of the CSS in this unit is the best within the Park, though at present less than optimum in quality. Management should include maintaining the existing vegetation while monitoring the area for further sightings and potentially enforcing trail closures during nesting season if Coastal California gnatcatcher are found to be present. Management shall consist of minimizing, through wildfire control, the destruction of existing CSS within defined CSS/CAGN potential habitat.

3. **Fuel Modification Management, MU-2**

The following recommendations can be found in Figure 3-6, the Fuel Modification Map. As mentioned previously, the intent of these recommendations is to protect sensitive habitat, improve or maintain habitat and provide a line of defense to bordering residential areas from wildfire.

a. **Fuel Level Monitoring, MU-2**
The areas requiring fuel level monitoring in this MU are polygons 2.1A and 2.3A. This monitoring can be accomplished by visual inspection and does not require sampling or weighing.

b. **Fuel Modification Management Techniques, MU-2**
The following management techniques are designed to prevent an uncontrolled wildfire from starting along high risk perimeter areas and to develop lines of defense if a wildfire does get started.

Polygon 2.1A-1 Service Road Zone. ***As Required***
Apply stubble management treatment for 75 feet on each side of the Vista Overlook Road. Treatment can be any or a combination of the following:
- Mow by gas powered walk behind mower (Preferred Treatment)
- Sheep or goat graze (2nd Preferred Treatment)
- Strip burn during spring

Polygon 2.1A-2 Service Road Zone. ***As Required***
Apply stubble management treatment for 75 feet on each side of the gas line road. Treatment can be any or a combination of the following:

- Mow by gas powered walk behind mower (Preferred Treatment)
- Sheep or goat graze (2nd Preferred Treatment)
- Strip burn during winter season

Polygon 2.2B Exterior Boundary Risk Abatement Zone. ***Treat Annually***
Application of environmentally approved long-term fire retardant or weed whip for at least 30-feet wide strip along the southern edge of Central Avenue (City right-of-way).

Polygon 2.3A Riparian Protection Zone. ***As Required***
Mow or strip burn a 100 feet wide strip along the eastern edge of the riparian area between MU-2 and MU-3 as required, depending on dead fuel buildup.

Polygon 2.4A Structure Protection Zone. ***Treat Annually***
Apply stubble management of mowing or animal grazing of a 100-foot wide strip along the Park boundary near the Central Avenue / Canyon Crest Apartments. Through a public education program, encourage the Canyon Crest Apartment residents to maintain an appropriate cleared 'defensible space' within their property and stress the importance of keeping all roofs free of leaves, pine needle accumulation and other combustible debris.

4. Public Use Management, MU-2

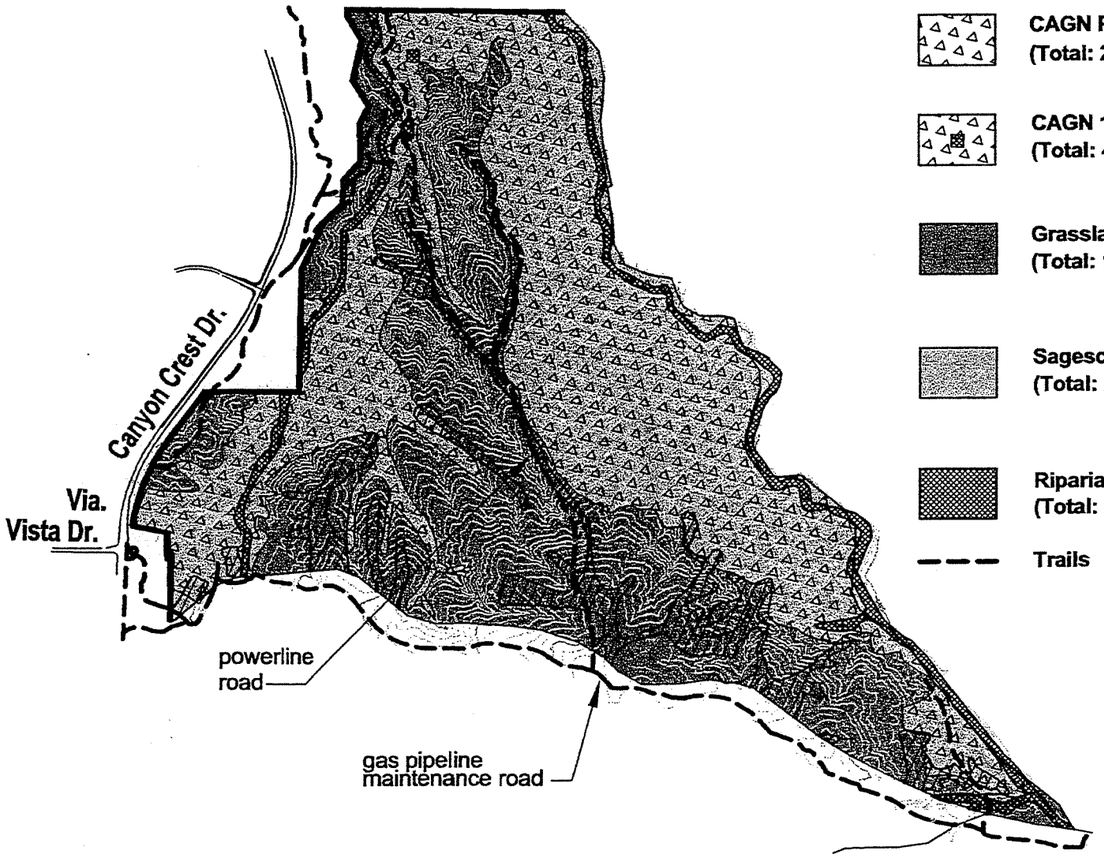
Within this MU a major trailhead with off-street parking for 20 vehicles and a trail head structure are proposed along Central Avenue (See Section 6.5.1 and Figure 6-3). Extending from this trailhead is the most extensively used trail in the northern portion of the canyon. Also contained within this unit is the Interpretive Center/Day Use Facility located at the terminus of the future Kangaroo Court.

a. Visitor Use Monitoring, MU-2
With such potentially heavy use at these two sites, illegal parking should be closely monitored and citations promptly issued. This trailhead and visitor center should be closed at dusk, and regularly patrolled by the ranger on duty. Informal monitoring, possibly via volunteers, for nesting Coastal California gnatcatcher should be conducted along this main trail and it should be closed if nesting pairs are found within 100 feet of the edge of the trail. The need for any new trails should be closely analyzed and implemented only if there is a net benefit to not only visitor use but also to the resources. Emergency access should be maintained along the Vista Overlook access road (Polygon 2.1A-1) and gas pipeline road (Polygon 2.1A-1) found on Figure 3-7.

b. Public Use Management Strategies, MU-2
Management should include regular investigations to assure no volunteer entrance trails are established through sensitive habitat. If this occurs, such trails should be blocked with brush or other suitable material and signed as "closed" until vegetation recovers completely.

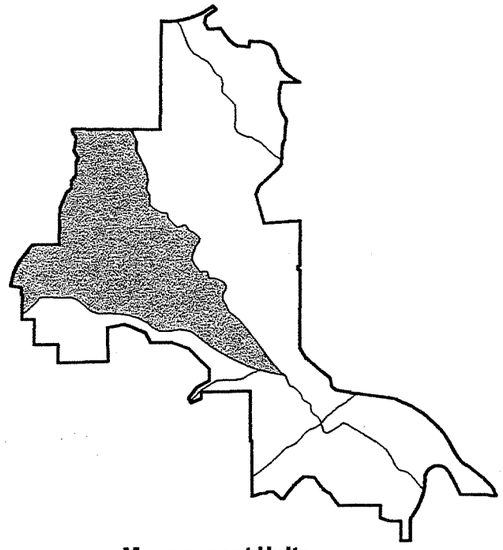
The Central Avenue trail head management will be the same as that mentioned in MU-1 above. The existing trail extending north from Kangaroo Court towards and off the park boundary must be relocated around the west side of the proposed residential development. This relocation must be coordinated with the developer of the subdivision to include a dirt road wide enough to allow emergency vehicle access and connected to the existing portion north of the development (See Figure 3-6).

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



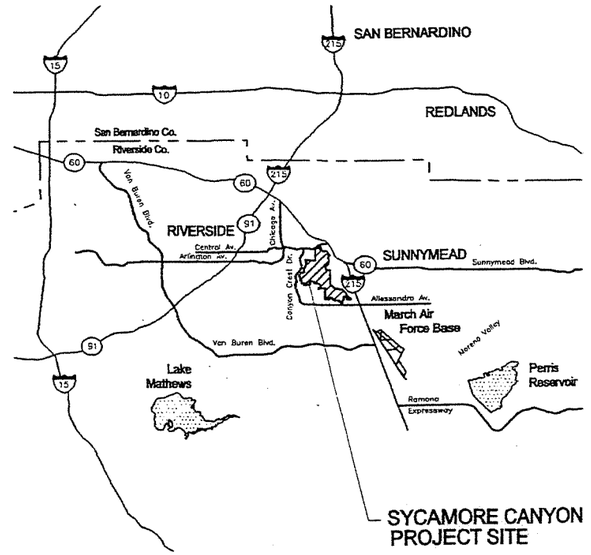
MU-3 LEGEND

- SKR Habitat (Total: 47.2 acres)
- CAGN Potential Habitat (Total: 253.5 acres)
- CAGN 1994-1995 occurence (Total: 4.8 acres)
- Grassland (Total: 199.0 acres)
- Sagescrub (Total: 215.1 acres)
- Riparian (Total: 13.6 acres)
- Trails



Management Units Key Map

N.T.S.



KEY PLAN

N.T.S.

Management Unit 3

Figure 3-9

North

0 600 1200 2400

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

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C. Management Unit #3

The second largest MU within the Park at approximately 427 acres, this area encompasses the west side of Sycamore Canyon and the west canyon near Canyon Crest Drive (See Figure 3-9). It is bounded on the north by medium density residential/golf, and the majority of the west by an undeveloped strip of land zoned for residential development that separates Sycamore Canyon Wilderness Park from Canyon Crest Drive. Just north of the intersection of Canyon Crest Drive and Via Vista Drive the Park has approximately 1,100 feet of street frontage along Canyon Crest Drive. The breakdown of vegetative types in this Unit is as follows:

Riparian	13.6 acres
Grassland	199.0 acres
Sage scrub	215.1 acres

The riparian vegetation areas within this MU were combined with the sage scrub calculations of potential CAGN habitat as referenced in Section 3.2.2.D.

1. SKR Habitat Management, MU-3

About 25% of the mapped grassland within this unit, or approximately 47 acres is occupied by SKR. The presently occupied areas are likely due to shallow soils or G/F ratios above 1.5. The SKR monitoring plot for this MU is located on a north facing ridge towards the northwesterly portion of the unit.

a. SKR Monitoring, MU-3

The monitoring plot should be surveyed twice a year, during spring to determine grass/forbes (G/F) ratio and fall to determine population count of SKR. The spring vegetative survey must be conducted at peak flowering of forbes and grasses usually sometime between the beginning of March through the end of April, depending on weather conditions. The fall survey for SKR population densities must be conducted following juvenile recruitment (when the juvenile SKR are accepted by the above ground population and become a part of the general population) and before the fall/winter rainy season. This would usually place the timing between the beginning of September and the end of October, depending on weather conditions. The following conditions should be surveyed:

Survey for active burrows, dust baths, scat, runways and tracks, calculate the density (# SKR/ha) using the equation: **D = (0.243) B**
(see Section 3.3.1)

b. SKR Management Treatment, MU-3

The following conditions and management actions are recommended;

i. Determine G/F ratio, if over 1.5, schedule mowing during that spring. If G/F ratio is below 1.5, record findings but do not treat.

ii. During the course of the spring scheduled grassland vegetation monitoring determine if aerial shrub cover exceeds 10%, if so schedule selective removal of shrubs to return to an aerial cover of less than 10%. If aerial cover is below 10%, record but do not treat.

iii. If density is below 10-20/ha treat all occupied habitat mapped within this MU by mowing that spring. If density is within 10-20/ha, but consistently near the 10/ha range, record and monitor closely, compare with aerial shrub cover data and G/F ratio data, but do not treat.

c. **SKR Adaptive Management Strategies, MU-3**
If the SKR population does not respond favorably to the above treatments, the reserve manager should first consult with the RMCC, then initiate studies into other possible causes for the decline. These might include increases in feral cat and/or predator population, or possible diseases or viruses.

2. **Coastal California gnatcatcher Habitat Management, MU-3**
The quality of CSS in this unit is some of the highest in the Park. The northern section of potential habitat area near the residential development is the location of the 1994/1995 sighting of Coastal California gnatcatcher. Management shall consist of minimizing, through wildfire control, the destruction of existing CSS within defined CSS/CAGN potential habitat.

The riparian vegetation along the west canyon has been increasing due to increased concentrated runoff from the residential development to the south. This dynamic reach of stream is also down-cutting at an accelerated rate, changing the vegetative mosaic year to year. Immediate action should be taken by the reserve manager to begin a plan of action of stabilization to curb further erosion. Management of the riparian corridor should include reducing trail crossings to the absolute minimum for visitor access and emergency access. The present *Arundo donax* (Arundo) eradication program must be maintained and monitored to prevent re-establishment.

3. **Fuel Modification Management, MU-3**

The following recommendations can be found in Figure 3-7, the Fuel Modification Map. The intent of these recommendations is to protect sensitive habitat, improve or maintain habitat and provide a line of defense to bordering residential areas from wildfire.

a. **Fuel Level Monitoring, MU-3**
The only fuel level monitoring that is required for this MU is covered in Polygon 3.1A below. This can be accomplished by visual inspection and does not require sampling or weighing.

b. **Fuel Modification Management Techniques, MU-3**
The following management techniques are designed to prevent an uncontrolled wildfire from starting along high risk perimeter areas and development lines of defense if a wildfire does get started.

Polygon 3.4. A Structure Protection Zone. ***Treat Annually***
Apply stubble management by animal grazing or mowing within a 100-foot wide

strip along the park boundary near the Canyon Crest Residential Area. Through a public education program, encourage the Canyon Crest Homeowners to maintain an appropriate defensible space cleared within their property and stress the importance for keeping all roofs free of leaves, pine needle accumulation and other combustible debris.

Polygon 3.1A Service Road Zone. ***As Required***

Stubble management for 75 feet on each side of power line road. Treatment by one or a combination of the following:

- Mow by Gas Powered Walk Behind Mower (Preferred Treatment)
- Sheep or goat graze (2nd Preferred Treatment)
- Strip burn during winter season

Polygon 3.2 B Boundary Risk Abatement Zone. ***Treat Annually***
Application of environmentally approved long-term fire retardant or weed whip for at least a 30-feet width along the eastern edge of Canyon Crest Drive (City Right-of-way).

Polygons 3.2 Exterior Boundary Risk Abatement Zones. ***Treat Annually***
Encourage private landowner to participate in the exterior boundary risk abatement by stubble management of these two polygons.

4. Public Use Management, MU-3

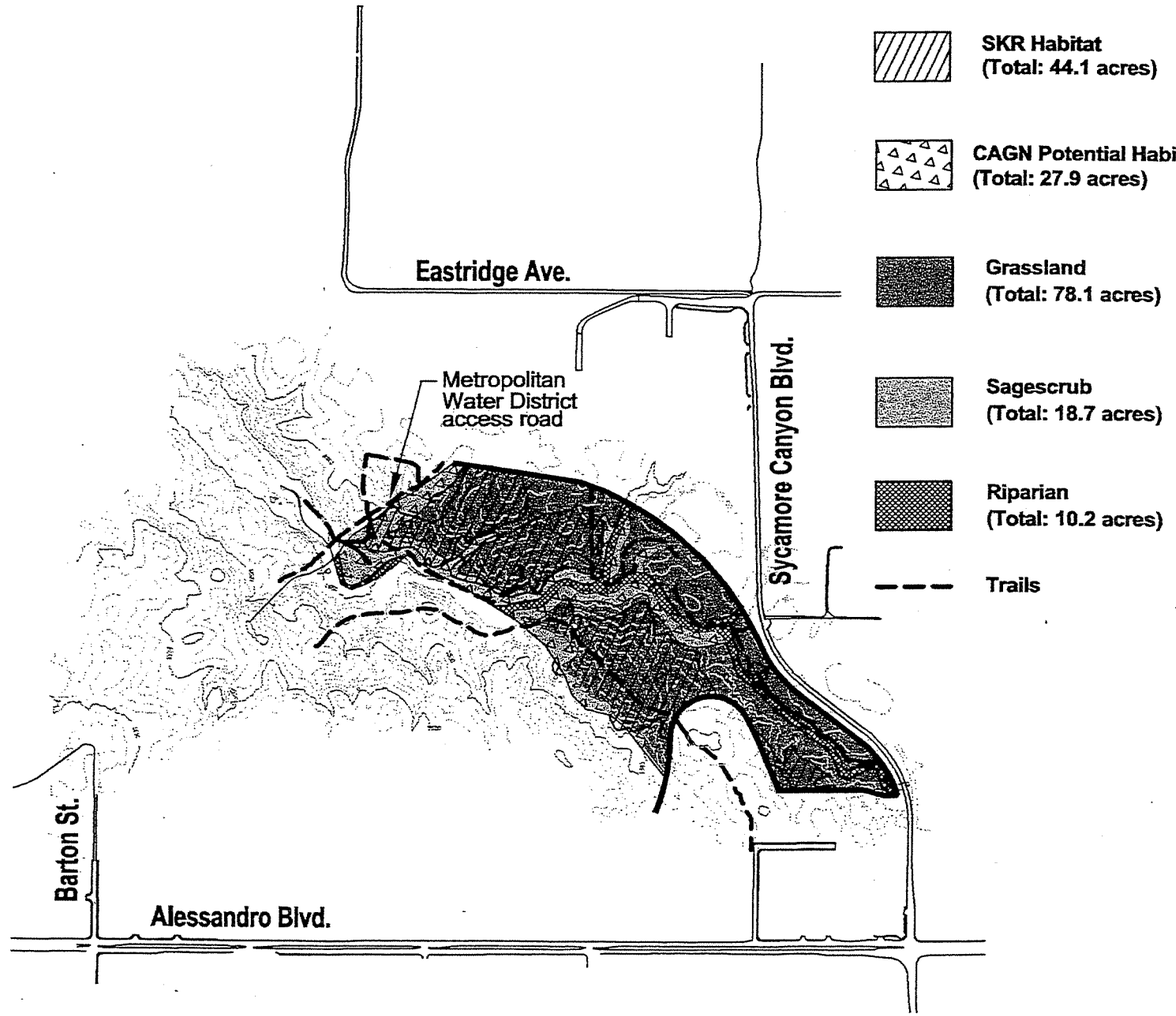
Recreational use west of the main canyon mostly originates at Canyon Crest Drive and Via Vista Drive. Due to sight lines and topography, the trailhead at this location must be located south of the gas valve facility, off City property. The major trail for west entrance visitors begins at this location and follows the gas maintenance road within MU-7.

a. Visitor Use Monitoring, MU-3
With the high speed of traffic on Canyon Crest Drive, illegal parking along this major arterial should be monitored and citations promptly issued for violations. This trailhead should be closed at dusk, and regularly patrolled by the ranger. Informal monitoring, possibly via volunteers, for nesting Coastal California gnatcatcher should be conducted along this main trail. The area should be closed if nesting pairs are found within 100 feet of the edge of the trail. Monitoring of pedestrian access points along the residential areas to the south of this unit should be established.

b. Public Use Management Strategies, MU-3
Management should include regular investigations to assure no volunteer entrance trails are established through sensitive habitat. If this occurs, such trails should be blocked with brush or other suitable material and signed as "closed" until vegetation recovers completely. The power line road (Polygon 3.1A, Figure 3-6), which follows the overhead power lines, should be maintained as mentioned in

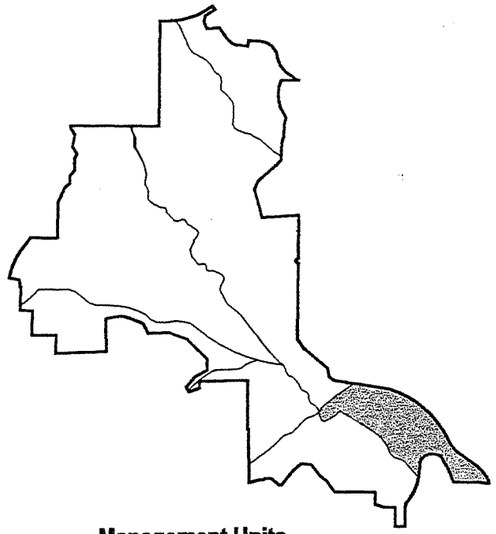
Section 3.3.8 and connected at the north property line to Via Las Nubes to provide emergency access and access for visitors from the nearby subdivisions. Any volunteer trail access points originating from the residential area to the south should be promptly acted upon by formally noticing the owner of the property and following up on closure of the access point illegally established.

SYCAMORE CANYON WILDERNESS PARK
Conceptual Development Plan Revision



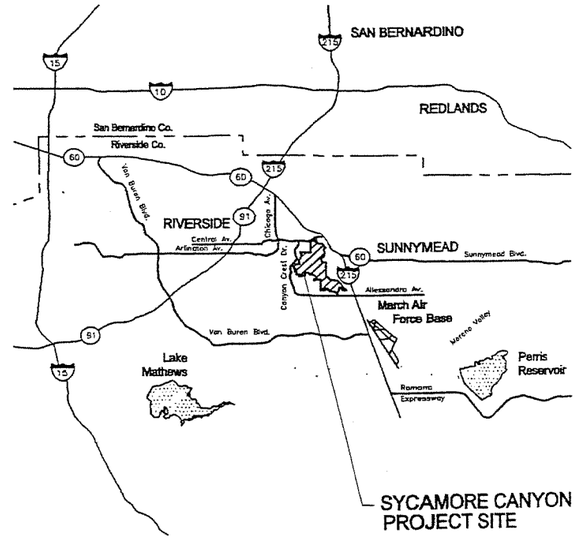
MU-4 LEGEND

- SKR Habitat (Total: 44.1 acres)
- CAGN Potential Habitat (Total: 27.9 acres)
- Grassland (Total: 78.1 acres)
- Sagescrub (Total: 18.7 acres)
- Riparian (Total: 10.2 acres)
- Trails



Management Units Key Map

N.T.S.



KEY PLAN

N.T.S.

Management Unit 4

Figure 3-10

North

0 600 1200 2400

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

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D. Management Unit #4

Encompassing approximately 107 acres, this MU is one of the smallest units in Sycamore Canyon Wilderness Park (See Figure 3-10). It is located at the southeast corner of the Park and is bordered by Sycamore Canyon Boulevard and Sycamore Canyon Business Park on the east and mostly undeveloped commercially zoned land to the south. Sycamore Canyon originates in this MU, and the topography is almost exclusively below 30% slope with a southwesterly aspect. The breakdowns of vegetative types in this MU are;

Riparian	10.2 acres
Grassland	78.1 acres
Sage scrub	18.7 acres

The riparian vegetation areas within this MU were combined with the sage scrub calculations of potential CAGN habitat as referenced in Section 3.2.2.D.

1. SKR Habitat Management, MU-4

Almost 25% of the acreage within this Unit is occupied habitat equaling approximately 44 acres. Monitoring recommended in Section 3.3.1 must be consistent to maintain habitat and population quality. The monitoring plot for this MU is located approximately in the center of the MU on gently sloping terrain with a southwest aspect. This MU is designated as a pilot management unit because of the type of SKR management recommended. The strategy is to establish two pilot management units, one utilizing limited controlled grazing and the other controlled burning. This MU is designated to be the pilot for limited controlled grazing by sheep or goats due to its low quality of CSS and surrounding open space land use.

The diagnostic plant species in herbaceous grassland are filarees (*Erodium* spp.), which are promoted by grazing activities (Rice, 1987). It is not surprising that the most abundant SKR populations occur in habitats receiving substantial grazing pressure. When grazing is reduced or eliminated, grasses increase proportionally. The SKR population on the Warner Ranch in San Diego County (O'Farrell and Uptain, 1987) decreased by approximately 90% from 1986 to 1989 (O'Farrell, unpublished data), when grazing pressure had been reduced by half and livestock changed from mixed Hereford stock to Holstein dairy cattle. These changes appeared to allow a perennial bunch grass (*Aristida* sp.) to become a dominant species.

a. SKR Monitoring, MU-4

The monitoring plot within this MU should be surveyed twice a year, during spring to determine grass/forbes (G/F) ratio and fall to determine population counts of SKR. The spring vegetative survey must be conducted at peak flowering of forbes and grasses usually sometime between the beginning of March through the end of April, depending on weather conditions. The fall survey for SKR population densities must be conducted following juvenile recruitment (when the juvenile SKR are accepted by the above ground population and become a part of the general population) and before the fall/winter rainy season. This usually occurs between the beginning of September and the end of October, depending on weather conditions. The following conditions should be surveyed:

Survey for active burrows, dust baths, scat, runways and tracks, calculate the density (# SKR/ha) using the equation

D = (0.243) B (see Section 3.3.1)

Monitoring should also be conducted to analyze negative impacts to habitat by the grazing sheep or goats following each treatment.

b. SKR Management Treatment, MU-4

The following conditions and management actions are recommended;

i. Determine G/F ratio, if over 1.5, schedule limited controlled grazing during that spring. If G/F ratio is below 1.5, record findings but do not treat.

ii. During the course of the spring scheduled grassland vegetation monitoring determine if aerial shrub cover exceeds 10%, if so schedule selective removal of shrubs to return to an aerial cover of less than 10%. If aerial cover is below 10%, record but do not treat.

iii. If density is below 10-20/ha treat all occupied habitat mapped within this MU by limited controlled grazing that spring. If density is within 10-20/ha, but consistently near the 10/ha range, record and monitor closely, compare with aerial shrub cover data and G/F ratio data, but do not treat.

The grazing will consist of the Shepard installing portable fencing at the direction of the Reserve Manager to tightly control the areas of grazing. Sheep or goats are the only animals recommended for this type of management. If no negative impacts are apparent after ten (10) treatments, and it proves to be cost effective the Reserve Manager should consult with the other reserve managers to discuss more wide spread application of this technique.

c. SKR Adaptive Management Strategies, MU-4

If the SKR population does not respond favorably to the above treatments, the reserve manager should first consult with the RMCC, then initiate studies into other possible causes for the decline. These might include increases in feral/dometic cat and/or predator population, or possible diseases or viruses. A last alternative would be to discontinue use of limited controlled grazing and revert to mowing as the treatment technique for the next three treatments and review data for population increases.

2. Coastal California gnatcatcher Habitat Management, MU-4

The limited amount of quality habitat, located mostly along fingers of riparian vegetation, could aid in providing linear connections to other offsite habitat. Monitoring of habitat to maintain or improve the quality could be a secondary management strategy to grasslands. Management shall consist of minimizing, through wildfire control, the destruction of existing CSS within defined CSS/CAGN potential habitat.

3. Fuel Modification Management, MU-4

The following recommendations can be found in Figure 3-6, the Fuel Modification Map. The intent of these recommendations is to protect sensitive habitat, improve or maintain habitat and provide a line of defense to bordering residential areas from wildfire. The

boundary along the north-east of the MU is zoned for industrial use and should be conditioned to construct a masonry wall along its boundary. The masonry wall (minimum 5' high) acts as a heat deflector from a wildfire and eliminates any need for fuel management along the boundary of the Park. If an open iron fence is permitted by the City along this boundary, a 100' wide stubble management zone must be maintained along the entire boundary. The location of the existing Metropolitan Water District access road, and the fact that the fuel loads within this south-east corner of the Park are low, would not require access by fire emergency vehicles.

a. Fuel Level Monitoring, MU-4

The only fuel level monitoring that is required for this MU is covered in Polygon 4.1A-1 below, this treatment should be applied annually.

b. Fuel Modification Management Techniques, MU-4

The following management technique is designed to prevent an uncontrolled wildfire from starting along high risk perimeter areas and to develop lines of defense if a wildfire does get started.

Polygon 4.1A-1 Exterior Boundary Risk Abatement Zone. ***Treat Annually***
Application of environmentally approved long-term fire retardant or weed whip for at least 30-feet wide strip along the western edge of Sycamore Canyon Boulevard (City right-of-way).

4. Public Use Management, MU-4

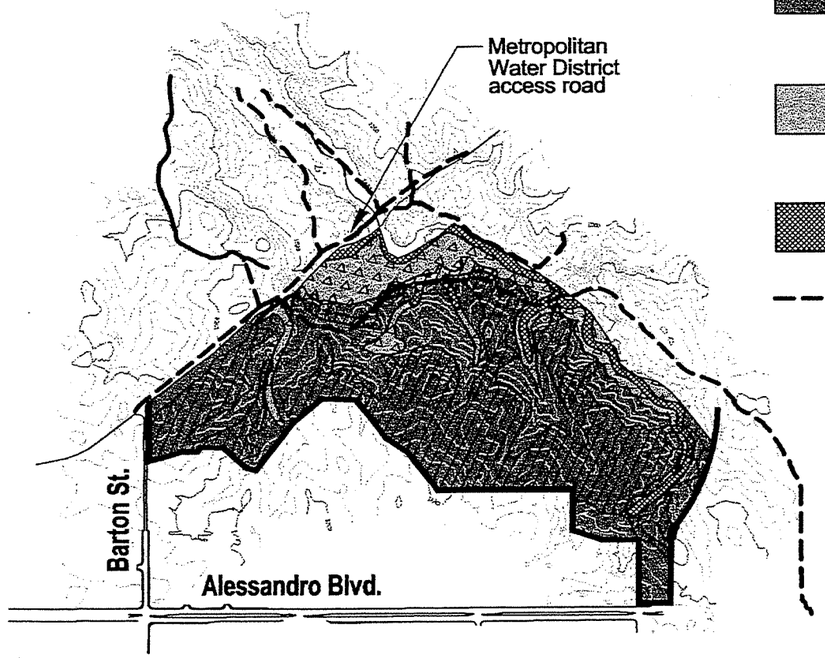
A secondary trailhead will be located and signed along Sycamore Canyon Boulevard at the eastern edge of this MU. Strategies should be developed to divert visitors to the trailheads. Volunteer trails must be monitored and signed until vegetation completely recovers. Trails found to be creating negative impacts to the riparian vegetation should be relocated and the existing trails signed, disced and allowed to naturally revegetate.

a. Visitor Use Monitoring, MU-4

This trailhead should be closed at dusk and regularly patrolled by the ranger. The proximity of this MU to Sycamore Canyon Boulevard makes this area very susceptible to off-road vehicle (ORV) access. Monitoring of possible access locations should be made on a regular basis. Monitoring of mountain bike use should focus along the riparian area with particular attention to erosion to the streambed.

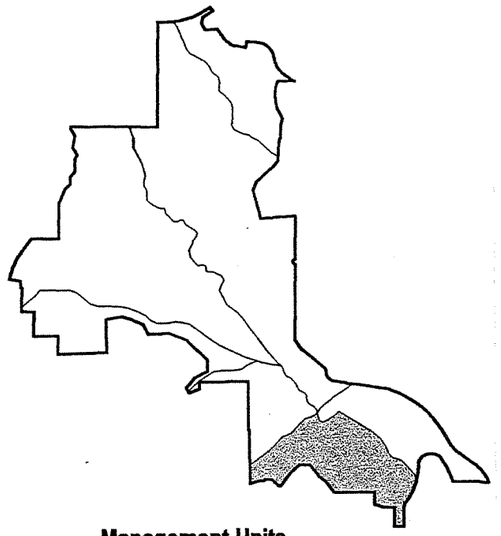
b. Public Use Management Strategies, MU-4

The perimeter vehicular control barrier should be installed as soon as possible to control possible ORV access. Management should include vegetation re-establishment of all volunteer trails.



MU-5 LEGEND

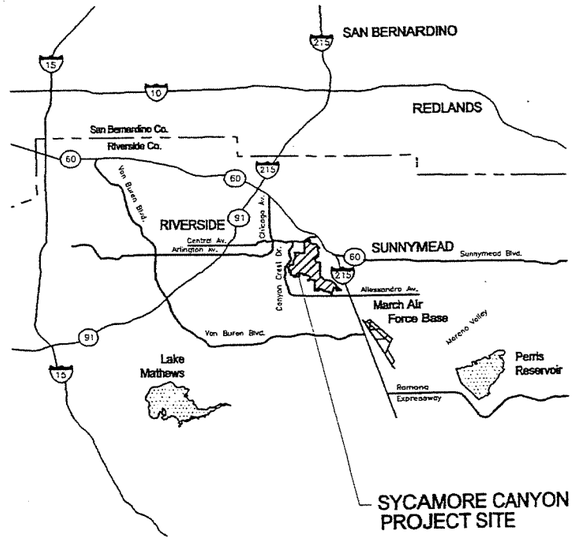
- SKR Habitat (Total: 70.2 acres)
- CAGN Potential Habitat (Total: 32.7 acres)
- Grassland (Total: 112.3 acres)
- Sagescrub (Total: 22.3 acres)
- Riparian (Total: 11.3 acres)
- Trails



Management Units Key Map

N.T.S.

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



KEY PLAN

N.T.S.

Management Unit 5

Figure 3-11

North

0 600 1200 2400

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

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Recreation and Environmental Planning

E. Management Unit #5

The majority of this MU (Figure 3-11) will be managed by the City under an Operating Agreement with the California Department of Fish and Game (See Section 2.2.3). This MU encompasses approximately 146 acres and is located at the southern-most portion of the Park. Bordered on the south and east by vacant commercially zoned property and on the west by the Metropolitan Water District (MWD) main line service road, this MU is comprised, similar to MU-4, mostly of grassland with fingers of riparian and sage scrub. The Barton Street trailhead will be located at the most south westerly corner of this MU at the terminus of the dirt road extending from the end of the paved section of Barton Street. The topography is almost entirely in the less than 30% slope range with a northeast aspect. The breakdowns of vegetative types in this Unit are;

Riparian	11.3 acres
Grassland	112.3 acres
Sage scrub	22.3 acres

The riparian vegetation areas within this MU were combined with the sage scrub calculations of potential CAGN habitat as referenced in Section 3.2.2.D.

Dominated by grassland, this MU will be managed primarily for SKR habitat. With 73% of this Unit mapped as grassland, it is basically a grassland with fingers of riparian and sage scrub bisecting it. Erosion occurring within the central portion of the unit due to increased upstream flows should be managed to minimize loss of sage scrub and potential Coastal California gnatcatcher habitat. The present *Arundo donax* (Arundo) eradication program must be maintained and monitored to prevent re-establishment. Management of the riparian corridor should include reducing trail crossings to the absolute minimum for visitor access and emergency access.

1. SKR Habitat Management, MU-5

Over 41% of MU-5 is occupied habitat, giving it the highest percentage of occupied habitat to overall land area within the Park. The extensive percentage makes this MU a prime candidate for increases in population through proper management.

a. SKR Monitoring, MU-5

The monitoring plot within this MU should be surveyed twice a year, during spring to determine grass/forbes (G/F) ratio and fall to determine population count of SKR. The spring vegetative survey must be conducted at peak flowering of forbes and grasses usually sometime between the beginning of March through the end of April, depending on weather conditions. The fall survey for SKR population densities must be conducted following juvenile recruitment (when the juvenile SKR are accepted by the above ground population and become a part of the general population) and before the fall/winter rainy season. This usually occurs between the beginning of September and the end of October, depending on weather conditions. The following conditions should be surveyed:

Survey for active burrows, dust baths, scat, runways and tracks, calculate the density (# SKR/ha) using the equation

D = (0.243) B (see Section 3.3.1)

b. SKR Management Treatment, MU-5

The following conditions and management actions are recommended;

i. Determine G/F ratio, if over 1.5, schedule mowing during that spring. If G/F ratio is below 1.5, record findings but do not treat.

ii. During the course of the spring scheduled grassland vegetation monitoring determine if aerial shrub cover exceeds 10%, if so schedule selective removal of shrubs to return to an aerial cover of less than 10%. If aerial cover is below 10%, record but do not treat.

iii. If density is below 10-20/ha treat all occupied habitat mapped within this MU by mowing that fall. If density is within 10-20/ha, but consistently near the 10/ha range, record and monitor closely, compare with aerial shrub cover data and G/F ratio data, but do not treat.

c. SKR Adaptive Management Strategies, MU-5

If the SKR population does not respond favorably to the above treatments, the reserve manager should first consult with the RMCC, then initiate studies into other possible causes for the decline. These might include increases in feral cat and/or predator population, or possible diseases or viruses.

2. Coastal California gnatcatcher Habitat Management, MU-5

The limited amount of quality habitat, located mostly along fingers of riparian vegetation, could aid in providing linear connections to other offsite habitat. Monitoring of habitat to maintain or improve the quality should be a secondary management strategy to grasslands. Management shall consist of minimizing, through wildfire control, the destruction of existing CSS within defined CSS/CAGN potential habitat.

3. Fuel Modification Management, MU-5

The boundary along the south of the MU is zoned for commercial use and should be conditioned to construct a masonry wall along its boundary. The masonry wall (minimum 5' high) acts as a heat deflector from a wildfire and eliminates any need for fuel management along the boundary of the Park. If an open iron fence is permitted by the City along this boundary, a 100' wide stubble management zone must be maintained along the entire boundary. The location of the existing Metropolitan Water District access road, and the fact that the fuel loads within this south-east corner of the Park are low, would not require access by fire emergency vehicles, hence no fuel modification treatments are required.

4. Public Use Management, MU-5

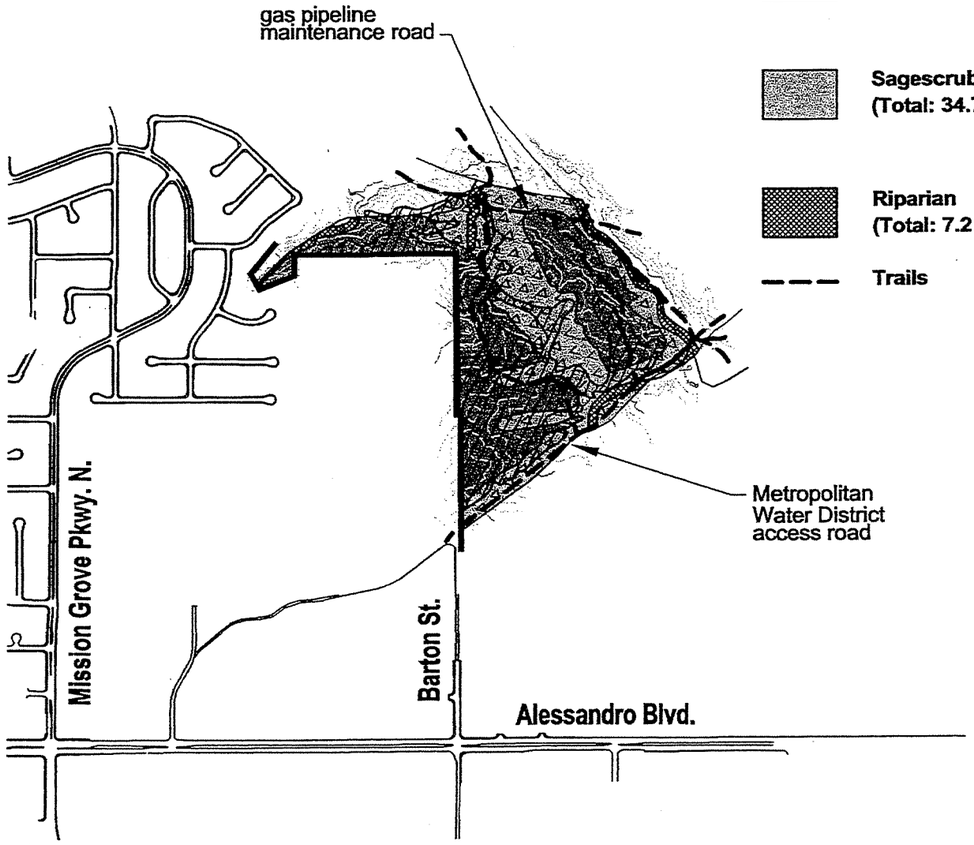
With a large portion of its border being undeveloped land adjacent to Alessandro Boulevard, ORVs can be a management challenge. The development of the commercially zoned property to the south must development conditions requiring installation of a minimum six foot high masonry wall between the Park and the development..

a. Visitor Use Monitoring, MU-5

With such potential ORV use at this site, illegal access should be closely monitored and citations promptly issued. This trailhead should be closed at dusk and regularly patrolled by the ranger.

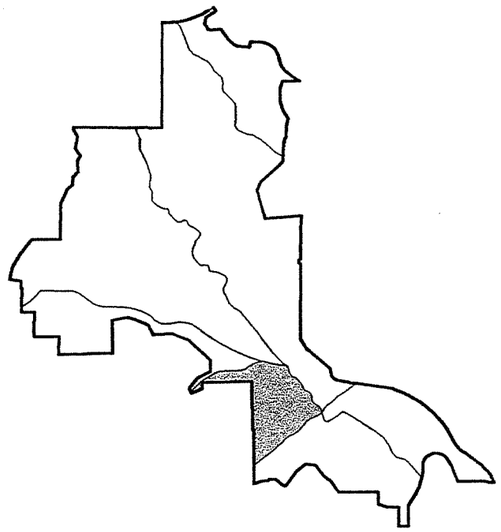
b. Public Use Management Strategies, MU-5

Management should include regular investigations to assure no volunteer ORV access locations are established through sensitive habitat. If ORV trails become established they should be disced and signed until vegetation recovers completely. If necessary it is recommended that a vehicle access barrier or chain link fence be installed by the adjacent property owner along the Alessandro Boulevard frontage to control ORVs.



MU-6 LEGEND

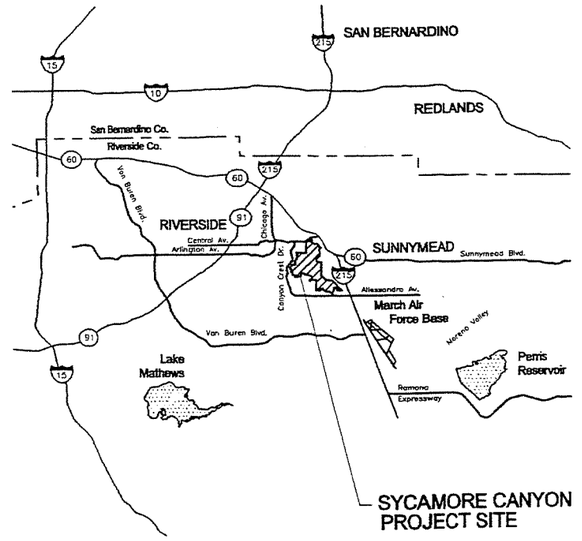
- SKR Habitat (Total: 34.8 acres)
- CAGN Potential Habitat (Total: 40.9 acres)
- Grassland (Total: 41.1 acres)
- Sagescrub (Total: 34.7 acres)
- Riparian (Total: 7.2 acres)
- Trails



Management Units Key Map

N.T.S.

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



KEY PLAN

N.T.S.

Management Unit 6

Figure 3-12

North

0 600 1200 2400

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

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iii. If density is below 10-20/ha treat all occupied habitat mapped within this MU by controlled burn for the upcoming winter. If density is within 10-20/ha, but consistently near the 10/ha range, record and monitor closely, compare with aerial shrub cover data and G/F ratio data, but do not treat.

c. SKR Adaptive Management Strategies, MU-6

If the SKR population does not respond favorably to the above treatments, the reserve manager should first consult with the RMCC, then initiate studies into other possible causes for the decline. These might include increases in feral cat and/or predator population, or possible diseases or viruses. As a last adaptive management strategy the Reserve Manager must stop control burn treatment of SKR occupied habitat and adjust to the preferred management treatment at that time. The Reserve Manager should also share their findings with the RMCC.

2. Coastal California gnatcatcher Habitat Management, MU-6

The CSS within this MU is such poor quality that a portion of the acreage is occupied by SKR. The areas occupied by SKR should be managed as SKR occupied grassland and not for CSS. All CSS area not occupied by SKR should be managed as Coastal California gnatcatcher habitat. Management shall consist of minimizing, through wildfire control, the destruction of existing CSS within defined CSS/CAGN potential habitat.

3. Fuel Modification Management, MU-6

The following recommendations can be found in Figure 3-6, the Fuel Modification Map. The intent of these recommendations is to protect sensitive habitat, improve or maintain habitat and provide a line of defense to bordering residential areas from wildfire. The Metropolitan Water District facility contains minimal fuel loads, contains no structures, and poses a very low risk to wildfire ignition. The location of the existing Metropolitan Water District access road, and the fact that the fuel loads within this south-east corner of the Park are low, would not require access by fire emergency vehicles, hence no fuel modification treatments are required.

a. Fuel Level Monitoring, MU-6

The only fuel level monitoring that is required for this MU is covered in Polygon 6.1A below, this can be accomplished by visual inspection and does not require sampling or weighing.

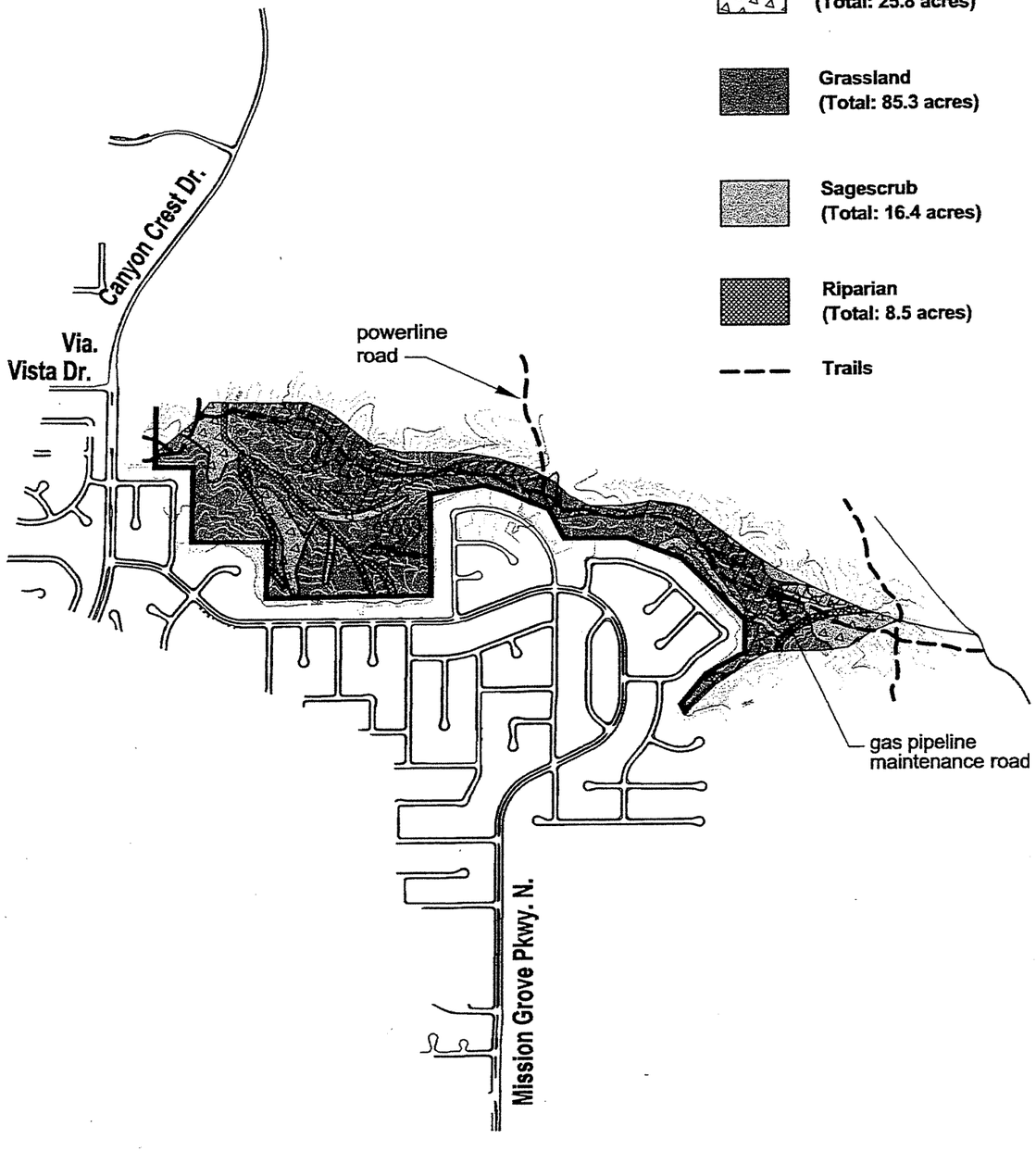
b. Fuel Modification Management Techniques, MU-6

The following management techniques are designed to prevent an uncontrolled wildfire from starting along high risk perimeter areas and development lines of defense if a wildfire does get started.

Polygon 6.1A Service Road Zone. ***As Required***

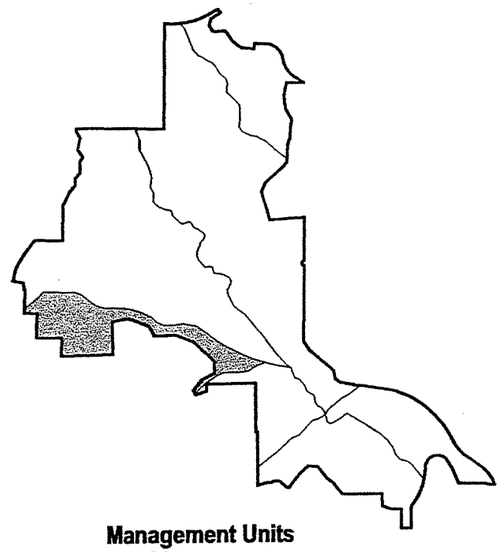
Apply Stubble Management treatment for 75 feet on each side of the Gas line access road. Treatment can be any or a combination of the following:

- Mowing by walk behind power mower (preferred option)
- Animal Grazing (sheep or goats)
- Strip burning in the winter season



MU-7 LEGEND

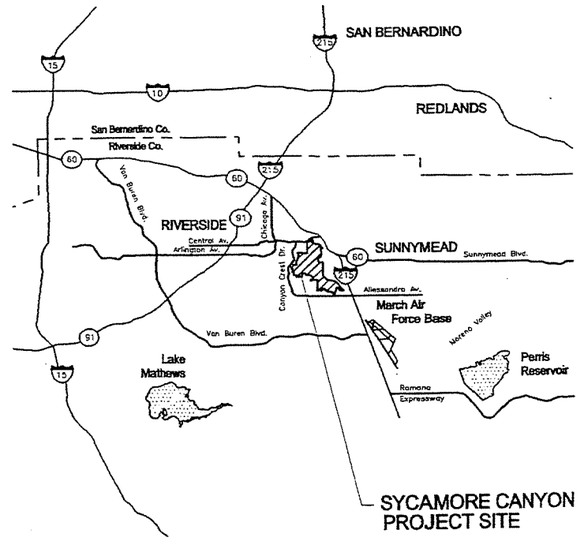
- SKR Habitat (Total: 26.4 acres)
- CAGN Potential Habitat (Total: 25.8 acres)
- Grassland (Total: 85.3 acres)
- Sagescrub (Total: 16.4 acres)
- Riparian (Total: 8.5 acres)
- Trails



Management Units Key Map

N.T.S.

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



KEY PLAN

N.T.S.

Management Unit 7

Figure 3-13

North

0 600 1200 2400

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

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Recreation and Environmental Planning

G. Management Unit #7

Located along the southwest border of the Park, this MU's southern edge is medium density residential with a very small portion of the units west border abutting a vacant parcel zoned residential. (Figure 3-13) Of the unit's approximately 110 acres, the topography is mostly less than 30% slope with a north aspect. The west canyon originates in this unit adjacent to the residential development (See MU-3 for riparian issue). This MU acts as the last line of defense for the neighboring residential development against a Santa Ana wind directed wildfire. The breakdowns of vegetative types in this Unit are;

Riparian	8.5 acres
Grassland	85.3 acres
Sage scrub	16.4 acres

The riparian vegetation areas within this MU were combined with the sage scrub calculations of potential CAGN habitat as referenced in Section 3.2.2.D.

The riparian areas should be monitored to assess the effects of the additional flows into the west canyon from the residential development while working to control the affects of erosion from such flows. The present *Arundo donax* (Arundo) eradication program must be maintained and monitored to prevent re-establishment.

1. SKR Habitat Management, MU-7

Approximately 25% of the MU is occupied habitat. The use of stubble management as mentioned below, could greatly increase the occupied area in conjunction with providing a wildfire fuel modification. The increasing erosion however, could begin to deteriorate grassland along the perimeters of the drainages.

a. SKR Monitoring, MU-7

Due to the minimal occupation and small size of this management unit, no monitoring plot was established. Utilize the data from the MU-3 monitoring plot to determine treatment within this MU.

b. SKR Management Treatment, MU-7

The following conditions and management actions are recommended, utilize data from MU-3 monitoring plot;

i. Determine G/F ratio, if over 1.5, schedule mowing during that spring. If G/F ratio is below 1.5, record findings but do not treat.

ii. During the course of the spring scheduled grassland vegetation monitoring determine if aerial shrub cover exceeds 10%, if so schedule selective removal of shrubs to return to an aerial cover of less than 10%. If aerial cover is below 10%, record but do not treat.

iii. If density is below 10-20/ha treat all occupied habitat mapped within this MU by mowing that fall. If density is within 10-20/ha, but consistently near the 10/ha range, record and monitor closely, compare with aerial shrub cover data and G/F ratio data, but do not treat.

c. SKR Adaptive Management Strategies, MU-7

If the SKR population does not respond favorably to the above treatments, the reserve manager should first consult with the RMCC, then initiate studies into other possible causes for the decline. These might include increases in feral cat and/or predator population, or possible diseases or viruses.

2. Coastal California gnatcatcher Habitat Management, MU-7

This CSS should be monitored and managed for improvement of CSS to improve habitat potential for the Coastal California gnatcatcher and also to minimize fuel levels near the medium density residential. Management shall consist of minimizing, through wildfire control, the destruction of existing CSS within defined CSS/CAGN potential habitat.

3. Fuel Modification Management, MU-7

The following recommendations can be found in Figure 3-7, the Fuel Modification Map. The intent of these recommendations is to protect sensitive habitat, improve or maintain habitat and provide a line of defense to bordering residential areas from wildfire.

a. Fuel Level Monitoring, MU-7

The only fuel level monitoring that is required for this MU is covered in Polygon 7.4A below. This can be accomplished by visual inspection and does not require sampling or weighing.

b. Fuel Modification Management Techniques, MU-7

The following management techniques are designed to prevent an uncontrolled wildfire from starting along high risk perimeter areas and to develop lines of defense if a wildfire does get started. The management technique of mowing almost this entire MU to minimize fuel levels should also help to improve SKR habitat potential of treated areas.

Polygon 7.4A Structure Protection Zone. ***Treat Annually***

Stubble Management for 75 feet in width north of gas line road and southerly to private property boundary for Mission Grove Structure Zone Protection. Treatment by one or combination of the following:

- Mowing by walk behind power mower (preferred option)
- Animal Grazing (sheep or goats)
- Strip burning during the winter season

The riparian/sage scrub area within the MU must be closely monitored during fuel management treatment. The treatment of this MU is designated for all areas within MU 7 excluding the riparian/sage scrub zones.

4. Public Use Management, MU-7

The most critical issue facing management for public use within this MU is to reestablish and maintain an agency approved crossing of the west canyon along the gas pipeline maintenance road (Figure 3-13,) for public access and emergency access vehicles.

Volunteer trails must be monitored and signed until vegetation completely recovers. Strategies should also be developed to divert visitors to trailheads. Trails found to be creating negative impacts to the riparian vegetation should be relocated and the existing trails signed, disced and allowed to naturally revegetate.

a. Visitor Use Monitoring, MU-7
The key issue is monitoring the area for volunteer trails.

b. Public Use Management Strategies, MU-7
Management should include regular investigations to assure no volunteer entrance trails are established through sensitive habitat, and if they do, they should be blocked and signed until vegetation recovers completely. Residents should be educated as to the impacts being created with these volunteer trails and illegal access.

3.2.4 Management Responsibilities

Management of Sycamore Canyon Core Reserve as defined by the RCHCA includes biological monitoring, adaptive management, habitat enhancement and restoration, access control, fire management, grazing and recreation. The responsibility of the above-mentioned management activities resides with the City of Riverside Park and Recreation Department. Coordination of these activities with the RMCC is the responsibility of the Reserve Manager, an employee of the City.

The Reserve Manager's responsibilities as outlined in the RCHCA HCP are in addition to the Reserve Manager's current functions. They include:

1. Adoption of reserve management plans and annual work programs for Sycamore Canyon Wilderness Park, and submission of applicable portions of same to the RCHCA for consideration of funding requests for SKR management;

2. Performance of management activities for SKR habitat within the reserves consistent with the HCP, approved multi-species HCP's, and State and local laws and policies;

3. Development and implementation of biological monitoring activities to measure SKR populations and evaluate their viability from year to year and over the term of the permit and agreement;

4. Development of land acquisition priorities and site selection criteria for recommendations to the RCHCA;

5. Identification and recommendations of habitat restoration and enhancement priorities and opportunities within core reserves, and;

6. Provision of technical assistance to RCHCA staff in the preparation of Requests for Proposals for competitive procurement of biological consulting services and SKR research activities funded by the RCHCA.

3.3 Maintenance/Management Rationale

Monitoring and management considerations may be reduced to very simple questions.

Monitoring:
- What are the key factors to monitor?
- How many monitoring locations are necessary?
- How often should monitoring be conducted?

Management:
- Which treatment or treatment combination most effectively enhances the suitability of the habitat for species of concern and for the safety of the site for public use?
- How often should the treatment be applied to maintain habitat and fuel modification conditions within acceptable limits?

These monitoring and management rationale were used to establish the various management techniques for each MU as outlined in sub-section 3.2.3. These rationale should be used by the reserve manager as a guide to establish alternative adaptive management strategies and/or modifications to the recommended techniques.

3.3.1 Stephens' Kangaroo Rat Management

Normally the primary management tool for maintaining the quality of grassland habitat for SKR is fire. Previous studies in other locations used controlled burns only during the fall (O'Farrell, 1994; 1997b). This practice is at odds with fire treatments elsewhere, which usually entail controlled burns in the spring. Most jurisdictional fire agencies avoid prescribed burning in the fall because of Santa Ana winds. If small areas of lingering heat or fire remain after a burn, the strong winds could bring them to life at the most inopportune time. However, spring disturbance was avoided in these previous studies for several reasons. In western Riverside County, natural fires occur in the fall months. Controlled burns in the spring would need to occur immediately upon drying of the majority of surface biomass. This would help eliminate seed reserves of unwanted grasses but would also eliminate necessary seeds and stem-and-leaf material. Loss of this food source in the middle of the major breeding period could adversely affect SKR. Without carefully controlled experiments, this practice could be detrimental to the long-term survival of the population.

The use of controlled burns is integrated into the overall Fire Management Plan (FMP) for the Park. Removal of accumulated dried biomass not only reduces the fuel load, decreasing the risk of unplanned wild fires, but also enhances the grassland habitat by opening the ground surface, decreasing exotic grasses, and promoting native forbes. Certain portions of the Park will require annual reduction of fuel load, particularly around the periphery adjacent to housing. Adequate swaths can be cleared by grazing (sheep or goats) and/or mowing to provide a functional fuel break. These techniques may be suggested in selected areas elsewhere in the Park under conditions of climatic wet cycles. The interface between grassland and surrounding habitats presents a particularly sensitive management area. Although controlled burns can be contained within prescribed limits under most conditions, it is necessary to consider the high fire potential in adjoining residences, woodlands and shrublands. The adjoining areas contain a suite of sensitive resources that could be significantly damaged by out of control fire.

The maintenance of adequate fuel breaks at the convergence of different habitats is also important. Mowing is a method of creating and maintaining these fuel breaks to provide short-term habitat enhancement for SKR, and a visually non-obtrusive surface. Other techniques, such as grazing, should also be explored.

Habitat treatments should be performed when key habitat features exceed critical thresholds and/or when SKR densities fall below certain levels. Based on the Shipley/Skinner Reserve study (O'Farrell, 1997b), the critical threshold for the Grass/Forbes ratio is 1.5. Values above this level indicate unsuitable conditions consistent with declining densities of SKR. The presence of aerial shrub cover is an indication of habitat degradation. Previous work indicated that SKR cannot occupy habitat with more than 35% aerial shrub cover (O'Farrell and Clark, 1987). For present management considerations, aerial shrub cover should not exceed 10% within areas designated as SKR habitat. If densities of SKR fall below the range of 10-20 individuals/ha, habitat treatment should be performed. A range is given for SKR density because of the inherent variability found throughout the range of the species. Use of the range will depend on previous conditions. For example, if initial densities are greater than 40 SKR/ha and the population drops to 20 SKR/ha, serious consideration should be given to habitat treatment. Likewise, if an initial density of 20 SKR/ha falls below 10 SKR/ha, treatment would be warranted. However, a decline from 20 to 15 SKR/ha would not form the basis for habitat treatment. The magnitude of population fluctuations should be considered concomitantly with habitat trends before making management decisions. Based upon these criteria and the findings from establishment of the permanent monitoring plots, it is recommend that habitat treatment (prescribed burn) be performed in Management Units 1 and 2. Burns should be confined to open grassland, preventing the spread into neighboring shrubland and riparian habitats. The burn will remove or reduce the dense biomass contributions of bromes and oats.

As an aid for management decisions, the key thresholds for initiating habitat treatments are as follows:

1. Density (# SKR/ha) falls below 10-20.

2. The grass to forb ratio (G/F) exceeds 1.5.

3. Aerial shrub cover exceeds 10%.

The apparent redundancy in monitoring will assist in evaluating other factors that might be affecting populations. For example, if the G/F ratio is maintaining below 1.5 but the fall densities decline below acceptable limits and represent a declining trend not seen for habitat features, other factors, such as disease, should be considered. This system of monitoring multiple factors should allow enough warning time to take appropriate action before conditions reach the point of no return. The long-term survival of SKR depends on the continued implementation of an accurate monitoring and management program.

At present the RMCC has not adopted a formal SKR monitoring/management protocol. When such a protocol is adopted, the City's Reserve Manager, in conjunction with the RMCC, will evaluate and determine the appropriate protocol for Sycamore Canyon Wilderness Park. Until the RMCC adopts a protocol and the aforementioned analysis is completed, the specific monitoring/management techniques found in Section 3.2.2 should be implemented.

3.3.2 Coastal California Gnatcatcher (Gnatcatcher)

Coastal sage scrub within the Park includes habitat with species composition and density suitable for nesting, and ecotonal areas with grasslands and riparian scrub/woodland that are often used by Coastal California gnatcatchers. Furthermore, current research indicates that Coastal California gnatcatchers disperse across areas lacking coastal sage scrub (i.e. grasslands, agricultural lands). The value of open space connections between Coastal California gnatcatcher populations cannot be overemphasized.

The United States Fish and Wildlife Service has prepared a survey protocol based on the best scientific information available regarding the detectability of the Coastal California gnatcatcher. The protocol requires six visits, one week apart, during the breeding season (March 15 through June 30) to determine the presence or absence of the species at a 95% confidence level. The protocol assumes that one biologist can cover approximately 80 acres in a day; larger areas require more survey days.

Due to limited funding being available, the surveys for Coastal California gnatcatcher performed as a part of this study were not conducted in accordance with USFWS protocol. Rather, their purpose was simply to establish the presence of Coastal California gnatcatcher within Sycamore Canyon Wilderness Park. In the course of the surveys the consulting biologists were able to evaluate the amount and effects of human disturbance on coastal sage scrub, grassland, and riparian habitats in Sycamore Canyon Wilderness Park. The impacts of humans on foot and on bicycles in the Park seems minimal, provided that individuals stay on existing trails. The current trail system provides limited easy access through portions of the Park, but most of the Park is accessed only by cross country hiking. Few people were encountered during the surveys, and all were on the trails. More serious impacts to the Park and its habitats come from the increasing urbanization on all sides, and the narrowing and degradation of corridors between the Park and other areas of open space in western Riverside County.

It is recommended that before any facility improvements are initiated, a USFWS approved protocol Coastal California gnatcatcher survey be completed for the immediate project area. Intensive public use facilities should be excluded from being near potential nesting areas. If nesting sites are identified during an above mentioned survey, that area should be identified and public use prohibited during the nesting season. See Section 3.2.2 for management techniques specific to management units.

3.3.3 Vegetation Management

Proposed future activities to restore and rehabilitate native habitats within the Park will be beneficial for most species mentioned in Appendix 9.2.2. The notable exception is Robinson's pepper-grass (List 1B; Skinner and Pavlik, 1994). Plants on List 1B meet the definitions of the Native Plant Protection Act and the California Endangered Species Act and are suitable for state listing. Thus, it is mandatory that they be fully considered for any action covered under CEQA. The pepper-grass occurs in dry, "scald" areas which are not well represented in the Park but can be found on broad ridges and hill tops. Before final determinations are made for the exact placement of trails and interpretive facilities, precise locations of extant populations of this plant species should be defined and appropriate avoidance measures instituted.

To control a critical problem within the drainage area of the Park, *Arundo donax* (Arundo), needs to be controlled. This exotic species is very aggressive and is propagating within the Park at an alarming rate. Present a vegetative control program has been developed by the City and is being implemented on an ongoing basis by the City's Rangers. This program may want to consider the utilization of such work crews as County Work Programs, California Conservation Corps in addition to the volunteer labor presently being used.

3.3.4 Hydrology *(Prepared by CDH)*

[Note: The scope of work for this Updated Conceptual Development Plan did not include consideration of Hydrological Resources, this section is excerpted verbatim from the original CDP]

As the land surrounding Sycamore Canyon Wilderness Park is developed, storm runoff will continue to increase. The increased storm runoff will result in increased erosion within the Park. There are several options for managing the increased storm runoff into the Park. A few options are presented herein.

The first option would be a do nothing approach. Such an approach would probably be undesirable as the accelerated rate of erosion would result in a magnification of an already unacceptable condition. Habitat destruction within the Park will increase, along with increases in sedimentation downstream.

Other options will require various drainage improvements which could include, but are not necessarily limited to:

- a series of drop structures and check dams;
- storm drain systems;
- lining the existing streams
- erosion control mats planted with native and/or non-native plants;
- upstream detention basins with filtering systems on adjoining property as adjacent lands develops.

A series of drop structures and check dams could be used to try and stabilize the stream beds and reduce flow velocities within the stream. The structures should be constructed at an interval that would reduce the gradient of the stream and reduce flow velocities to non-erosive levels.

Storm drain systems could be constructed to divert the additional storm runoff around the Park. These could be a combination of a number of systems, including open channels, reinforced concrete pipe, and box culverts. Due to probable costs, this option may be impractical.

Lining the existing streams within the Park would reduce erosion considerably. Possible materials include: concrete, riprap, wire and pipe revetment, soil cement, and erosion control mats planted with native or non-native plant species. Such an approach will require extensive construction within the Park, resulting in a significant degradation of the existing natural habitat. Consequently, this option would likely be undesirable. Due to new more stringent environmental regulations of the Army Corps of Engineers and the California Department of Fish and Game, the mitigation that would be required to make such adjustments in the canyon drainage would likely be prohibitive.

Another option is the construction of upstream detention basins and filtering systems as adopted in the Sycamore Canyon Specific Plan and Environmental Impact Report. The detention basins would catch the storm runoff generated by the surrounding developments and release the runoff at an acceptable flow rate over a longer period of time. Thus, the streams- flow rates can be kept low and erosion minimized, while avoiding unnecessary construction within the Park. Filtering systems would minimize the amount of oil, grease, trash, and other urban debris into the Park habitats.

At the time of this report, information was unavailable as to the exact location, size, outflow volume, and point of outlet into the canyon of proposed siltation basins. It is the assumption of CDH that the development of detention basins and filtering systems on upstream adjacent developments is being resolved through the approval process in the City of Riverside's Planning and Public Works Departments.

RECOMMENDATION:
It is recommended that the management strategy for the drainage improvements within Sycamore Canyon Wilderness Park allow the flowlines to follow their dynamic natural course and not imped or restrict any natural occurrences that may occur within them.

3.3.5 Archeological Resources *(Prepared by CDH)*

[Note: The scope of work for this Updated Conceptual Development Plan did not include consideration of Archeological Resources, this section is excerpted verbatim from the original CDP]
Grinding slicks are abundant in the Park area and are amenable to public display and interpretation. These slicks should, however, be avoided during any type of road or building construction. Slicks in heavily visited areas will also undergo gradual abrasion from the shoes of those who climb on the boulders. This gradual attrition is acceptable so long as:

- better preserved slicks remain away from trails and
- the Park is used as an educational facility to promote understanding of and respect for archaeological resources.

The two (2) existing bedrock mortar sites are also amenable to public display and interpretation. Under no circumstances should these sites be destroyed. They could be incorporated into building sites or parking lots. Bedrock mortars will probably suffer some wear and vandalism which may be acceptable since the Park is intended to serve as an educational facility and so long as at least one (1) bedrock mortar site is preserved by keeping trails and traffic at a distance.

The surface artifact scatter (CA-RIV-2425) which holds some research potential, simply does not lend itself to in-place public interpretation due to the risk of unauthorized collecting. This site should be avoided during all construction activities and by any trail construction that may be planned.

Although the cupule rock site is unique and amenable to public display and interpretation, because the boulder and cupules are badly weathered, this site must be protected from vandalism. Options include fencing or enclosing the rock within the interpretive center. If fenced in place, the site should be incorporated into shorter trails so that it can be seen by most visitors.

Although sensitive in nature, the following sites do not lend themselves to in-place public display and interpretation and have little research potential and require no special preservation efforts:

- the three (3) mano sites,
- the grinding stone site (CA-RIV-2454), and
- the chipping debris site (CA-RIV-1196).

Park officials should be aware that stone grinding slicks, especially in heavily visited areas, will suffer vandalism (i.e., spray paint) and that these areas should be chemically treated for removal and not scraped or sandblasted. Visitors should be discouraged from touching the slicks with knives, keys, and coins.

3.3.6 Fuel Modification Planning

Sycamore Canyon Wilderness Park consists of approximately 1,480 acres of undeveloped open space park land, with highly flammable native vegetation, surrounded by residential subdivisions, commercial and industrial property all located within the city limits of Riverside, California.

The City of Riverside Fire Department, early in the planning process, expressed a concern regarding their ability to protect the surrounding structures adequately without some key strategic fuel modification measures within the open space property. This concern led to the request for a Fire Management Plan (FMP) for the Proposed Sycamore Canyon Wilderness Park, including evaluation of additional fire risk impacts from future recreational development.

- **Methodology**

The primary purpose of this Fire Management Element is to provide an efficient, cost effective plan of action that minimizes the City's liability from wildfire and reduces fire hazard and risk within the reserve. The plan incorporates current goals of the City Park and Recreation Department and additional goals ascertained during the planning process.

Site-specific recommendations were derived from both on-site and off-site fire hazard and risk assessments, along with the known values at risk to wildfire. This approach allows for management direction diversity between the seven (7) designated MU's in the Sycamore Canyon Wilderness Park. See Section 1.1.2 and Section 3.2.1 for further clarification of Management Units.

A. Plan Phasing - 7 Steps to Fire Management Planning

The management planning models for this FMP were prepared utilizing a 7 step method. Each step plays a vital role in the overall Fire Management Plan.

Step 1. Composite Fire Hazard Assessment.

Fire Hazard is determined by a combination of vegetative type and age class, slope percent, and historic fire weather conditions. The fire management team used city Flood Control District aerial photographs and topographic maps of the Sycamore Canyon Study Area combined with several thorough visits to the site to assess the fire hazard.

Each of the designated MU's was given an aggregate rating in one of the three following fire hazard classifications using criteria as described in 3.3.7 (B.1).

- High Fire Hazard Area
- Moderate Fire Hazard Area
- Low Fire Hazard Area

Step 2. Composite Fire Risk Assessment.
Off-site land uses and existing open space use of the Park were analyzed to assess the potential of a wildfire ignition (fire risk). The Park and immediate off-site land use patterns were rated into three fire risk categories using criteria described in 3.3.7 (B.2).

- High Risk
- Moderate Risk
- Low Risk

Step 3. Values Threatened by Wildfire.
Structure and natural resource values that would be threatened if a wildfire occurred were identified and mapped. The coordinated multi-discipline team determined key areas where fire will have either a negative or positive impact on that specific site.

Step 4. Designation of Management Units (MU).
Homogeneous wildfire protection zones that have common vegetation (Fuel Models), topographic features, expected fire behavior, and similar values at risk from wildfire were delineated as management units. (Note: These same management unit configurations were ultimately adopted for all other management elements of this maintenance/management plan.) Generally wildfire fire protection strategy and fuel management treatment recommendations are different for each MU.

Step 5. Development of Draft Fire Management Plan Recommendations.
The Fire Management Team prepared draft fuel modification, key fire response access routes, and fire prevention recommendations for each MU. This information is found in Section 3.2.2.

Step 6. Interaction with Principal Agencies.
After all sites were initially assessed, interviews were conducted with the City of Riverside Fire Department and Park and Recreation personnel to gain their feedback and support for the FMP recommendations.

Step 7. Presentation and submittal of the Conceptual Management Plan.
The Conceptual Management Plan was submitted to the City Fire Department and Park and Recreation Department Staff for review and comment.

B. Wildland Fire Severity Analysis

Wildland fire severity ratings are determined by an analysis of the combined ratings of fire hazard and fire risk. Wildland Fire Hazard and Risk Assessments were based upon the existing use patterns and vegetative conditions found within the Sycamore Canyon Wilderness Park and those areas immediately surrounding the Park. These Assessments included fire hazard and risk evaluation of each designated MU and were based upon the information gathered in, Steps 1 and 2 mentioned above.

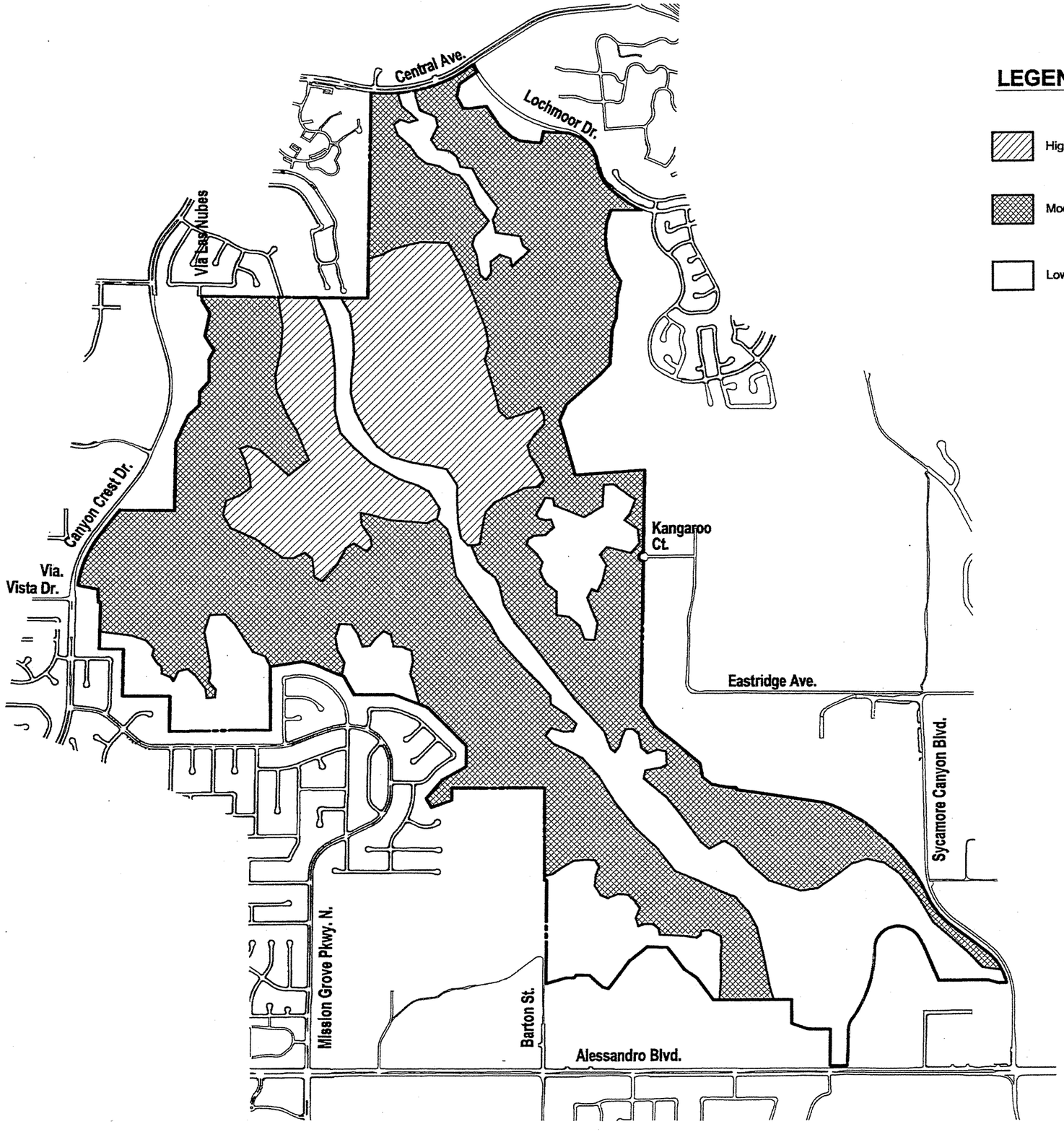
1. Wildland Fire Hazard Assessment

Wildfire has been a significant part of the environment of Sycamore Canyon for many years. The types of vegetation currently growing in the area, combined with slope and exposure to the wind represent a moderate to high fire hazard. To change or reduce the fire hazard, several alternatives have been developed. Removing or modifying and reducing the volume of vegetation reduces the fire hazard. However, in every case, vegetation will grow back the following year.

Therefore, a dynamic maintenance plan to mitigate the fire hazard over time should be developed and implemented. The three classifications of fire hazard are:

- **High** (Sage Scrub vegetation on 25 % plus southwest slopes aligned with the prevailing wind).
- **Moderate** (Grassland, sage scrub and light brush on gentle slopes, (25% or less, aligned with the prevailing wind).
- **Low** (Grassland and riparian fuels generally not aligned with the prevailing wind)

A map of the three fire hazard classification areas can be found in Figure 3-14.



LEGEND

- High Fire Hazard
- Moderate Fire Hazard
- Low Fire Hazard

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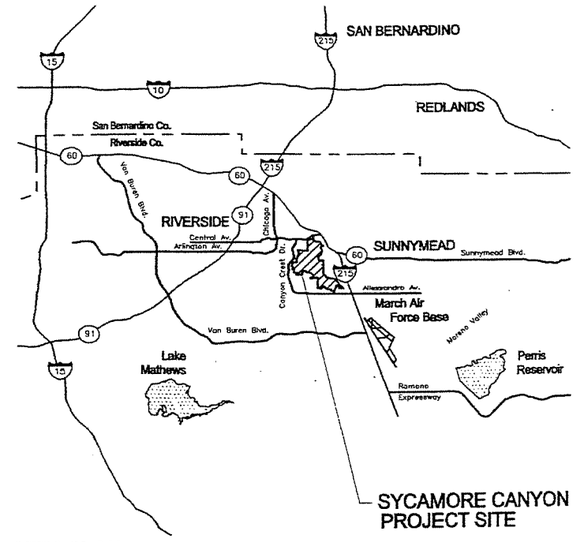

KEY PLAN
N.T.S.

Wildland Fire Hazard Assessment

Figure 3-14

North

0 750 1500 3000

SCALE IN FEET

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Recreation and Environmental Planning

2. Wildland Fire Risk Assessment

In southern California, lightning causes approximately 10% of the vegetative fires over the long term. The other 90% of vegetation fires are person-caused. Person-caused fires are the fires that will be discussed in this plan. Agency employee presence, volunteer presence, law enforcement, and education programs to increase Park visitor understanding of the wildfire problem will help to reduce the risk of ignition. Although a small percentage of wildfires are intentionally set, most are carelessly or unintentionally caused. Therefore, a visitor education program will help to keep the risk low despite increasing numbers of park visitors.

Vehicles are also sources for vegetation fire ignitions and represent a high risk along heavily traveled streets and roads. The City can help to reduce this risk through vegetation modification or fire retardant treatment along city road rights-of-way adjacent to Sycamore Canyon Wilderness Park (Canyon Crest Drive and Central Avenue).

The three classifications of Fire Risk Areas are:

- **High Fire Risk Area**

  Canyon Crest Drive (MU-3) between the paved road and Sycamore Canyon Wilderness Park western boundary. (Vehicle accidents, hot exhaust, smoker, and arson).
  Central Avenue (MU-1 and 2) between the paved road and the Sycamore Canyon Wilderness Park northern boundary. (Vehicle accidents, hot exhaust, smoker, and arson).

- **Moderate Fire Risk Area**

  MU-2 and MU-3, adjacent to Canyon Crest Apartments and residential area access. (Children playing with matches and illegal fireworks).
  MU-7, Mission Grove residential area access (Children playing with matches and illegal fireworks). Interior dirt roads and trails with unauthorized motorcycle use and smokers.

- **Low Fire Risk Area**
  All other areas of Sycamore Canyon Wilderness Park there is a low occurrence of potential ignition causes.

See Figure 3-15 for locations and descriptions of the three fire risk classifications.

3. Values at Risk to Wildfire

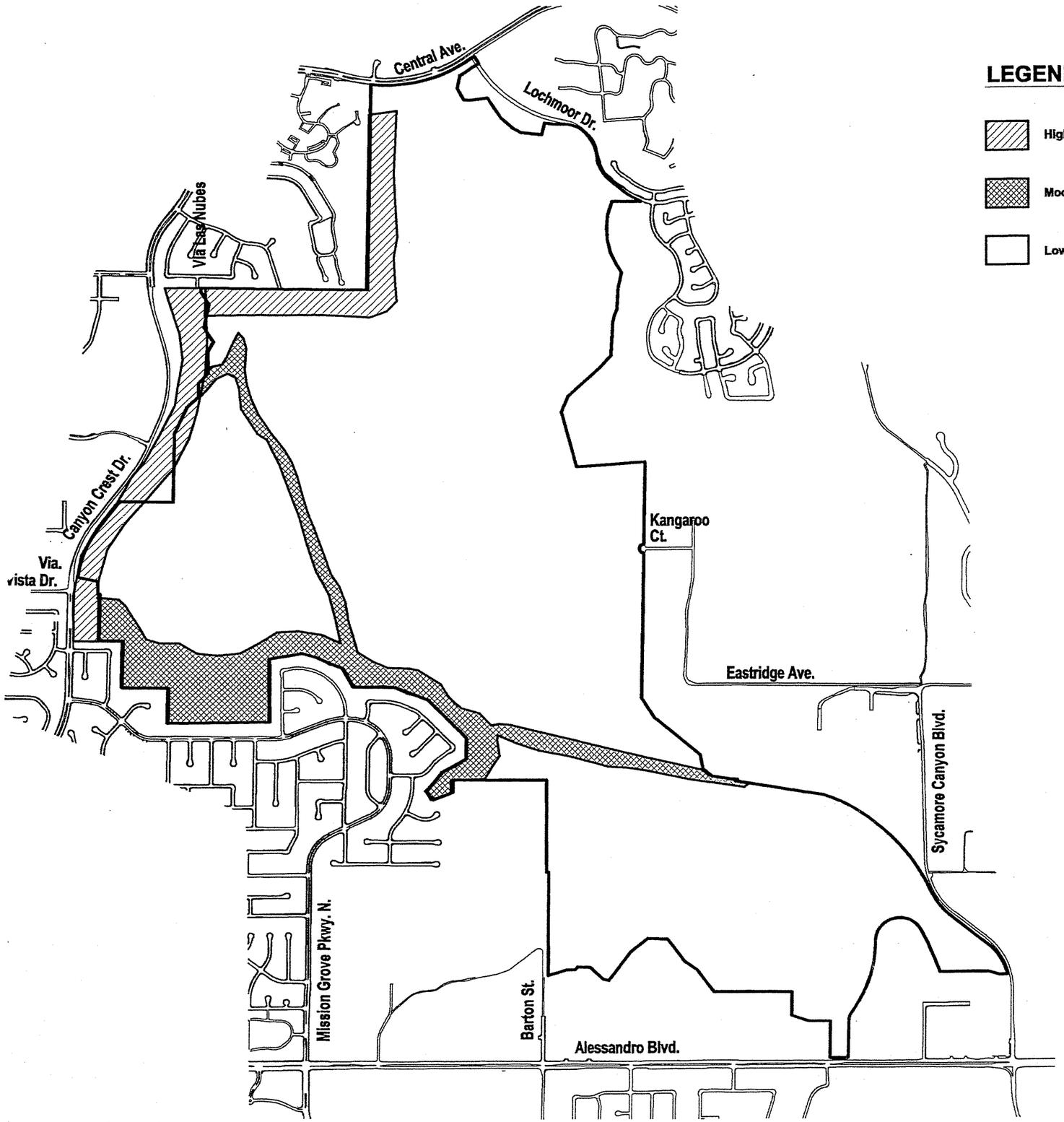
The third portion of the assessment is values at risk to wildfire (See Figure 3-16). There are many types of values in and around this Park. If a fire burns trees, bushes, grass, animals, insects, houses, etc., people and/or the environment will be negatively impacted. The values to be protected will help to set priorities for the City. Life is valued more highly than any material things. Loss of residential structures are assigned the next highest value, with rare and threatened species habitat, and natural resources respectively following in descending order. These values have been identified and grouped. Fire protection objectives, and Park and recreation priorities became the driving forces in the fire management planning process.

Fire management strategies were developed for key environmental areas within each MU based upon the biological recommendations and concerns expressed to the fire management team. Refer to Figure 3-16 for a map showing location and description of the Values at Risk to Wildfire Areas.

C. Predicting Wildland Fire Behavior

The minute-by-minute movement of a wildland fire will probably never be totally predictable - certainly not from weather conditions forecast many hours before the fire. Nevertheless, practice and experienced judgment in assessing the fire environment, coupled with a systematic method of calculating fire behavior, yields surprisingly good results (Rothermel 1983)'.

A computerized Fire Behavior Prediction and Fuel Modeling System - Burn Subsystem, Part I, known as BEHAVE, was developed by Patricia L. Andrews, USDA-Forest Service research scientist at the Intermountain Forest Fire Laboratory, Missoula, Montana and is one of the best systematic methods for predicting wildland fire behavior. The BEHAVE modeling system is utilized by wildfire experts nationwide. Because the system was designed to calculate the spread of a fire, the fire model describes the fire behavior only within the flaming front.



LEGEND

- High Risk
- Moderate Risk
- Low Risk

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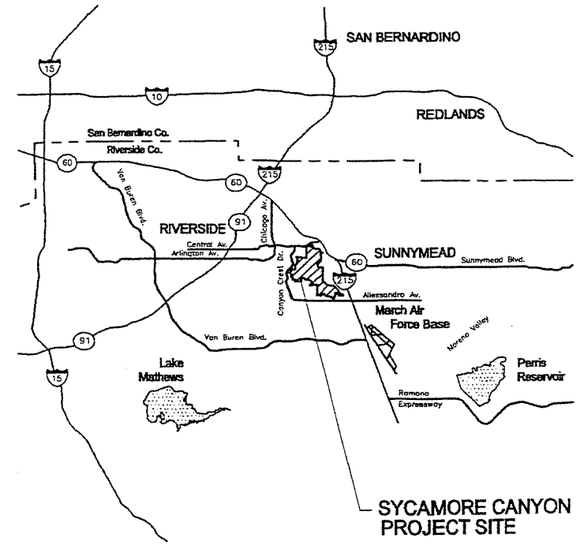

KEY PLAN
N.T.S.

Wildland Fire Risk Assessment

Figure 3-15

North

0 750 1500 3000

SCALE IN FEET

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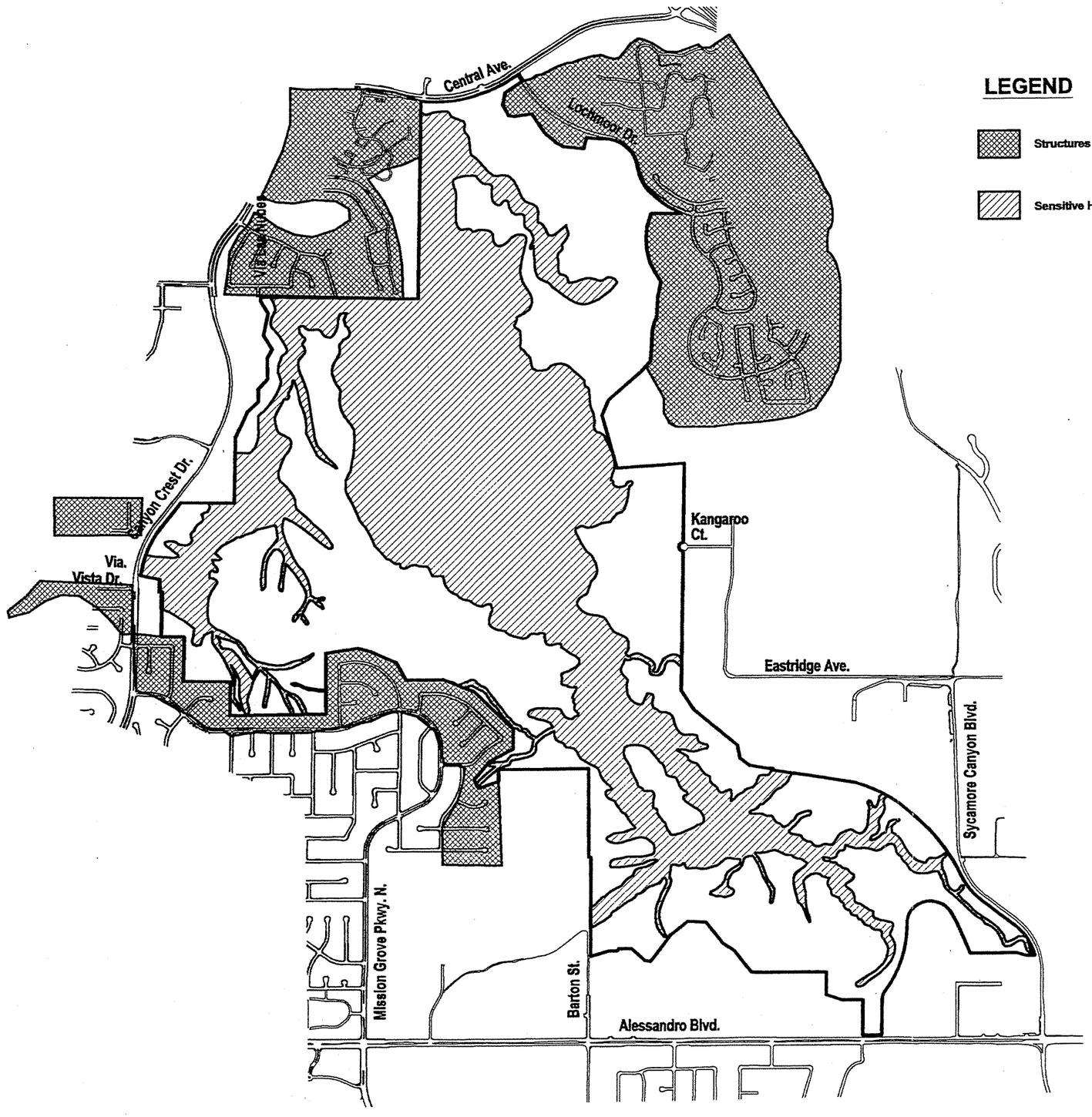
Recreation and Environmental Planning



LEGEND

- Structures at Risk
- Sensitive Habitat at Risk

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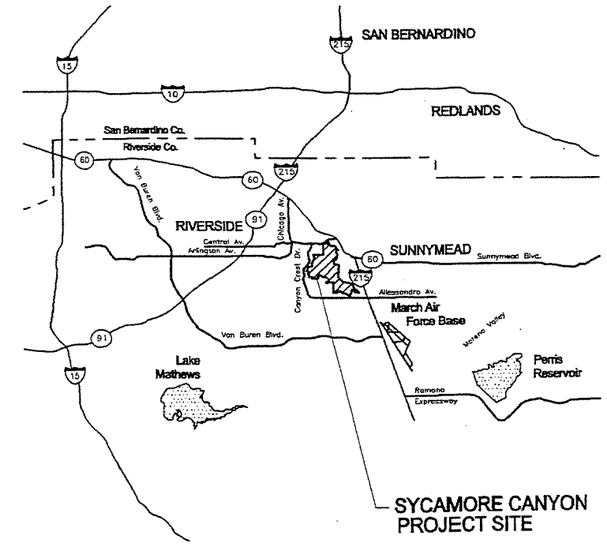

KEY PLAN
N.T.S.

Values at Risk to Wildfire

Figure 3-16

North

0 750 1500 3000

SCALE IN FEET

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The primary driving force in the fire behavior calculations is the dead fuel less than one-fourth inch in diameter; these are the fine fuels (grass, leaves and twigs) that carry the fire. Fuels one-fourth to three inches are modeled to determine overall fire intensity. 'Fuels larger than three (3) inches in diameter are not included in the calculations at all (Andrews 1986)'.
Regardless of the limitations expressed, experienced wildland fire managers can use the BEHAVE modeling system to project the expected wildfire flame lengths, fire intensity, rate of spread (feet per minute), and fire size with a reasonable degree of certainty for use in fire protection planning purposes.

1. Fire Behavior Calculations for Sycamore Canyon Wilderness Park.

FW 2000 used the BEHAVE: Fire Behavior Prediction and Fuel Modeling System to determine the expected wildland fire behavior within each MU or combination of MU's. BEHAVE: Fire Behavior Calculations have been made for the representative normal-summer fire weather, above-average and extreme fire weather conditions normally found within the Study Area. Fire behavior calculations projected the expected: (1) fire size (acres) by 6, 12, & 18-minute response times, (2) rate of spread (feet per hour), (3) fire intensity (BTU's per Square Foot), and (4) flame lengths (expressed in feet). This information was very valuable in determining fire's effect on natural resources, probability of control before reaching 'values at risk' and helped to identify possible liabilities from wildfires originating on the study area property and spreading off-site.

D. Expected Fire Behavior Results (Rate of Spread, Fireline Intensity and Flame Lengths).

Fire behavior calculations for Sycamore Canyon Wilderness Park were based on the following assumptions and are depicted in the following tables. Tables A, B, and C display the expected fire behavior results of calculations for the typical normal-summer, above average, and extreme fire weather conditions listed directly above each table.

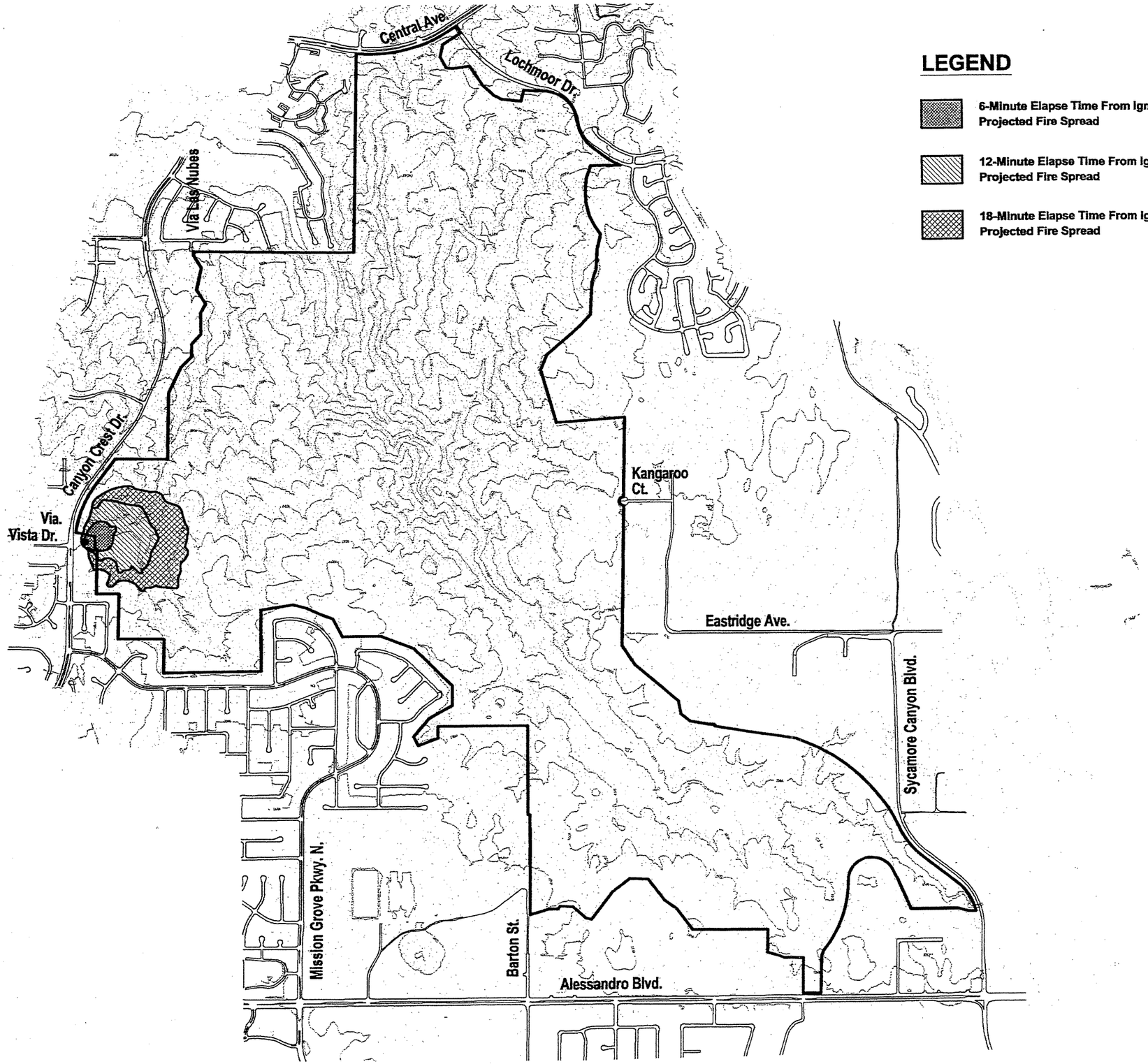
Normal Summer Fire Weather Conditions (June - July)

- Temperature.....90 degrees (F)
- Relative Humidity .....35 %
- 1-Hour Fine Fuel Moisture of..... 5 %
- 10-Hour Fuel Moisture of.....8 %
- 100-Hour Fuel Moisture of.....12 %
- Live Fuel Moisture of.....100 %
- Wind Direction and Speed.....Southwest at 12 mph
- Mid-flame wind speed (0.4).....5 mph
- Slope percent.....30 %
- Wind Vector.....360 degrees

There are two principal Fire Behavior Fuel Models; 1) Fuel Model 1 - Grass, and 2) a combined fuel model of 60% Fuel Model 1 (Grass) and 40% Fuel Model 2 (sage scrub).

TABLE A Normal-Summer Fire Weather Conditions Expected Fire Behavior Results of Calculations	
Fuel Model 1 - Grass	
Rate of Spread	**128 Feet per minute**
Fireline Intensity	**196 BTUs per square foot**
Flame Length	**5.1 feet**
Combined Fuel Model 1 - Grass (60%) and Fuel Model 2 (40%) Light Brush	
Rate of Spread	**95 feet per minute**
Fireline Intensity	**380 BTUs per square foot**
Flame Length	**6.9 feet**

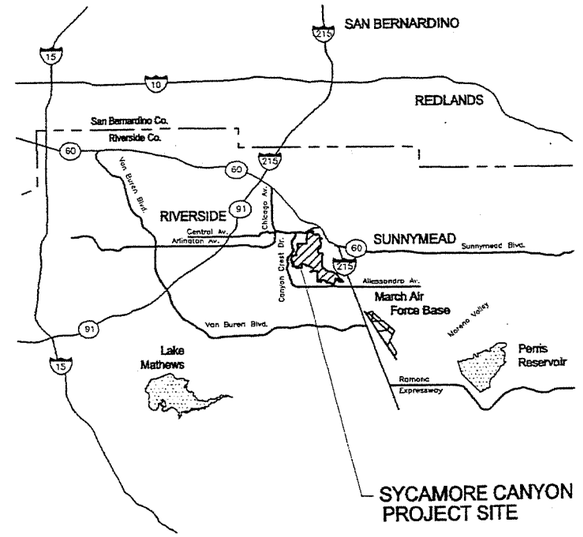
Figure 3-18 illustrates what a simulated Sycamore Canyon Wilderness Park wildfire would look like at 6, 12 and 18 minutes elapsed time from an ignition starting under normal-summer fire weather conditions.



LEGEND

- 6-Minute Elapse Time From Ignition Projected Fire Spread
- 12-Minute Elapse Time From Ignition Projected Fire Spread
- 18-Minute Elapse Time From Ignition Projected Fire Spread

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



KEY PLAN
N.T.S.

Normal Summer Fire Weather Conditions Map

Figure 3-17

North

0 750 1500 3000
SCALE IN FEET

CONTOUR INTERVAL: 5 FEET

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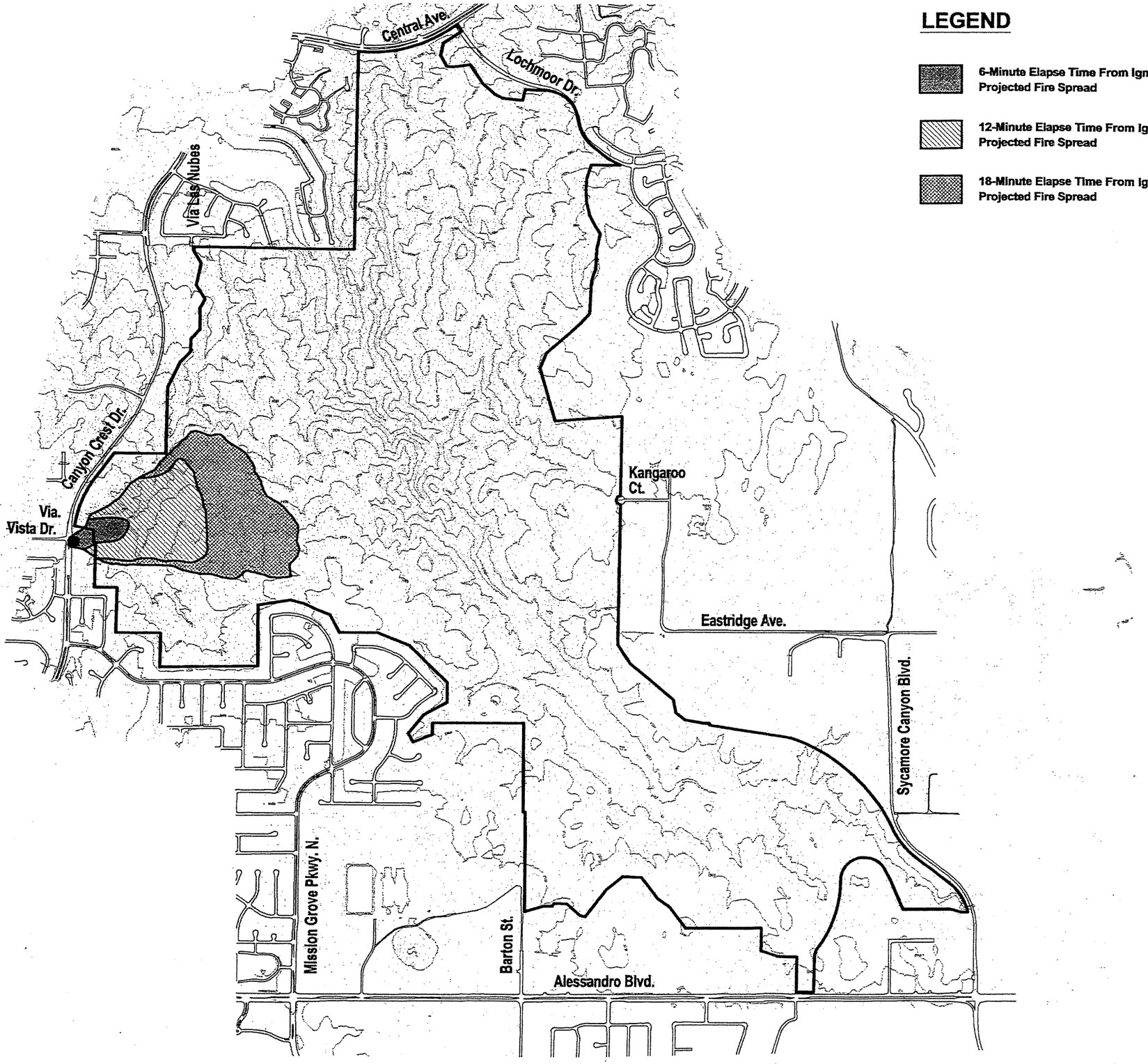
Above Average Fire Weather Conditions (August - September)

- Temperature.....95 degrees (F)
- Relative Humidity.....25 %
- 1-Hour Fine Fuel Moisture of.....4%
- 10-Hour Fuel Moisture of.....6 %
- 100-Hour Fuel Moisture of.....10 %
- Live Fuel Moisture of.....70 %
- Wind Direction and Speed..... Southwest at 15 mph
- Mid-flame wind speed (0.4).....6 mph
- Slope percent.....30 %
- Wind Vector.....360 degrees

There are two principal Fire Behavior Fuel Models; 1) Fuel Model 1 - Grass and 2) a combined fuel model of 60% Fuel Model 1 (Grass) and 40% Fuel Model 2 (sage scrub).

TABLE B Above Average Fire Weather Conditions Expected Fire Behavior Results of Calculations	
Fuel Model 1 - Grass	
Rate of Spread	**188 feet per minute**
Fireline Intensity	**301 BTUs per square foot**
Flame Length	**6.2 feet**
Combined Fuel Model 1-Grass (60%) and Fuel Model 2 (40%) Light Brush	
Rate of Spread	**143 feet per minute**
Fireline Intensity	**636 BTUs per square foot**
Flame Length	**8.8 feet**

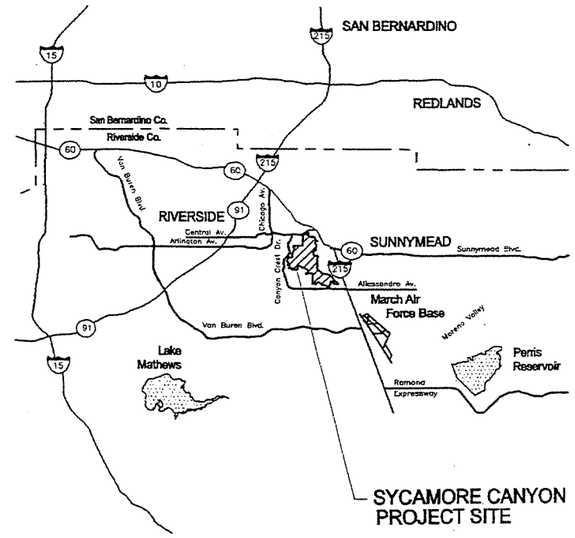
Figure 3-18 illustrates what a simulated Sycamore Canyon Wilderness Park wildfire would look like at 6, 12 and 18 minutes elapsed time from an ignition starting under above average fire weather conditions.



LEGEND

- 6-Minute Elapse Time From Ignition Projected Fire Spread
- 12-Minute Elapse Time From Ignition Projected Fire Spread
- 18-Minute Elapse Time From Ignition Projected Fire Spread

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



KEY PLAN
N.T.S.

Above Average Fire Weather Conditions Map

Figure 3-18

North

0 750 1500 3000

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

Dangermond & Associates
Recreation and Environmental Planning

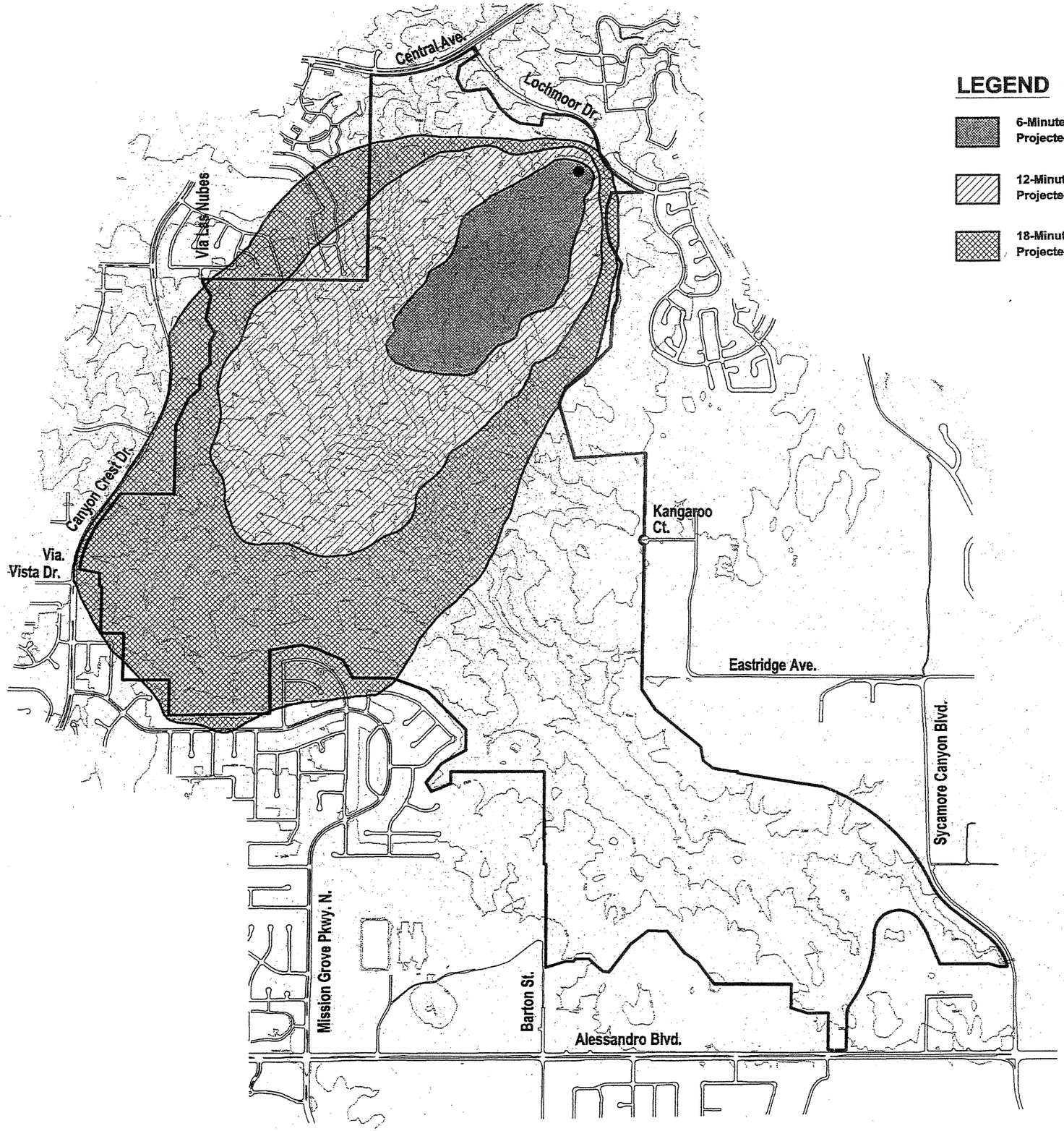
Extreme Fire Weather Conditions (October - November)

- Temperature.....100 degrees (F)
- Relative Humidity.....15 %
- 1-Hour Fine Fuel Moisture of.....2 %
- 10-Hour Fuel Moisture of.....4 %
- 100-Hour Fuel Moisture of.....8 %
- Live Fuel Moisture of.....50 %
- Wind Direction and Speed.....North-North east at 30 mph
- Mid-flame wind Speed (0.4).....12 mph
- Slope percent.....30 %
- Wind Vector.....360 degrees

There are three principal Fire Behavior Fuel Models; 1) Fuel Model 1 - Grass, 2) a combined fuel model of 60% Fuel Model 1 (Grass) and 40% Fuel Model 2 (sage scrub) and 3) Fuel Model 9 (Hardwood/Riparian).

TABLE C Extreme Fire Weather Conditions Expected Fire Behavior Results of Calculations	
Fuel Model 1 - Grass	
Rate of Spread	**733 feet per minute**
Fireline Intensity	**1415 BTUs per square foot**
Flame Length	**12.7 feet**
Combined Fuel Model 1-Grass (60%) and Fuel Model 2 (40%) Light Brush	
Rate of Spread	**564 feet per minute**
Fireline Intensity	**3168 BTUs per square foot**
Flame Length	**18.3 feet**

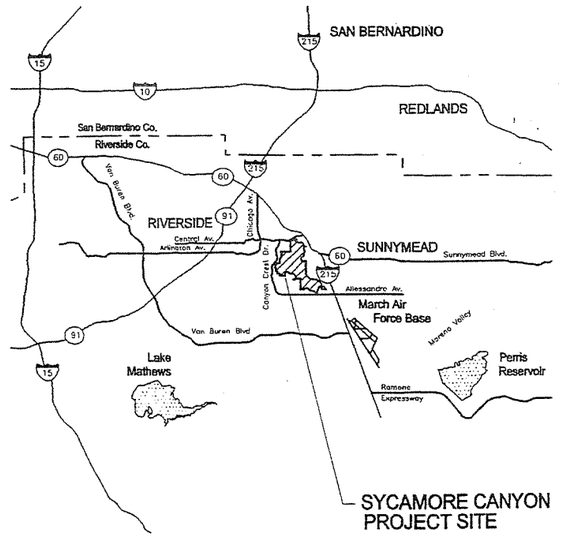
Figure 3-19 illustrates what a simulated Sycamore Canyon Wilderness Park wildfire would look like at 6, 12 and 18 minutes elapsed time from an ignition starting under extreme fire weather conditions.



LEGEND

- 6-Minute Elapse Time From Ignition Projected Fire Spread
- 12-Minute Elapse Time From Ignition Projected Fire Spread
- 18-Minute Elapse Time From Ignition Projected Fire Spread

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



KEY PLAN
N.T.S.

Extreme Fire Weather Conditions Map

Figure 3-19

North

0 750 1500 3000

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

Dangermond & Associates
Recreation and Environmental Planning

E. Fire Department Response Capabilities

The City of Riverside Fire Department's existing response capabilities were evaluated based upon the aforementioned expected wildland fire behavior. This included route access and response times, types of wildland and structural fire protection resources and equipment, and existing cooperative mutual aid agreements.

The emergency fire response capabilities were evaluated based upon the proposed (new) fire hazard and risk abatement measures, which are expected to be a reduction in wildland fire behavior and intensity, and then projected the fire department's ability to contain wildfires at a size compatible with the Park objectives.

The Riverside City Fire Department has 13 fire stations of which 8 are within 10 miles of the west side of the Park. The City and the California Department of Forestry and Fire Protection (CDF) / Riverside County share a fire station on Eucalyptus Street, 1 mile east of the Park. This CDF/Riverside County Engine would be automatically dispatched for any fire inside or adjacent to the Park. If additional engines are required, they would be dispatched by CDF/Riverside County from the main office in Perris. The City has Mutual Aid Agreements with other jurisdictions surrounding the City. These agreements would be activated when required to staff a serious fire inside or adjacent to the Park.

The City has two type 3 engines which are the most commonly used wildland fire engines. The rest of their engines are more commonly used for structure firefighting. The type 3 engines, with high ground clearance, are well suited to traversing low standard dirt roads while performing vegetation fire suppression operations.

Riverside City's 13 fire stations are staffed with the various fire apparatus required to provide fire protection and other services for a city of 300,000 people. In addition to the other apparatus discussed, the city has two type four engines that are set up for special purposes, but the fire fighting capability was preserved. City Station 1 has a type 4 that is set up for fire investigations. Station 3 has a type four engine that has been adapted for foam.

When a fire occurs in Sycamore Canyon Wilderness Park, the City should activate its Mutual Aid Agreement with the CDF/Riverside County Fire Department. If the City orders a wildland response from CDF/County Fire, the 1st engine in will be CDF Engine 1 from Perris Headquarters; the second engine will be Engine 18 from West Riverside. The third and fourth will be Engine 20 from Beaumont and Engine 25 from San Jacinto. If Riverside City requests closest available resources, they will get type 1 and/or type 2 engines from Moreno Valley. The city of Moreno Valley contracts with CDF to provide fire protection. The City may also choose to activate its Mutual Aid Agreement with the City of Corona. This request would generate additional engines of all types depending on which engines are available.

1. Current Fire Department Response Times and Capability

Station	North Miles	ETA Mins.	East Miles	ETA Mins.	South Miles	ETA Mins.	West Miles	ETA Mins.
1	5.9	11	8.9	15	8.2	15	7.6	13
2	13.71	20	13.69	22	9.74	19	9.61	19
3	7.87	13	9.42	20	6.41	12	4.61	8
4	3.29	6	5.96	11	8.5	15	3.5	7
6	4.87	8	7.6	13	9.8	17	6.3	11
9	4.17	7	5.75	10	2.7	6	1.34	5
11	7.48	12	5.53	11	2.2	5	2.97	6
13	3.73	6	1.63	5	4.19	7	7.33	12

2. Fire Department Response Times and Capability Projections Based upon Full Implementation of all Fuel Modification Recommendations.

Once the proposed fuel modification recommendations and key fire access roads are in place and continued maintenance is provided, the City of Riverside Fire Department and its mutual aid cooperators will have strategic and safe fire containment lines to anchor their fire suppression efforts within the Park boundaries. These pre-located features will significantly aid in reducing natural resource habitat damage, structure losses and overall fire suppression costs to the City of Riverside. The exact amount expressed in dollar expenditures for habitat restoration, structure loss, and suppression costs are determined based on the fire weather conditions and availability of area-wide fire fighting resources for that given day. During periods of high or extreme fire weather conditions, Riverside County and neighboring Counties may have multiple fires occurring at the same time that will commit the cooperative fire fighting resources. Therefore, pre-planned fuel treatment and well-maintained access roads are the only stable fire fighting tools that can be counted on during a wildfire.

F. Values At Risk

1. Public Safety (Life & Property)

Public safety is the highest priority for establishing the Sycamore Canyon Wilderness Park fire and fuel management recommendations. Safety of Park users, firefighters, and adjacent residential area citizens are the key issues addressed in forming the MUP recommendations. While the City of Riverside has the responsibility and liability for all wildfires starting within the Park and/or burning through the Park, the adjacent individual property owners are solely responsible to provide for an appropriate 'defensible space' so that potential wildfire losses to adjacent private property will be minimized.

The Mission Grove residential area currently has excellent 'defensible space' around each home and all structures have Class A fire resistant tile roofs. Fire research studies strongly support the fact that when adequate 'defensible space' is provided and structures have well maintained Class A roofing, over 97% of the structures can be protected, with a minimum of damage, from wildfires burning during extreme fire weather conditions. Maintained roofing means roofs free of pine needles, leaves and other highly flammable debris.

However, the same can not be said for the Canyon Crest residential and apartment areas. Some of the property owners have Class A roofing and have provided mowed fuel breaks around their structures and on adjacent Park lands. The lack of adequate roof maintenance still remains as a serious problem. Pine needle and various tree leaves have been allowed to accumulate and will make excellent fuel beds for any flying fire brands (spot fires) created by a wildfire. Many structures have shake/shingle roofing with debris accumulation, and thus are almost impossible to protect during a wildfire situation.

Regardless of what the City does to reduce the fuel loading in Sycamore Canyon Wilderness Park, the Fire Department will have an extremely tough role to protect these Canyon Crest Drive / Central Avenue structures during an above average or extreme fire weather condition wildfire. Therefore, adjacent property owners should be put on notice that individual structure protection by providing adequate 'defensible space', Class A roofing and continued maintenance is the sole responsibility of individual homeowners or homeowner associations.

2. Expected Cover Loss

The expected amount of vegetative cover loss will depend on the fire weather conditions occurring at the time of ignition. Section 3.3.6, Tables A through C depict the Forward Rate of Fire Spread for various expected fire weather situations and can be used to project the amount of cover loss. In other words, the forward rate of spread is usually 2.0 to 2.5 times the lateral (side) rate of spread. Therefore, if the forward rate of spread is 188 feet per minute (as shown in Table B) a cigar shaped polygon of 188 feet long by 94 feet wide would be the rough expected fire size for one minute. For six minutes; multiply both the forward and lateral rate of spreads by six.

3.3.7 Public Use Facilities

A. Interpretive Center/Day Use Facilities

The Interpretive Center and its surroundings should incorporate, as much as feasible, "Green Architecture" and self sustaining grounds comprised of native plant material. The structures can provide a learning center for energy conscious design in the context of the natural ecosystem of Sycamore Canyon Wilderness Park. The exterior public spaces should exhibit the use of recycled materials, the blending of those materials into the natural setting, and the use of native drought tolerant plant material for ornamental purposes.

B. Trails and Trailheads

Existing trails that are located in ecologically sensitive areas should be evaluated as to their necessity in the overall Park trail network. If visitor use of certain existing trails is creating extensive negative impacts on endangered or sensitive species habitat, the Reserve Manager must review the situation with outside expertise and temporarily or permanently close the trail. It may be necessary, depending on use patterns and impacts to relocate an existing trail. If this situation exists, qualified biologists must be retained to assure environmentally sensitive relocation.

3.4 Resource Management Goals

The following goals, established by the city, were utilized to guide the development of the management strategies and should be utilized for future strategy formulation.

1. Natural Resource Goals
   a. Manage the natural resources to maintain a balanced ecological reserve.
   b. Monitor vegetative ecosystems and manage to maintain present ratio of diversity.

2. Endangered Species Resource Goals
   a. Manage SKR habitat to promote an increase in individual densities.
   b. Manage Coastal California gnatcatcher habitat to promote an increase in individual densities.

3. Archeological Resource Goals
   a. Preserve sites by exclusion of public, minor interpretation for educational purposes only.
   b. Minimize possible identification of sensitive archeological sites by public.

4. Visual Resource Goals
   a. Minimize visual clutter in signage and structures.
   b. Maintain existing ridge-line views by excluding any built structures on ridges.

5. Recreational Resource Goals
   a. Educate the public as to the significance of the Park's ecosystem.
   b. Maintain existing trail system and improve to minimize adverse environmental impacts.

4.1 Natural Resources

This section provides a current overview of the general biological resources within the Park. It identifies the potential for sensitive biological resources, maps the existing plant communities and distribution of SKR, and discusses the natural processes at work at Sycamore Canyon Wilderness Park.

4.1.1 Methodology

The biological survey and mapping were conducted from 20-24 January 1997. The entire park was traversed by vehicle and on foot by three observers (M. J. O'Farrell, D. JM Bradney, and T. M. O'Farrell) providing intensive coverage of the site. Weather during the survey was cool, windy, and interspersed with occasional showers.

The initial field reconnaissance yielded the basic composition and variation both between and within vegetation groups present within the boundaries of the Park. Plant communities were classified at the series level according to Sawyer and Keeler-Wolf (1995) and a list of plant species was compiled. The potential of other sensitive biological resources was determined by a search of the California Natural Diversity Data Base, conducted 8 January 1997.

To address SKR, all potential habitat was examined for sign of the species. A thorough search was made for diagnostic surface sign of SKR (i.e., burrows, scat, runways, tracks, dust baths), following the methodology developed by O'Farrell and Uptain (1989). Limits of SKR -occupied habitat (Figure 3-1) were established by the presence of sign and plant community boundaries which were visually determined and accurately mapped on Riverside County Flood Control orthophoto quads with topographic features (1:200 scale). Maps were then prepared for entry into the City's GIS database.

A. Stephens' Kangaroo Rat Habitat and Population Monitoring

After the initial biological survey, the Park was divided into management units (MU) in collaboration with the fire management members of the team. The delineation of management units was based on a number of factors including fire behavior topography, the habitat mosaic, existing access roads, and the distribution of sensitive species. Thus formed, the management units can be individually assessed and treated for any biological component. The distribution of SKR within each management unit formed the basis for site selection for permanent monitoring plots within designated management areas.

A total of 6 monitoring plots were established (Figure 3.13). MU 7 did not receive a monitoring plot because of the small size and lack of other than peripheral occupation by SKR. Each plot had 4 permanent transect lines spaced 15 m apart, following the methodology established by O'Farrell (1992). Vegetation was assessed on these plots

following the methodology developed for the Shipley/Skinner Reserve (O'Farrell (1997b). Shrub cover was assessed using the line-intercept method (Mueller-Dombois and Ellenberg, 1974) along each transect line and shrub height was obtained at each encounter. Ground cover was assessed using the point-intercept method (Mueller-Dombois and Ellenberg, 1974). A 1-m point frame was placed at each meter interval along each transect line and 4 point "hits" were recorded at 20, 40, 60, and 80 cm along the point frame, perpendicular to the transect line. All plants intercepted were recorded by species; bare ground and rock (> 2 cm) were separately recorded. Only the first item encountered was recorded. This may have precluded measurement of a secondary understory of ground vegetation. Ground cover was calculated as a percentage of contribution of bare ground, rock, litter, grass, and forbs. Two grasses (*Schismus barbatus* and *Vulpia myuros*) were included with forbs due to similar patterns of rapid disintegration (O'Farrell, 1997b). Plant transects were performed on 15-16 April 1997.

On 25-26 August 1997, each of the plots was examined for SKR density as determined by active burrow counts (O'Farrell, 1992). The method used the same 4 parallel transect lines used for habitat characterization.

All active SKR burrows within a 3-m swath along the right side of each transect line were counted. Density (# SKR/ha) was calculated using the equation

$$D = (0.243)B$$

where, D is density and B is the active burrow count (the standard error of the regression coefficient = 0.027; $r^2 = 0.95$; $F = 82.9$; $df = 1,4$; $P < 0.001$).

B. California Gnatcatcher Survey

The CAGN nesting habitat assessment was conducted by ground-truthing information from the aerial photograph of the park and O'Farrell's vegetation map. Patch size, species composition, structure, and density were factors considered in assessing nesting habitat, as well as the presence of other birds known to occur in coastal sage scrub.

Recent records of CAGN in Sycamore Canyon were provided by local birdwatchers Patrick Temple and Rob Day. Mr. Temple provided a locality and dates for a pair observed in 1994 and 1995. (Figure 3-4). Mr. Day alerted the consulting biologists to the pair that was subsequently found during the surveys (Figure 3-4).

The California Department of Fish and Game's Natural Diversity Data Base was searched for records of CAGNs in the vicinity of Sycamore Canyon. Three records were found for the Moreno Valley area. The closest of these to Sycamore Canyon is about 2 miles east, at the southwest portion of the Box Springs Mountains. These records were the consulting biologists' observations in 1988 and 1989.

The surveys were conducted in 1997 on February 13 (McGaugh and Myers), March 21 (McGaugh), March 26 (McGaugh and Myers), April 15 (McGaugh), April 21 (McGaugh and Myers), and April 28 (McGaugh and Myers). Surveys were conducted between 6:45 - 11:00 a.m. A survey scheduled for March 20 was cancelled on-site because of excessive wind. The surveys consisted of slow walks through suitable habitat and the playing of recorded calls of CAGN in hopes of eliciting a response.

The cost of performing USFWS protocol was prohibitive under the limitations of the budget of the City of Riverside planning effort. The protocol calls for multiple surveys to be performed. Suitable habitat in the park was surveyed only once, and on some surveys attempts were made to cover more than the USFWS recommended 80 acres per day. The information gathered is adequate for this planning purpose because the goal of the CAGN survey was to first determine if any CAGN were present within Sycamore Canyon Wilderness Park and second to simply define the areas of potential habitat. The potential habitat was conservatively determined to be approximately 98% all of the CSS whether high quality or marginal quality. The planning efforts for visitor facilities assume all of the mapped potential habitat is sensitive and avoidance of these areas is the facility siting criteria.

CAGNs are known to use coastal sage scrub of many types, as well as ecotones with chaparral, riparian, and grassland habitats. For this reason, mapping suitable gnatcatcher habitat is difficult. Drawing a line between coastal sage scrub and grassland with scattered shrubs may not be appropriate. A study of the aerial photograph (and verified by the surveys) reveals that there are small patches of coastal sage scrub virtually everywhere within the park. Figure 3-4 defines the core areas of coastal sage scrub in Sycamore Canyon Wilderness Park, and the areas most likely to provide nesting territories for CAGNs.

Bird species typically associated with coastal sage scrub in western Riverside County were noted on all surveys, including Bell's Sage Sparrow (*Amphispiza belli belli*), Southern California Rufous-crowned Sparrow (*Aimophila ruficeps canescens*), California Towhee (*Pipilo crissalis*), California Quail (*Callipepla californica*), Bewick's Wren (*Thryomanes bewickii*), Greater Roadrunner (*Geococcyx californianus*), Costa's Hummingbird (*Calypte costae*), and California Thrasher (*Toxostoma redivivum*).

4.1.2 Results

A. Vegetation

Vegetation fell into three broad categories: grassland, shrubland, and riparian (Figure 4-1). The grassland community present within the Park is represented by the California annual grassland series. Plant species typical of this series are bromes (*Bromus* spp.), filaree (*Erodium* spp.), oats (*Avena* spp.), lupines (*Lupinus* spp.), horehound (*Marrubium vulgare*), and blue dicks (*Dichelostemma capitatum*). Scattered remnants of the historic shrubland vegetation occur throughout the grassland matrix. Grasslands occur within the Park on open flats and rounded hilltops, displacing sage scrub communities. Total grassland acreage is estimated as 313.7 ha (775.2 acres).

Shrubland communities are represented by mixed sage and California sagebrush-California buckwheat series. The two series integrate and form mosaics within the shrublands. The mixed sage series is characterized by the presence of a more or less equal mix of black sage (*Salvia mellifera*), white sage (*S. apiana*), brittlebush (*Encelia farinosa*), California buckwheat (*Eriogonum fasciculatum*), bush monkeyflower (*Mimulus aurantiacus*), and California sagebrush (*Artemisia californica*). The California sagebrush-California

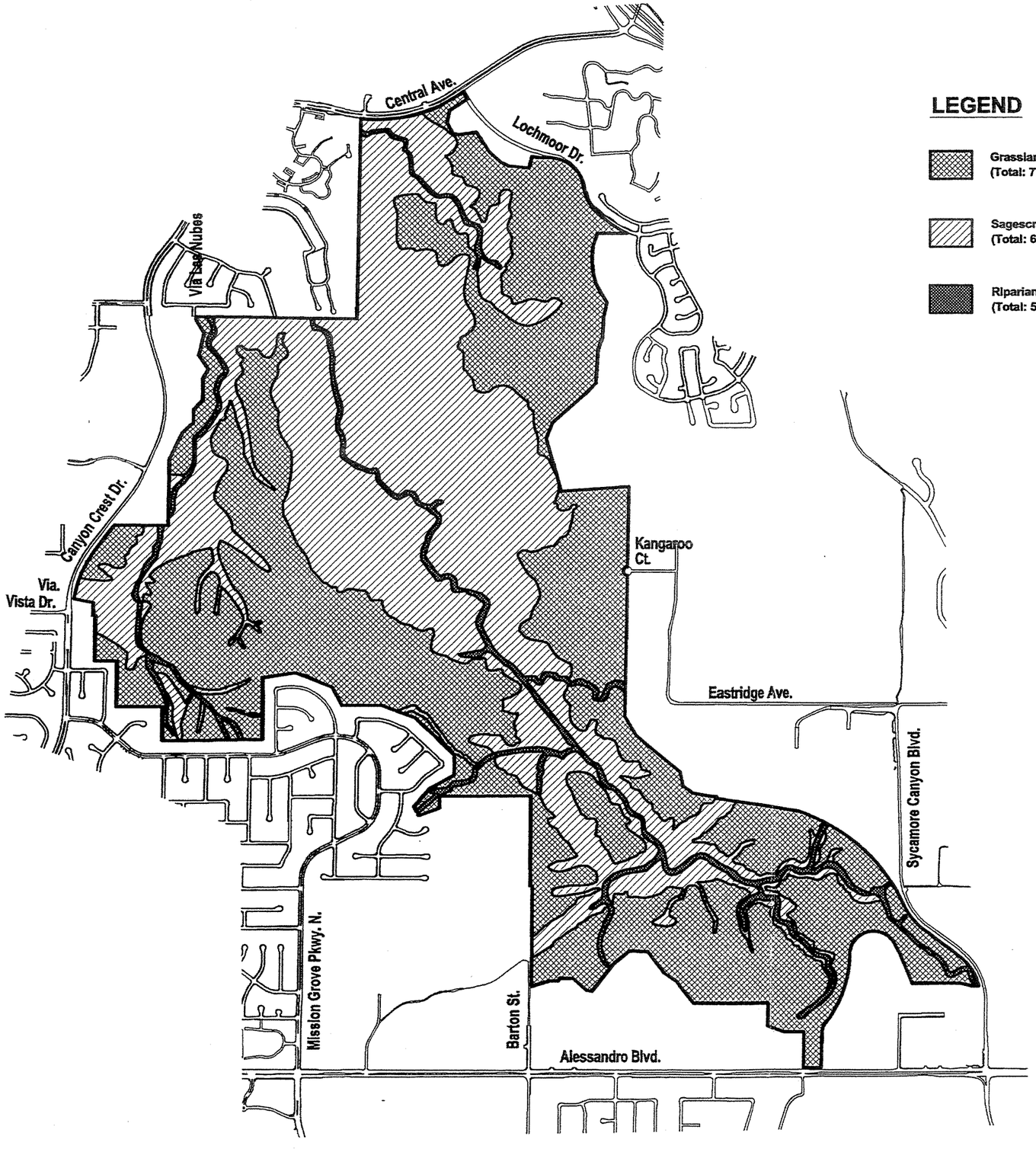
buckwheat series is characterized by the dominance of those two species, associated with white sage, black sage, bush monkeyflower, and chamise (*Adenostoma fasciculatum*). Shrublands occur throughout the park, on side slopes, in shallow drainages and on open flats where they are often replaced by California annual grasslands. Total shrubland acreage is estimated as 261.5 ha (646.1 acres).

Riparian communities are represented by the mixed willow and California sycamore series within the Sycamore Canyon drainage and associated tributaries. Mixed willow is the predominant vegetation within wet drainages and is characterized by a mixture of black willow (*Salix gooddingii*) and arroyo willow (*S. lasiolepis*) with mulefat (*Baccharis salicifolia*) and tarragon (*Artemisia dracunculus*) in the understory. Scattered throughout the mixed willow matrix are islands of California sycamore series vegetation. Dominated by California sycamore (*Platanus racemosa*), the understory is comprised of arroyo willow and other species typical of the mixed willow series. Total riparian acreage is estimated as 23.7 ha (58.8 acres).

B. Stephens' Kangaroo Rat Distribution

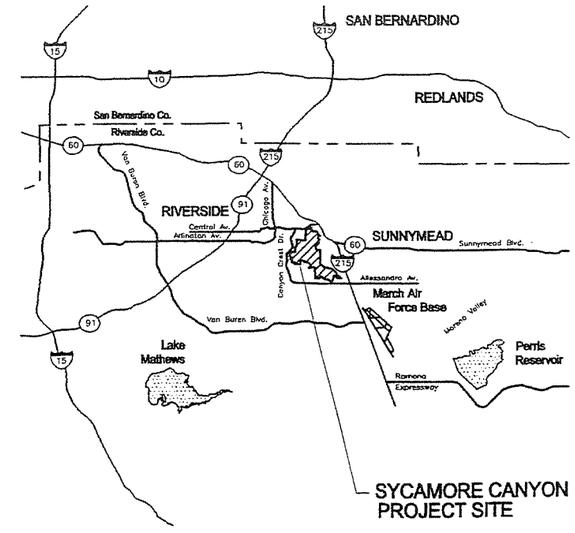
The SKR was found throughout the Park within the grassland series, in sparse shrubland, and along trails in more well-developed shrublands along ridge lines and hill tops (Figure 3-1). The limits of the mapped distribution accurately depict where SKR is currently found. The acreage occupied may be slightly larger than that mapped because of surface conditions (e.g., density of grasses, both accumulated dead biomass and newly germinated plants at the edge of the mapped distribution obscured potential marginally occupied acreage). The distribution was mapped on the basis of visual identification only through the extensive plant material. Total estimated acreage occupied by SKR at the time of the survey was 136.7 ha (337.7 acres). Actual occupied acreage is probably greater and is expected to expand with implementation of habitat enhancement activities. Distribution of SKR was primarily on ridge tops, gentle side slopes, and generally flat or rolling terrain. Where the surface vegetation was dominated by annual forbs as opposed to introduced annual grasses, SKR was found extensively on steeper hillsides in the northern portion of the Park.

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



LEGEND

- Grassland (Total: 775.2 acres)
- Sagescrub (Total: 646.1 acres)
- Riparian (Total: 58.8 acres)



KEY PLAN
N.T.S.

Plant Communities

Figure 4-1

North

0 750 1500 3000

SCALE IN FEET

Dangermond & Associates
Recreation and Environmental Planning

Table 4-1. Summary of ground cover (%), grass to forb ratio (G/F), aerial cover (%), and mean shrub height on the Sycamore Canyon monitoring plots. Two grasses (*Schismus barbatus* and *Vulpia myuros*) were included with forbs, since they are structurally similar to them. This table also shows the number of active burrows on transect lines and estimated density (# Dipodomys stephensi/ha) on established monitoring plots.

	MONITORING PLOTS					
	1	2	3	4	5	6
GROUND COVER						
Bare	2.48 %	4.73 %	2.71 %	2.94 %	3.49 %	8.09 %
Rock	0.32 %	0.0 %	0.0 %	0.0 %	0.60 %	2.02 %
Litter	0.09 %	1.19 %	1.47 %	0.14 %	0.69 %	1.29 %
Grass	78.72 %	43.70 %	44.81 %	43.52 %	26.42 %	21.00 %
Forb	18.38 %	50.41 %	51.29 %	53.45 %	68.84 %	67.60 %
G/F RATIO	4.28 G/F	0.87 G/F	0.87 G/F	0.81 G/F	0.38 G/F	0.31 G/F
AERIAL COVER	9.69 %	6.95 %	11.06 %	2.27 %	2.51 %	7.85 %
MEAN SHRUB HEIGHT	65.66 cm	43.46 cm	57.29 cm	44.42 cm	33.40 cm	52.87 cm
# ACTIVE BURROWS	14	37	97	48	62	54
ESTIMATED DENSITY	3.40/ha	8.99/ha	23.57/ha	11.66/ha	15.07/ha	13.12/ha

C. California Gnatcatcher Distribution

On March 21 McGaugh observed a male CAGN at the location shown on Figure 3-4. The bird was agitated by McGaugh's presence and exhibiting territorial behavior. It was assumed that a female and/or nest was close by. To avoid disturbing the birds at a critical time in the nesting process, McGaugh left the area. Habitat at the location of this sighting is characterized by California sagebrush, Black Sage, and Mexican Elderberry.

On April 28 Myers observed a pair of CAGN in the (presumed) western portion of their territory (see Figure 3-4), accompanied by at least three dependent fledglings. The family of birds was foraging in dense Black Sage and California Sagebrush, and both adults were seen feeding fledglings. This family is assumed to be the family of the male seen March 21.

No other CAGNs were observed during the surveys. While it seems unlikely that only one pair of CAGN occurs in the entire park, it is a possibility. The intensity of the surveys (USFWS protocol was not followed) does not allow for a positive statement of absence for any portion of the park where suitable habitat occurs.

Figure 3-4 shows the results of the nesting habitat assessment. It includes some areas of marginal suitability for nesting but that are contiguous with areas of optimal nesting habitat.

D. Other Biological Resources

A list of vertebrate species observed, or known to occur, was compiled (Refer to Section 9.2.2). It should be noted that these checklists are not exhaustive. The survey represents a point in time and does not provide a seasonal examination or involve the specialized survey techniques necessary to fully document the many species of nocturnal or otherwise cryptic animal species.

1. Sensitive Biological Resources

The California Natural Diversity Data Base search revealed the presence of potential of the following sensitive biological resources: Parry's spineflower (*Chorizanthe parryi* var. *parryi*); Thread-leaved brodiaea (Brodiaea filifolia); smooth tarplant (*Hemizonia pungens* ssp. *laevis*); Robinson's pepper-grass (*Lepidium virginicum* var. *robinsonii*); western spadefoot (*Scaphiopus hammondii*); orange-throated whiptail (*Cnemidophorus hyperythrus*) coastal western whiptail (*C. tigris multiscutatus*); San Diego horned lizard (*Phrynosoma coronatum blainvillei*); California gnatcatcher (*Polioptila californica*);tricolored blackbird (*Agelaius tricolor*); Stephens' kangaroo rat (*Dipodomys stephensi*).

The SKR has been dealt with in the present survey and is the focus of management guidelines. Surveys for the CAGN were conducted resulting in the sighting of a pair. The scope of the biological study prepared for this report precludes the ability to determine whether the other species are currently resident within the Park. Proposed future activities to restore and rehabilitate native habitats within the Park will only be beneficial for most of the sensitive species given above. The notable exception is Robinson's pepper-grass (List 1B; Skinner and Pavlik, 1994). Plants on List 1B meet the definitions of the Native Plant Protection Act and the California Endangered Species Act and are suitable for state listing. Thus, it is mandatory that any potential impact to these species be fully considered for any action within park that requires review through CEQA. The pepper-grass occurs in dry, "scald" areas which are not well represented in the Park but can be found on broad ridges and hill tops. Before determination of exact placement of trails and interpretive facilities, precise locations of extant populations of this plant species should be defined and appropriate avoidance instituted.

4.1.3 Monitoring Plots (See Figure 3-2)

A. Existing Habitat Conditions

Vegetation on the monitoring plots differed among the management areas (Table 4-1). Most striking was the large contribution of grasses, primarily wild oat (*Avena barbata*), on Plot 1. This trend is apparent on the lower slopes and swales between hills throughout a large portion of this management area. Another item of concern was the level of aerial cover approaching or exceeding 10% on plots 1 and 3. Continued increase of these parameters will result in decreasing suitability of the general habitat to support SKR. An interesting

aspect of Plot 6 was the combined open ground surface of 10% contribution of bare soil and rock. This may indicate shallow ChF2 Cieneba Sandy Loam (see figure 4-4) soil over a portion of that habitat that may not be suitable for occupation. The autumn population estimate will provide insight into this potentially limiting factor.

The general surroundings of all monitoring plots, except for Plot 5, appeared indicative of the general management unit. Plot 5 indicated habitat conditions that are optimal for SKR. Much of the surrounding habitat to the south, east, and west contained dense *Avena* totally obscuring the ability to locate surface sign. Soil and topography are suitable for the species and some sign was observed during the winter distribution survey. This qualitative assessment would indicate the potential of a declining trend in habitat quality, similar to that of Plot 1.

B. Existing SKR Population Status

Population estimates for SKR varied among the management units (Table 4-1). The lowest density was found on Plot 1, possibly reflecting the high proportion of grass to forbs. Population density levels for most of the units are between 10/ha (10/2.55ac) and 20/ha (20/2.55ac). Population levels are within the ranges estimated from earlier surveys, although a general declining trend is apparent. Plots in the northwest quarter of Section 9 yielded density estimates of 21.6 SKR/ha (55.08ac) north of Sycamore Canyon and 7.1 SKR/ha (18.1ac) south of Sycamore Canyon (O'Farrell, 1990a). The distribution and abundance mosaic established for the adjacent Mills Filtration Plant (O'Farrell, 1991), also provides a comparative baseline for evaluation of past conditions for the Park. The distribution was widespread through the available grassland and densities generally ranged between 12 and 19 SKR/ha (ac). Salvage trapping conducted from 14-21 October 1991 (O'Farrell, unpublished data) provides a partial inventory of other small mammals that occur within grassland habitat within the Park.

4.1.4 Discussion

A. SKR Issues

In order to manipulate habitat successfully for a single species, it is imperative to know which habitat features are limiting for the target species. Once key habitat features have been determined, specific treatments can be formulated. To be of value, treatments must be cost effective and practical or they will never be implemented as management tools. Several habitat treatments have been examined to determine individual and synergistic efficacy in enhancing and maintaining optimal habitat conditions for SKR (O'Farrell, 1997b).

A preliminary study of habitat selection revealed that, although SKR may be found in habitats containing up to 30% aerial shrub cover, more than 75% of occurrences were in habitat patches totally devoid of shrubs (O'Farrell and Clark, 1987). Abundance was also positively related to a lack of shrub cover. However, not all grassland components were suitable. A strong negative correlation was found between density of SKR and the proportion of annual grasses and forbs ($r = -0.76$, $P < 0.10 > 0.05$; O'Farrell and Uptain, 1987).

In disturbed non-native grassland, initial invasive weedy species are replaced by intermediate seral stages dominated by annual grasses or by annual forbs. Although both are annual, many of the grasses tend to persist for several years, resulting in the formation of dense mats of dried biomass. Annual herbaceous species disintegrate rapidly after they dry, resulting in substantial patches of bare ground. SKR avoids dense grasses and thrives in areas dominated by herbaceous material (O'Farrell, 1990b). Presumably this is due to the presence of a more desirable food resource and the ability to use the specialized bipedal, hopping mode of locomotion in the open areas.

When the ratio of grass to forbs (G/F) and concomitant distribution and abundance of SKR were examined in more detail (O'Farrell, 1990c), it became clear that some species of grass were related to higher densities of SKR. The grass genera *Schismus* and *Vulpia* are structurally similar to annual forbs, disintegrating rapidly after complete drying in the summer. Brome grasses, without mechanical disturbance, tend to persist for multiple years, forming dense mats. SKR harvests dried leaf-and-stem material as a form of hay and stores this food in blind side tunnels within the burrow system (O'Farrell and Uptain, 1987). Densities of this kangaroo rat were high in situations of high grass to forbs ratio when the major grass contribution was from *Schismus* and/or *Vulpia*. The G/F ratios on the Shipley/Skinner Reserve (O'Farrell, 1997b) were calculated both with and without these two species and was found to more accurately reflect kangaroo rat population changes when included as forbs.

B. California Gnatcatcher Issues

The biologists concluded that at least one pair of CAGN resides in Sycamore Canyon Wilderness Park, and that they nested successfully during the breeding season of 1997. Furthermore, approximately 900 acres of suitable coastal sage scrub habitat occurs in the park, and the possibility exists that other CAGN escaped our notice. The observations of Patrick Temple in 1994 and 1995 indicate a continuing presence of CAGN in the park. The CAGN surveys were reasonably thorough based on the time alloted, but, as stated earlier, the USFWS protocol was not followed; therefore, determinations of absence would not be valid.

4.1.5 Topography

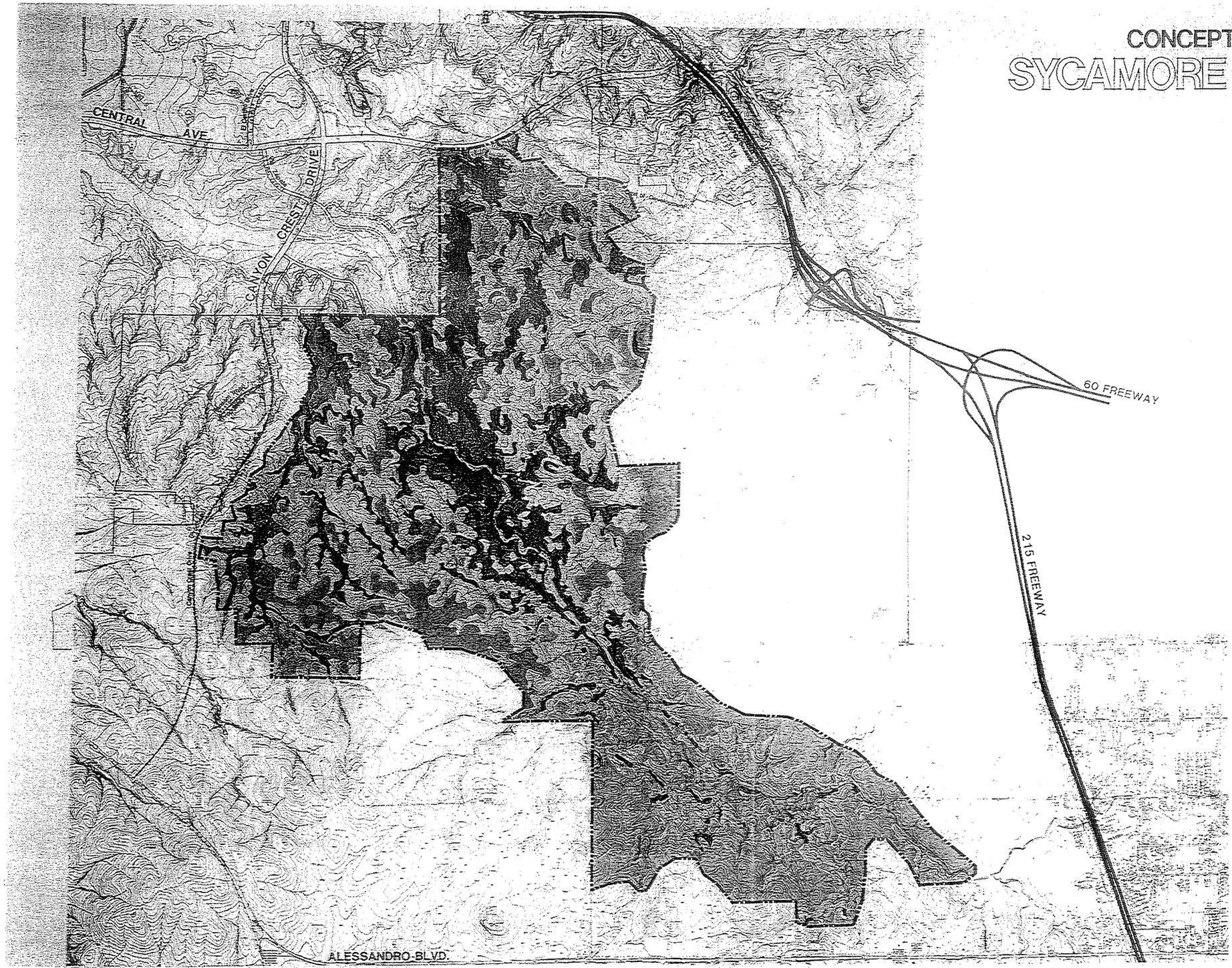
The topography of Sycamore Canyon Wilderness Park ranges from gently rolling hills to rugged hillsides and canyons exposing large boulder outcrops of underlying granitic bedrock. (Refer to the Slope Analysis Map, Figure 4-2) Three canyons define the topography of the park; the main canyon, called Sycamore Canyon, the west canyon and the north canyon. The main canyon cuts a diagonal course through the park starting in the southeast area of the park and running to the northwest. The northern section of the park is characterized by steep canyons while the southern section typically has more rolling hills.

CONCEPTUAL DEVELOPMENT PLAN

SYCAMORE CANYON PARK

CITY OF RIVERSIDE, CA.

Figure 4-2



LEGEND

- 0-15% SLOPE
- 16-30% SLOPE
- 31-45% SLOPE
- 46% AND ABOVE

SLOPE ANALYSIS

CARDOZA DILALLO HARRINGTON

Elevations range from 1,100 feet in the northwest section of the park rising to approximately 1,600 feet in the southern portion of the park. In some areas of the main canyon there is more than a 200 foot drop from the ridge down to the bottom. The two side canyons have less dramatic changes in elevation but still have drops of up to 100 feet. About 10% of the park has slopes steeper than 46%, 15% has slopes between the range of 31-45%, 50% of the park is in the range of 16-30%, and 25% of the park has slopes between 0 and 15%.

Sycamore Canyon Wilderness Park is largely in a natural state with the exceptions of numerous dirt roads, City of Riverside's utility lines, a high pressure Southern California Gas pipeline, and Metropolitan Water District pipeline that cross the property. The site has been used to graze sheep and for unofficial off-road vehicle functions

4.1.6 Geology / Soils *(Prepared by CDH)*

[Note: The scope of work for this Updated Conceptual Development Plan did not include consideration of Geology and Soils, this section is excerpted verbatim from the original CDP]

The geotechnical investigation portion of the Conceptual Development Plan for Sycamore Canyon Park included:

- review of pertinent published and unpublished maps and reports,
- examination of aerial photographs,
- geologic field reconnaissance and map preparation, and
- summarizing findings of major geotechnical opportunities and constraints.

Specific items evaluated included:

- geologic setting
- earth-materials
- soil characteristics
- faulting and lineaments
- seismicity
- mineral resources
- potential seismic and geologic hazards

A. Geologic Setting

Sycamore Canyon Park is situated near the northern end of a structural block of the earth's crust known as the Perris Block. It is composed of granitic rocks that are believed to have formed during Mesozoic time, some 90 to 100 million. years ago. These crystalline rocks are, in turn, part of a much larger plutonic complex that is exposed in the Peninsular Range geomorphic province. This plutonic mass is known as the Southern California Batholith.

The granitic rocks of the Perris Block form an elongated mass that is bounded by San Jacinto and Elsinore fault zones on the northeast and southeast sides, respectively. The Santa Ana River is an approximate northwest boundary of the Perris Block and the southeast boundary is ill-defined.

B. Earth Materials

Only broad brush regional mapping has been previously undertaken within the boundaries of Sycamore Canyon Park (e.g. Dudley, 1936; Rogers, 1965). The Generalized Geotechnical Map, (Figure 4-3) depicts the summary of earth materials which is based on these and other regional geologic studies and interpretation of aerial photographs. This was supplemented by reconnaissance geologic field mapping and knowledge of local geology gained from geotechnical studies of nearby properties.

Metasediments (ms): Two (2) small outcrops of older metasedimentary bedrock are exposed in the northern and southern parts of the site. This rock unit consists of foliated siliceous metamorphic quartzite and quartzite gneiss that is very hard and blocky. It was part of a much larger metamorphic sequence that overlaid the granitic rock that now dominate the region.

Perris Quartz Diorite (Kqd): The granitic bedrock underlying the site has been classified by Dudley (1935) as the Perris Quartz Diorite.- It is characterized as a gray color, fine to coarse texture, mafic zenolith inclusions and large spherical outcrops of boulders that have been highly resistant to weathering. Outcrops are generally massive and only slightly weathered. Based on studies of nearby properties, the bedrock is expected to become quite dense with depth. Foliation within the bedrock is not well developed.

Granodiorite (Kgd): In the central part of the site is a fairly extensive outcropping of granodiorite bedrock. Its light tan to nearly white color makes this unit distinct from darker colored Perris quartz diorite. The granodiorite is fine to medium grained, slightly foliated and contains few of the zenoliths that are characteristic of the Perris quartz diorite. Like the Perris quartz diorite, it weathers into large spherical outcrops. Contact between the granodiorite and Perris quartz diorite is concealed beneath surficial soils, but is most likely intrusive in nature.

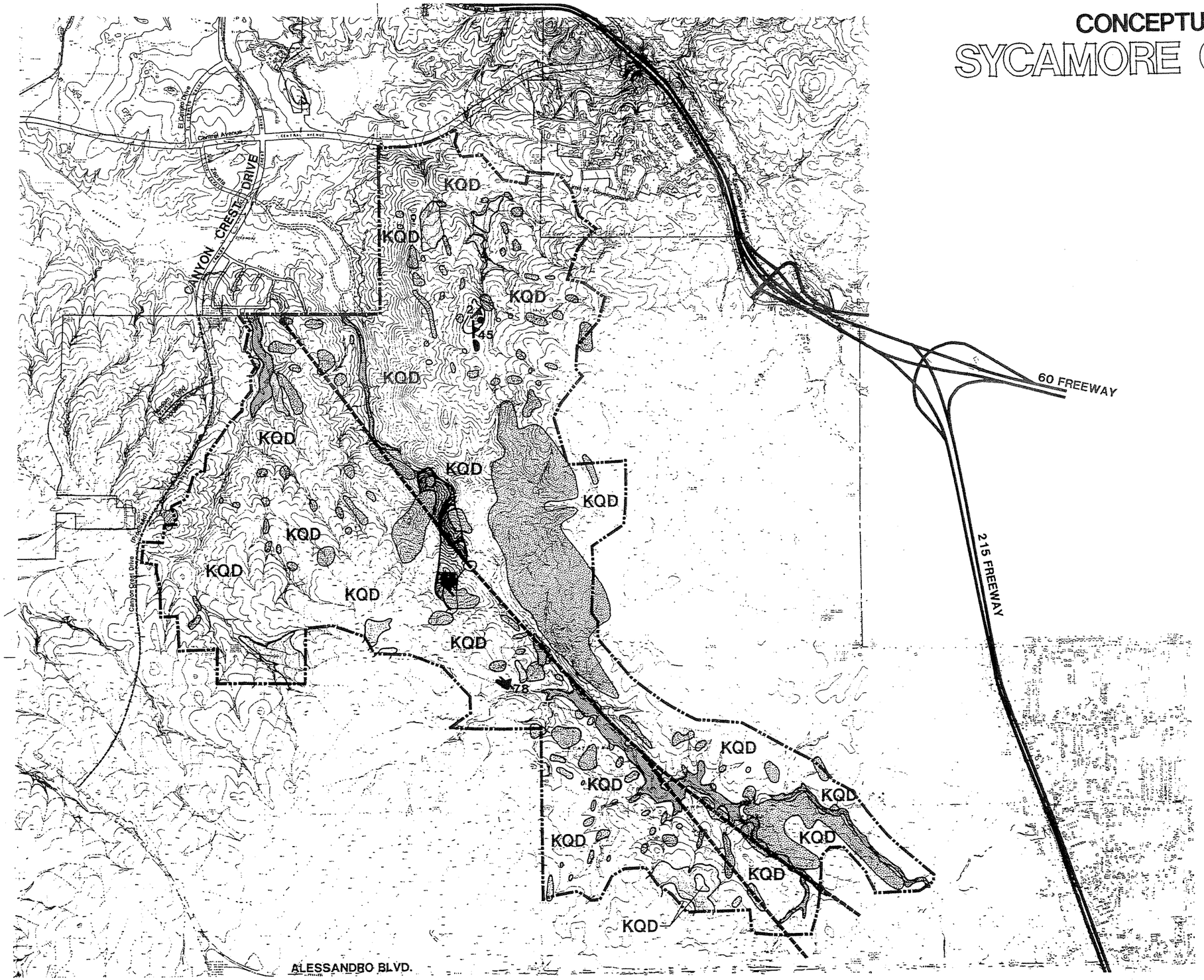
Older Alluvium (Qoal): Many old erosional surfaces within the Perris Block are blanketed with older alluvial deposits. Geotechnical studies of nearby properties indicate that these deposits generally consist of reddish brown silty sands that are moderately loose to moderately dense. Locations of older alluvial deposits shown on the Generalized Geotechnical Map are based on interpretation, of aerial photographs and field reconnaissance.

Younger Alluvium (Qal): Younger alluvial deposits occupy the bottoms of ravines and canyons that actively drain the property. These materials consist of sands and silty sands derived from topsoils, older alluvium and weathered bedrock materials. Alluvial deposits in larger canyons are shown on the Generalized Geotechnical Map. Alluvial deposits in smaller canyons are not shown due to the small scale of the base map utilized.

Surficial Soil Units: Based on field observation, surficial soil units overlying the bedrock generally consist of brown to reddish brown silty sands that are " slightly clayey. It is anticipated that these soils are a few feet or less in thickness along ridgelines and become progressively thicker to form colluvial deposits at the base of hills. Gray and Leiser (1982) indicate that this type of soil is moderately erodible.

CONCEPTUAL DEVELOPMENT PLAN
SYCAMORE CANYON PARK
CITY OF RIVERSIDE, CA.

Figure 4-3



LEGEND

EARTH UNITS

- CURRENT BOUNDRY
- ALLUVIUM
- OLDER ALLUVIUM
- GRANODIORITE
- METASEDIMENTS
- PERRIS QUARTZ DIORITE (KQD)

SYMBOLS

- ABUNDANT BEDROCK OUTCROPPINGS
- FOLIATION ATTITUDE (45)
- MAJOR LINEAMENTS
- ABANDONED QUARRY

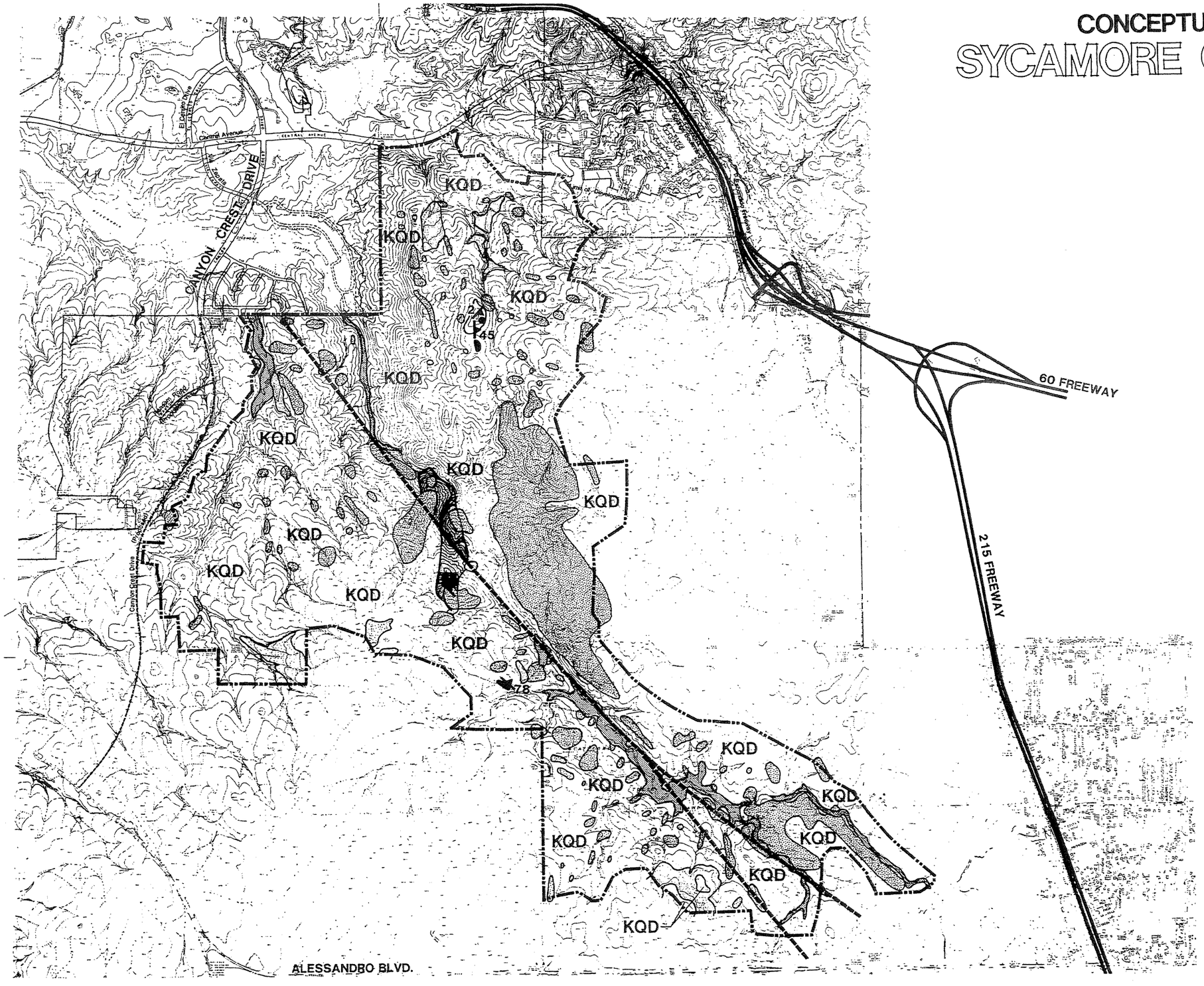
GENERALIZED GEOTECHNICAL MAP

0 400 800 1600

CARDOZA DILALLO HARRINGTON

CONCEPTUAL DEVELOPMENT PLAN
SYCAMORE CANYON PARK
CITY OF RIVERSIDE, CA.

Figure 4-3



LEGEND

EARTH UNITS

- CURRENT BOUNDRY
- ALLUVIUM
- OLDER ALLUVIUM
- GRANODIORITE
- METASEDIMENTS
- PERRIS QUARTZ DIORITE (KQD)

SYMBOLS

- ABUNDANT BEDROCK OUTCROPPINGS
- FOLIATION ATTITUDE (45)
- MAJOR LINEAMENTS
- ABANDONED QUARRY

GENERALIZED GEOTECHNICAL MAP

0 400 800 1600

CARDOZA DILALLO HARRINGTON

C. Soil Characteristics

The Soil Characteristic Map (Figure 4-4) and the following information was derived from the Western Riverside Area California Soil Survey (1971). The Southern California Coastal Plain is a physiographic section made up of "soils in intermediate valleys or in intermountain valleys at a low elevation. Most of the areas consist of dry alluvial fills." The soils of Sycamore Canyon Park are from the following Associations of Southern California Coastal Plain. Percentage by type of the existing soil runoff rate, and hazard of erosion are found in Table 4-2 below.
Insomuch as definitions determine a basis for common ground discussion, erosion, as used in this report, is the process of deteriorating or diminishing a particular landform's structure. Runoff is that portion of precipitation (rain or snow) falling on the land that ultimately reaches streams or rivers.

Cieneba-Rock Land-Fallbrook Association

Cieneba-Rock Land-Fallbrook Association soils are "well-drained shallow to moderately deep soils that have a surface layer of sandy loam and fine sandy loam; on granite rock." They make up roughly 95% of Sycamore Canyon Park. Soils of this association are common to areas used for pasture, dry-farmed grain, recreation, and wildlife habitation.

Cieneba soils occur on slopes ranging from 5-50% and are formed in coarse-grained igneous rock. Fallbrook soils are developed on granodiorite and tonalite and occur on slopes from 2-50%. Vista is a minor soil of this association and occurs on slopes ranging from 2-35% on weathered granite and granodiorite.

Hanford-Tujunga-Greenfield Association

Hanford-Tujunga-Greenfield Association soils are "very deep, welldrained to excessively drained, nearly level to moderately steep soils that have a surface layer of sand to sandy loam; on alluvial fans and flood plains." Soils of this association are common for dryfarmed grain, pasture, and homesites. Hanford soils are developed in alluvium made of granite materials on slopes less than 15%.

Monserate-Arlington-Exeter Association
Monserate-Arlington-Exeter Association soils are "well-drained, nearly level to moderately steep soils that have a surface layer of sandy loam to loam and are shallow to deep to a hardpan." Soils of this association are common to areas used for dryfarmed grain, pasture, and home sites.

Arlington soils are found on granitic rock, alluvial fans and terraces of slopes less than 15%. Monserate soils are developed from predominately granitic materials on slopes less than 25%. They are commonly found on terraces and old alluvial fans.

TABLE 4-2
RUNOFF and EROSION HAZARD POTENTIAL

	Runoff	Erosion	% on Site
Arlington Fire Sandy Loam (AnC,AnD)	medium	moderate	1.0
Arlington Loam (ArD)	medium	moderate	.5
Cieneba Sandy Loam (ChD2,ChF2)	medium	moderate	16.0
Cieneba Rocky Sandy Loam (CkF2)	rapid	high	52.0
Fallbrook Sandy Loam (FaD2,FbC2)	medium	moderate	2.0
Fallbrook Sandy Loam (FaE2,FbF2)	rapid	high	10.0
Fallbrook Rocky Sandy Loam (FcF2)	rapid	high	2.0
Fallbrook Fine Sandy Loam (FfC2)	slow	slight	.5
Fallbrook Fine Sandy Loam (FkD2)	medium	moderate	1.5
Hanford Coarse Sandy Loam (HcC)	slow-medium	slight-moderate	2.5
Monserate Sandy Loam (MmB)	slow	slight	.5
Monserate Sandy Loam (MmC2,MmD2)	medium	moderate	1.0
Vista Coarse Sandy Loam (VsD2,VsF2)	medium	moderate	10.5

D. Faulting and Lineaments

Faults have not been mapped through the site in regional studies by Dudley (1936) and Rogers (1965). Furthermore, Sycamore Canyon Park is not located within the boundaries of any Alquist-Priolo Special Fault Studies Zone (Hart, 1985)or within a County Fault Hazard Zone (Envicom and County of Riverside,1985)

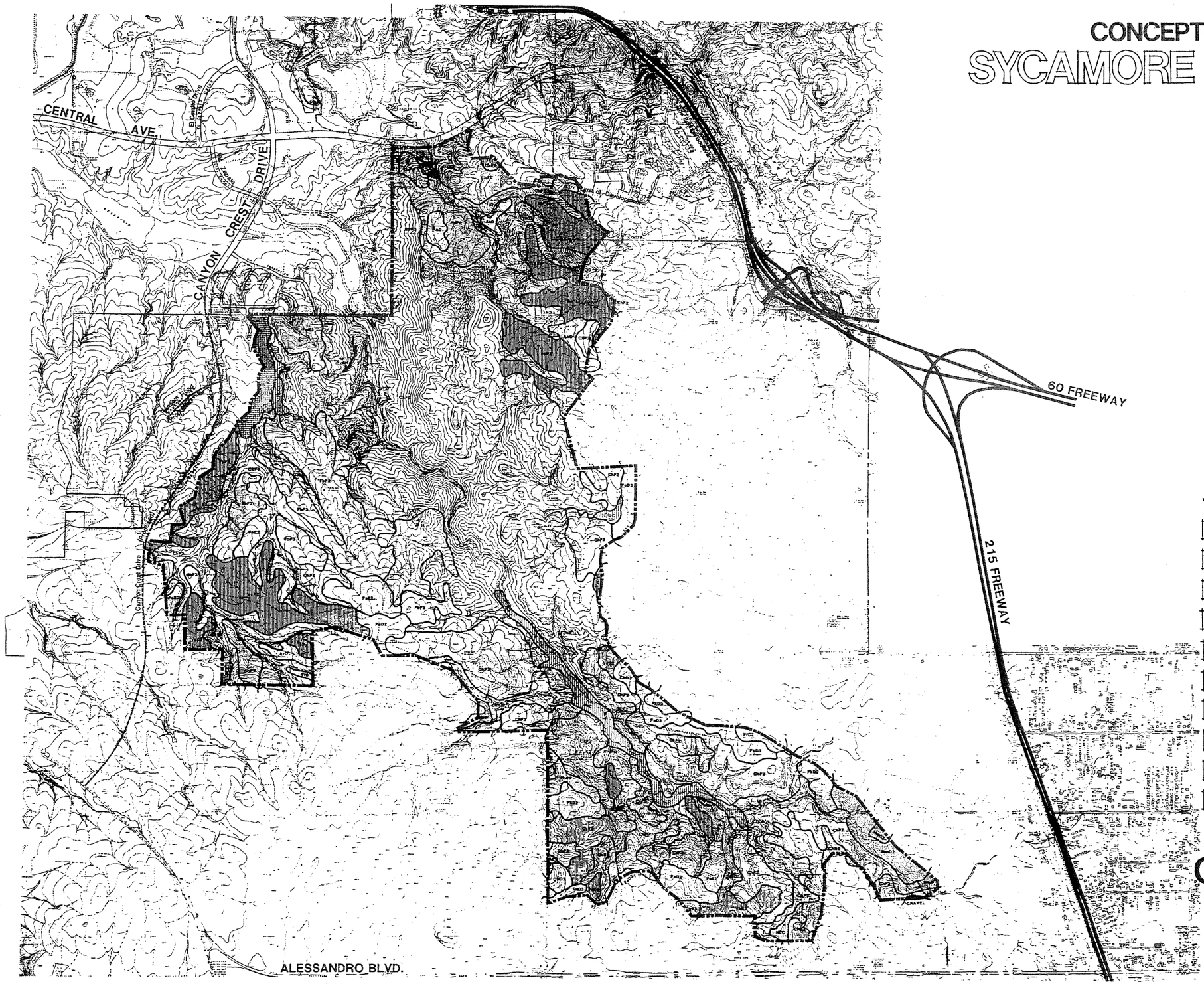
There is, however, a pronounced linear trend to topography within and outside of the site. These lineations consist of alignments of canyons, saddles, swales, and ridgelines that trend to the northwest. This trend is essentially parallel to that of the San Jacinto fault, which is the nearest active fault located 7.5+ miles to the northeast. Another fault located at the base of Box Springs Mountain, approximately 1.5 + miles to the northeast, is also essentially parallel to the San Jacinto fault and lineaments within the site.

That fault is commonly known as the Box Springs fault, and it is not known to be active. The parallel nature of these faults and lineaments suggest a faulting and/or fracturing pattern that has been produced by regional tectonics. The more distinctive of these linaments are shown on the Generalized Geotechnical Map (Figure 4.3). Based on the current state of knowledge of tectonics in Southern California, it is unlikely that if faults are present within the site that they are active. It should be pointed out, however, that there is no site specific data to support this opinion at this time.

Other prominent regional faults that could affect the site in terms of ground shaking are the San Andreas, Whittier-Elsinore, and Cucamonga faults. The distances of these faults from the site at their nearest points are presented in Section 9.2.3, located in the Appendices.

CONCEPTUAL DEVELOPMENT PLAN
SYCAMORE CANYON PARK
CITY OF RIVERSIDE, CA.

Figure 4-4



LEGEND

- CURRENT BOUNDARY
- AnC ARLINGTON FINE SANDY LOAM
- AnD ARLINGTON FINE SANDY LOAM
- ArD ARLINGTON LOAM
- CnD2 CIENEBA SANDY LOAM
- CnF2 CIENEBA SANDY LOAM
- CkF2 CIENEBA ROCKY SANDY LOAM
- FaD2 FALLBROOK SANDY LOAM
- FaE2 FALLBROOK SANDY LOAM
- FbC2 FALLBROOK SANDY LOAM
- FbF2 FALLBROOK SANDY LOAM
- FcF2 FALLBROOK ROCKY SANDY LOAM
- FfC2 FALLBROOK FINE SANDY LOAM
- FfD2 FALLBROOK FINE SANDY LOAM
- HcC HANFORD COARSE SANDY LOAM
- MmB MONSERATE SANDY LOAM
- MmC2 MONSERATE SANDY LOAM
- MmD2 MONSERATE SANDY LOAM
- Ter TERRACE ESCARPMENTS
- VsC2 VISTA COARSE SANDY LOAM
- VsF2 VISTA COARSE SANDY LOAM
- GRAVEL

SOIL CHARACTERISTICS

0 400 800 1600

CARDOZA DILALLO HARRINGTON

E. Seismicity

Sycamore Canyon Wilderness Park is located in an area of high regional seismicity, as is the case throughout Southern California. Section 9.2.3 presents anticipated seismic parameters for major active faults near the site. As can be seen from Section 9.2.3, a maximum peak ground acceleration of 0.47g could occur at the site should a magnitude M7.2 earthquake occur along the San Jacinto fault near the site. The repeatable ground acceleration for such an event is expected to be approximately 0.31g, with a predominant period of 0.34 seconds and a duration of strong shaking of twenty-seven (27) seconds. Ground shaking originating from earthquakes along other active faults in the region is expected to be less due to smaller anticipated earthquake magnitudes and/or greater distances to these other faults.

The above maximum ground acceleration is slightly less than the maximum ground acceleration presented in the City of Riverside Seismic Safety Element (Envicom, 1977). That report indicates that structures should be designed according to an importance of Use Category and a seismic zone in which they are to be located. Using the Essential Use Category B (public assembly with capacity of 300 of more and schools) and Seismic Zone IIIA (weathered bedrock), a maximum ground acceleration of 0.54g with a duration of strong shaking of fifteen (15) to twenty (20) seconds and a predominant period of 0.1 to 0.2 seconds is indicated.

F. Mineral Resources

According to Saul, et. al. (1968), no mines or mineral resources have been developed within the park site at the location shown on the Generalized Geotechnical Map (Figure 4-3). However, one (1) small quarry was found in the northern part of the site at the location shown on the Generalized Geotechnical Map. It was apparently used as a source of rock products or decorative stones and was developed in an exposure of metasedimetary bedrock.

Nearby areas to the south and east have been developed as sources of decomposed granite (Saul et al., 1968). However, these operations have been small and sporadic. Elsewhere in Riverside County, areas containing large boulder outcrops similar to this site have been mined for dimension stone and crushed rock.

G. Potential Geologic Hazards and Problems

Potential geologic hazards and problems are primarily of concern in areas to be developed with structures, roads, and possibly trails. Hazards and problems are less of a concern where human interaction is expected to be minimal. Items of concern are summarized in Section 9.2.5, located in the Appendices, and discussed further below.

1. Seismicity

Ground shaking originating from earthquakes along active faults in the region is the primary seismic hazard affecting the site. Potential levels of ground shaking are presented in Section 9.2.3. Such ground shakings could dislodge some of the many boulders that are exposed within the site. Some more minor soil failure could also occur.
Of less concern is the potential for ground rupture along faults. Since there are no active or potentially active faults known to be present within the site, the potential for this type of hazard is considered to be low. However, lineaments observed within the site could be faults and the potential for rupture along these features would require further evaluation.

2. Mineral Resources

Development of the property as a park site will result in a loss of access to potential sources of decomposed granite, rock products, dimension stone, and decorative stone. These materials, however, are quite common throughout the inland region of Southern California; therefore, it is expected that other sources should be available.

3. Percolation

The feasibility of onsite disposal of sewage effluence is questionable due to the presence of shallow granitic bedrock. An appreciable increase in ground water levels from properly functioning leach fields or seepage pits is not expected due to the minimal amount of development proposed.

4. Slope Stability

Natural hillsides within the site generally have a low potential for instability due to the crystalline nature of the underlying granitic bedrock. Exceptions are the potential for boulders being dislodged by earthquake activity or potential surficial failures. These potential instabilities should be considered in location and construction of structures, trails, and roads. Slope instability is not expected to be a major constraint due to the minimal extent of development proposed.

5. Excavation Characteristics

Where earthwork is necessary to establish roads, building pads, and trails, excavation characteristics of earth materials should be considered. Conventional heavy duty grading equipment should be capable of excavating surficial soils, alluvium, and decomposed granite with the exception of hard rock floaters. Fresh granitic bedrock could require blasting. Seismic refraction techniques will be necessary to further evaluate excavation characteristics of granitic bedrock.

6. Land Subsidence

Ground water, oil, gas, and geothermal fluids are not being extracted from the granitic bedrock that underlies the site. Land subsidence as a result of extraction of these fluids, therefore, is not considered a problem. Settlements as a result of oxidation of peat deposits has not been reported in the area of the park site, and this is not expected to be a problem with this site. Some soils near the park site have been found prone to hydroconsolidation. This would be of concern only where development is proposed and it is expected that it could be mitigated by grading techniques.

7. Volcanic Hazards

Volcanic hazards are not expected to affect the site due to the absence of nearby active volcanoes.

4.1.7 Hydrology *(Prepared by CDH)*

[Note: The scope of work for this Updated Conceptual Development Plan did not include consideration of Hydrological Resources, this section is excerpted verbatim from the original CDP]

The drainage basin boundaries for the three (3) distinctive canyons are located on the Hydrology Analysis (Figure 4-5). The westerly canyon's basin covers approximately 400 acres and extends beyond the Park's boundary into the new residential areas to the south. The northeast canyon's basin covers approximately 200 acres and is also somewhat contained within the Park's borders. The main canyon's basin, however, covers about 6400 acres extending southeast to Arnold Heights, west through Moreno Valley, and north to Pigeon Pass Valley.

Due to the extent and impact of these potential watersheds, the study completed for this Conceptual Development Plan was a cursory look at the existing conditions and the potential changes. The study included:

- identifying the limits of the natural drainage courses; estimating the existing runoff;
- estimating the increased runoff from known residential storm drains into the westerly canyon;
- analyzing alternatives for controlling runoff, erosion, and debris build-up; and
- coordinating with the City of Riverside's Public Works Department and County of Riverside Flood Control and Water Conservation District.

A. Surface Water and Ground Water

For the purpose of discussing hydrology conditions within Sycamore Canyon Park, a few definitions are inserted here for clarification. Runoff is that portion of precipitation (rain or snow) falling on the land that ultimately reaches streams or rivers. Base flow is water from ground springs or other natural or man-made sources, like storm drain discharge or irrigation water, which is not in the form of precipitation.

There is running surface water within the main canyon of Sycamore Canyon Park. The patterns of drainage channels are indicated on the Hydrology Analysis. The map depicts the three (3) major courses as defined by the "blue line" on the 1980 USGS map and significant secondary or lateral courses. This water appears to originate as inflow from groundwater within the park's watershed. The surface water could be the result of intermittent springs produced by seepage along intersecting bedrock joints and fractures. Faults, if present, could also produce springs by creating barriers to ground water flow. Springs, if present, most likely would be located in areas supporting heavy brush. Another source of water previously was the sewage treatment plant located just east of the park. (The Edgemont Community Services District's plant is no longer in operation.)

The growth of trees and heavy brush in some canyons and the presence of surface water suggest that ground water may be locally perched within alluvium above the bedrock. According to the Riverside County Flood Control District (1987), there are no water wells located within the park.

B. Flooding

The Sycamore Canyon Wilderness Park site is not located within the boundaries of a 100-year flood hazard zone (Envicom and City of Riverside, 1977). Upstream areas within the Park's watershed, however, have been included within a flood hazard zone; thus it appears that the lack of a designated flood hazard zone may, in part, reflect a lack of development within the property.

Based on the size of the Park's natural watersheds, substantial runoff and periodic flooding of large canyons within the site should be expected. Arrows shown on the Hydrology Analysis indicate major entry points for probable future storm drain inlets into the park.

The Sycamore Canyon flood control dams located northwest of the Park at the Canyon Crest Golf Course and at the Victoria Country Club further attest to the substantial flows that currently pass through the site. The specific effects of adjacent developments on these flows are not yet known, but a significant overall increase is to be expected.

C. Sedimentation and Erosion

According to Braden (1984), there has been increased erosion in Sycamore Canyon in the last thirty-five (35) to forty (40) years as a result of grazing sheep, use of off-road vehicles, dry farming, and nearby urbanization. As land uses in Riverside continue to change from rural to urban, and as use of the park becomes restricted, erosion by sheep, off road vehicles, and farming should be less of a factor. Increased flows, however, will result from development of adjoining properties. Construction sites are also a potential temporary source for increased sediment. Braden (1984) predicts 50% and 90% increases in runoff from properties developed for residential and industrial /commercial uses, respectively. Braden (1984) recommends mitigation of the increased runoff by construction of check dams and flood control basins. Other mitigation measures proposed by Braden (1984) are excluding sheep from the park site and not increasing flows into the park. While the exclusion of sheep may be possible, restricting flows seems unlikely due to ongoing urbanization in the region, will take a well coordinated effort between the City and proposed developments.

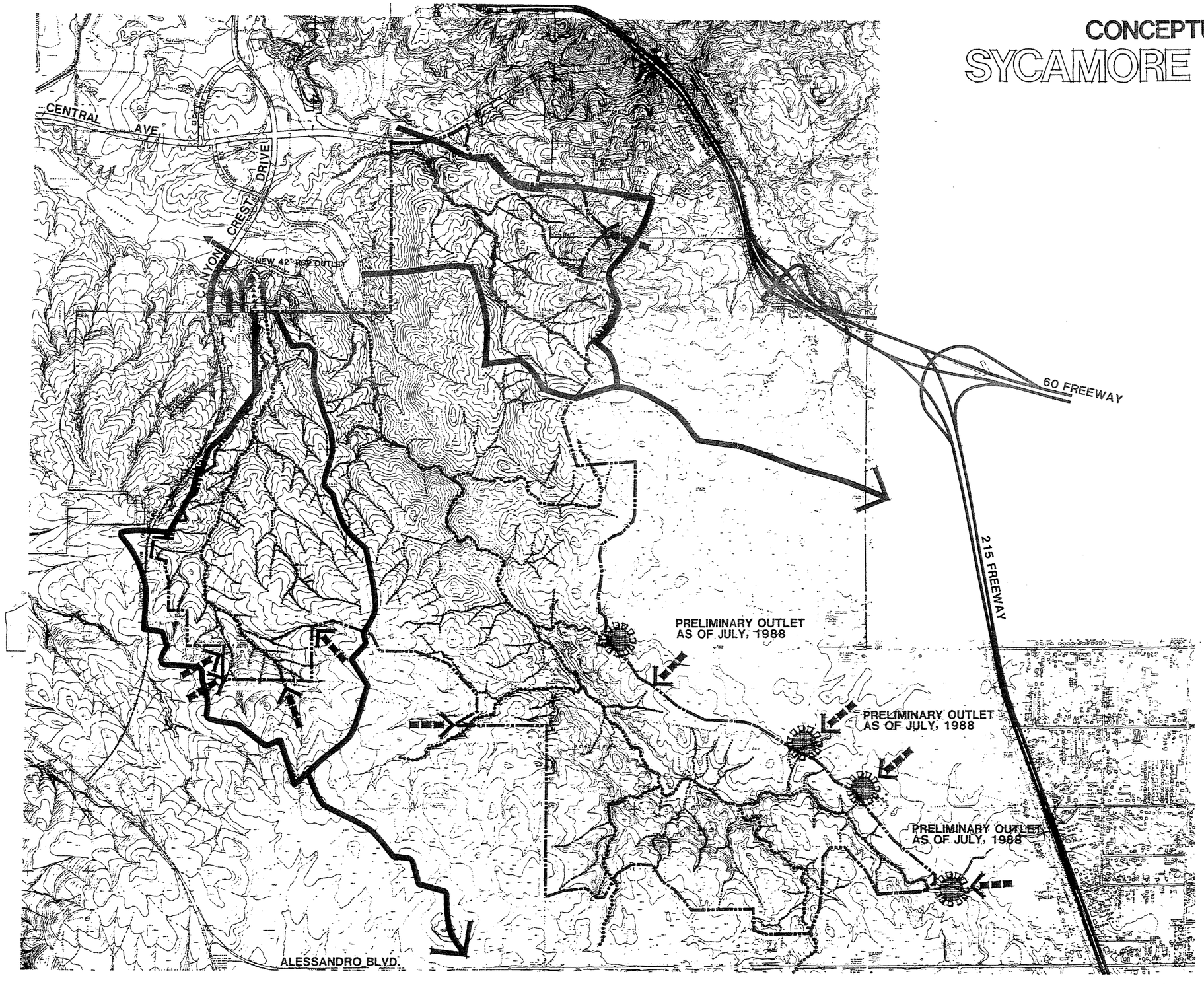
D. Canyon Flows

1. Westerly Canyon Flows

The westerly canyon of Sycamore Canyon Park has an existing tributary drainage area of approximately 400 acres. Land in the canyon is in its natural, undeveloped state. The canyon has an average gradient of 5% in the lower reaches and 8% in the upper reaches. Gradients ranging from 12% to 20% exist for short distances in the upper reaches of the canyon. Soil in the canyon, as determined by the soil survey, is of a relatively erodible nature.

CONCEPTUAL DEVELOPMENT PLAN
SYCAMORE CANYON PARK
CITY OF RIVERSIDE, CA.

Figure 4-5



LEGEND

- CURRENT BOUNDARY
- MAJOR COURSE USGS BLUELINE
- SECONDARY COURSE
- PROBABLE FUTURE STORM DRAIN INLETS
- EXISTING RCP OUTLET PIPES
- DRAINAGE BASIN BOUNDARIES (See Figure 8A)
- SILTATION PONDS (LOCATED AS SHOWN ON 1984 SYCAMORE CANYON SPECIFIC PLAN)
- NEW RCP OUTLET PIPES

HYDROLOGY ANALYSIS

0 400 800 1600

CARDOZA DILALLO HARRINGTON

The upper reaches (southerly portion) of the canyon extend into proposed residential developments. The westerly canyon will experience significant effects due to additional storm runoff generated by these proposed residential developments. Hydrologic calculations indicate an increase in flows of 100% in the upper reaches of the westerly canyon (Q10-70 cfs undeveloped flows vs. 140 cfs developed flow.) Overall, the increase in flows in the entire westerly canyon at its lowest reach is 20% (Q10 - 300 cfs undeveloped flow vs. 370 cfs developed flows).

Due to the increase in the developed flows, the potential for erosion in the westerly canyon can be expected to increase. An existing, sixty inch (60") reinforced concrete pipe (RCP) storm system drains the westerly canyon through the existing developments downstream of the westerly canyon. Although the existing sixty inch (60"') RCP has the capacity to convey the developed flow, the specific effects of the increased flows are not yet known. As of August 1988, an additional forty-two inch (42"') RCP storm drain has been approved for construction near the aforementioned sixty inch (60"') RCP. Other future improvements may be necessary to adequately protect the existing downstream developments and storm facilities from the increased runoff and sediment load.

2. Northeast Canyon Flows

The northeast canyon of Sycamore Canyon Park has a tributary drainage area approximately 200 acres in size. Land in the canyon is in its natural, undeveloped state. The canyon has an average gradient of 10% in the upper reaches and 7% in the lower reaches. This is steeper than the gradients experienced in either the westerly or main canyons. The existing, undeveloped ten (10) year flows in the canyon are approximately 200 cfs.

The easterly edge of the canyon borders Box Springs and may be subject to additional runoff from existing or future developments. The quantity of runoff from these developments has not been determined. The effects from any increased runoff from the developments would be similar to that experienced in the westerly canyon. However, the impact on erosion may be more pronounced for the following reasons:

- the steeper gradient of the canyon results in higher flow velocities and an increase in the carrying capacity of the water and
- the lower existing flows results in the net change (percentage) being larger for a given increase in runoff.

Therefore, any diversion of flows or increase in runoff due to development should be addressed as in the westerly canyon. The change in flow should be determined on a percentage basis.

3. Main Canyon Flows

Research of existing Riverside County Flood Control District records indicate the following storm water flows at the lower end of the main canyon of Sycamore Canyon Park as of 1956. Due to the development and changes of the watershed since then, these flows are probably very low. Riverside County Flood Control District concurs that calculations are variable for anything more recent then 1956.

SYCAMORE CANYON CREEK STORM FLOWS*

Frequency	Flow Rates
10 Year	610 cfs
25 Year	1300 cfs
50 Year	2140 cfs
100 Year	3360 cfs

cfs - cubic feet per second

The accuracy of these flow rates are uncertain due to the type of calculation methods utilized and lack of supportive back-up data. Outflows into the canyon determine the impact into the canyon and were not feasible to specifically determine. Therefore, for this report, the above flow rates are adequate.

At the time of preparation of this document, the City's Public Works Department was in the process of preparing a master plan of drainage and calculating the impact of additional flows to be generated from Moreno Valley and outletting into the southeast end of the main canyon. The City's master plan will more accurately determine the effects of the additional storm water flows into the canyon from the surrounding developments. It will provide the mitigation requirements necessary for the increased flows into the canyon.

4.2 Archeological Resources *(Prepared by CDH)*

[Note: The scope of work for this Updated Conceptual Development Plan did not include consideration of Archeological Resources, this section is excerpted verbatim from the original CDP]

4.2.1 Surveys *(Prepared by CDH)*

A search of the archaeological records (UCR-ARU) reveals that there are several hundred recorded sites within Sycamore Canyon Park. Scrutiny of the maps provided in the survey reports indicate that Sycamore Canyon Park, as well as a number of extensions, has been completely covered by archaeological survey. Previous studies include:

Gardner, M.C., 1973.
Golden Crest Residential Development: expected impact on archaeological resources. Ms. on file at the Archaeological Research Unit, University of California, Riverside.

Lerch, Michael K., 1982.
Cultural resources assessment of the Kaplan Pit, Upper Sycamore Canyon Area, City of Riverside, California. Ms. on file at the San Bernardino County Museum, Redlands.

McManis, C.W., 1978.
Addendum to: Golden Crest Residential Development: expected impact on archaeological resources. Ms. on file at the Archaeological Research Unit (UCRARU #69), University of California, Riverside.

Smith, Gerald A. and Michael K. Lerch, 1983.
Cultural Resources assessment of the northern, western and southern extensions of the Sycamore Canyon specific plan, City of Riverside, California. Ms. on file at the San Bernardino County Museum. Redlands.

Swenson, James D., 1982

An archaeological assessment of the Sycamore Canyon specific plan study area, Riverside County, California (UCRARU #703). Ms. on file at the Archaeological Research Unit, University of California, Riverside.

Swenson, James D., 1982

An archaeological assessment of the Box Springs Industrial Park specific plan study area, Riverside County, California (UCRARU #703). Ms. on file at the Archaeological Research Unit, University of California, Riverside.

"Coverage" refers to areas within which survey techniques were applied. Covered areas may still be surveyed by different techniques and at vastly different intensities. In the above surveys, some differences in techniques and intensity do exist, but, overall, the surveys were adequate to discover most of the sites. After a review of the literature, project team members, with the assistance of University of California Archaeological Research Unit personnel, reviewed the original field records and conducted a field check.

4.2.2 Nature of the Resources *(Prepared by CDH)*

The vast majority of archaeological sites in Sycamore Canyon Park (See Figure 4-6) consist of one or more granite boulders, each containing one or more "slicks". A "slick" is a smooth, reflective area, ca. 100 cm^2 to 3000 CM^2, on the boulder created by activities of prehistoric Indians such as those formed by seed grinding using a handstone or "mano". However, activities such as leather preparation are also possible (Adam, N.D., Use Wear Analysis of Handstone, Journal of Field Archaeology in Press). Microscopic analyses of slick surfaces and experimental replication of possible uses will be needed to shed additional light on the functions of slicks. Slicks cannot presently be dated, but they are more than several hundred years old and may be as old as several thousand years (Gardner, Lerch, McManis).

Two (2) sites (CA-RIV-2493 and 2494) consist of six (6) bedrock 1 "mortars" which are circular depressions in the granite outcrop, created by pecking and grinding. Most likely they were used for pounding larger nutmeats or seeds with a wooden or stone pestle; perhaps juniper berries, acorns or hollyleaf cherries were processed. Like slicks, bedrock mortars cannot be dated at present.

One (1) other site (CA-RIV-998) consists of a boulder with more than eighty (80) small depressions or cups that have been pecked into a vertical surface, known as a "cupule boulder". The function of the depressions and cupule boulder are unknown. Some investigators believe that they served a ceremonial function (McManis). A wide ranging search of Indian uses of stone along with experimental replication would be needed to increase knowledge about these enigmatic features. The cupule boulder site cannot be dated, but it is probably more than 1,000 years old (Adams, N.D.).

One (1) other site (CA-RIV-2425) exists as a large surface scatter of artifacts. The artifacts observed include ground stone fragments, manos, hammerstones, flaked stone tools, and historic debris. The prehistoric occupation probably was a seasonally occupied camp site, perhaps used by seed collectors during spring and summer months. The historic occupation may have been a turn-of-the-century homestead. However, on the basis of presently available information, the source of the several planted trees of obvious cultural origin is unknown.

At three (3) sites (CA-RIV-2428, CA-RIV-2458, CA-RIV-2459) complete manos were found. At one (1) site (CA-RIV-2454) a number of manos and metates, whole and fragmentary, were

found. However, this site, which provides no indication of containing intact buried materials, has been badly disturbed by historic agriculture. At yet another site (CA-RIV1196) two (2) flakes and a core were found but with no evidence of subsurface material.

4.2.3 Other Archeological Resources *(Prepared by CDH)*

Although not of current archaeological interest, other traces of human behavior can be found in the Park and carefully selected examples can be incorporated into trails and exhibits to illustrate a variety of themes relating to the conceptual frameworks of land-use history, environmental education, and people and the material world.

4.3 View Potential and Visual Impact *(Prepared by CDH)*

[Note: The scope of work for this Updated Conceptual Development Plan did not include consideration of Visual Resources, this section is excerpted verbatim from the original CDP]

View potential describes the views from the site to the surrounding areas whereas visual impact indicates the visibility of the site from the bordering development. Often the areas with the strongest impact also provide the greatest view potential.

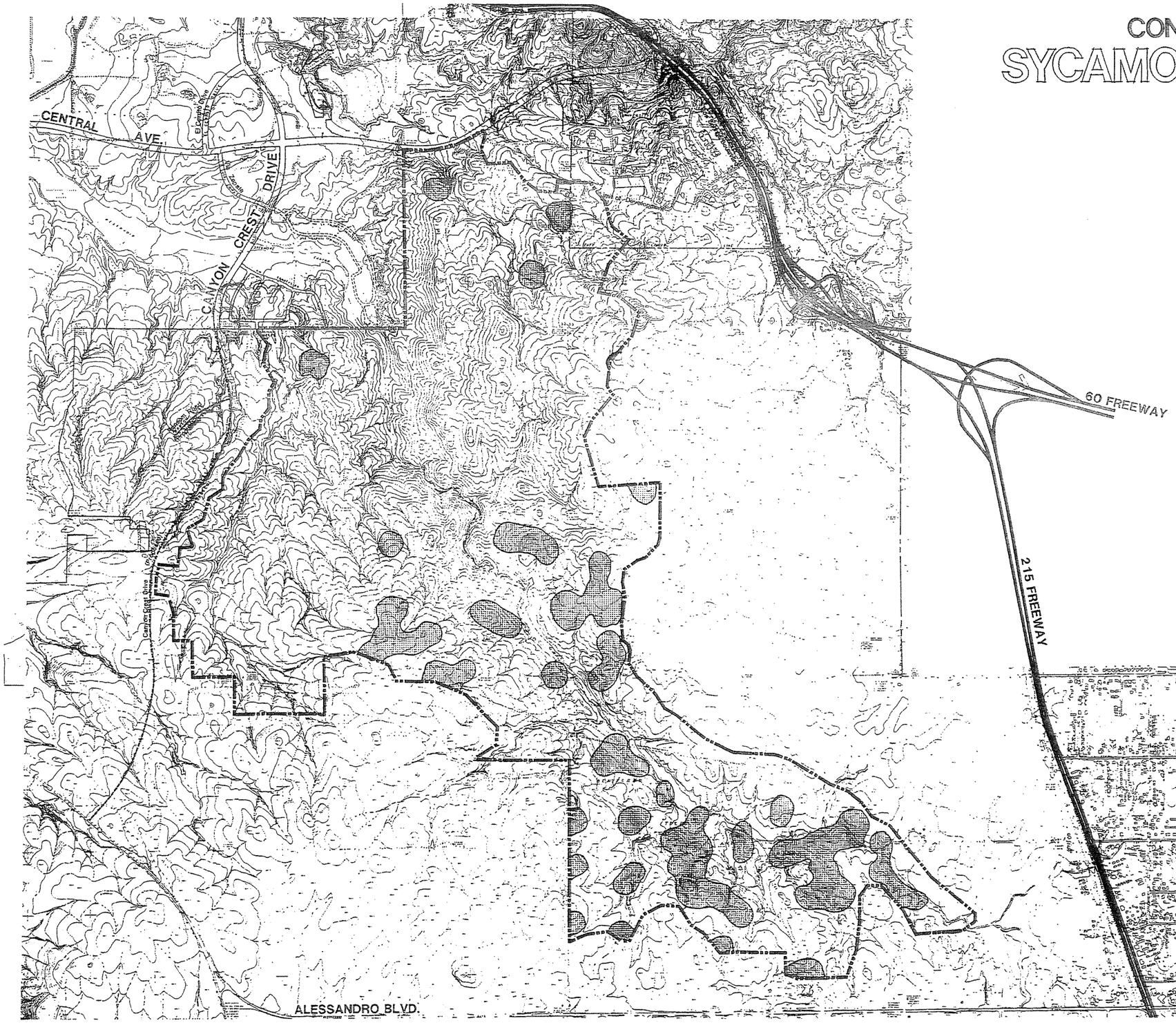
The project team studied and mapped view potential and visual impact. The View Analysis (Figure 4-7) is the result of several days spent delving into the canyons and ridges of Sycamore Canyon Park. The legend depicts the hierarchy with the major views being those high points with the most panoramic and far reaching vistas and the insignificant views as those constricted view areas that would look directly into adjacent developments or have minimal potential for quality environmental observation. These view and vista areas linked by a trail system would provide the hiker a sequential experience of land form, features.

CONCEPTUAL DEVELOPMENT PLAN

SYCAMORE CANYON PARK

CITY OF RIVERSIDE, CA.

Figure 4-6



LEGEND

CURRENT BOUNDARY

SITE LOCATIONS

ARCHAEOLOGICAL SITE LOCATIONS

0 400 800 1600

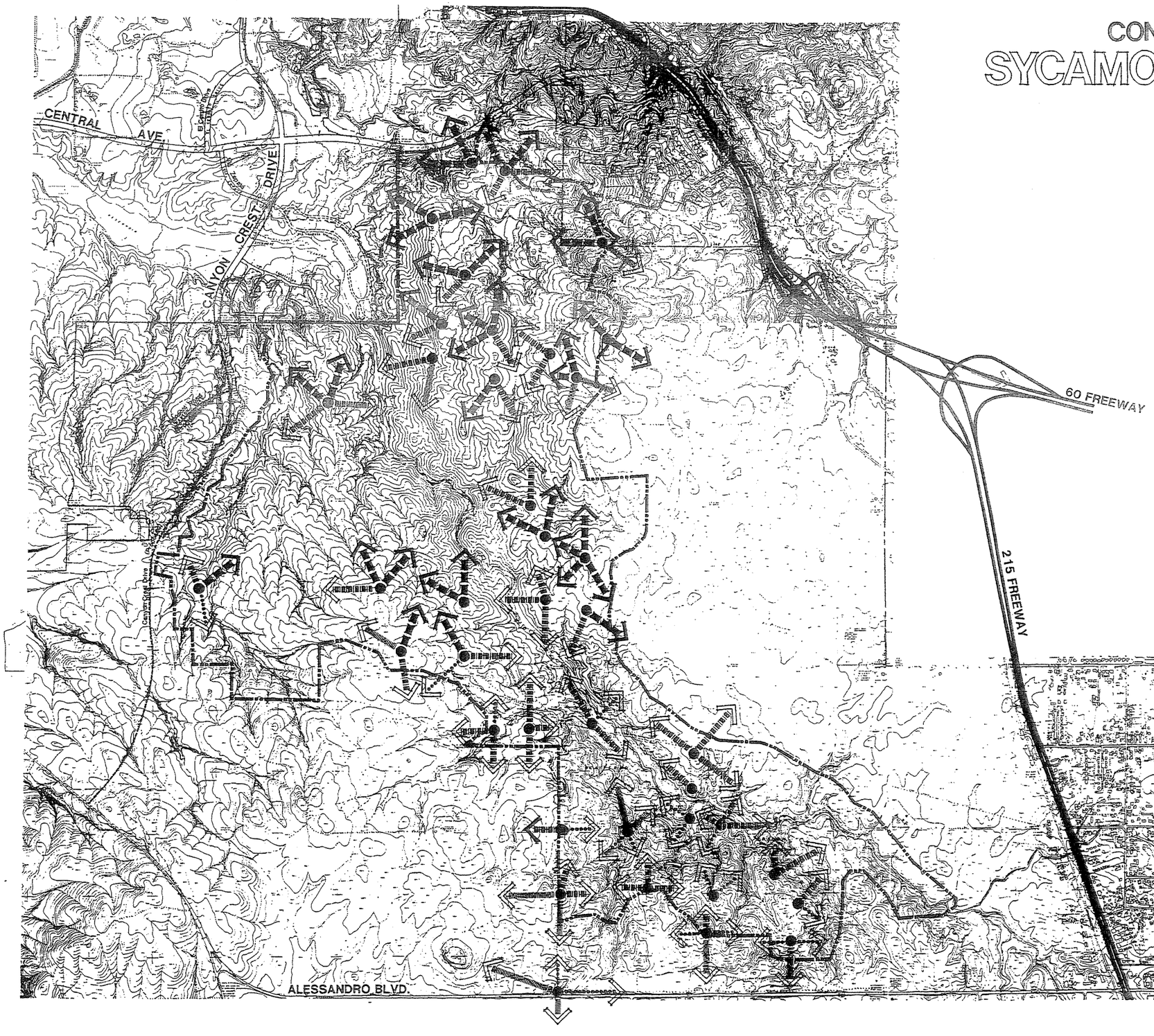
CARDOZA DILALLO HARRINGTON

CONCEPTUAL DEVELOPMENT PLAN

SYCAMORE CANYON PARK

CITY OF RIVERSIDE, CA.

Figure 4-7



LEGEND

- CURRENT BOUNDARY
- MAJOR VIEW
- SIGNIFICANT VIEW
- MINOR VIEW
- INSIGNIFICANT VIEW
- VIEW AREA

VIEW ANALYSIS

0 400 800 1600

CARDOZA DILALLO HARRINGTON

4.4 Recreational Resources

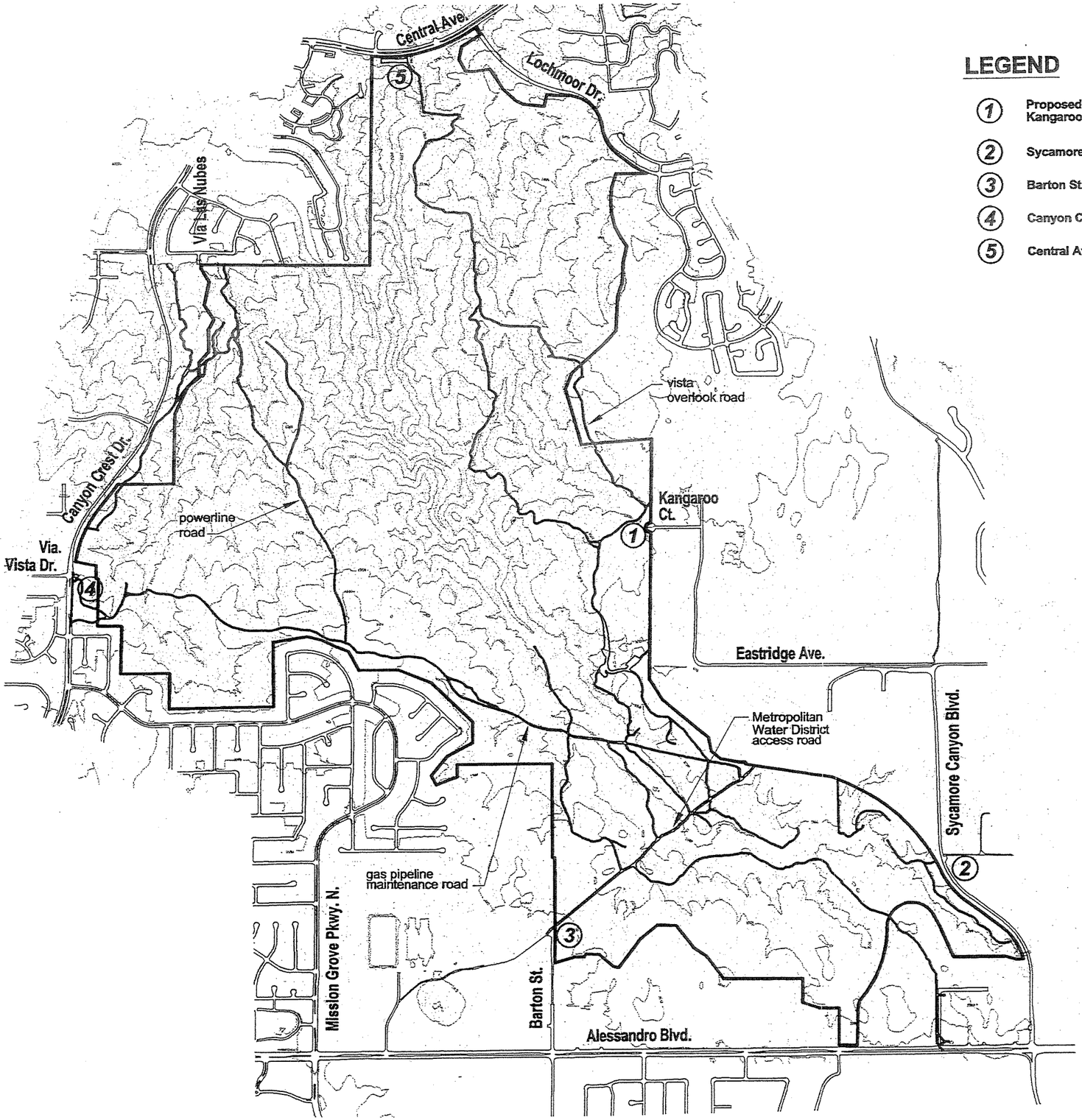
4.4.1 Existing Trail Network

The existing trail network (Figure 4-8) at Sycamore Canyon Wilderness Park is comprised of three basic trail types. Ridge trails have spectacular views into the Canyon and meander in and out of the coastal sage scrub. Grasslands trails provide access through open park-like settings with seasonal wild flowers. Riparian trails, partly enclosed by a Sycamore canopy, offer a cool escape from the intense summer sun and have unique opportunities for wildlife viewing. All of the trails are accessible to a diverse user group, including mountain bikers, hikers, runners, and wildlife enthusiasts.

4.4.2 Existing Trail Access Locations

The existing trail access locations (Figure 4-8) at Sycamore Canyon Wilderness Park are informal and only one, at Central Ave., is designated by a sign. The Central Avenue trail access location at the northern border of the park has informal parking for approximately 40 cars. To the east, trail access from the industrial park is located at the end of Kangaroo Court. There are various access points in the southern portion of the park; a few of them are accessed off of Sycamore Canyon Blvd. and one at the end of Barton Street. No official access points are located along the southwestern border from the residential development. On the western border of the park, trail access points are located near the intersection of Via Vista and Canyon Crest Drive. The northwestern portion of the park is accessed by a gate through the residential development off of Via las Nubes.

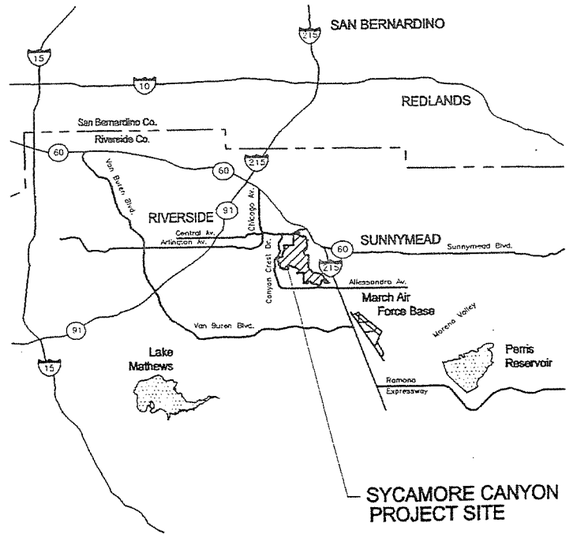
Recommendation:
Since these pre-established locations were created by visitors and do not create adverse environmental impacts, its recommended that they all be formalized and remain to minimize visitor confusion and possible volunteer reestablishment.



LEGEND

1. Proposed Kangaroo Ct. - Interpretive Center
2. Sycamore Canyon Blvd. - Trailhead
3. Barton St. - Trailhead
4. Canyon Crest Dr. - Trailhead
5. Central Ave. - Trailhead

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



KEY PLAN
N.T.S.

Existing Trails, Trail Heads & Emergency Access

Figure 4-8

North

0 750 1500 3000

SCALE IN FEET

CONTOUR INTERVAL: 10 FEET

Dangermond & Associates
Recreation and Environmental Planning

4.5 Existing Zoning and Land Uses

4.5.1 Existing Zoning

The area surrounding Sycamore Canyon Wilderness Park is zoned for a variety of uses (Figure 4-9). Along the northern and northeastern boundary, the land is zoned for residential use ranging from 5 - 8 dwelling units per acre to 20 dwelling units per acre. The land to the east of the park is zoned for light industrial uses. The southern area between the park and Alessandro Blvd. is zoned for commercial uses. The southwestern area is zoned for industrial uses and adjacent to that is an area zoned for medium density residential use. The western border of the park is also zoned for residential use and the portion along the northwestern border is zoned for a mix of high and medium residential.

4.5.2 Surrounding Land Uses

The parcels of land directly adjacent to Sycamore Canyon Wilderness Park are quickly becoming developed. An apartment complex located along Central Avenue is across from the northern boundary of the park. A residential community is located along the northeastern boundary. An industrial park is being developed along the eastern and southeastern section of the park boundary. Currently the area along the southern boundary is undeveloped. There is a large residential community along the southwestern edge while the western edge is currently undeveloped. A housing and apartment complex with a golf course are built along the northwestern border of the park. A large shopping center is located at the intersection of Central Avenue and Canyon Crest Drive.

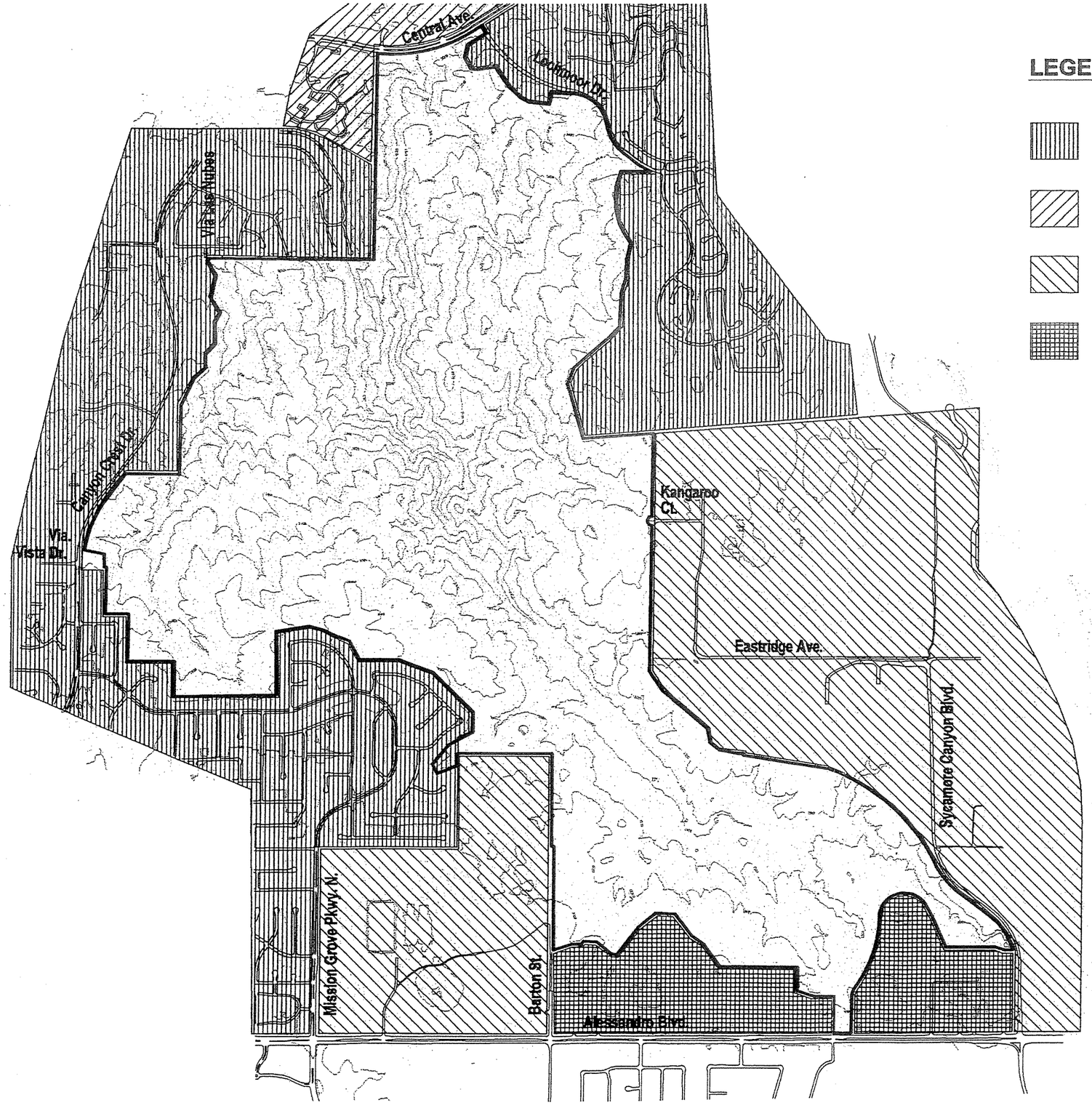
4.5.3 Establishment of Park Boundaries

The boundaries of Sycamore Canyon Wilderness Park were largely developed during the Specific Plan process of 1983. The following guidelines were used at that time to develop the boundaries:

- Protection of the integrity of the three main canyons. Most of the natural features in the Riverside area are mountains. Sycamore Canyon is unique in that it is a canyon and no other natural park in the region duplicates its character. Sycamore Canyon Wilderness Park is meant to be a place where natural processes still prevail, which can only happen if the canyons remain intact. Therefore, protecting the integrity of the canyon as a whole is paramount.
- Protection of the viewsheds from within the Park, as much as possible, was very important. The entire circumference of the Park was studied to identify the areas that would be least likely to impact the views from within the park in order to maintain a sense of wilderness.
- Residential and industrial properties were used as boarders, rather than roads as much as possible, in order to create protection barriers. Prior to the development of surrounding parcels, Sycamore Canyon had problems with trespassers, gun fire, trash dumping and off-road vehicles cutting through the vegetation. Residential and industrial neighbors have helped reduce the amount of illegal activity within the park by alerting law enforcement when it occurs.
- Several special circumstances altered the Park boundaries. In one instance, a large rock outcropping with grinding stones was located near the eastern park boundary in the vicinity of Kangaroo Court. The park boundary was shifted to include this area in the Park.

Recommendation:

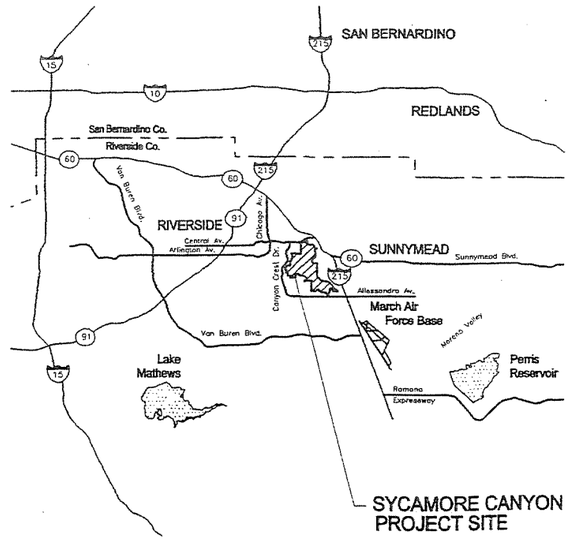
It is recommended that consideration be given to altering the boarder on the west to include the vacant residentially zoned portion of land bordering Canyon Crest Drive. The original idea of residential development to create barriers has been so successful it is feasible to consider this addition. This would provide views into the natural habitat areas for people driving on Canyon Crest Drive and would raise the awareness of its existence without unduly subjecting the site to the problems of the past of trespassers, gun fire, trash dumping and off road vehicles cutting through the vegetation.



LEGEND

- Medium Density Residential
- High Density Residential
- Light Industrial
- Commercial

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



KEY PLAN
N.T.S.

Existing Zoning and Land Use

Figure 4-9

North

0 750 1500 3000
SCALE IN FEET

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SECTION 5.0
INTERPRETIVE OBJECTIVES AND THEMES (CDH)

5.1 Interpretation Defined *(Prepared by CDH)*

[Note: The scope of work for this Updated Conceptual Development Plan did not include consideration of Interpretive Resources, this section is excerpted verbatim from the original CDP]

Sycamore Canyon Wilderness Park has many realms to explore. And, with the change in seasons, many different faces.

Interpretation, by Webster's (1983) definition, is "a teaching technique that stresses appreciation and understanding by combining factual with stimulating explanatory information."

Park administrators view the art and science of interpretation relative to three (3) basic areas of responsibilities: resources, visitors, and management. Park resources are the natural, cultural, and recreation opportunities. Effective programs instill an understanding and appreciation for the value of the resources and develop the public's support for preserving the resources.

Visitors frequent wildland parks for a variety of reasons. The interrelationships of diverse user groups is a challenge. The resource manager is concerned with providing the appropriate avenues in such a manner for enjoyment of the park's resources for today's visitor that does not impair enjoyment by future generations.

An effective interpretative program provides information on the park's resources and associated recreation opportunities. The program also provides the visitor with an understanding of the relationship to and responsibility for the park's environment. Park interpreters are educators of values, not entertainers.

The third area of responsibility, park management, is the planning, protecting, and operating of successful, totally conceived, interpretive programs. The challenge is in developing such policies for interpretation as an integrated part of the overall park management program. Strategies are further discussed in the Operational Plan, Section 7.

An interpretative program should be all encompassing. One which provides:

- orientation and awareness of what the facilities offer
- an understanding and appreciation of the park's resources
- for user safety and resource protection,
- participation activities and individual growth
- a two-way communication channel
- educational significance

5.2 Interpretive Objectives

Interpretive objectives for Sycamore Canyon Wilderness Park include:

- To inform the public of historic habitations of the land by indigenous people, how the lifestyle of the indigenous peoples better preserved the ecosystem than the current lifestyles in the urban environment
- To promote an awareness of the special needs and sensitivities of the natural environment, and to foster an appreciation for the sense of serenity the natural landscape can provide
- To ensure that the majority of visitors have a common orientation to the park
- To allow visitors to use all their senses to experience the park

5.3 Interpretation at Sycamore Canyon Wilderness Park *(Prepared by CDH)*

Interpretation as defined at Sycamore Canyon Wilderness Park, should unfold the story of the property and be the prime focus of the resource management strategies. It is the project team's recommendation that the facility and programs concentrate on being interpretive and not be a visitor center that only disseminates information.

There is a wide variety of amplifying devices to be used in a well-designed interpretive program to hold the interest and address the spectrum of concerns of the visiting public. Due to the uniqueness of the site and its location geographically, the interpretive program should not be limited to a specific user group or type of visitor but reach a diverse population ranging from:

- old to young
- active to passive
- casual to intense
- hobbyist to research investigator
- groups to individuals

As individuals our philosophies are unique. Our outlook on life is derived from questioning our fundamental relationships with other life forms. Similarly, one of the concepts of the Western Regional Environmental Educational Council's "Project Wild" is that "wildlife is an indicator of environmental health. It is important to the quality of life." The Conceptual Development Team's goals for the establishment of an interpretive program for Sycamore Canyon Wilderness Park include:

- Introducing the visitors to the resource values of Sycamore Canyon Wilderness Park
- providing a basis for understanding and an appreciation of the value of ecological habitats
- building a sense of values and responsibilities of the interrelationship and ecological effects of human activities to living things
- focusing on the outdoors and encouraging the visitor to enjoy "hands on" experiences and learn about the special environments of Sycamore Canyon Wilderness Park
- utilizing the theme of earth and sky: raptors (predator birds) and rodents (prey) as the common thread with which the interpretive stories are woven.

The interpretive program should be for all ages and abilities, for the novice observer and as an outdoor classroom for schools. Park management should consider the possibilities and strengths of incorporating role playing, campfire sing-alongs, evening stargazing sessions, living history demonstrations, supervised student internship, volunteer work, college or university field trips, and research studies including nature, history, and sociology (ie: crowd control). Interpretive programs are best when they are a combination of carefully planned programs and incidental encounters in the field.

There are a number of development options for showcasing resources that should be considered before continuing into the next phase of implementation for Sycamore Canyon Wilderness Park. Better defined criteria based on the options herein would provide the most effective type of facility and program to meet the desires and goals of the City.

In addition to an interpretive center, Sycamore Canyon Wilderness Park should be considered a regional center for environmental learning and developed to provide a broad, integrated view of the environmental sciences as well as of cultural ecology, Native Americans, and archaeology. This concept might mean that the site could include structures like bunkhouses and associated facilities to be made available for students who would be bussed in for a one- or multiple-day stays where they would participate in a variety of field-classroom learning experiences. Most of the Los Angeles and Orange County's school districts have had this type of resident outdoor learning programs since 1925.

Consideration should be given to the Park being a participant in regional wildlife studies and lending Park personnel and facilities to these larger efforts. Sycamore Canyon Wilderness Park as a laboratory would mean that Park personnel would keep records of weather, seasonal changes, and unusual events as they relate to regional studies, as well as notes and photos documenting the plant and animal comminutes of the Park on a seasonal basis to show efforts of long-term change. The aforementioned Western Regional Environmental Education Council offers such a sponsorship participation program for agencies.

Another avenue to consider is the concept of Sycamore Canyon Wilderness Park as a Native American Technology Center which would allow persons skilled and knowledgeable in Native American technologies to be able to give specific cultural demonstrations. These demonstrations could be passive or active for the student or visitor and could include:

- the manufacturing of chipped stone tools and bows and arrows
- basket and pottery making
- fire making with bows and pump drills
- shelter construction
- grinding of seeds with mano and metate
- the preparation of hides and skins

Another use for this type of center would be a collaboration with an archaeologist to replicate and use prehistoric artifacts contributing to the ongoing prehistoric research.

5.4 Interpretive Program Opportunities *(Prepared by CDH)*

Using the theme of Earth and Sky to demonstrate Raptors and Rodents provides a valuable teaching tool to effectively carry out learning and understanding. The theme emphasizes what is special about Sycamore Canyon Wilderness Park. Use of the theme should be generous and imaginative. It should also pervade the interpretation of all the various aspects of the biotic, cultural, and physical resources of Sycamore Canyon Wilderness Park. The following few pages provide some samples of the limitless variety of program opportunities. These ideas are broken down by passive and interactive mechanisms and coincide in order with the respective sections of this document.

5.4.1 Wildlife Opportunities *(Prepared by CDH)*

Passive mechanisms for interpreting the various animal ecosystems might include:

- an exhibit detailing the ecological niche of SKR and other sensitive mammals at Sycamore Canyon Wilderness Park and their respective habitat requirements
- an exhibit detailing the ecological niche of raptors at Sycamore Canyon Wilderness Park and their respective habitat requirements
- portrayal of the balance and impact of food webs within the Sycamore Canyon Wilderness Park
- habitats of quail who have acquired a somewhat rodent-like, ground dwelling way of living

Interactive mechanisms for interpreting the various animal ecosystems might include:

- a typical rock outcropping outside the interpretative center where visitors can explore the inside of a crevice system
- ecological studies involving the temporary capture and marking by trained naturalists for observation in the field by school groups who could then learn about home ranges, territories, and thermoregulation behavior.

5.4.2 Vegetation Opportunities *(Prepared by CDH)*

Passive mechanisms for interpreting the various plant ecosystems might include:

- various signs, posters, and displays
- progression of aerial photographs showing the evolution of Sycamore Canyon over time
- interpretive slide or movie programs
- native grassland history
- management of various plant communities
- exhibits of how change in plant communities affect raptors and rodents

Interactive mechanisms for interpreting the various plant ecosystems might include:

- conducted ranger hikes
- labeled self-guided trail systems.

5.4.3 Geologic and Hydrologic Situations *(Prepared by CDH)*

There are extensive outcroppings of granitic bedrock allowing the park visitors the opportunity to examine the mineral and crystal structure of granite rocks at close hand. Granitic rocks are formed from molten materials deep within the earth. Their exposure, uplift, and erosion at the surface is related to the major earth processes that have created the Southern California landscape. On this scale, the park provides examples of the geomorphology of the Perris Block and development of land forms and stream patterns in granitic terrain. For trained professionals or students, detailed geologic and stream flow rate studies could be undertaken.

5.4.4 Archeological Opportunities *(Prepared by CDH)*

A. Archeological History

Classifications and definitions should be introduced, such as the difference between an archaeological survey, which is the activity of finding sites in an area, and an excavation, which is the activity of carefully recovering buried artifacts. Talks should educate the public on how archaeologists, using a variety of ancillary information, infer what old artifacts are, how they were made and used and their functions as well as inferences on human diet, population size, settlement patterns and even social organization. It is interesting to note that archaeologists carry out experiments and study living patterns.

Passive mechanisms for interpreting the cultural resources might include:

- photo enlargements designating different site locations of Southern California Indians engaged in various activities
- charts of tribal boundaries
- drawings/photographs designating succession of inhabiting cultures
- display cases of removed and preserved artifacts
- short audio/visual presentations on prehistory and preservation of archaeological sites
- legends and ballads that relate to "oral history traditions" of recorded tales, customs and beliefs
- exhibits that help the visitor transcend from today's technologically advanced era to a less complex time in history
- techniques of archaeology
- exhibit depicting how living things, including humans, depend upon other living things for sustenance

Interactive mechanisms for interpreting the cultural resources might include:

- replicas of a grinding stone for visitors to grind grass seeds
- chipped stone tools for scraping and whittling
- ground stone tools to shape ornaments from bone and shell
- a mounted bow that allows the visitor to experience the "pull"

To educate the visitor even further, the program staff should consider topics addressing the impact of human societies upon the natural environment and how many simpler societies use a variety of approaches for keeping population sizes in check so that they do not overshoot their resource base. To illustrate land-use history, topics centering on how each society has a distinctive way of life and how that modifies the landscape in distinctive ways should be highlighted along with the concept that the accumulated effects of past societies in any area can be seen today.

In order to create a more direct involvement with history, simulated archaeological dig sites could be created. Simulated digs work well for the visiting student groups who could work in teams with archaeologists on site excavations. This type of program would require the presence of a staff or visiting archaeologist and minimal laboratory facilities.

B. Conceptual Framework for the Resources

Conceptual frameworks are used as themes for presentation of the resources. A description of possible themes follow.

1. Appropriate Technology

This conceptual framework stresses that technologies need to be appropriate for local conditions of society and the environment. This concept can be illustrated by themes centering on how advanced technologies are usually material and/or energy-intensive to make, use, and maintain. Less developed societies usually have more access to labor than capital. The successful technologies of Native American societies provide inspiration for developing appropriate technologies (Schumacher 1973).

2. Traditional Native American Culture

This focus looks at the cultures and life ways of Native American societies as integrated wholes and is based in anthropology, archaeology, and history. It concentrates on the themes of Native American society as a unique configuration of practices and beliefs that must be understood as a functioning whole and that each society has its own history and cannot be understood apart from that history. It stresses that in Native American societies kinship organization is very important and goes on to illustrate how trade within and between tribal groups has long been essential in Native American societies (Kroeber 1976).
3. Understanding the Material World

Understanding the Material World is a study of the relationships between people and their material things through the study of their material culture or artifacts. This study, based on archaeology, folklore, and history, highlights themes on how artifacts have both utilitarian and symbolic functions, that adoptions of new artifacts usually have unforeseen consequences and that it is the overwhelming reliance on artifacts that makes human societies unique (Will Rathje and M.B. Schiffer 1982).

5.4.5 Wildland Fire *(Prepared by CDH)*

The interpretive program should include an educational section on wildland fire danger as well as a section on fire ecology inclusive of fire effects and the fire-erosion-flood cycle. If a fire should occur, the burned area would provide material for interpretive study on the dynamics of fire-adapted ecosystems. For instance, how do raptors and rodents cope with or adapt to fire and how does it compare or contrast with humans' ability to cope with fire.

The interpretive center should include an exhibit that deals with fire ecology, fire history, wildland fire control as well as fire protection. This section should also include site specific planning for a home inclusive of fire-safe building materials and landscaping and maintenance of the home. A practical brochure could be developed along these guidelines to be sold or given to park visitors, surrounding residents, and new homeowners, as well as individuals taking out a building permit in the natural watershed areas of the City of Riverside.

SECTION 6.0
PROPOSED FACILITIES AND LAND USES

6.1 Objectives

This Conceptual Development Plan examines a variety of alternatives for trailheads near "user-established" access nodes, edge treatments to control user access, and interpretive/day-use facility locations that will avoid significant impacts to sensitive species habitat. The mission of this Conceptual Development Plan Update is to re-evaluate the placement and design of the public use facilities proposed in the 1988 plan to accommodate the SKR and CAGN. The RCHCA requires 1:1 habitat replacement mitigation for any disturbance within the core reserves which may result in the incidental take of SKR. The City of Riverside will also be required to conduct SKR and CAGN biological surveys for the proposed disturbance areas, as well as meet with representatives from the RCHCA, USFWS, and CDFG to determine methods of avoiding, minimizing and mitigating the impacts to SKR. (RCHCA, HCP, p. 173)

A critical task in the planning of facilities and land uses was the analysis of the opportunities and constraints of the Park. The Opportunities and Constraints analysis (See Figure 6-1) identified broad constraints to public use planning from environmental factors. This early analysis allowed the planning team the opportunity to identify possible conflicts between management strategies needed within varying biological situations and proposed public uses. After the analysis of the Opportunities and Constraints, the program and location of the Interpretive Center, trailheads and trail use areas from the existing Conceptual Development Plan (CDP) were re-evaluated.

The following objectives guided the planning team in the design and placement of the Public Use Facilities:

1. Provide for a wide range of recreational opportunities for all ages and socio-economic groups while protecting the existing site resources
2. Provide thoughtful assessment of the need to preserve plant and wildlife species (ecosystems) to ensure their survival, and how the survival of ecosystems relates to the survival of the human species.
3. To have the variety of park experiences ranging from the serene and peaceful to the physically challenging and interactive
4. To allow travelers on Central Avenue, Canyon Crest Drive and Sycamore Canyon Boulevard to view the natural and open landscape of Sycamore Canyon Wilderness Park when passing by, through edge treatments, signage and views
5. Ensure the trail system within the park will provide a safe and varied experience for visitors

6.2 Regional Context

Sycamore Canyon Wilderness Park is very unique in its wildland character surrounded by urban development. The Park is located at the eastern edge of the City of Riverside near the juncture of Highways 215 and 60. It is the largest park within the City's park system and one of the few municipally owned wilderness parks in California surrounded by development. The Park has the potential of providing recreation and education to visitors living in Riverside and surrounding communities up to 30 miles away.

This Park varies from other typical municipal parks in that it provides a wilderness 'sense of place' to the visitor, not the typical manicured appearance of an urban park. The intent is to maintain a more natural, self sustaining landscape for the visitor to enjoy while still providing a safe and exciting experience.

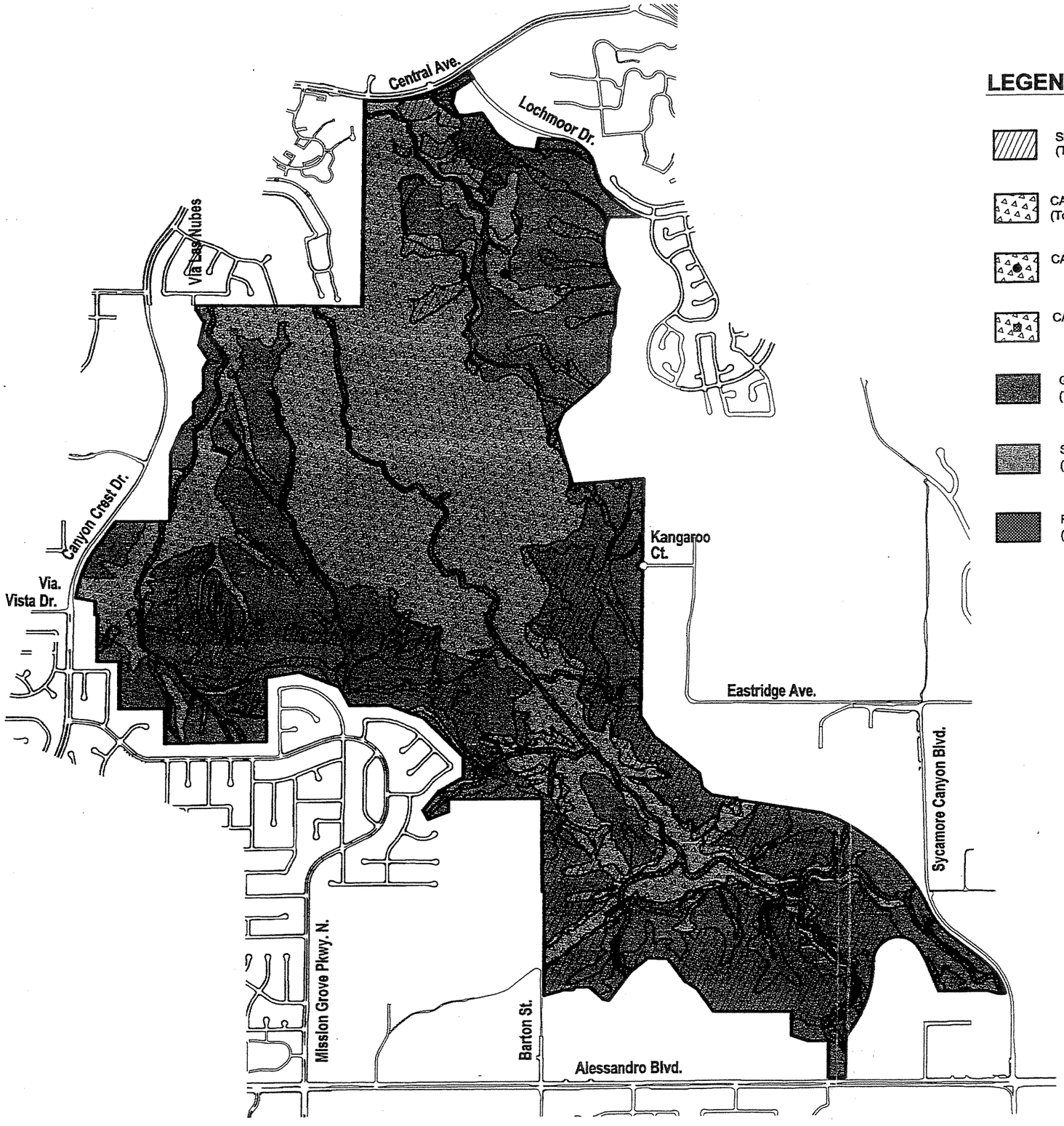
6.3 Existing Access/Circulation Patterns

6.3.1 Existing Access

Access to Sycamore Canyon Wilderness Park has become more controlled in recent years due to the development of adjacent parcels. The following locations are presently used by visitors to access the trail network (See Figure 4-8);

1. Central Avenue: This location contains the only permitted off street parking, and a Park information panel. Accommodating approximately 40 cars this is the most heavily used access point.
2. Kangaroo Court: Currently access to this location is by a dirt road through the undeveloped portions of the Sycamore Canyon Business Park. Although access will improve as development occurs, this is now the most difficult area in which to control access due to the extensive unfenced boundary. It is likely that the majority of ORV traffic is entering the Park from this boundary.
3. MWD Service Road: This area is accessed through paved roads within the Sycamore Canyon Business Park. The gated entrance is only available to MWD and agency vehicles.
4. Sycamore Canyon Boulevard: With approximately 1,500 feet of frontage to the Park, this location has numerous trails extending from the road. On-street parking is available along Sycamore Canyon Boulevard which contributes to the most heavily used access at the south end of the Park.
5. Barton Street: Located off Alessandro Boulevard along the east property line of the MWD Treatment Facility, this paved road also has room for on-street parking.
6. Canyon Crest Drive: This access point is located at the intersection of Via Vista Drive near the gas valve facility. This access is actually being taken access property owned by Southern California Edison with only limited on street parking. The speed and lack of deceleration and acceleration lanes creates a very dangerous vehicular situation for visitors.
7. Via Las Nubes: Located off Canyon Crest Drive in a subdivision at the northwest corner of the site, this location appears to be used mostly by the residents of the nearby subdivision.

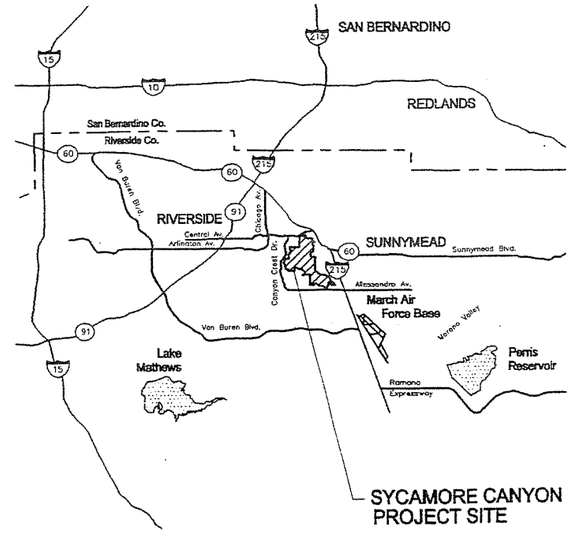
Recommendation: Providing key access from the north to the power line service road, it is recommended that the Via Las Nubes access be gated and improved to provide emergency access.



LEGEND

- SKR Habitat (Total: 337.7 acres)
- CAGN Potential Nesting Habitat (Total: 680.4 acres)
- CAGN 1997 occurence
- CAGN 1994-1995 occurence
- Grassland (Total: 775.2 acres)
- Sagescrub (Total: 646.1 acres)
- Riparian (Total: 58.8 acres)

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



KEY PLAN
N.T.S.

Opportunities and Constraints

Figure 6-1

North

0 750 1500 3000

SCALE IN FEET

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6.3.2 Circulation Patterns

The existing trail network (see Figure 4-8) provides a variety of experiences within the Park. Created by hikers and bicyclists, most of the trails follow ridge lines and service roads. There are major trails leading from the Central Avenue parking area south past Kangaroo Court and eventually connecting with Sycamore Canyon Boulevard. Another north-south trail begins at Via Las Nubes and extends south to connect with the gas line service road. This trail is commonly referred to as the power line trail. A major east-west trail extends from Canyon Crest Drive at Via Vista Drive and follows the gas line service road, crossing the main canyon, and connecting with the north-south Central Avenue to Sycamore Canyon Boulevard trail. The MWD service road is not classified as a trail but is often used by visitors to cross the main canyon. There are other trails, south of the gas line service road, which provide routes of travel across the MWD service road and to the southern most tip of the Park.

6.4 Interpretive/ Day Use Facilities

Analysis of the constraints and opportunities posed by the project site and the existing CDP leads to six alternative site designs for the Interpretive/Day-use Facility at three separate site configurations. The six alternatives explore a variety of parking and interpretive facility locations. Refer to Section 9.3 in the Appendices for descriptions of the alternatives not recommended. The recommended alternative is proposed to be located at the Kangaroo Court location and is described below. The impacts to SKR at this location are avoided by siting the parking lot and interpretive structure completely out of mapped occupied habitat. The trails leading from the interpretive center to the overlooks and along the east rim of the canyon are currently occupied by SKR will only be modified to maintain trail integrity and to minimize erosion.

6.4.1 Interpretive Center

The combined structure, including a 2,000 s.f. interpretive center, two restrooms and a 500 s.f. office space is proposed to be located on the northeast corner of the parking lot. (See Figure 6-2) Access to the site will be provided via a 250 foot entrance drive connecting to Kangaroo Court, and is intended to create a sensory transition for the visitor from the urban environment of the industrial park to the natural environment of the Interpretive Center and parking area. The gravel parking lot will provide parking for 20 vehicles and a bus drop-off area. An overflow parking area is proposed behind the Interpretive Center, north of the entrance road which can be mowed when the park staff determines there is a need for additional parking. An outdoor plaza area with interpretive panels and seating for those visitors who arrive when the Center is closed is also proposed. The interpretive plaza area can be located directly adjacent to the Interpretive Center with a veranda shade structure.

The Interpretive Center is planned to include a theater for presentations with seating for 35 to 40 people, and will also include exhibits and an information center. The Center could also have a small Interpretive Store, staffed by volunteers, as a means of raising revenue for the Park.

6.4.2 Picnic Area

A Day Use area is proposed within an existing olive grove which, after some pruning, can provide shade to visitors. Located adjacent to the proposed parking facility and Interpretive Center, the grove can be an inviting oasis, ideal for picnicking. The tables would be placed on decomposed granite pads constructed from selected onsite material to minimize maintenance. Oak trees can be planted among the existing olives to increase the shade canopy where necessary.

6.5 Trailheads/ Emergency Vehicle Access

Providing access nodes at established and logical locations around the park boundary is critical if degradation of habitat and resources is to be minimized. Four trailhead locations were selected utilizing these criteria and assuming the Kangaroo Court site would be used for the Interpretive Center. Trailheads are proposed at Central Avenue, Sycamore Canyon Boulevard, Canyon Crest Boulevard and Barton Street. Refer to Figure 4-8 for trailhead and emergency vehicle access locations in reference to the Park and adjacent improvements. The Trailhead Plaza design (Figure 6-3), is intended to provide a pleasing visual portal into the Park as well as information/interpretation and a gathering location. The typical trailhead plaza includes a small "signature" shelter, such as a fabric tension structure, to provide shade and a consistent vertical design element and set a character to the built environment that will be readily associated with Sycamore Canyon Wilderness Park. Protected by the shade structure, benches, an ADA approved drinking fountain and informational/interpretive signage will provide the park user an inviting portal. In addition to the typical trailhead plaza facilities, the following variables apply to each one of the sites:

6.5.1 Central Avenue:

Located at a major existing use area along a main arterial, this location also includes a gravel parking area for 20 to 40 vehicles. Steep topography leading into the Park and a narrow trail preclude any standard emergency vehicle access from this location.

6.5.2 Sycamore Canyon Boulevard:

Located along a secondary arterial, this location will provide on-street parking only. The narrow trail leading from this location is not capable of accommodating standard emergency vehicle access.

SYCAMORE CANYON WILDERNESS PARK
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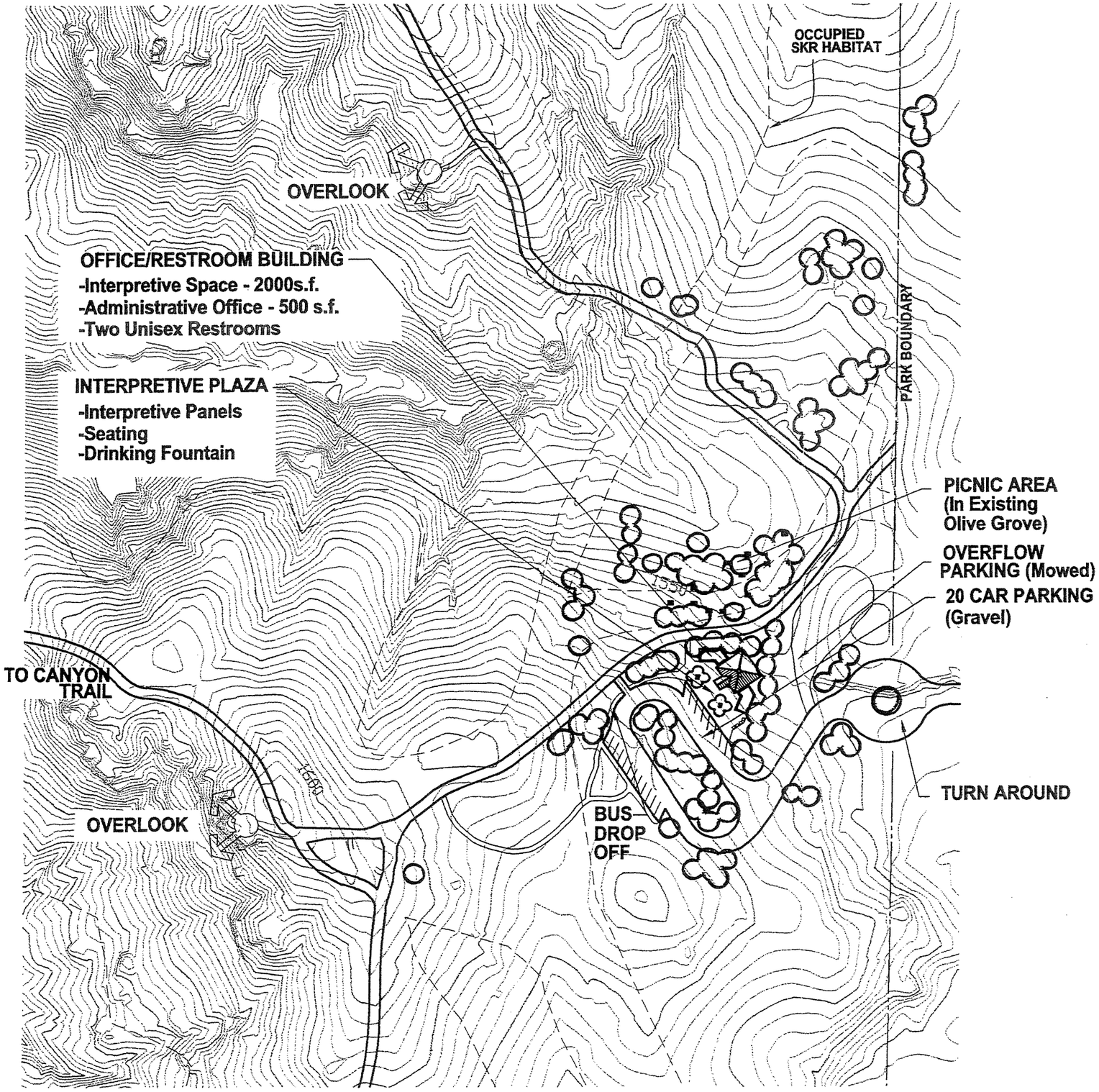

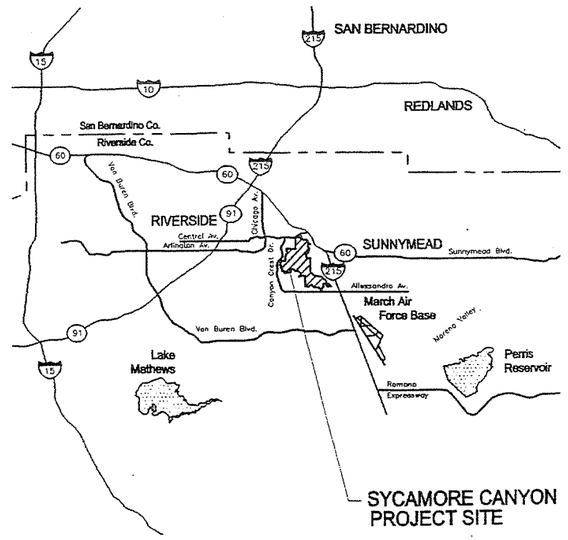

KEY PLAN
N.T.S.

Interpretive Center/ Day Use Area Selected Alternative

Figure 6-2

0 75 150 300
North
SCALE IN FEET

CONTOUR INTERVAL: 2 FEET

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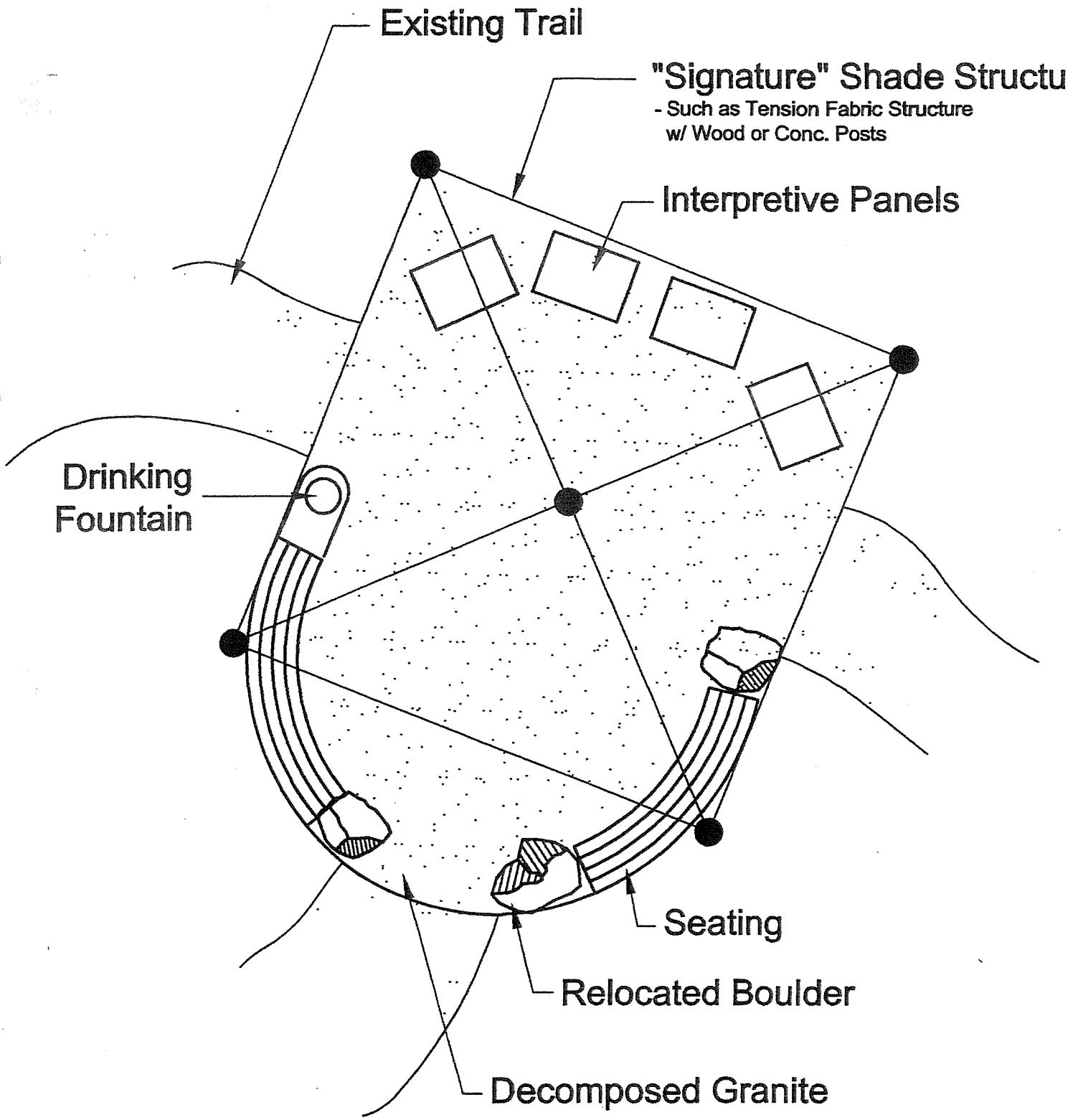

Scale 3/16" = 1'

Figure 6-3

Trailhead Plaza

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6.5.3 Canyon Crest Boulevard at Via Vista Drive:

Located along a major arterial, this trailhead area will include a 15 to 20 car gravel parking lot. Additional deceleration and left turn lane striping or signalization may be needed. With improvements to the crossing of the west canyon, the on-site service road leading from this location could provide critical emergency vehicle access.

The addition of off street parking at this trail head would require the purchase of 5 acres of additional land along Canyon Crest Boulevard, south of the land owned by Southern California Edison (SCE). A Memorandum of Understanding with SCE may be needed for vehicular access and development.

6.5.4 Barton Street:

Adjacent to a paved public street, no on-site parking will be provided at this location. This trailhead is intended to provide pedestrians and bicyclists entry to the site. Due to the close proximity of this access point to the MWD access road, this location can provide a logical emergency access portal.

6.5.5 Kangaroo Court:

The existing dirt roads and the future paved cul-de-sac in the vicinity will provide a logical emergency access point to the entire east half of the park.

6.5.6 Alternative Interpretive/Day Use Facility Designs

Two of the trailhead locations were analyzed for possible Interpretive/Day Use Facility sites (See Section 9.2). These sites are not recommended due to site constraints, vehicular access and public concern for negative impacts.

6.6 Trails

6.6.1 Trail Descriptions

The trail system within Sycamore Canyon Wilderness Park is well defined and very functional. The most challenging aspect of maintaining a trail system which does not negatively impact the resources of the park is the Reserve Manager's ability to close any newly blazed "volunteer" trails within sensitive resource areas. Sufficient effort, resources and educational information should be channeled toward this effort if a balanced mix of public use and quality species habitat is to coexist.

Presently, the existing trail system is serving the visitors well. Therefore, the only acceptable new trail would be a replacement to an existing trail which needs to be closed due to negative environmental impacts. The only new trail required will be north of Kangaroo Court where the existing 15' wide trail/emergency access road crosses the park boundary onto private land which is nearing development. A new trail/road will need to be located as close to the proposed residential fencing as possible to avoid impacts to the SKR habitat.[1]

A detailed analysis of the trail system within Sycamore Canyon Wilderness Park was not a part of this project. General observations indicate that the trails provide valuable transit corridors for SKR and the trail edges are useable habitat for SKR, and thus do not pose any negative impacts. Trails with extensive use and in close proximity to a nesting pair of CAGN can disturb this species and cause them to leave their nest for long periods of time, putting the eggs or fledglings at risk. Any trail determined to be causing a negative impact to a nesting pair of CAGN will need to be monitored and possibly closed to trail use during nesting season .

6.6.2 Trail Experiences *(Prepared by CDH, edited by D&A)*

Trails, whether guided or self-guided, leave and return to the interpretive center. Presented herein are two (2) theme-oriented loops that could be developed for interpretive purposes.

A short trail would take the visitor on a multisensory trip through a variety of plant communities and to a few archaeological slicks. It would be designed for ADA access and provide sensory stimulation for the hearing and sight impaired. Although touch and smell sensations can be emphasized, other senses would be challenged including: cool, warmth, shape, and taste. The trail would lead to and from some of the prominent vista locations providing the observer with environmental diversity and maximizing the visual potential into the canyon and along canyon walls. By these samples, the visitor is encouraged to get in touch with some of the natural realities of Sycamore Canyon Park.

In order to evoke more student participation, trail maps could be issued to record trail features. Information on prehistoric cultures and Indians of Southern California could also be included and can be periodically posted along the trails next to the few selected archaeological sites. This multisensory trail accompanied with guidebooks, could serve as the basis for viewing individual plant species, plant communities, and assorted wildlife habitats. Existing features that lend themselves to interpretation would be:

- riparian woodland biota and ecology;
- meadow biota ecology;
- inland sage scrub, biota and desert ecology;
- chaparral biota and ecology; and
- seasonal wildflowers.

1

The RCHCA requires 1:1 habitat replacement mitigation for any disturbance within the core reserves which may result in the incidental take of SKR. The City of Riverside will also be required to conduct SKR, CAGN and QCB biological surveys for the proposed disturbance areas, as well as meet with representatives from the RCHCA, USFWS, and CDFG to determine methods of avoiding, minimizing and mitigating the impacts to SKR. (RCHCA, HCP, p. 173)

A second loop trail, longer than the first, could be raptor-oriented near areas known to have nests and roosts. The visitor would experience a different set of opportunities for discovery. Sycamore Canyon becomes still more of a reality as the visitor uses this trail to further explore ecological habitats.

6.7 Edge Treatments

Protection of resources and habitat is one of the major objectives for this Park, necessitating the exclusion of Off Road Vehicles (ORV) from Park trails and dirt service roads. Emergency and administrative vehicles will have locked gated access at selected trailheads and at the interpretive facility as well as other locations as required. The following edge treatments do not attempt to prevent pedestrians from entering the Park at non-trailhead areas. However, the improvements at the trailheads and existing access points should carry through the edge treatment pattern. These edge treatments are intended to prevent, to a reasonable extent, motorcycles and 4x4 vehicles from entering the Park. Refer to the corresponding lettered details on Figures 6-4 through 6-8 and the comprehensive Edge Treatment Diagram (Figure 6-9) for graphic illustrations of each of the following alternatives.

6.7.1 Roadway Edge Treatment (Ridge Situation):

At this edge situation a standard six foot wrought iron fence will provide the visual access into the Park for the passing motorist. This visual access is very important to their visual enjoyment of the park. To prevent ORV access, a 30" high barrier of wood timbers is recommended. Since the road is at least 24" above the existing ground within the park, the barrier would be placed at a point on the slope below the motorists' level line of sight. (See Figure 6-4)

6.7.2 Roadway Edge Treatment (Level Situation):

The same criteria as for 6.7.1 applies to this treatment. To prevent ORV access, the 30" barrier could be placed in a 30" deep gradual depression, or Ha-Ha, to keep the barrier below the eye level of the passing motorist. (see Figure 6-5)

6.7.3 Open Space Treatment:

The treatment for this area would incorporate the 30" high timber vehicle barrier mentioned in 6.7.1 above, placed on the park boundary and on finish grade. (see Figure 6-6)

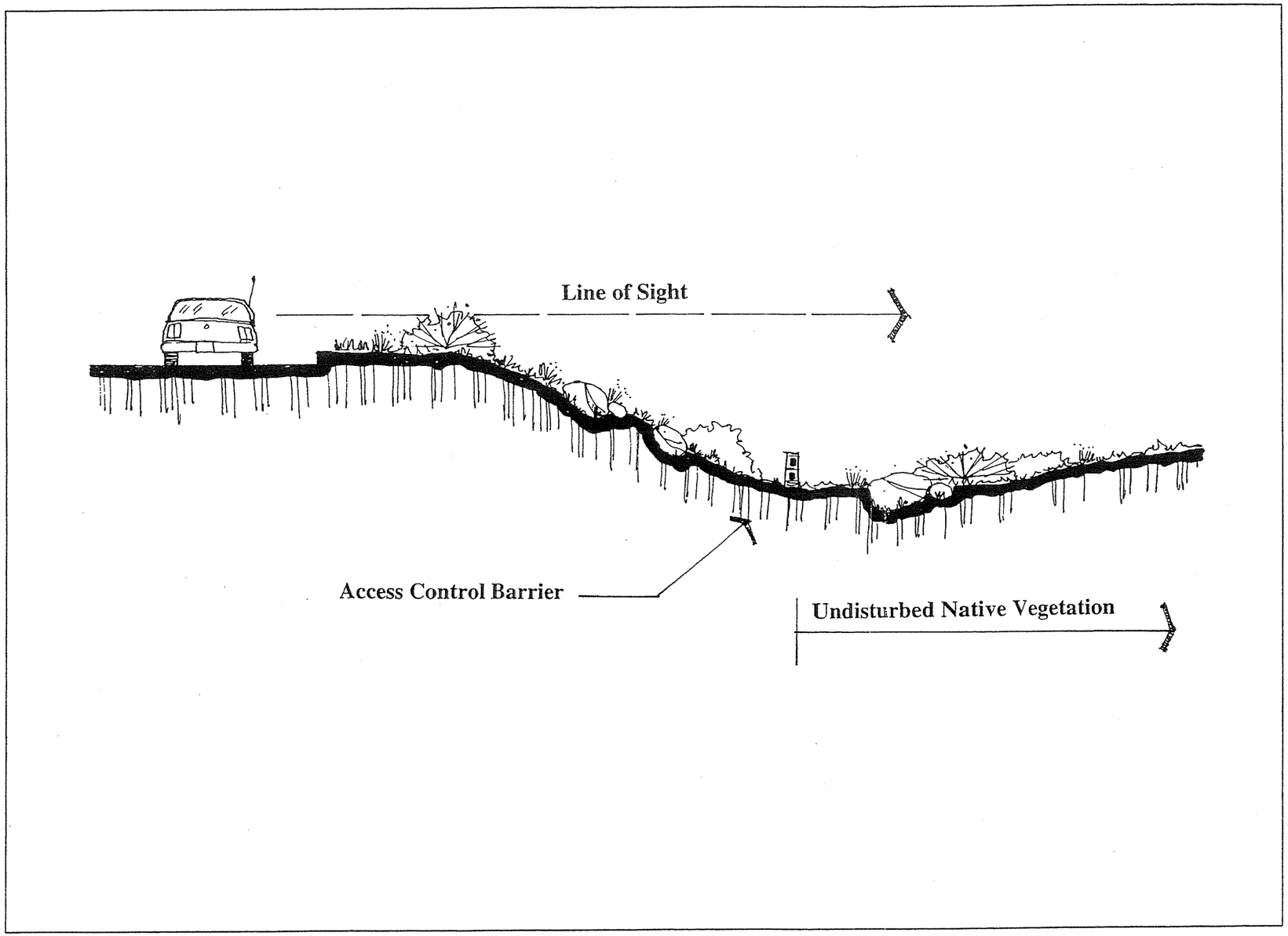
6.7.4 Residential Edge Treatment:

A condition of approval typically required by the City of Riverside for residential development requires a specific fence design incorporating a masonry foundation with painted tubular steel fencing to a height of six feet. This fence detail should be continuous with no gates between the between the Park and residential properties. (see Figure 6-7)

6.7.5 Industrial/Commercial Edge Treatment:

As noted in the Sycamore Canyon Business Park, Specific Plan/E.I.R., a seven foot high masonry wall shall be constructed along all commercial/industrial development adjacent to the park. This wall shall only have emergency vehicle access gates as required. To soften the visual impacts of the masonry wall, a planted area consisting of columnar trees and fire resistant shrubs will stretch out a maximum of 80' from the wall (See Figure 6-8). The possible substitution of open six foot high iron fencing in place of the masonry wall (as noted in Section 3.3.6) will require, a 100 foot swath of stubble management along such boundarys. This will eliminate any opportunity to screen the industrial or commercial service areas from Park visitors as well as create higher risk of wildfire ignition.

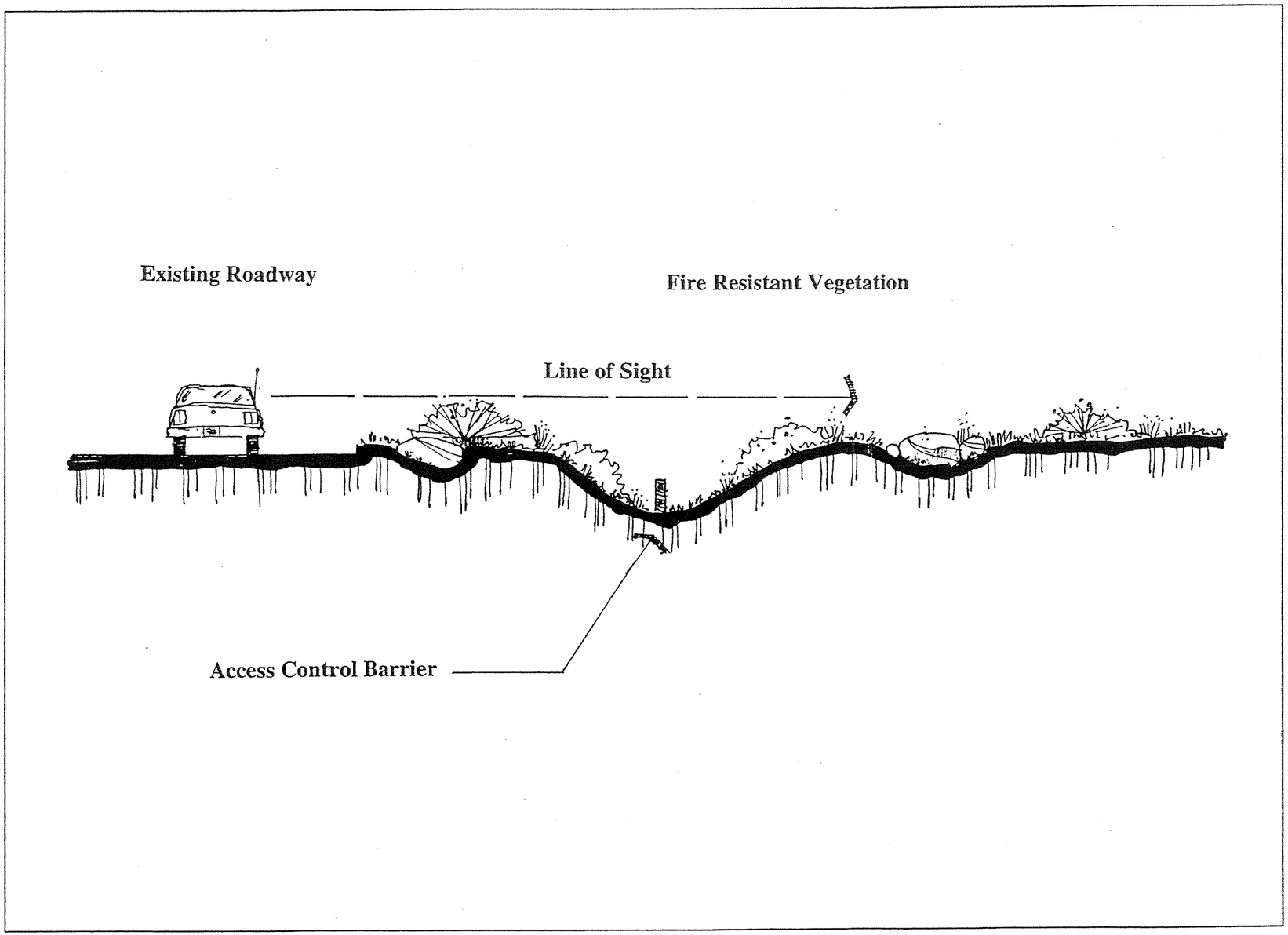
For a compilation of edge treatments, please refer to Figure 6-9.



Roadway Edge Treatment (Ridge Situation)

Figure 6-4

Dangermond & Associates
Recreation and Environmental Planning

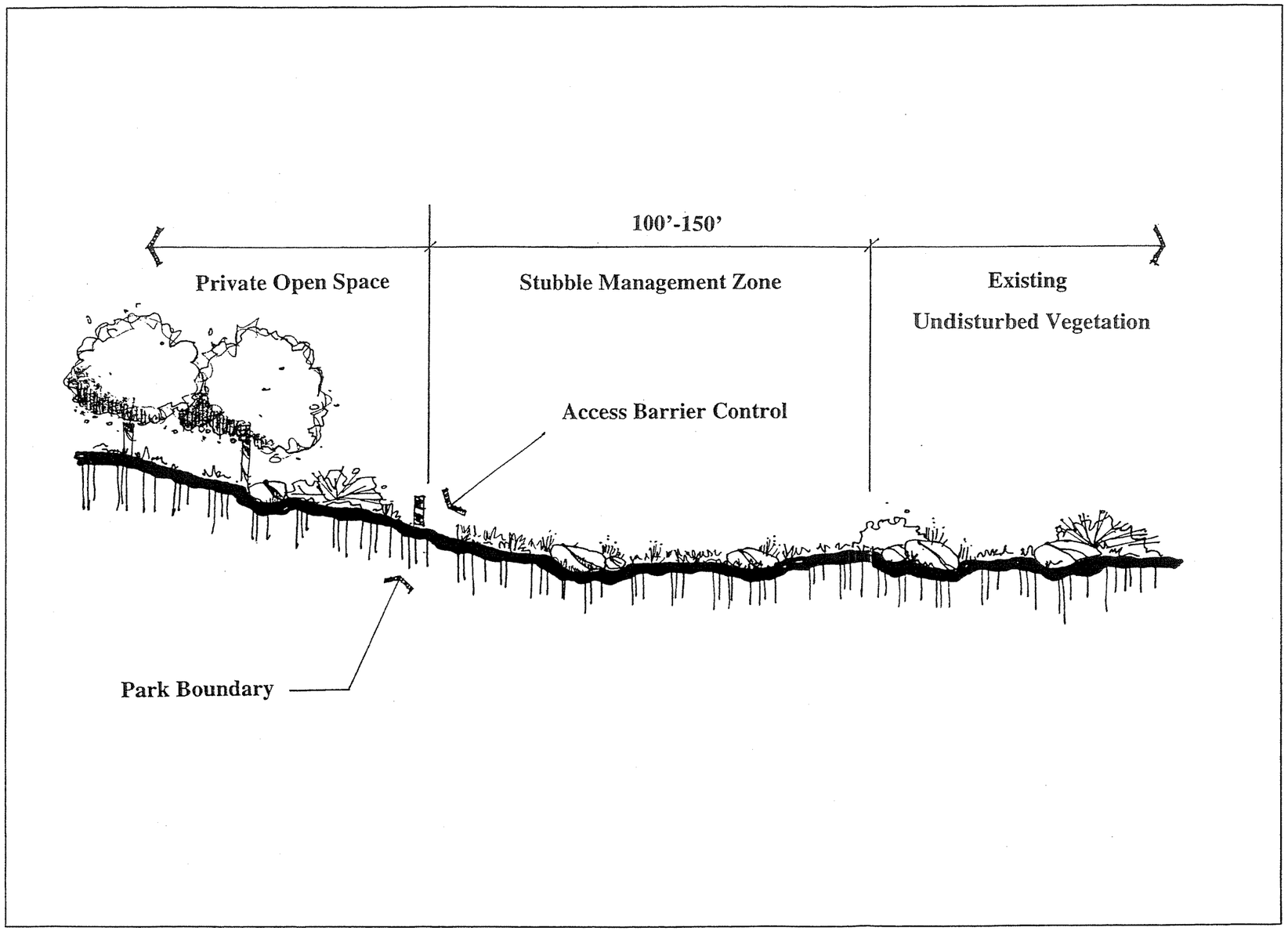


Roadway Edge Treatment (Level Situation)

Figure 6-5

Dangermond & Associates
Recreation and Environmental Planning

SYCAMORE CANYON WILDERNESS PARK
Conceptual Development Plan Revision

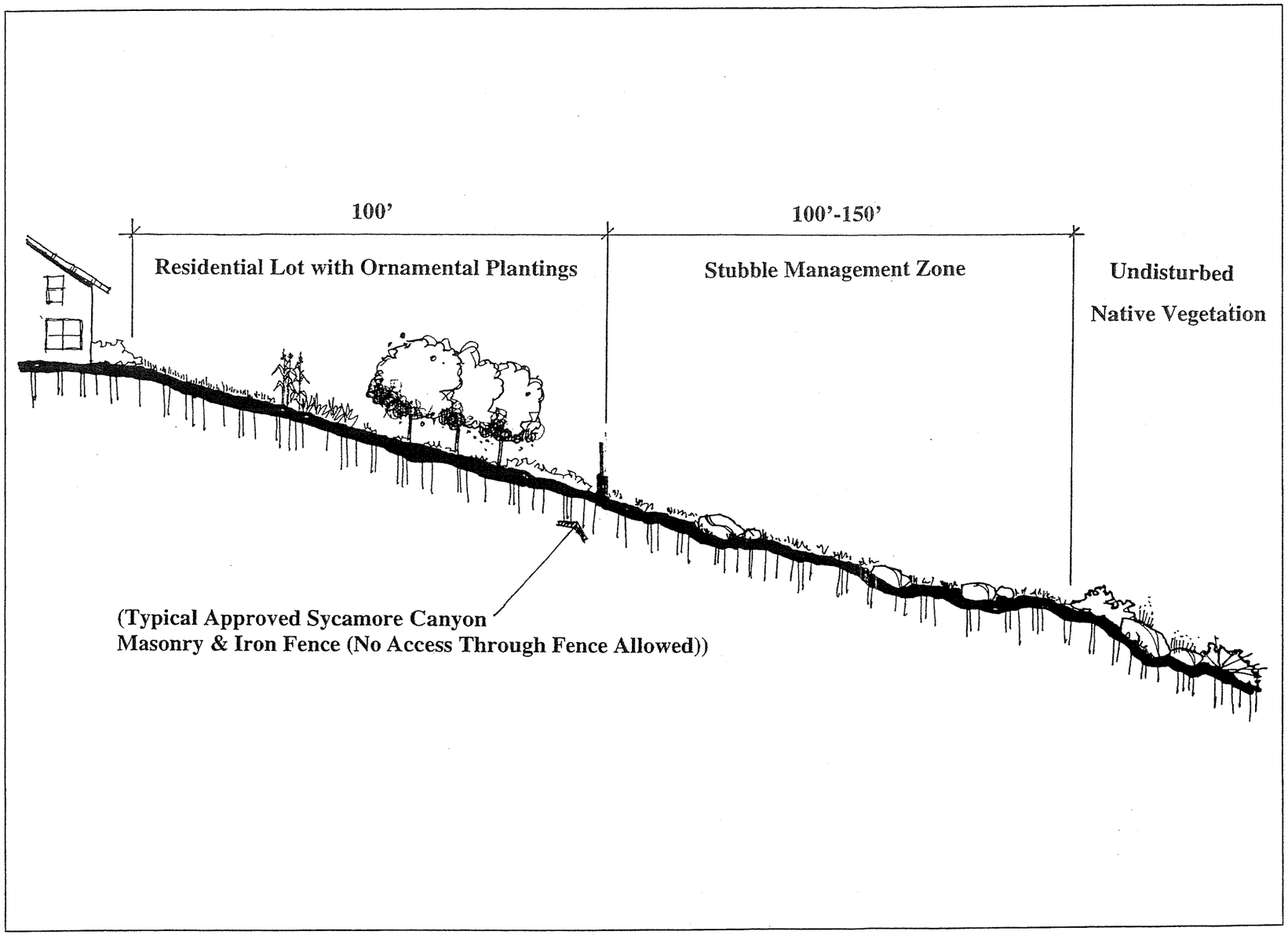


Open Space Edge Treatment

Figure 6-6

Dangermond & Associates
Recreation and Environmental Planning

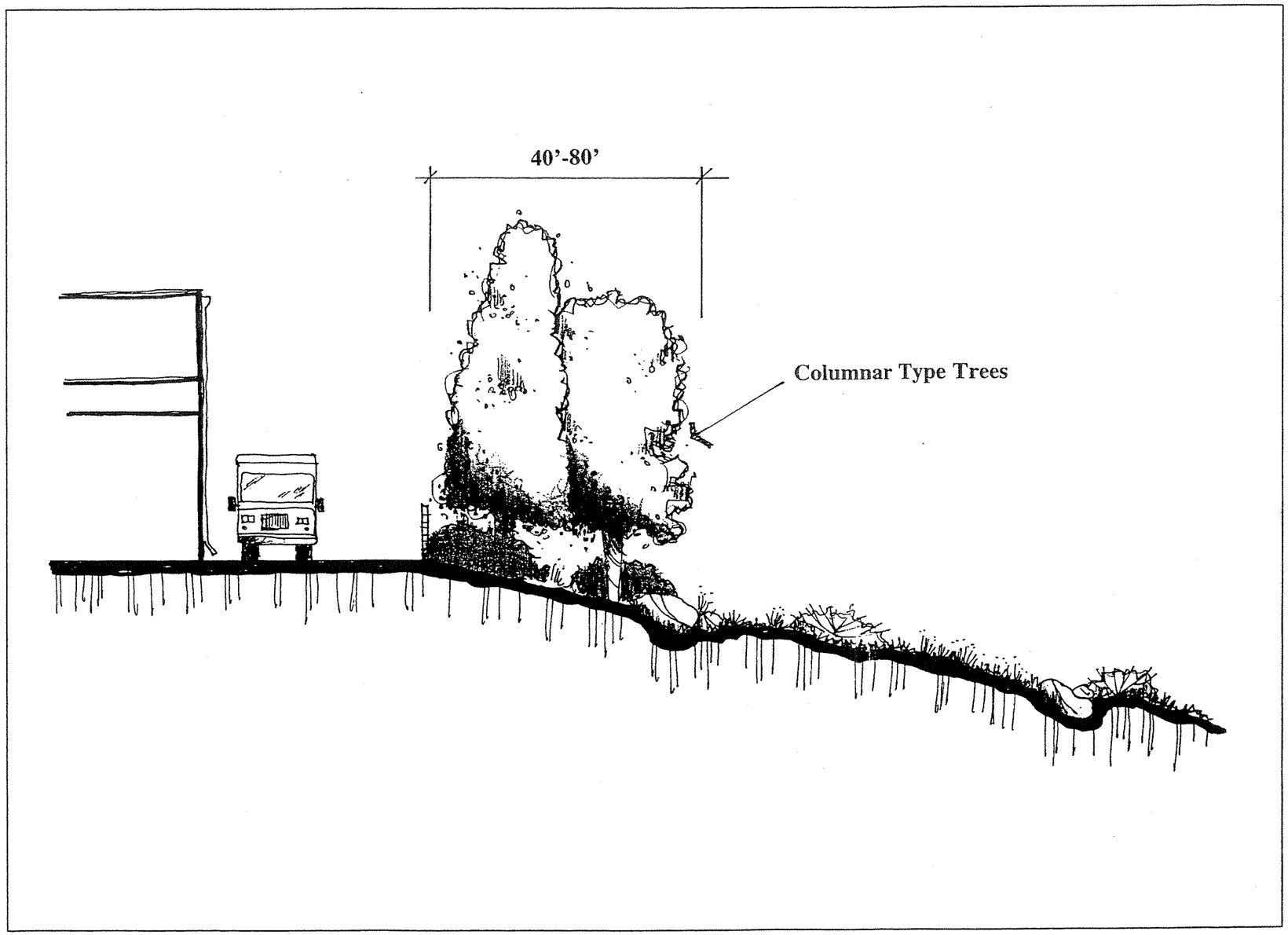
SYCAMORE CANYON WILDERNESS PARK
Conceptual Development Plan Revision



Residential Edge Treatment

Figure 6-7

Dangermond & Associates
Recreation and Environmental Planning



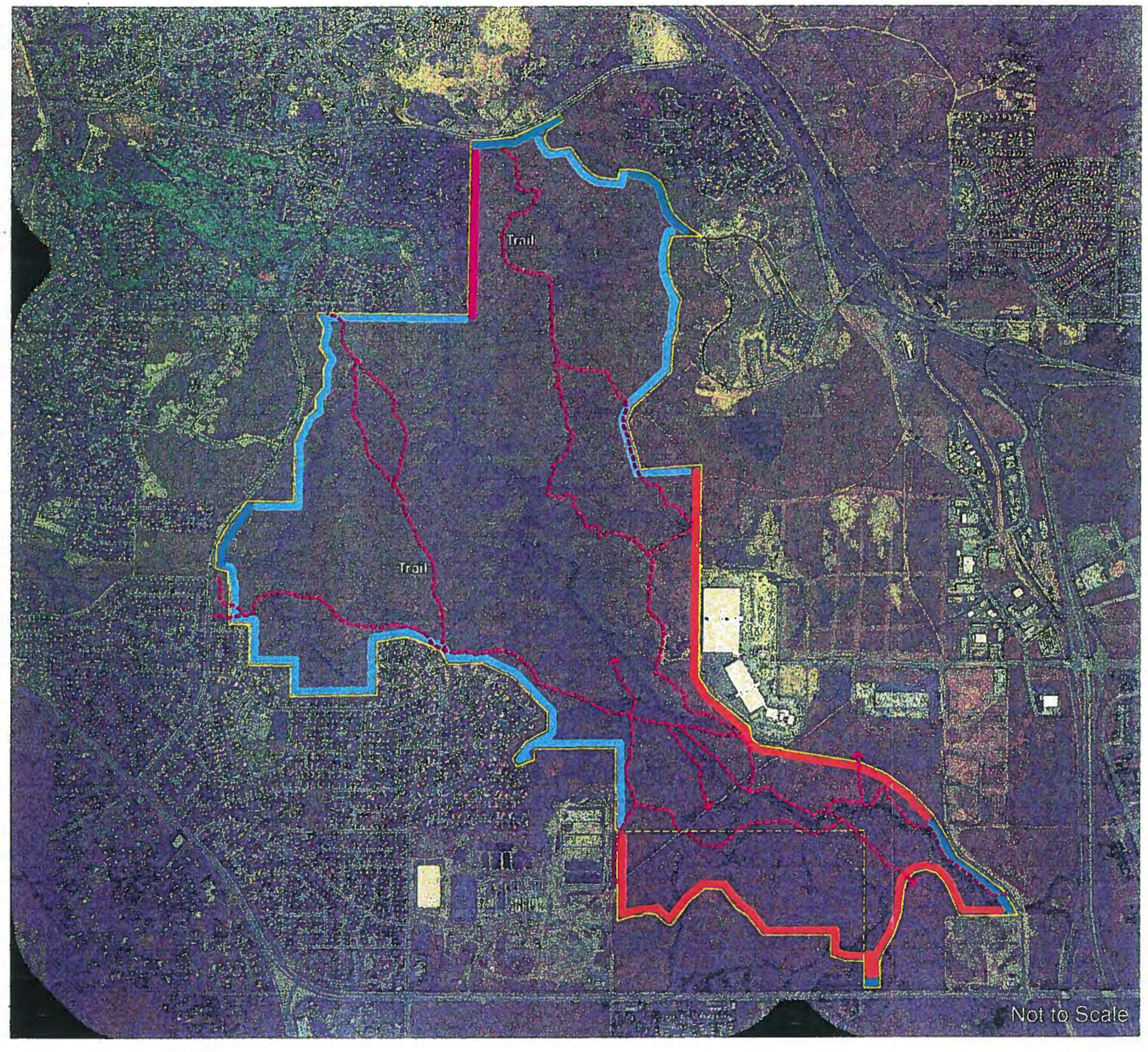
Industrial/Commercial Edge Treatment

Figure 6-8

Dangermond & Associates
Recreation and Environmental Planning

SYCAMORE CANYON WILDERNESS PARK

Conceptual Development Plan Revision- Edge Treatments



Legend:

Residential Treatment
- Continuous City of Riverside approved SKR fence

Industrial/ Commercial Treatment
- Fire resistant vegetative screen

Road Treatment
- Access barrier control

Open Space Treatment
- Access barrier control

Existing Trail

Special Note: Edges along industrial /commercial and residencial areas not presently developed shall incorporate the "Open Space" edge treatment until development occurs.

Dangermond & Associates
Recreation and Environmental Planning

Figure 6-9

6.8 Future Acquisition Considerations

With most of the property adjacent to the Park presently or in the process of development, there is little available land for possible acquisition. The only areas adjacent to the Park with undeveloped land are along Alessandro Boulevard and Canyon Crest Drive. The present zoning of commercial and the appraised value of the property along Alessandro Boulevard place it into a very low priority for purchase. However the residentially zoned properties along Canyon Crest Drive represent a viable option to expand the Parks boundary to the natural management line of the arterial. The 10acre site south of the Southern California Edison property is needed if the trailhead is to be constructed at that location. The portion of City property extending to the boulevard has many site constraints which would be very costly to alleviate if other lands were not acquired.

Recommendation: Priorities for future acquisition are; 1) 5 acre site at the intersection Via Vista and Canyon Crest Drive, 2) Property along Canyon Crest Drive, north of Via Vista zoned residential.

6.9 Suggested Priorities and Phasing

Phasing and priorities for the improvements recommended in this report should first focus on protecting the resources and then on improving the visitor experience. The following outline is a recommended list without consideration for unknown future fiscal situations or opportunities the City may experience.

Priority	Description
1	Secure perimeter of Park to prevent ORV access;
2	Trailhead facilities and parking at Central Avenue & Canyon Crest Drive;
3	Interpretive Center/Day Use Facilities;
4	Trailhead Facilities at Sycamore Canyon Boulevard and Barton Street.

6.10 Design Guidelines

6.10.1 Aesthetic Issues

The 'sense of place' inherent at Sycamore Canyon Wilderness Park must be maintained and conveyed through the built environment as well as the natural. The desire to maintain a sense of wilderness open space leads one to the conclusion that materials and textures applied to the structures and site furnishings should be natural. This does not necessarily mean that all materials must be natural, but that the character and color of the chosen materials blend with the natural colors, textures and shapes of the site and its vegetation.

Recommendation: Pavement materials should be, where possible, decomposed granite or other natural materials. The intrusion of noncolored concrete and asphalt into the landscape at the Park is not recommended. If recycled materials are available that meet the above guidelines, priority should be given to such materials.

6.10.2 Seismic Parameters

Seismic parameters presented in Section 4.1.6 (E) and in Section 9.2.5 in the Appendices, along with any other pertinent data, should be utilized in the design of structures to minimize the effects of ground shaking produced by regional seismic events.

6.10.3 Geotechnical Review

A geotechnical engineer should review grading and foundation plans for development of the interpretative center and related buildings and infrastructure. The items to be addressed should include:

- removal depths for unsuitable soils
- excavation characteristics of earth materials
- requirements for compacted fills
- slope stability considerations
- percolation tests if onsite sewage disposal is planned
- pavement section design
- evaluation of lineaments
- required geotechnical observation and testing during grading

6.11 Preliminary Opinion of Proposed Facilities Costs

The following tables contain the preliminary opinion of costs for the proposed trailhead facilities and Interpretive Center. The tables also include the vehicle barrier cost, listed under miscellaneous, which refers to the edge treatments discussed in Section 6.7. This cost reflects the amount of park boundary closest to that facility requiring an edge treatment.

1. Central Avenue Trailhead:

Item	Unit	Quantity	Unit Cost	Total
Site Work				
Grading	S.F	5,000	$0.20	$1,000.00
Gravel Paving	S.F	8800	$0.60	$5,280.00
DG Paving	S.F	2000	$1.50	$3,000.00
Subtotal				**$9,280.00**
Site Utilities				
Water	L.S	1	$3,000.00	$3,000.00
Structures				
Trailhead Plaza				
• Concrete Columns				
• Overhead				
• 2 Benches				
• Boulders				
• Drinking Fountain				
• Interpretive Panels				
• DG Paving	Each	1	$20,000.00	$20,000.00
Landscaping				
Low Volume Irrigation	L.S	1	$1,500	$1,500.00
Split Rail Fencing	L.F	250	$7.50	$1,875.00
15 Gal. Trees	Each	12	$75.00	$900.00
Revegetation	Acre	1	$1,600.00	$1,600.00
Boulder/ Placement	Each	10	$100.00	$1,000.00
Subtotal				**$6,875.00**
Miscellaneous				
Vehicle Barrier (optional)	L.F	500	$10.00	$5,000.00
Design Fees and Administrative Costs	L.S.			$19,870.00
			Total	**$64,025.00**

2. Sycamore Canyon Blvd.

Trailhead:

Item	Unit	Quantity	Unit Cost	Total
Site Work				
Grading	S.F	1,000	$0.20	$200.00
DG Paving	S.F	1,000	$1.50	$1,500.00
Subtotal				**$1,700.00**
Site Utilities				
Water	L.S	1	$3,000.00	$3,000.00
Structures				
Trailhead Plaza				
• Concrete Columns				
• Overhead				
• 2 Benches				
• Boulders				
• Drinking Fountain				
• Interpretive Panels				
• DG Paving	Each	1	$20,000.00	$20,000.00
Landscaping				
Low Volume Irrigation	L.S	1	$1,500.00	$1,500.00
Split Rail Fencing	L.F	250	$7.50	$1,875.00
15 Gal. Trees	Each	12	$75.00	$900.00
Revegetation	Acre	1	$1,600.00	$1,600.00
Boulder/ Placement	Each	10	$100.00	$1,000.00
Subtotal				**$6,875.00**
Miscellaneous				
Vehicle Barrier (optional)	L.F	1,700	$10.00	-0-
Design Fees and Administrative Costs	L.S.			$14,200.00
			Total	**$45,775.00**

3. Canyon Crest Trailhead:

Item	Unit	Quantity	Unit Cost	Total
Site Work				
Grading	S.F	25,000	$0.20	$5,000.00
Gravel Paving	S.F	6600	$0.60	$3,960.00
DG Paving	S.F	2000	$1.50	$3,000.00
Subtotal				**$11,960.00**
Site Utilities				
Water	L.S	1	$3,000.00	$3,000.00
Structures				
Trailhead Plaza • Concrete Columns • Overhead • 2 Benches • Boulders • Drinking Fountain • Interpretive Panels	Each	1	$20,000.00	$20,000.00
Landscaping				
Low Volume Irrigation	L.S	1	$1,500.00	$1,500.00
Split Rail Fencing	L.F	250	$7.50	$1,875.00
15 Gal. Trees	Each	12	$75.00	$900.00
Regevetation	Acre	1	$1,600.00	$1,600.00
Boulder/ Placement	Each	10	$100.00	$1,000.00
Subtotal				**$6,875.00**
Miscellaneous				
Vehicle Barrier (optional)	L.F	1,200	$10.00	$12,000.00
Design Fees and Administrative Costs	L.S.			$24,200.00
			Total	**$78,035.00**

4. Barton Street Trailhead:

Item	Unit	Quantity	Unit Cost	Total
Site Work				
Grading	S.F[2]	1,000	$0.20	$200.00
D.G Paving	S.F	1,000	$1.50	$1,500.00
Subtotal				**$1,700.00**
Site Utilities				
Water	L.S[3]	1	$3,000.00	$3,000.00
Structures				
Trailhead Plaza • Concrete Columns • Overhead • 2 Benches • Boulders • Drinking Fountain • Interpretive Panels	Each	1	$20,000.00	$20,000.00
Landscaping				
Low Volume Irrigation	L.S	1	$1,500.00	$1,500.00
Split Rail Fencing	L.F[4]	250	$7.50	$1,875.00
15 Gal. Trees	Each	12	$75.00	$900.00
Revegetation	Acre	1	$1,600.00	$1,600.00
Boulder/ Placement	Each	10	$100.00	$1,000.00
Subtotal				**$6,875.00**
Miscellaneous				
Vehicle Barrier (optional)	L.F	100	$10.00	$1,000
Design Fees and Administrative Costs	L.S			$14,650.00
			Total	**$47,225.00**

[2] Square feet
[3] Lump sum
[4] Linear feet

5. Kangaroo Court Interpretive Center/ Day Use Area:

Item	Unit	Quantity	Unit Cost	Total
Site Work				
Grading	S.F	70,000	$0.20	$14,000.00
Gravel Paving	S.F	8800	$0.60	$5,280.00
DG Paving	S.F	2000	$1.50	$3,000.00
Subtotal				**$22,280.00**
Site Utilities				
Water	L.S	1	$3,000.00	$3,000.00
Electrical	L.S	1	$9,000.00	$9,000.00
Sewer	L.S	1	$10,000.00	$10,000.00
Telephone	L.S	1	$4,000.00	$4,000.00
Gas	L.S	1	$7,000.00	$7,000.00
Subtotal				**$33,000.00**
Structures				
Administration Space	S.F	670	$150.00	$108,500.00
• Bathrooms (2 Units)				
Indoor Interpretive Space				
• Building Shell	S.F	2000	$100.00	$200,000.00
• Interior Exhibits	S.F	1000	$200.00	$200,000.00
Subtotal				**$508,500.00**
Landscaping				
Low Volume Irrigation	L.S	1	$2,500.00	$2,500.00
15 Gal. Trees	Each	50	$75.00	$3,750.00
Split Rail Fencing	L.F	500	$7.50	$3,750.00
Benches (wood/conc. 8')	Each	6	$650.00	$3,900.00
Boulder/ Placement	Each	30	$100.00	$3,000.00
Picnic Tables	Each	12	$850.00	$10,200.00
Revegetation	Acre	2	$1,600.00	$3,200.00
Subtotal				**$30,300.00**
Miscellaneous				
Outdoor Interpretive Panels	Each	4	$1,500.00	$6,000.00
Conc. Vehicle Barrier	L.F	100	$10.00	$1,000.00
Design Fees and Administrative Costs	L.S.			210,380.00
Subtotal				**$217,380.00**
			TOTAL	**$811,460.00**

7.1 Staffing and Expertise Required *(Prepared by CDH, edited by D&A)*

Interpretation of wildland areas encompasses not only the available resources and visitors but also park management. The arena of planning, protecting, and operating a successful, totally conceived interpretive program should be the predominant factor of the City's resource management team for Sycamore Canyon Wilderness Park. As previously stated, the challenge is in developing policies for interpretation as an integrated part of the overall park management program. This Management Plan/Conceptual Development Plan document provides an overview of the possibilities and variety of programs that might be available to the reserve manager for the Sycamore Canyon Wilderness Park.

The most difficult facet will be the management of human beings - the regulation of visitors within the park's boundaries. Communication with the public will be a critical factor for success. Their knowledge of the special conditions that affect Sycamore Canyon Wilderness Park will be a benefit to protecting the rich resources. Properly utilized interpretive efforts with the public will result in a cost-effective way to minimize visitor-related problems.

Sycamore Canyon Wilderness Park is a precious commodity and the marketing or "selling" of the interpretive concepts should relate to the aspirations of potential users for quality life and a better environment. The newspaper articles, brochures /pamphlets, educational videos and public appearances of staff should "sell" the facility and its programs.

7.1.1 Staffing Needs *(Prepared by CDH, edited by D&A)*

Staffing a facility like Sycamore Canyon Wilderness Park takes a combination of operational staff and interpretive staff: full-time paid employees along with part-time paid employees and volunteers. Managing a wildland park is quite an undertaking requiring specific types of staff with specific knowledge and skills. Analysis of all things considered, it is the thought of the project team that Sycamore Canyon Wilderness Park will need the following minimum full-time paid staff to fulfill the requisite reserve management functions and be a first rate environmental educational facility. General qualifications guidelines follow.

- one (1) facility reserve manager
- one (1) ranger/maintenance coordinator

Part time employees will be a valuable asset at peak times of visitations: weekends and during the spring and summer. These may include students from nearby colleges and universities as interns to assist with specialty program development, summer day camp programs, or maintenance. As interns their pay will help to further their education and the experience is invaluable on resumes.

Recommendation:
The reserve manager should be responsible for the overall coordination and administration of interpretation at Sycamore Canyon Wilderness Park. This individual would be responsible for the development and delivery of the interpretive programs and park operations. Educational qualifications should include a bachelor's degree in interpretive services, environmental education, biological services, recreation and park administration, public relations, behavioral sciences, ecology or other related fields. Experience should include nature or wildlife interpretive functions for a park or forestry department, educational institute, museum, or other related institution; or teaching natural sciences at a high school or college level. This experience should demonstrate a knowledge of:

- methods and procedures for managing and maintaining park natural areas
- natural history, archaeology, cultural heritage, flora and fauna of inland plain, mountain, and low desert regions of Southern California
- methods and procedures for developing nature and environmental programs at the primary, secondary, and adult education levels
- methods of field collection, identification, and preparation of laboratory and study specimens
- audio-visual techniques, including photography and basic exhibit concepts
- oral and written communication skills

Recommendation:
The ranger/maintenance coordinator should be capable of coordinating efforts with City maintenance personnel, preserving peace, ensuring visitor safety, and protecting wildland property. The individual should be reasonably knowledgeable of state and local laws and ordinances as well as security/enforcement procedures.

7.1.2 Advisory Board and Associated Affiliations *(Prepared by CDH)*

Due to the size and uniqueness of Sycamore Canyon Wilderness Park, the Park and Recreation Department should maintain a good-neighbor relationship with the RCHCA, Metropolitan Water District, Riverside Sanitation District, Riverside County Flood Control District, Riverside County Vector Control, U.S. Fish and Wildlife, and the California Department of Fish and Game. Related to the park/urban interface, interagency communications should be maintained with City Planning, Public Works, Fire, and Police for establishing and implementing procedural and management policies.

Since community relationships will be vital to the success of an intepretive program, it is recommended that an Advisory Board be established with representatives from Friends of Sycamore Canyon and other organizations and groups as appropriate.

7.1.3 Natural Resource Protection *(Prepared by CDH, edited by D&A)*

Unfortunately, there is a need to watch for visitor behavior that may endanger sensitive resources. Such behavior would include defacing artifacts, picking wildflowers, cutting or chopping of trees, and collecting or harassing lizards and/or other wildlife species. Vulnerable archaeological resource sites are the two (2) existing bedrock mortar sites, the cupule rock site, three (3) mano sites, the grinding stone site, the chipping stone site, and surface artifact scatter which should be well-known to the park ranger and resource manager, but should not be publicly identified. Regular focused patrol surveillance should be conducted within the property boundaries.

Constant monitoring of the trails should be standard operating procedure. Staff should establish "photo records" and regularly photograph the trails from standard locations to determine the usage patterns and identify when it's time to alter the path's location.

An arborist and avian biologist should regularly be retained to inspect all sycamore, cottonwood, and willow trees, and make recommendations for corrective pruning and other remedial maintenance.

Wildlife studies should be part of the overall resource management plan. These might include, but not limited to, yearly collection of owl pellets and raptor nest counts. Only through these types of continual population monitoring will it be feasible to predict and adjust for the delicate ecological food-chain balance desired. What may be advantageous to one species may be detrimental to another.

The boundary between civilization and nature is diminishing. Human and wildlife habitats are merging into one, and territorial conflict is inevitable. The park's management team and animal control officials should have a working relationship to solve problems of park animals invading residential/industrial areas. Laws may need to be enacted to forbid the feeding of coyotes and other predators. Annual warnings regarding rattlesnakes may need to be issued. Wildlife "guzzlers" (artificial watering holes) may not only aid species populations but keep animals away from residential areas.

Residents surrounding the park must be educated to the values of the wildlife in the park. They may incur some damage from the larger mammals to their property and to their pets unless they follow sensible management techniques. Garbage must be disposed of in bins inaccessible to wildlife. Residents must also discourage family and friends from feeding wild animals and must control domestic pets. Education of prospective and new human neighbors of the park now will reduce problems later.

7.1.4 Visitor Protection and Safety *(Prepared by CDH, edited by D&A)*

It is human nature to develop patterns and habits of reaction based on past experiences. Visitor behavior and attitude is controllable through well-designed interpretive programs and well-trained staff. Visitors often consider recreation areas to be a place without harm.

Therefore, the reserve manager is faced with protecting visitors from their own negligence. With a wildland area this task is even greater. The park staff's challenge will be in identifying hazards that are inherent to the environment but which may not be obvious to the urban visitor. Therefore, appropriate signs and safety brochures will be necessary to warn visitors of wildland fire, wildlife (i.e., rattlesnake), and plant (i.e., poison oak) dangers. Part of environmental interpretation is the explanation of how park resources, used safely, provide minimum risk to the visitor. The interpretive program provides the opportunity to make the visitor aware of these inherent risks.

7.1.5 Life Saving Support Services *(Prepared by CDH)*

City Fire and Police Departments have requested that an area be set aside for a helicopter pad for medical and patrol emergencies. Fire vehicle/ life-saving support services emergency access points should be considered as a condition of each new residential and industrial tract that is adjacent to the park for immediate access in the event of a wildland fire or life-saving emergency. Refer to Section 6.5 for more information on this issue.

To supplement City Fire Department for wildland fire suppression, it is recommended that cooperative agreements be established well in advance of the fire season with wildland fire protection agencies such as the California Department of Forestry and Fire Protection. Park personnel may need to enforce "closure" days when high wildland fire potential has been determined.

7.1.6 Possible Shared Resources with Other Core Reserves

The Reserve Managers Coordinating Committee (RMCC), established by the RCHCA pursuant to the SKR HCP, will address the issues relating to SKR habitat management and biological monitoring activities among the individual core reserves. (RCHCA, HCP, Section 5, p. 168) Within this forum, core reserve managers will be able to participate in an exchange of ideas and experience with other reserve managers and agency representatives. In addition to this, the exchange of data regarding the effects of fire management, vegetation management, impacts of visitation, and various successes and failures of the adaptive management techniques would be very useful and informative to other reserve managers. Generalized interpretive exhibits addressing the biological resources of the area could also be shared with other core reserves.

7.1.7 Volunteerism *(Prepared by CDH)*

Due to the extent of the programs needed and the lack of funding for most municipally run environmental educational facilities, volunteers and docents will be paramount to the City's successful operation. The City of Riverside is fortunate in that a very strong, effective volunteer group, Friends of Sycamore Canyon Park, are already active and involved. However, after the facilities and programs are implemented, consideration should be given to extending the volunteer circle. Items like exhibit preparation, interpretive docents, guided walks, trail maintenance and signage, erosion control, publications and program design could be handled by the following types and groups:

- teachers and college professors during their summer vacation
- scouts and other youth-oriented groups needing service assignments
- weekend court work crews
- student research projects

Docents are individuals with the ability to conduct groups in particular program areas. Although usually well-qualified in a particular subject matter, such instructors should be provided with an intense, in-depth training in the specific program activity for Sycamore Canyon Wilderness Park. In return they should make a commitment to give a specific amount of time to helping "educate" others.

7.1.8 Realm of Assistance *(Prepared by CDH)*

A proper staff will have all of the right connections and know where to get the correct answers to provide the most technologically advanced resource management tools. The concept of an environmental educational facility is not new and there is a wealth of information and existing programs to use as a springboard. Some of these sources include, but are not limited to:

- Kern County School Districts Environmental Education Program (Montana de Oro State Park, California)
- Clemmie Gill School of Science and Conservation (Scicon) (Tulare Co.)
- California Wildlife Defenders
- Association of Interpretive Naturalists
- Nolde Forest Environmental Educational Center (Pennsylvania)
- Student Conservation Program (New Hampshire)
- Western Regional Environmental Education Council (Colorado)
- Outdoor Biological Instructional Strategies (Berkeley, California)
- Educational Facilities Laboratories (New York)
- U.S. Department of Energy Education Division (Washington, D.C.)
- Minnesota Environmental Sciences Foundation, Inc.
- Environmental Action Coalition (New York)
- National Wildlife Federation
- Federation of Ontario Naturalists (Canada)

Establishing contact and possibly a working relationship with one or more of the above

mentioned organizations will be beneficial in constructing a dynamic outline which can be adapted to fit the unique needs of Sycamore Canyon Wilderness Park. The creation and establishment of this informational network will provide the needed foresight in preparing for the park's future. Time flexibility, resourcefulness, and visionary forecasting will be critical elements needed to sustain, restore, and enhance Sycamore Canyon Wilderness Park.

7.1.9 Operation Evaluation *(Prepared by CDH)*

The operational policies of the Park should be general enough to cover all anticipated problems. Hazards should be identified and corrective measures should be defined to reduce the impact to the visitor or employee.

Employees should be aware of and constantly alert to potential hazards in all areas inclusive of those not necessarily designated for visitors. A risk evaluation system should be developed consisting of the following "hazard classes":

- those likely to cause permanent disability or loss of life
- those likely to cause temporary injury, illness, or property damage, and
- those likely to cause minor injury or nondisruptive property damage.

Operation evaluations, like program evaluations, should be an element of the management system and include:

- entry and facility use fees, - uniform procedures
- assessing management of staffing and operating budget
- assessment of protection of natural and cultural resources
- assessment of visitor services and program direction
- common resource inventory and workload factors

7.2 Economic Summary

The following tables itemize the costs for various management activities described in Section 3.0 of this report. The SKR and CSS management costs will be funded by the $500,000 non-wasting endowment established by the RCHCA. The fire safety management costs will need to be covered by some other funding source, such as the City of Riverside General Fund.

Adaptive management strategies will only be implemented at Sycamore Canyon Wilderness Park when baseline management practices fail to maintain the Stephens' kangaroo rat and the Coastal California gnatcatcher populations above acceptable limits and are therefore not included in the economic summary for management activities. Due to their sporadic use, it is difficult to determine when funding would be needed to implement the adaptive management strategies and how much funding would be necessary. These strategies should be funded by the City of Riverside General fund or by some other funding source.

7.2.1 SKR Management Costs

	Rate/Hour	Hours	Cost
Spring Vegetation Monitoring			
Biologist	$100.00	55	$5,500.00
Assistant	$ 35.00	42	$1,470.00
Sub-Total			**$6,970.00**
Fall SKR Burrow Count Monitoring			
Permitted SKR Biologist	$100.00	33	$3,300.00
Assistant	$45.00	20	$900.00
Sub-Total			**$4,200.00**
SKR Management (Mowing/ Burning / Grazing)			
(Max. 85 acres treated/Yr.)			
Reserve Manager	$35.00	11	$ 385.00
Park Maintenance Worker 2[1]	$30.00	88	$2,640.00
Equipment[2] (Walk-Behind Brush Mower)	L.S.		$600.00
Sub-Total			**$ 3,625.00**
Sub-Total SKR Management			**$14,795.00**

7.2.2 Annual Fire Safety Management Costs

	Rate	Hours	Cost / Acre	Sub-Total	Total
1. Weed Whip 30' wide section along Canyon Crest & Sycamore Canyon Blvd.					
(Polygons # 3.2B & 4.1A-1) - 8 Acres					
Park Maintenance Worker 1	$25.00	60	$187.50		$1,500.00
2. Apply Fire Retardant to 30' wide section along Central Ave.					
(Polygon 2.2B) - 1 Acre					
Park Maintenance Worker 2	**Lump Sum**	**n/a**	**$1,300.00[3]**		**$1,300.00**
3. Weed Whip 30' wide strip adjacent to housing at northwest boundary					
(Polygons 2.4A & 3.4A) - 4.24 Acres					
Park Maintenance Worker 1	**$25.00**	**33**	**$187.50**		**$825.00**
4. Mow 100' wide strip along northeast boundary					
(Polygon 1.4A & 2.4-1) - 18.4 Acres					
Park Maintenance Worker 2	**$30.00**	**25**	**$35.70**		**$750.00**
5. Depending on fuel load, one of the following treatments may be executed each fire season					
a. Mow 50' wide strip north of gas pipeline maintenance road, south to property edge					
(Polygons 2.1A, 6.1A & 7.4A)) - 81 Acres					
Park Maintenance Worker 2	$30.00	85	$30.00	$2,550	
b. Mow 75' wide strip on each side of the Powerline Road and the Vista Overlook Road					
(Polygons 2.1A & 3.1A) - 27.5 Acres					
Park Maintenance Worker 2	$30.00	30	$30.00	$900.00	
c. Mow 100' wide strip along east edge of riparian zone and east edge of MU1 ridge.					
(Polygons 1.3A & 2.3A) - 30.5 Acres					
Park Maintenance Worker 2	$30.00	32	$30.00	$960.00	

Total Annual Fuel Modifications Management Actions -Minimum	**$3,625.00**
Total Annual Fuel Modifications Management Actions- Maximum	**$6,175.00**

7.3 SKR Endowment Investment Options

There are numerous options available for investing the $500,000 non-wasting SKR endowment established by the RCHCA. Three scenarios have been explored which examine different annual interest rates and options for initial re-investment of possible income. A non-wasting endowment assumes that only the interest earned from the endowment will be spent. The original SKR endowment, therefore, can continue to grow and support the intended SKR reserve management while staying ahead of the inflation rate. These scenarios were created by calculating $16,000 as the minimum annual cost of managing SKR Habitat at Sycamore Canyon Wilderness Park. All three scenarios assume an inflation rate of 2.75%.

The first scenario assumes the SKR endowment will be invested by Riverside County with an annual interest rate of 4.75%. Based on this interest rate, and subtracting the 2.75% which needs to be reinvested to keep pace with inflation, the rate of return is 2%. This rate of return is too low to fund the minimum annual cost of managing the park within 15 years. Even when the entire interest earned is re-invested for the first five years, and withdrawals from the endowment are not made until the sixth year of investment, funding ultimately is not adequate.

The second scenario invests the SKR endowment funds with the City of Riverside at an interest rate of 6.0% and a return rate, after adjusting for inflation, of 3.25%. This higher rate of return allows for the minimum annual management to begin during the first year of investment. The income withdrawal also keeps pace with the rate of inflation.

The third scenario also assumes investment of the SKR endowment with the City of Riverside at an interest rate of 6% and a net rate of return of 3.25%. However, this scenario differs from scenario #2 in that it reinvests the possible income withdrawal for the first five years of investment. The SKR endowment surplus after 15 years totals a little over $7,500.00annually, compared to the endowment surplus of $565.23 annually with scenario #2.

Recommendation:
It is recommended that the City of Riverside initiate discussions with the RCHCA to implement Endowment Investment Scenario #3 as soon as possible. This scenario provides for and an adequate annual surplus which can be re-invested or as an adaptive investment tool in the case of extremely high annual inflation rates.

1. SKR Endowment Investment Scenario #1

Assumptions:
1. Endowment Invested by Riverside County
2. Interest Rate: 4.75% Inflation Rate: 2.75% Net Return Rate: 2.0%
3. Endangered Species Minimum Annual Management Cost: $ 16,000 (1998 dollars)
4. Re-invest entire interest earned for years 1 through 5, no funds from this source spent on management until year 6.

Year	Endowment Balance	Interest Earned @ 4.75%	Interest Re-invested @ 4.75%	Possible Income Withdrawal @ 2.0%	Inflated Annual Management Costs @ 2.75%	Endowment Surplus/(deficit)
1	500,000.00	23,750.00	23,750.00	-	16,000.00	-
2	523,750.00	24,878.13	24,878.13	-	16,440.00	-
3	548,628.13	26,059.84	26,059.84	-	16,892.10	-
4	574,687.96	27,297.68	27,297.68	-	17,356.63	-
5	601,985.64	28,594.32	28,594.32	-	17,833.94	-
6	630,579.96	29,952.55	16,554.61	12,611.60	18,324.37	(5,712.77)
7	647,134.56	30,738.89	17,340.95	12,942.69	18,828.29	(5,885.60)
8	664,475.51	31,562.59	17,796.20	13,289.51	19,346.07	(6,056.56)
9	682,271.71	32,407.91	18,273.08	13,645.43	19,878.09	(6,232.65)
10	700,544.79	33,275.88	18,762.47	14,010.90	20,424.74	(6,413.84)
11	719,307.26	34,167.09	19,264.98	14,386.15	20,986.42	(6,600.27)
12	738,572.24	35,082.18	19,780.95	14,771.44	21,563.54	(6,792.10)
13	758,353.19	36,021.78	20,310.74	15,167.06	22,156.54	(6,989.48)
14	778,663.93	36,986.54	20,854.71	15,573.28	22,765.85	(7,192.57)
15	799,518.64	37,977.14	21,413.26	15,990.37	23,391.91	(7,401.53)

The above investment scenario depicts the inability of funding a minimum management program in 15 years. The low "rate of return" does not allow the "possible income withdrawal" amount to reach the needed minimum "inflated annual management costs" within the 15 year period.

2. SKR Endowment Investment Scenario #2

Assumptions:
1. Endowment Invested by the City of Riverside
2. Interest Rate: 6.0% Inflation Rate: 2.75% Net Return Rate: 3.25%
3. Endangered Species Minimum Annual Management Cost: $ 16,000 (1998 dollars)

Year	Endowment Balance	Interest Earned @ 6.0%	Interest Re-invested @ 6.0%	Possible Income Withdrawal @ 3.25%	Inflated Annual Management Costs @ 2.75%	Endowment Surplus
1	500,000.00	30,000.00	14,000.00	16,250.00	16,000.00	250.00
2	514,000.00	30,840.00	14,400.00	16,705.00	16,440.00	265.00
3	528,400.00	31,704.00	14,811.90	17,173.00	16,892.10	280.90
4	543,211.90	32,592.71	15,236.08	17,654.39	17,356.63	297.75
5	558,447.98	33,506.88	15,672.94	18,149.56	17,833.94	315.62
6	574,120.92	34,447.26	16,122.88	18,658.93	18,324.37	334.56
7	590,243.80	35,414.63	16,586.33	19,182.92	18,828.29	354.63
8	606,830.14	36,409.81	17,063.74	19,721.98	19,346.07	375.91
9	623,893.87	37,433.63	17,555.54	20,276.55	19,878.09	398.46
10	641,449.42	38,486.96	18,062.23	20,847.11	20,424.74	422.37
11	659,511.64	39,570.70	18,584.28	21,434.13	20,986.42	447.71
12	678,095.93	40,685.76	19,122.21	22,038.12	21,563.54	474.57
13	697,218.14	41,833.09	19,676.55	22,659.59	22,156.54	503.05
14	716,894.69	43,013.68	20,247.84	23,299.08	22,765.85	533.23
15	737,142.52	44,228.55	20,836.65	23,957.13	23,391.91	565.23

The above scenario depicts the feasibility of funding a minimum management program in the first year with a slight "endowment growth" to assist in contingency funding needs. This scenario also sufficiently covers the minimum management costs adjusted for yearly inflation.

3. SKR Endowment Investment Scenario #3

Assumptions:

1. Endowment Invested by the City of Riverside
2. Interest Rate: 6.0% Inflation Rate: 2.75% Net Return Rate: 3.25%
3. Endangered Species Minimum Annual Management Cost: $ 16,000 (1998 dollars)
4. Re-invest entire interest earned for years 1 through 5, no funds from this source spent on management.
5. Begin funding Endangered Species Management from this funding source in year 6.

Year	Endowment Balance	Interest Earned @ 6%	Interest Re-invested @ 6.0%	Possible Income Withdrawal @ 3.25%	Inflated Annual Management Costs @ 2.75%	Endowment Surplus
1	500,000.00	30,000.00	30,000.00	-	16,000.00	-
2	530,000.00	31,800.00	31,800.00	-	16,440.00	-
3	561,800.00	33,708.00	33,708.00	-	16,892.10	-
4	595,508.00	35,730.48	35,730.48	-	17,356.63	-
5	631,238.48	37,874.31	37,874.31	-	17,833.94	-
6	669,112.79	40,146.77	21,822.39	21,746.17	18,324.37	3,421.79
7	694,356.97	41,661.42	22,833.12	22,566.60	18,828.29	3,738.31
8	720,928.41	43,255.70	23,909.63	23,430.17	19,346.07	4,084.10
9	748,922.14	44,935.33	25,057.24	24,339.97	19,878.09	4,461.88
10	778,441.26	46,706.48	26,281.74	25,299.34	20,424.74	4,874.60
11	809,597.61	48,575.86	27,589.44	26,311.92	20,986.42	5,325.51
12	842,512.55	50,550.75	28,987.21	27,381.66	21,563.54	5,818.11
13	877,317.88	52,639.07	30,482.53	28,512.83	22,156.54	6,356.29
14	914,156.70	54,849.40	32,083.56	29,710.09	22,765.85	6,944.25
15	953,184.50	57,191.07	33,799.16	30,978.50	23,391.91	7,586.59

The above scenario depicts funding a minimum management program in the 6th year with an "endowment growth" after 15 years of over $7,500.00. This scenario also sufficiently covers the minimum management costs adjusted for yearly inflation.

1. Maximum of 88 acres treated per year at $30.00 / acre. Costs determined using the most expensive of the three techniques.

2. Cost amortized over 5 years

3. Based on an application cost of $3.00/gallon with 2 gallons of retardant required for every 100 square feet.

SECTION 8.0
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8.2.2 AERIAL PHOTOS UTILIZED

Date	Photo Number	Flight	Agency
4/30/52	17686: 1-20, 1-21	County	Riverside County Flood Control District
6/11/52	16-3125	Roll 2	U.S. Geological Survey
4/16/66	1-29, 1-70	GS-VBNF	U.S. Geological Survey
5/24/74	159	County	Riverside County Flood Control District
10/30/80	6-87, 6-77	GS-VEZS	U.S. Geological Survey
2/07/84	1521, 1522, 152-3, 1484, 1485	County	Riverside County Flood Control District
7/28/85	353-74	331606 HAP 84F (Color Infrared)	U.S. Geological Survey

8.2.3 Organizations and Individuals Contacted

Atwell, Joe; SR/WA; Metropolitan Water District of Southern California

Bachman, Dee; Director, City of Riverside Parks and Recreation Department

Bainbridge, Eldon; Bainbridge Development

Box, Bob; Mesa Public Schools, Mesa, Arizona

Brennan, Tina; Jurupa Unified School District, Curriculum

Cianci, Al; Park Supervisor, City of Riverside Parks and Recreation Department

Clem, Tom; Riverside County Flood Control and Water Conservation District

Clinton, Phil; Riverside City Fire Marshall

Dangermond, Peter; Dangermond & Associates, Inc.

Davis, Hester; Arkansas Archaeological Survey, Fayetteville

Ellis, Don; J.F. Davidson Associates

Estrada, Alex; Lusk Company

Falco, Kathleen; Administrative Assistant, City of Riverside Parks and Recreation Dept.

Gershon, Sam; Civil Engineer, Webb Assoicates

Griffin, Liz; Concordia Development

Hall, Chuck; Riverside City Police

Hanson, David; Western Municipal Water District

Hawkins, Nancy; Department of Culture, Recreation and Tourism, Baton Rouge, Louisiana

Hazard, Norwood; Curriculum Specialist, Riverside County Educational Office -Science

Hickman, Greg; Wildlife Care Consultant, ROP North - Orange County

Hileman, Liane; Friends of Sycamore Canyon

Jenkins, Dirk; City of Riverside Planning Department

Johnson, John; City of Riverside Electrical

Johnson, Robert L.; Park Projects Coordinator, City of Riverside Parks and Recreation Department

Jordan, John; Civil Engineer., Webb Associates

Kamrath, Hans; City of Riverside Public Works Department

Kaupp, Ann; Department of Anthropology, Smithsonian Institution

Kraisoski, Bill; City of Riverside Public Works Department

LaPre, Larry; Tierra Madre Consultants

McCarthy, Daniel; Archaeological Research Unit, UC Riverside

McFarland, Linda; Park Ranger, Santiago Oaks, Orange County Parks and Recreation Dept.

McKinney, Bill; Caltrans, Traffic Division

Merrin, Larry; State Department of Health Services

Morephew, Lynn; GTE Sprint, San Francisco construction office

Nash, Susan; President, Friends of Sycamore Canyon

Nielsen, Terry; Parks Superintendent, City of Riverside Parks and Recreation Department

Omohundro, W.; Riverside County Office of Education

Pecis, Joe; Riverside Region, California Department of Fish and Game

Pidot, Ron; Riverside City Museum - Educational Services

Pilcher, Kathy; Riverside Unified School District - Curriculum K-12

Plam, Joan; City of Riverside Planning Department

Presley, Robert; Senator, State of California

Right, Kathy; Alvord Unified School District - Curriculum

Riverside, City of, Public Utility Department

Riverside City College - Natural Sciences Department

Riverside Transit Agency

Sams, Evelyn; City of Riverside Chamber of Commerce

Santa Ana Zoo

Simmons, Jodi; Tucson Unified School District, Tucson, Arizona

Southern California Gas Company, Planning Department

Staley, Frederick; College of Education, Arizona State University

Sweeney, Linda; Friends of Sycamore Canyon

Underground Service Agency (formerly Southern Pacific Pipe Line)

White, L.; California Natural Diversity Data Base; California Dept. of Fish and Game.

Wilke, Philip J.; Archaelological Research Unit, UC Riverside

Willis, Lucinda; JF Davidson and Associates

Winters, Faye; Wildrife Biologist

Woosher, Linda; Moreno Valley Unified School District Curriculum

Young, Jann; Director of Interpretive Services, Riverside County Parks Department

Zomorrodian, Kazem.; Southland Engineering

9.1 Appendix for Fire Safety Management

9.1.1 Fire Resistant Tree and Plant List

Botanic Name	Common Name	Type	Remarks
Alnus rhombifolia	White Alder	Tree	30 -50' Height
Arbutus unedo	Strawberry Tree	Tree	
Ceratonia siliqua	Carob	Tree	
Cercidium floridum	Blue Palo Verde	Tree	
Cercis occidentalis	western redbud	Tree	
Heteromeles arbutifolia	Toyon	Shrub	*see below
Juglans californica	California black walnut	Tree	not drought tol.
Parkinsonia aculeata	Mexican Palo Verde	Tree	
Pittosporum undulatum	Victorian Box	Tree	
Platanus racemosa	California Sycamore	Tree	Moist areas
Prunus caroliniana	Carolina Cherry Laurel	Shrub/Tree	
Prunus lyonii	Catalina Cherry	Shrub/Tree	
Quercus agrifolia	Coast live oak	Tree	Oak woodland
Quercus dumosa	California scrub oak	Shrub	* see below
Quercus engelmannii	Engelmann Oak	Tree	
Quercus lobata			
Quercus suber	Cork oak	Tree	
Rhamnus californica	Coffee berry	Shrub	drought tolerant
Rhus integrifolia	Lemonade berry	Shrub	* see below
Rhus lancea	African sumac	Tree	25 ft. in height
Rhus laurina	Laurel sumac	Shrub	
Robinia species	locust	Tree	
Sambucus mexicana	Mexican elderberry	Tree	drought tolerant
Umbellularia californica	California laurel	Tree	

Notes

* May be trimmed into a tree.

9.1.2. Glossary Of Terms for Fire Management Plan

Abatement: Actions to avoid, minimize, reduce, eliminate, or rectify the adverse impacts of a fire protection management practice.

Abatement Measure: Measures proposed that would eliminate, avoid, rectify, compensate for or reduce negative environmental effects.

Anchor Point: An advantageous location, generally a fixed location, from which to start constructing a fuelbreak, fuel modification area or "*defensible* space".

Conflagration: A raging, destructive fire. Often used to describe a fire burning under extreme fire weather. The term is also used when a wildland fire burns into a wildland/urban interface, destroying many structures.

Dead Fuel Moisture: Dead fuel moisture is the moisture content in fuel material that is dead and is measured as the percentage of moisture to total weight. Dead fuel moisture is changed by the moisture content of air and usually described in four specific different time lag periods. Time lag is the time it takes for the moisture content of fuels and the surrounding air to equalize. These time lag periods are 1-hr, 10-hr, 100-hr and 1000-hr:

1-Hour. One-hour fuels are those which will react to atmospheric changes in one hour. They are those pieces of vegetation which are ¼-inch in diameter and smaller (grasses, needles and twigs).

10-Hour. Ten-hour fuels are those which will react to atmospheric changes in ten hours. Those pieces of vegetation ¼-inch to 1-inch in diameter are in the 10-hour class (leaves, stems, large twigs).

100-Hour. 100-hour fuels are larger, and react to atmospheric changes in 100 hours. 100-hour fuels are classified as fuels in the one-inch to three-inch diameter size (large limbs and small logs usually found in riparian and small tree areas).

1000-Hour. 1000-hour fuels are dead and down logs and limbs in the three-inches to 12-inches in diameter category. These fuels will take 1000 hours of exposure to change the dead fuel moisture content either upward or downward.

Defensible Space: Defensible space refers to that area, between a structure and an oncoming wildfire, where the native vegetation has been modified to reduce the wildfire threat. This area is designed to provide an opportunity for firefighters to safely maneuver hoselines and defend the structure.

Edge: Area where plant communities meet or where successional stages or vegetation conditions within plant communities come together.

Extreme Fire Behavior: "Extreme" implies a level of wildfire behavior characteristics that ordinary precludes any method of direct control action. One or more of the following is usually involved: fast rates of wildfire spread, prolific crowning and/or spotting, presence of fire whirls, a

strong convection column. Predictability is difficult because such fires often exercise some degree of influence on their environment and behave erratically.

Extreme Fire Weather (Santa Ana, Sundowner): Hot and dry weather typified by strong north easterly to easterly winds and associated with very low relative humidity. Winds often produce strong down-canyon winds that lead to erratic fire behavior, including fire whirls and intense spotting.

Fire Behavior: The manner in which a fire reacts to the variables of fuel, weather, and topography. Usually expressed in fire intensity (BTU's per square foot), rate of spread (feet per minute), and flame length (in feet).

Fire Brands: Pieces of burning building or vegetation that can be potential source of forward fire ignition (spotting) after transport by wind.

Fire Hazard: A fuel complex defined by kind, arrangement, volume, condition and location that determines the degree of both ease and difficulty to suppress a wildfire.

Management Unit (MU): A wildfire protection zone that has common; vegetation, topographic features, expected fire behavior, and values at risk to wildfire.

Fire Prevention: Activities directed at reducing the number of fires that start; including public education, law enforcement and engineering methods to reduce fire risk.

Fire Resistant Roofing: The classification of Roofing assemblies A, B, or C as defined in the Uniform Building Code (UBC) Standard 32.7.

Fire Risk: The chance of a fire starting as affected by the nature and incidence of causative agents (Smoking, children with matches, equipment, electrical transmission lines, vehicle or arson caused fires).

Fire-Resistive Construction: Construction to resist the spread of fire, details of which may be specified in the Building Code of the jurisdiction. Usually described in 2-hour and 4-hour time increments.

Fire Response Time: The time for a fire apparatus and crew to arrive at a fire, pull hose and begin squirting water.

Fire Weather: Weather conditions, which influence fire starts, fire behavior, or fire suppression.

Foehn Wind: (A German word pronounced "Fern") Winds created by a well established high pressure system over the Great Basin states and a low-pressure system off Baja, California. Often referred to as Santa Ana's, Santana, Devil Winds, Diablo Winds, or north eastern.

Fuelbreak: A strategically placed fuel modification or fuel reduction area or zone to defend from oncoming wildfires. Fuelbreaks are usually 100 feet or more in width. Hazardous fuels are replaced with less fire intensive fuels (like grass or thinned, less fire intensive vegetation.) A fuelbreak divides fire-prone areas into smaller parcels for easier fire control and to provide both access and a safety zone for fire suppression personnel.

Fuels (Vegetation) Management: Modification of natural vegetation in open space, along wildland/urban interface or intermix areas to enhance protection from wildland fires for

structures and open space sensitive areas. This modification consists of selected techniques to reduce fuel loading, fuel bed continuity, dead and decadent vegetation. Limbing up and thinning of larger native shrubs or trees may be included in key strategic areas. Strategic, rather than full, implementation is utilized to maximize fire protection and minimize environmental impacts.

Fuel Model: A quantitative basis for rating fire danger in different types of vegetation, and predicting fire behavior through established mathematical models.

Fuel Moisture: The quantity of water in a fuel particle expressed as a percent of the oven dry weight (212 degrees Fahrenheit) of the fuel particle.

Habitat: The sum of environmental conditions of a specific place that is occupied by an organism, a population, or a community.

Impacts: The environmental change (both negative and positive) or consequences of an fire related activity.

Mid-Flame Wind Speed: The standard height for wind measurements used by land management agencies is twenty-feet above the ground surface, adjusted for vegetation depth. Most fires in surface fuels burn below the 20-foot height, and since wind is slowed significantly by friction near the surface, the 20-foot wind speed must be adjusted downward. Research has shown that a 30% to 60% adjustment depending on the fuel model type will be required, and this adjusted wind speed is called the **mid-flame wind speed.**

Prescribed Fire: The use of fire, as a management tool, to meet natural resource and structure protection objectives. Ignition is performed by skilled fire managers and takes place only after a thorough fire prescription and environmental assessments have been made.

Riparian Area: Land situated along the bank of a stream, water course or other body of water. Land directly influenced by the presence of water, e.g., stream sides, lake shores, etc. Strategic fire protection design often incorporates riparian areas in their natural state to provide low fire intensity fuelbreaks where applicable. Riparian areas make excellent wildlife corridors.

Setback: A minimum distance required by zoning to be maintained between two structures or between a structure and the property line.

Stubble Management: The act of reducing grass and forbs to a 4 inch stubble height or lower. Techniques include: animal grazing, mowing (tractor and hand), weed-whipping and/or strip burning.

9.2 Appendix for Natural Resources

9.2.1 Checklist of Plants

Plants found within the Sycamore Canyon Wilderness Park, January 1997.
G = non-native grassland; S = shrubland; RO = rock outcrops; D/R = drainage or riparian.

FAMILY/SPECIES	COMMON NAME	HABITAT TYPES			
		G	S	RO	D/R
Anacardiaceae					
Schinus molle	Pepper Tree	X			
Araceae					
Washingtonia filifera	California fan palm				X
Apiaceae					
Apiastrum angustifolium	Wild Celery				X
Asteraceae					
Artemisia californica	California Sagebrush	X	X		
Artemisia ludoviciana	Silver Wormwood				X
Baccharis salicifolia	Mule Fat				X
Baccharis sarothroides	Broom Baccharis				X
Brickellia californica	Brickellbush			X	
Conyza canadensis	Horseweed	X			
Encelia farinosa	Brittlebush		X		
Ericameria palmeri	Palmer's Goldenbush		X		
Eriophyllum confertiflorum	Flat-topped Golden Yarrow		X		
Filago californica	California Filago	X			
Gutierrezia californica	California Matchweed		X		
Hazardia squarrosus	Saw-toothed Goldenbush				X
Helianthus annuus	Western Sunflower	X	X		
Hemizonia fasciculata	Fascicled Tarweed	X			
Hemizonia paniculata	San Diego Tarweed	X	X		
Heterotheca grandiflora	Telegraph Weed	X			X
Hypochaeris glabra	Smooth Cat's Ear	X			
Lasthenia californica	Goldfields	X			
Lepidospartum squamatum	Scalebroom				X
Lessingia filaginifolia	California-Aster	X	X		
Stephanomeria virgata	Tall Stephanomeria		X		
Tetradymia comosa	Cotton-Thorn	X	X		
Boraginaceae					
Amsinckia menziesii	Yellow Fiddleneck	X			
Pectocarya linearis	Slender Pectocarya	X			
Plagiobothrys collinus	California Popcorn Flower	X			

Checklist of Plants, continued

FAMILY/SPECIES	COMMON NAME	HABITAT TYPES			
		G	S	RO	D/R
Brassicaceae					
Hirschfeldia incana	Perennial Mustard	X			
Cactaceae					
Opuntia basilaris	Beavertail Cactus				X
Opuntia parryi	Cane Cholla	X			
Caprifoliaceae					
Sambucus mexicana	Blue Elderberry			X	X
Chenopodiaceae					
Atriplex canescens	Fourwing Saltbush				X
Atriplex lentiformis	Big Saltbush				X
Convolvulaceae					
Calystegia macrostegia	Finger-leaf Morning Glory				X
Crassulaceae					
Crassula connata	Sand Pygmy-weed	X			
Dudleya lanceolata	Live-Forever				X
Cucurbitaceae					
Cucurbita foetidissima	Calabazilla	X			X
Marah macrocarpus	Wild Cucumber	X	X	X	
Cupressaceae					
Juniperus californica	California Juniper	X	X		X
Cyperaceae					
Scirpus sp.	Tule				X
Euphorbiaceae					
Chamaesyce albomarginata	Rattlesnake Weed	X			
Croton californicus	California Croton				X
Eremocarpus setigerus	Dove Weed	X	X		
Fabaceae					
Astragalus pomonensis	Pomona Rattle-weed	X			
Lotus scoparius	California Broom	X	X		

FAMILY/SPECIES	COMMON NAME	HABITAT TYPES			
		G	S	RO	D/R
Fabaceae (Continued)					
Lotus strigosus	Bishop's Lotus	X			
Lupinus bicolor	Miniature Lupine	X			
Lupinus hirsutissimus	Stinging Lupine		X		
Geraniaceae					
Erodium botrys	Long-beaked Filaree	X			
Erodium cicutarium	Red-stemmed Filaree	X	X		
Erodium moschatum	White-stemmed Filaree	X			
Hydrophyllaceae					
Eucrypta chrysanthemifolia	Common Eucrypta				X
Nemophila menziesii	Baby Blue-eyes		X		
Phacelia distans	Common Phacelia		X		
Lamiaceae					
Marrubium vulgare	Horehound	X			
Salvia apiana	White Sage	X	X		
Salvia columbariae	Chia	X	X		
Salvia mellifera	Black Sage	X	X		
Liliaceae					
Dichelostemma pulchella	Blue Dicks	X			
Malvaceae					
Malacothamnus fasciculatus	Chaparral Mallow		X		X
Nyctaginaceae					
Mirabilis californica	Wishbone Bush	X		X	
Oleaceae					
Olea europaea	Mission Olive	X			
Oxalidaceae					
Oxalis pes-caprae	Bermuda Buttercup	X			
Platanaceae					
Platanus racemosa	Western Sycamore				X

Checklist of Plants, continued

FAMILY/SPECIES	COMMON NAME	HABITAT TYPES			
		G	S	RO	D/R
Poaceae					
Arundo donax	Giant Reed				X
Avena barbata	Slender Wild Oat	X	X		
Bromus diandrus	Ripgut Grass	X	X		X
Hordeum murinum	Mouse Barley	X			
Schismus barbatus	Mediterranean Schismus	X			
Vulpia myuros	Foxtail Fescue	X	X		
Polygonaceae					
Eriogonum fasciculatum	Leafy Buckwheat		X		
Rumex salicifolius	Willow Dock				X
Portulacaceae					
Calandrinia ciliata	Red Maids	X			
Claytonia perfoliata	Miner's Lettuce				X
Salicaceae					
Populus fremontii	Fremont Cottonwood				X
Salix gooddingii	Goodding's Black Willow				X
Salix lasiolepis	Arroyo Willow				X
Scrophulariaceae					
Keckiella antirrhinoides	Chaparral Beard-Tongue		X		
Mimulus aurantiacus	Red Bush Monkey Flower			X	
Scrophularia californica	California Figwort			X	
Solanaceae					
Datura wrightii	Jimson weed				X
Nicotiana glauca	Tree Tobacco				X
Solanum xanti	Purple Nightshade		X		
Typhaceae					
Typha latifolia	Broad-leaved Cattail				X
Urticaceae					
Urtica dioica	Hoary Nettle				X

Nomenclature follows Hickman (1993).

9.2.2 Checklist of Vertebrates observed at Sycamore Canyon Wilderness Park, January 1997.

FAMILY/SPECIES	COMMON NAME
Amphibians and Reptiles	
Pelobatidae	
Bufo boreas	Western Toad
Hylidae	
Hyla regilla	Pacific Tree-frog
Iguanidae	
Sceloporus orcutti	Granite Spiny Lizard
Uta stansburiana	Side-blotched Lizard
Teiidae	
Cnemidophorus tigris	Western Whiptail
Birds	
Accipitridae	
Circus cyaneus	Northern Harrier
Buteo jamaicensis	Red-tailed Hawk
Aquila chrysaetos	Golden Eagle**
Falconidae	
Falco sparverius	American Kestrel
Phasianidae	
Callipepla californica	California Quail
Columbidae	
Zenaida macroura	Mourning Dove
Trochilidae	
Calypte anna	Anna's Hummingbird
Tyrannidae	
Sayornis saya	Say's Phoebe

FAMILY/SPECIES	COMMON NAME
Birds (Continued)	
Alaudidae	
Eremophila alpestris	Horned Lark
Corvidae	
Corvus corax	Common Raven
Troglodytidae	
Salpinctes obsoletus	Rock Wren
Muscicapidae	
Sialia mexicana	Western Bluebird
Laniidae	
Lanius ludovicianus	Loggerhead Shrike
Emberizidae	
Pipilo fuscus	Brown Towhee
Amphispiza belli	Sage Sparrow
Zonotrichia leucophrys	White-crowned Sparrow
Euphagus cyanocephalus	Brewer's Blackbird
Sturnella neglecta	Western Meadowlark
Fringillidae	
Carpodacus mexicanus	House Finch
Mammals	
Vespertilionidae	
Myotis californicus	California Myotis
Myotis yumanensis	Yuma Myotis
Pipistrellus hesperus	Western Pipistrelle
Eptesicus fuscus	Big Brown Bat
Antrozous pallidus	Pallid Bat

FAMILY/SPECIES	COMMON NAME
Mammals (Continued)	
Molossidae	
Tadarida brasiliensis	Brazilian Free-tailed Bat
Leporidae	
Sylvilagus audubonii	Desert Cottontail
Lepus californicus bennettii	San Diego Black-tailed Jack Rabbit[++]
Sciuridae	
Spermophilus beecheyi	California Ground Squirrel
Geomyidae	
Thomomys bottae	Botta's Pocket Gopher
Heteromyidae	
Chaetodipus fallax fallax	Northwestern San Diego Pocket Mouse[++]
Dipodomys stephensi	Stephens' Kangaroo Rat[+,*]
Muridae	
Peromyscus maniculatus	Deer Mouse
Neotoma lepida intermedia	San Diego Desert Woodrat[++]
Neotoma fuscipes	Dusky-footed Woodrat
Microtus californicus	California Vole
Canidae	
Canis latrans	Coyote
Urocyon cinereoargenteus	Gray Fox

[+] Federally-listed Endangered

[*] State-listed Threatened

[++] Federal Category 2 Candidate (USFWS, 1994)

Nomenclature follows AOU (1983), Jennings (1983), Jones et al. (1982);*Chaetodipus* = *Perognathus* (Hafner and Hafner 1983).

9.2.3 Regional Seismic Activity

Potential Causative Earthquake Fault	Closest Distance from Fault to Site	Length of Fault (Notes 1 and 2*)	Richter Magnitude of Historical Earthquake	Approximate Age of Most Recent Surface Displacement	Maximum Credible Event			Maximum Probable Earthquake (Design Earthquake)		
					Richter Magnitude	Mean Estimated Recurrence Interval In Years	Richter Magnitude (Note 9)	Peak Horizontal Ground Acceleration at Site (Note 4) (Fraction of Gravity)	Predominant Period at Site (Note 5)	Duration of Strong Shaking at Site (Note 6) (In seconds)
San Andreas Fault (South of Garlock Fault)	15 mi 25 km	500 km 310 mi	8.25+ (1857) 6.5 (1948)	Historic (1857 and 1948)	8.5 (Note 11)	MB=125-225 (Note 7)	8.3	0.42 (0.27)	0.42	31
San Jacinto Fault	7 mi 12 km	440 km 274 mi	7.0 (1899) 6.5 (1968)	Historic (1899 and 1968)	7.5 (Note 8)	M6=4-10 M7=40-100 M8=400-1000 (Note2)	7.2	0.47 (0.31)	0.34	27
Whitter-Elsinor Agua Caliente Fault	16 mi 12 km	260 km 162 mi	5.5 (1938) 6.0 (1910)	Historic (1910)	7.5 (Note 8)	M6=20-90 M7=200-900 M8=3000-9000 (Note 2)	6.7	0.24 (0.16)	0.30	18
Sierra Madre Fault - Cucamonga Fault	18 mi 30 km	100 km 62 mi (Note 3)	6.4 (1971)	Historic (1971)	7.0 (Note 3)	M7=5000 (Note 3)	6.5 (Note 3)	0.19 (0.12)	0.29	18

*Notes listed in Section 9.2.4

9.2.4 Notes from 9.2.3 (Regional Seismic Activity)

Note 1 Postulated maximum rupture length based on L/2 (maximum credible earthquake), and L/5 (maximum probable earthquake).

Note 2 After D. Lamar, 1973.

Note 3 After R. Crook, B. Kamb, C. Allen, M. Payne and R. Proctor, 1978.

Note 4 After Schanabel and Seed, 1973 in Greensfelder, 1974. The repeatable high ground acceleration (*), taken as 65 percent of the peak acceleration, for sites within 20+ miles of the epicenter (after Ploeseel and Slosson, 1974.) may be more applicable for design analysis.

Note 5 After Seed, ldress and Kiefer (1969).

Note 6 After Bolt (1973), in Leeds (1973).

Note 7 After Sieh (1981).

Note 8 After Greensfelder, 1974.

Note 9 After Albee and Smith, 1966 and after Bonilla, 1970, in Greensfelder 0 974).

Note 10 After Barrows, 1974.

Note 11 After Morton, Miller and Evans, 1976.

9.2.5 Geotechnical Hazards

GEOLOGIC PROBLEMS		DEGREE OF HAZARD OR PROBLEM				POSSIBLE MITIGATION MEASURES		
PROBLEM	ACTIVITY CAUSING PROBLEM	NONE	SLIGHT	MODERATE	SEVERE	CODE CONFORMANCE	CODE CONFORMANCE + SPECIAL WORK*	ADVANCE PLANNING, AVOIDANCE RESTRICTION
Earthquake Damage	Fault Movement		●				●	
	Liquefaction		●					●
	Landslides			●			●	●
	Differential Compaction/Seismic Settlement		●				●	
	Ground Rupture		●					
	Ground Staking			●	●		●	
	Tsunami	●						
	Seiches	●						
	Flooding (Dam or Levee Failure)		●					●
Loss of Mineral Resources	Loss of Access		●					●
	Deposits Covered by Changed Land Use		●					●
	Zoning Restrictions		●					●
Waste Disposal Problems	Change in Groundwater Level		●				●	
	Disposal of Excavated Material	●	●			●		
	Percolation of Waste Material			●	●	●		
Slope and/or Foundation Instability	Landslides and Mudflows		●				●	●
	Unstable Cut and Fill Slopes	●					●	
	Collapsible and Expansive Soil		●	●			●	
	Trench-wall Stability		●	●	●	●		
Erosion Sedimentation, Flooding	Erosion of Graded Areas		●				●	
	Alteration of Runoff		●	●			●	
	Unprotected Drainage Ways		●	●			●	●
	Increased Impervious Surfaces		●	●			●	●
Land Subsidence	Extraction of Groundwater, Gas Oil, Geotechnical Energy	●						
	Hydrocompaction, Peat Oxidation		●				●	
Volcanic Hazards	Lava Flow	●						
	Ash Fall	●						

9.2.6 CFG Ecological Reserve Regulations

FISH AND GAME COMMISSION
Title 14
Pages 307-308
July 1994

CHAPTER 11. ECOLOGICAL RESERVES

630 Ecological Reserves

The areas specified in this chapter have been declared by the Fish and Game Commission to be ecological reserves. A legal description of the boundaries of each ecological reserve is on file at the department's headquarters, 1416 Ninth Street, Sacramento. Ecological reserves are established to provide protection for rare, threatened or endangered native plants, wildlife, aquatic organism and specialized terrestrial or aquatic habitat types. Public entry and use of ecological reserves shall be compatible with the primary purposes of such reserves, and subject to the following applicable general rules and regulations, except as otherwise provided for in the special area regulations:

a. **General Rules and Regulations:**

1. **Protection of Resources.** No person shall mine or disturb geological formations or archeological artifacts or take or disturb any bird or nest, or eggs thereof, or any plant, mammal, fish, mollusk, crustacean, amphibian, reptile, or any other form of plant or animal life in an ecological reserve except as provided in subsections 630 (a) (2) and (a) (8). The department may implement enhancement and protective measures to assure proper utilization and maintenance of ecological reserves.
2. **Fishing.** Fishing shall be allowed in accordance with the general fishing regulations of the commission except that the method of taking fish shall be limited to angling from shore. No person shall take fish for commercial purposes in any ecological reserve except by permit from the commission.
3. **Collecting.** No collecting shall be done in an ecological reserve except by permit issued pursuant to section 650 of these regulations. Any person applying for a permit must have a valid scientific collecting permit issued pursuant to part 3 of this title.
4. **Motor Vehicles.** No person shall drive, operate, leave, or stop any motor vehicle, bicycle, tractor, or other type of vehicle in an ecological reserve except on designated access roads and parking areas.
5. **Swimming.** No person shall swim, wade, dive, or use any diving equipment within an ecological reserve except as authorized under the terms of a permit issued pursuant to subsection (3).
6. **Trails.** The department may designate areas within an ecological reserve where added protection of plant or animal life is desirable, and may establish equestrian or walking trails or paths within such designated areas. No person shall walk or ride horseback in such areas except upon the established trails or paths.
7. **Firearms.** No person shall fire or discharge any firearm, bow and arrow, air or gas gun, spear gun, or any other weapon of any kind within or into an ecological reserve or possess such weapons within an ecological reserve, except law enforcement personnel and as provided for in individual area regulations that allow for hunting.
8. **Ejection.** Employees of the department may eject any person from an ecological reserve for violation of any of these rules or regulations or for any reason when it appears that the general safety or welfare of the ecological reserve or persons thereon is endangered.
9. **Public Entry.** Public entry may be restricted on any area at the discretion of the department to protect the wildlife, aquatic life, or habitat. No person except state and

local law enforcement officers, fire suppression agencies and employees of the department in the performance of their official duties or person possessing written permission from the department, may enter any ecological reserve, or portion thereof, which is closed to public entry. No person may enter any Ecological Reserve between sunset and sunrise except with written permission from the Department, which may be granted for purposes including night fishing in accordance with subsection 630 (a) from designated shore areas only.

10. **Introduction of Species**. Unless authorized by the commission, the release of any fish or wildlife species, including domestic or domesticated species, or the introduction of any plant species, is prohibited. The department may reintroduce endemic species on ecological reserves for management purposes.
11. **Feeding of Wildlife**. The feeding of wildlife is prohibited.
12. **Pesticides**. The use of pesticides is prohibited on any ecological reserve unless authorized by the commission.
13. **Litter**. No person shall deposit, drop or scatter any debris on any ecological reserve except in a receptacle or area designated for that purpose. Where no designated receptacles are provided, any refuse resulting from a person's use of an area must be removed from that area by such person.
14. **Grazing**. The grazing of livestock is prohibited on any ecological reserve.
15. **Falconry**. Falconry is prohibited.
16. **Aircraft**. No person shall operate any aircraft or hovercraft within a reserve, except as authorized by a permit from the commission.
17. **Pets**. Pets, including dogs and cats, are prohibited from entering reserves unless they are retained on a leash of less than ten feet or are inside a motor vehicle.
18. **Fires**. No person shall light fireworks or other explosive or incendiary devices, or start or maintain any fire on or in any reserve, except for management purposes as provided in subsection (a) (1).
19. **Camping**. No person shall camp on/in any ecological reserve.
20. **Vandalism**. No person shall tamper with, damage or remove any property not his own when such property is located within an ecological reserve.

9.3 Appendix for Proposed Facilities

Analysis of the constraints and opportunities posed by the project site and the existing Conceptual Development Plan led to three alternative site locations for the Interpretive/Day-use Facility. Three alternatives were developed for the site at Kangaroo Court and one alternative each was developed for two other sites. The five alternatives explore a variety of parking and interpretive plaza locations. For advantages and disadvantages of each of these alternatives, refer to Figures A1-A5.

9.3.1 Alternative 1 for Interpretive / Day Use Facility (Figure A-1)

This site is located at the end of Kangaroo Court. The concept for this alternative is to minimize the amount of site disturbance by locating all facilities as close to the future paved turnaround as possible. In general this alternative would provide some cost savings by condensed facility siting, however the visitor, being in very close proximity to the proposed industrial development, would not experience any type of transition from a highly urban setting to the wilderness park experience. Views of the canyon are not possible from this alternative.

9.3.2 Alternative 2 for Interpretive / Day Use Facility (Figure A-2)

This site is located at the end of Kangaroo Court. Utilizing the parking and restroom/office structure option from Alternative 1, this alternative locates the interpretive plaza to the north side of the proposed picnic area in the existing olive grove. The cost associated with this option would be slightly higher than Alternative 1 due to providing electrical and water supply to the interpretive plaza. The visitor transitional experience from the industrial area to parking will be the same as Alternative 1, minimal, however the transition from parking to interpretive plaza will be improved to allow the visitor a progression towards a greater experience of the environmental setting. Slight views northwest across only the north portion of the park are possible with this option.

9.3.3 Alternative 3 for Interpretive / Day Use Facility (Figure A-3)

This site is located at the end of Kangaroo Court. Emphasizing the concept of creating the best visitor transition from industrial development to the wilderness park ecosystem is the objective of this alternative. Siting the parking lot approximately 250 feet within the park and the interpretive plaza an additional 500 feet from the parking provides a progressive transitional experience for the visitor from industrial to grassland primitive parking to interpretive plaza then on to the main overlook with splendid views of the majority of the park. Costs associated with this alternative would be slightly higher than Alternative 2 due to the additional gravel road and terrain sensitive parking design.

9.3.4 Alternative 4 for Interpretive / Day Use Facility (Figure A-4)

Located at the intersection of Canyon Crest Boulevard and Via Vista Drive, this alternative is located entirely off of City property. Due to the sites topographic limitations and the presence of a gas line valve facility, access and suitable land for development, the best location for an interpretive facility with the required elements is on the adjacent privately owned land. This area is commonly used as an entrance for park visitors and is heavily disturbed. Vehicular access to this site is dependent on the four-way signalization of the Canyon Crest Boulevard and Via Vista Drive intersection. A signal is essential to the safe ingress and egress of this site along this four lane section of roadway due to the speed of traffic and grade of Canyon Crest Boulevard. The parking of autos and buses in this design allows for separation of the two vehicles yet places both in close proximity to the pedestrian entrance. The following is a list of facilities planned for this alternative.

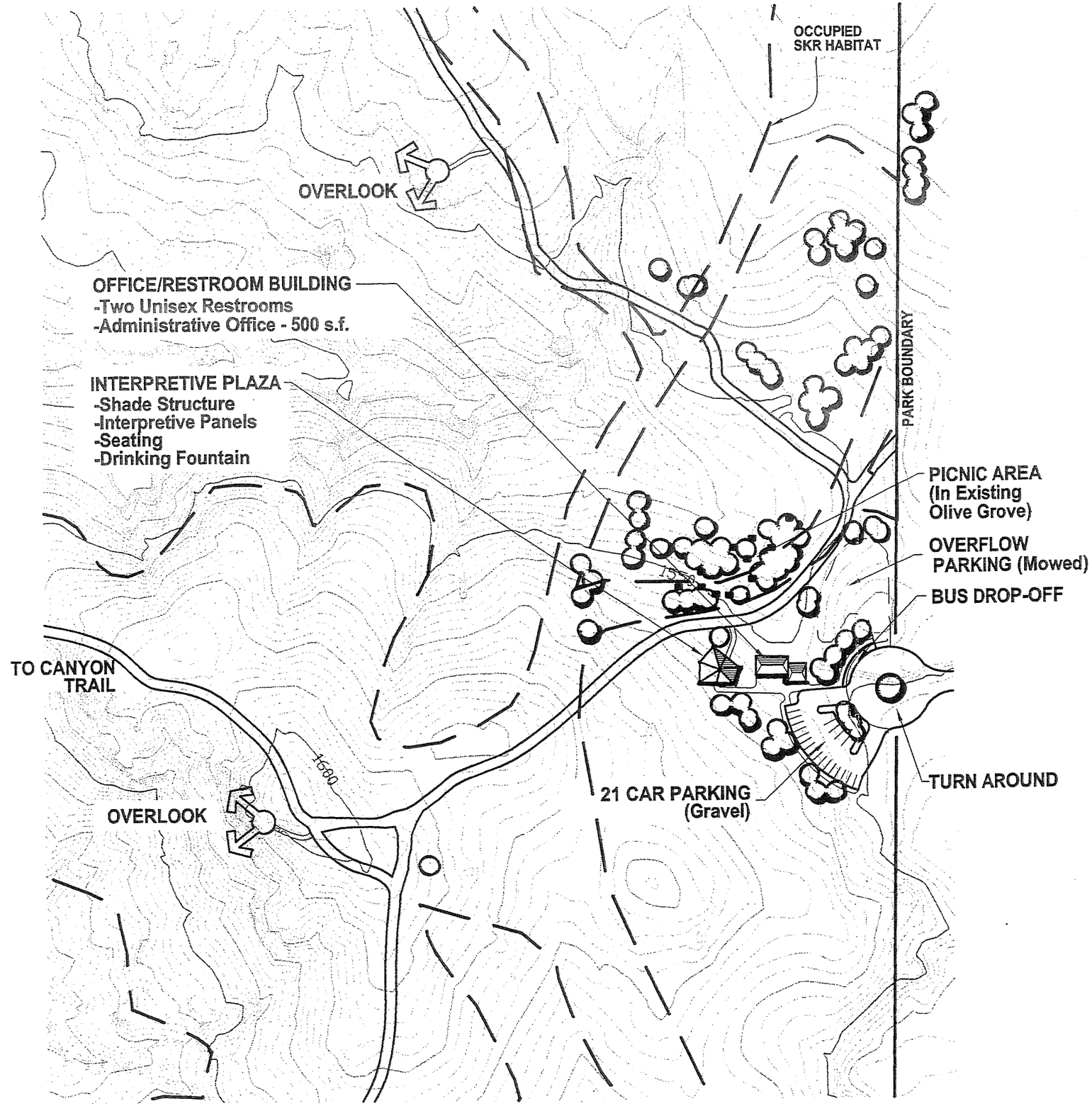
- 23 car gravel parking lot
- Bus loading and parking area (Auto overflow parking)
- 500 s.f. Office
- Two Unisex Restrooms
- Shaded Picnic Area
- Covered Interpretive Plaza
- Overlook Site

Cost of Alternative 5 would be comparable to the other alternatives located near roadways with a short entrance road and average parking efficiency.

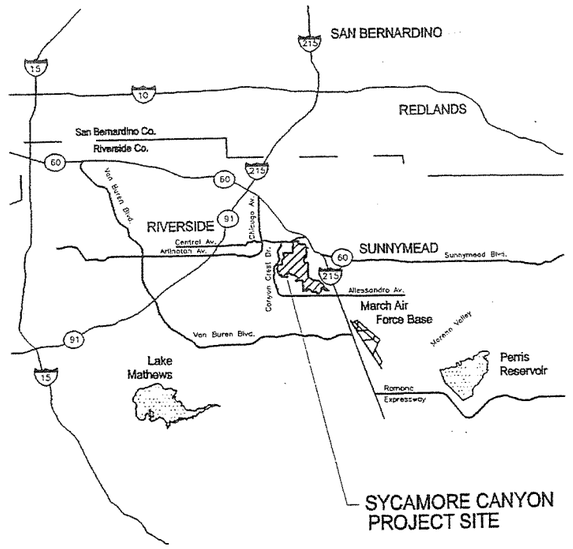
9.3.5 Alternative 5 for Interpretive / Day Use Facility (Figure A-5)

Taking advantage of a previously disturbed area presently used for parking by park visitors, this alternative is located off Central Avenue near Lockmoore Drive. This location is limiting in it's orientation and area for facility placement. The existing disturbed area is linear in shape and parallels Central Avenue to the North, limited by the park boundary to the West, and deep drainages to the East and South. The design of this alternative is very linear due to the previously mentioned site conditions. Included in this plan are 24 auto parking spaces, a bus loading area and bus parking. The bus parking area can also be utilized as auto overflow parking. As with the other alternatives, all of the parking areas and drives are gravel to reinforce the rural character of the park. The restroom and office buildings are placed to frame the visitors entrance to the interpretive plaza. Views from the interpretive plaza are limited due to the terrain of the surrounding hills. Due to it's compact nature, the cost of this alternative would be comparatively low. Following are the elements planned at this location:

- 24 car gravel parking lot
- Bus loading and parking area (Auto overflow parking)
- 500 s.f. Office
- Two Unisex Restrooms
- Shaded Picnic Area
- Covered Interpretive Plaza



SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision



KEY PLAN
N.T.S.

Interpretive\Day-use Facility, Alternative 1

Figure A-1

North

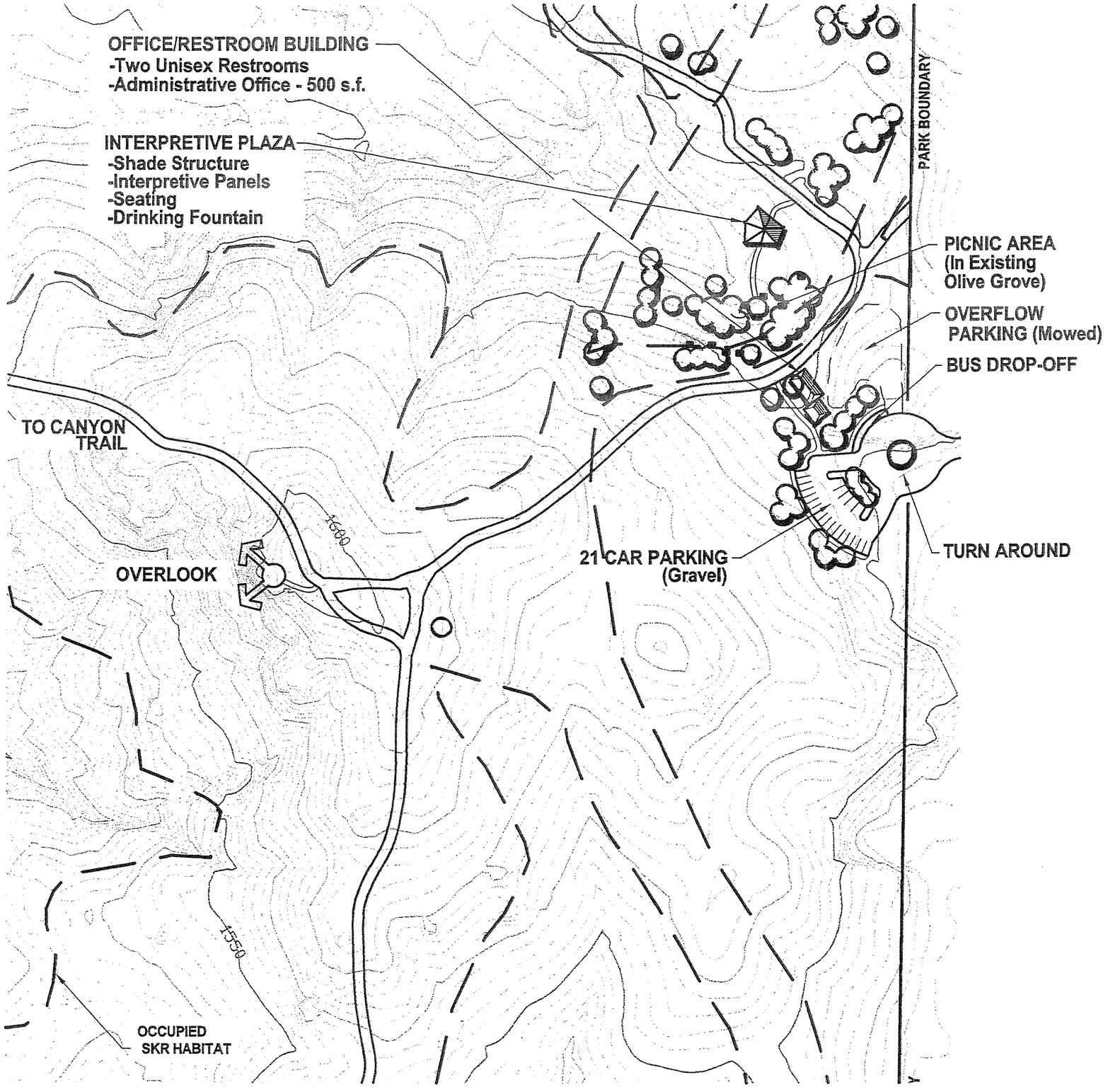
0 75 150 300

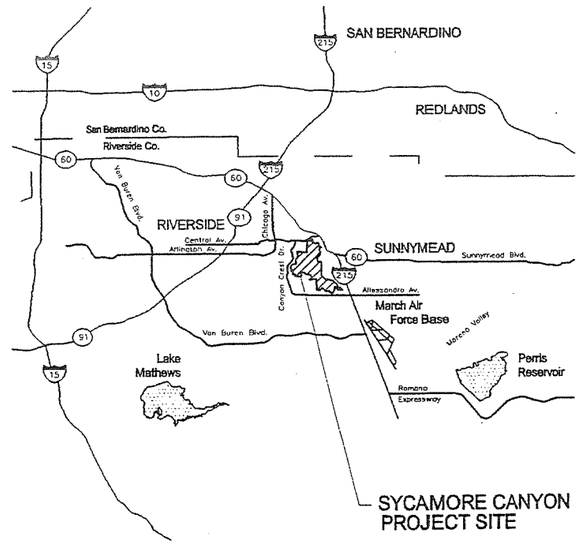
SCALE IN FEET

CONTOUR INTERVAL: 2 FEET

Dangermond & Associates
Recreation and Environmental Planning

SYCAMORE CANYON WILDERNESS PARK
Conceptual Development Plan Revision





KEY PLAN
N.T.S.

Interpretive\Day-use Facility, Alternative 2

Figure A-2

North

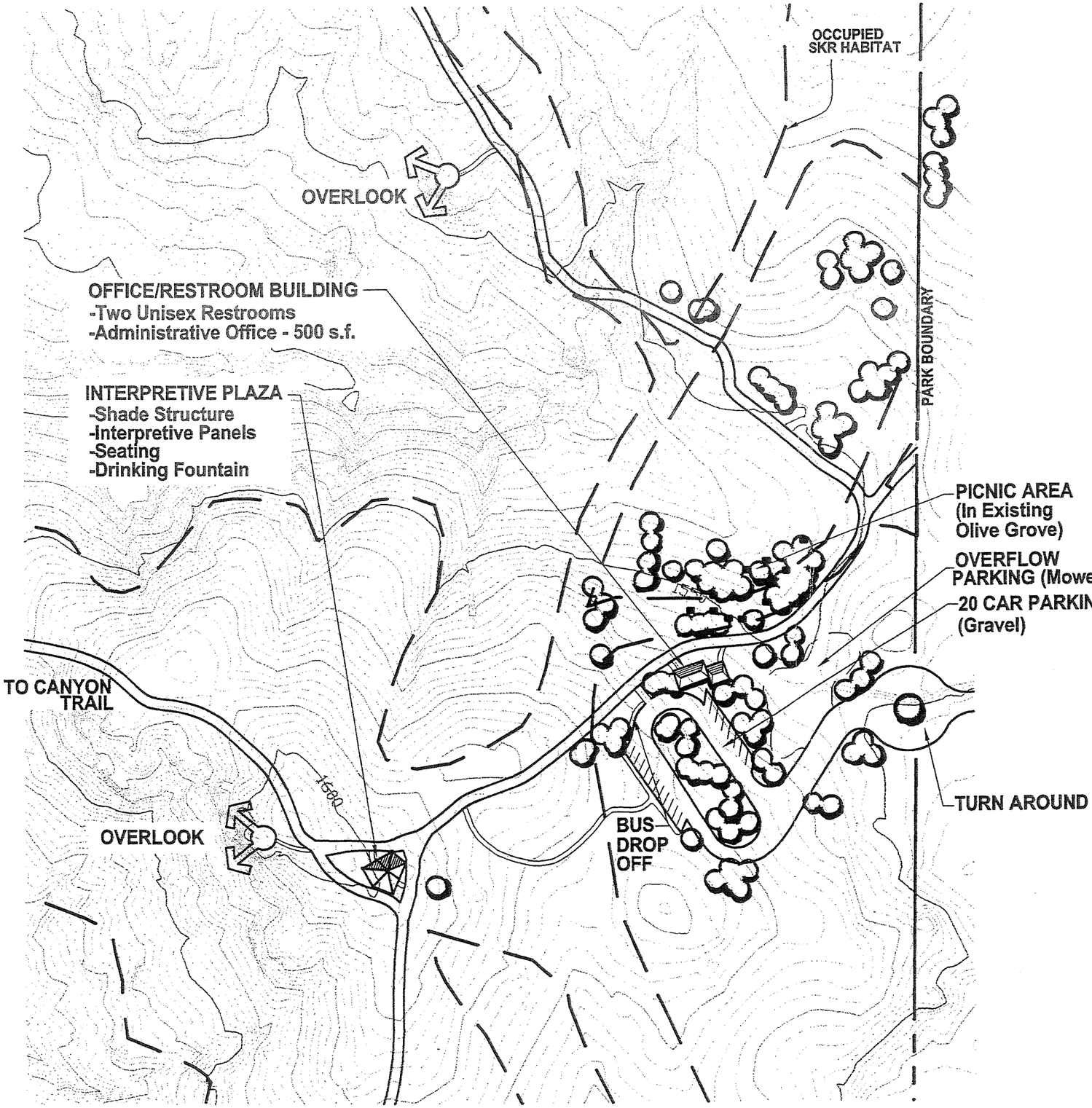
0 75 150 300

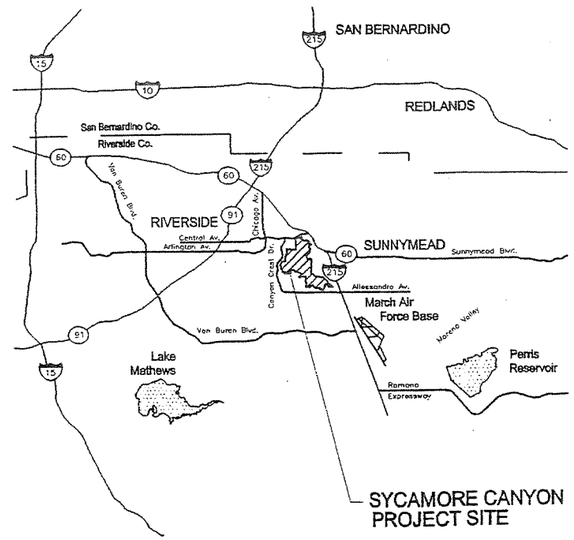
SCALE IN FEET

CONTOUR INTERVAL: 2 FEET

Dangermond & Associates
Recreation and Environmental Planning

SYCAMORE CANYON WILDERNESS PARK Conceptual Development Plan Revision





KEY PLAN
N.T.S.

Interpretive\Day-use Facility, Alternative 3

Figure A-3

North

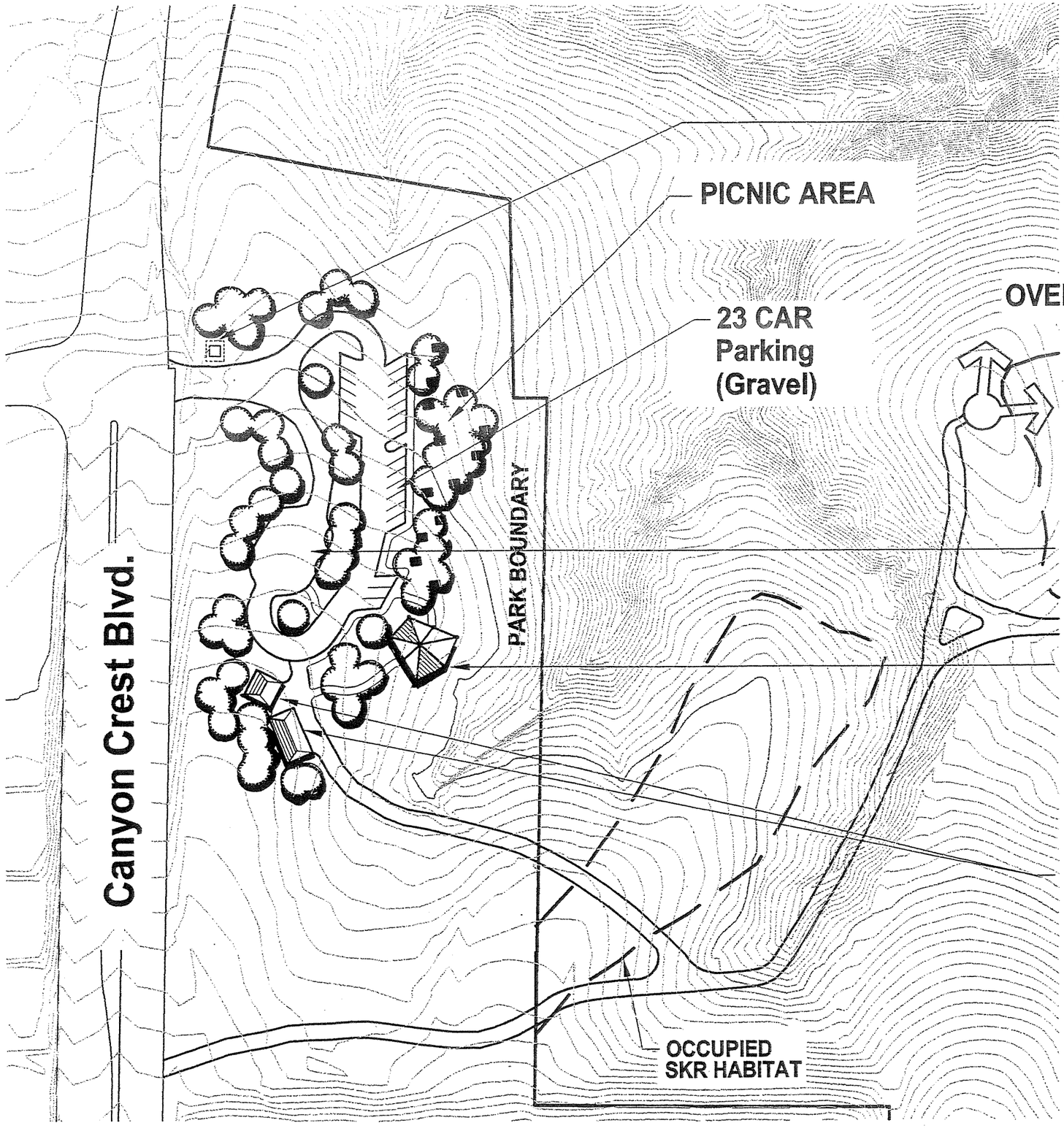
0 75 150 300

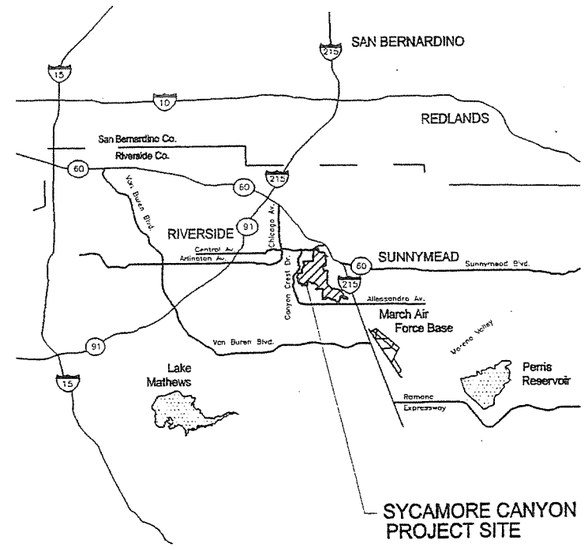
SCALE IN FEET

CONTOUR INTERVAL: 2 FEET

Dangermond & Associates
Recreation and Environmental Planning

SYCAMORE CANYON WILDERNESS PARK
Conceptual Development Plan Revision





KEY PLAN
N.T.S.

Interpretive\Day-use Facility, Alternative 4

Figure A-4

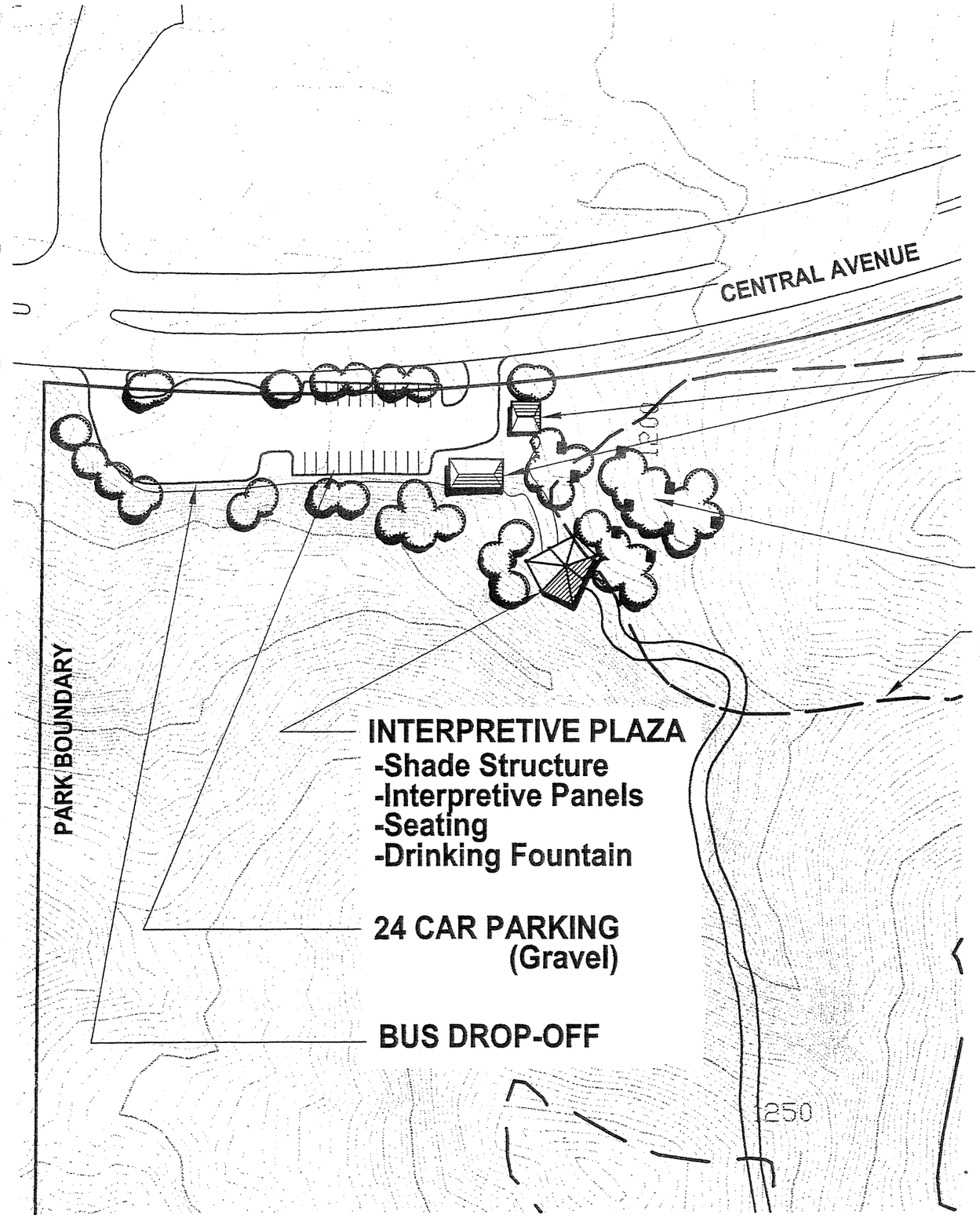
North

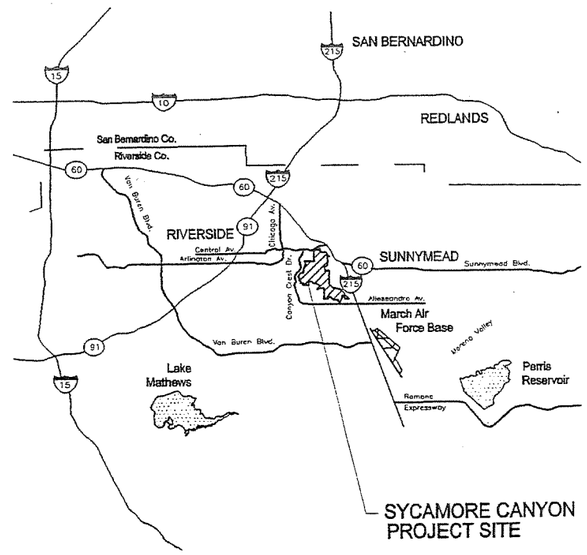
0 50 100 200
SCALE IN FEET

CONTOUR INTERVAL: 2 FEET

Dangermond & Associates
Recreation and Environmental Planning

SYCAMORE CANYON WILDERNESS PARK
Conceptual Development Plan Revision





KEY PLAN
N.T.S.

Interpretive\Day-use Facility, Altervative 5

Figure A-5

North

0 50 100 200
SCALE IN FEET

CONTOUR INTERVAL: 2 FEET

Dangermond & Associates
Recreation and Environmental Planning

9.4 Appendix for CDH 1988 Plan (CDH)

9.4.1 Surrounding Schools

Moreno Valley School District

March Air Force Base:

Arnold Heights School
Elementary/Special Ed
Moreno Valley: (those present on existing map)
Honey Hollow Elementary
Sunnymead School Elementary
Sunnymeadow School Elementary
Edgemont Elementary School
Moreno Valley High School

Riverside Unified School District

Elementary Schools
Castle View Elementary School
Woodcrest Elementary School
Harrison Elementary School
Liberty Elementary School
Sunshine Elementary School
Jackson Elementary School
Monroe Elementary School
Adams Elementary School
Hawthorne Elementary School
Jefferson Elementary School
Mountain View Elementary School
Madison Elementary School
Washington Elementary School
Magnolia Elementary School
Pachappa Elementary School
Bryant Elementary School
Grant Elementary School
Fremont Elementary School
Highgrove Elementary School
Highland Elementary School
Longfellow Elementary School
Emerson Elementary School

Alcott Elementary School
Victoria Elementary School
Hyatt Elementary School

Middle Schools
Sierra Middle School
Chemawa Middle School
Gage Middle School
Central Middle School
University Middle School

Riverside School District Projections:

Riverside Unified:
K-12 (w/o Special Ed. Or Special Program, if included + 1200)

1987- 26,108
1- 26,954
2- 29,089
3- 29,523
4- 31,080

Jurupa Unified:
(#'s not due not until late January)

Alvord Unified:
(to be updated in January, estimate about + 200)

1987- 12,256
1- 12,333
2- 12,825
3- 13,516
4- 14,194
5- 14,931

Moreno Valley Unified:
1988-89- 23,108
1980-90- 26,572
1990-91- 30,276
1991-92- 34,062
1992-93- 38,024
1992-94- 42,132

9.5 SKR and Small Mammal Sampling Protocol

9.5.1 Lake Mathews Draft 5 Year Plan

The following protocol is included as reference to the suggested protocol within Section 3.0 of this document. At the completion of this 5 year plan it is anticipated that the RMCC will review the success and financial impacts of this protocol to determine if this, or a modification of this, protocol should be recommended for implementation throughout the other reserves.

INTRODUCTION

The Stephens' kangaroo rat (SKR) is a State of California threatened species and a federally-listed endangered species. Its presence on-site in substantial numbers was one of the deciding factors leading to the establishment of the approximately 12,000 acre Lake Mathews-Estelle Mnt. Reserve. Roughly 38% of Reserve lands consist of occupied SKR habitat. For the RCHCA and the MWD to maintain their permits for incidental take of the SKR, Reserve lands containing the species must be managed to protect existing populations and if possible to enhance them.

The need to monitor SKR populations becomes highly important given the management framework of the Reserve. Limited funds and time mostly prevent extensive trapping efforts. One approach management could take would be to only monitor the extent of the existing populations. Thus, if determining persistence of populations is the sole goal of the management program, cursory examinations of the habitat for diagnostic SKR evidence (sign) is sufficient. Extent of populations can be mapped according to the presence or absence of this sign. If populations appear to contract, some sort of habitat manipulation may be warranted. However, as is discussed below, SKR populations can vary tremendously from year-to-year, and changes in the extent of populations may only be the result of normal "background" variation. Management could then be performing actions and expending precious funds for manipulations that may not be necessary.

More pro-active management decisions, such as habitat enhancement by prescribed burns, grazing or mowing, may not have obvious effects on populations for some time, possibly for years after implementation. It therefore becomes exceedingly important that a monitoring program incorporate a parameter which can detect changes in populations that may not be readily apparent. One widely used parameter is the density of the population (ie. number/unit area).

The protocol described here represents a pilot research program designed to determine the scientific validity and fiscal costs in using a protocol of burrow counts to assess SKR population densities within occupied habitat. This protocol has come about through a series of discussions centered on its initial draft, and presented to the Riverside County Reserve Manager's Coordinating Committee (RMCC). At the behest of the RMCC, LMEM Reserve Management chaired a subcommittee on SKR monitoring. This subcommittee had lengthy discussions surrounding the protocol and has solicited and received comments on it from leading SKR experts and local academicians. What is presented here is only the pilot research protocol to be used at LMEM over the next three years, and it does not discuss the details of the interim protocol finally presented to the RMCC by the subcommittee. How this protocol fits in with the overall monitoring of the SKR within the entire reserve system will depend upon its results. Additional information about this coordinated effort can be obtained

from the RCHCA.

SOURCES OF VARIATION IN POPULATIONS

Numerous sources producing variation in populations are known. Population density can vary tremendously over relatively short time spans. For instance, SKR density estimates in the spring may not include the young for that year - density can vary with season. Price & Goldingay (1992) showed that the number of individuals varied seasonally, but generally were more abundant during the fall. McClenaghan & Taylor (1991) showed that recruitment into populations peaked in late spring as did total population density. Thus population estimates completed only during one season may not be representative of the population as a whole. Further, sampling during only one season does not allow the assessment of recruitment into the population. Assuming that the management goal is to determine an accurate yearly estimate of SKR populations, combined estimates based upon a single season's sampling would appear unreliable for this goal, whether derived from trapping or from burrow transects.

Density can also vary between years in response to rainfall patterns and vegetation abundances. Price & Kelly (1992a), with regard to differences in density between 1990 and 1991 stated, "The several-fold variation in densities that we observed at a single site is indicative of temporal variation in the carrying capacity that parallel variation among years in rainfall patterns." Thus there seems to be a level of background variation among SKR populations which may be attributable to yearly patterns of rainfall and vegetation characteristics. Sampling completed during a single year, particularly during years of drought or heavy rains, may miss this variation and supply a density estimate of the population that may not be accurate in the long run. This in turn could cause management to unnecessarily expend funds and person-hours for habitat manipulations that are, in reality, not needed. Therefore, monitoring should be of sufficient discriminatory power to distinguish this background variation from variation caused by changes in the management environment. However, it may take several years of data to reach any kind of definitive conclusion.

Density can also be expected to vary with a number of other parameters. The proximity of the population to human-induced disturbance factors (human residences, pets, ORV use, weed control), soils, and fire. Again, sampling should attempt to take these various factors into account as much as possible, and be able to factor out any background changes in density attributable natural causes (eg. rainfall, vegetation, etc.).

AVAILABLE SKR METHODOLOGIES:

Currently, there are three primary techniques used to assess SKR populations. One is presence/absence surveys, another is the burrow count method, and the other being

live-trapping programs. All have advantages and disadvantages. Presence/absence surveys search the habitat and map the extent of diagnostic sign. Burrow count methodology involves walking transects of known length, and recording the number of diagnostic burrows encountered, and relating that number back to a predetermined density category (ie. high, medium, low, trace). The live-trapping method involves setting-up a trapping grid (sometimes trapping lines) of some predetermined size, and then live-trapping, marking and releasing captured SKR. Trapping grids are usually monitored for a minimum of four consecutive nights.

Presence/Absence Surveys

Presence/absence surveys are essentially designed to determine the extent of occupied habitat. They are performed by walking across suspected areas in search of diagnostic sign including burrows, scats, tracks, tail-drag marks, dust bowls and seed caches. This type of survey has been widely used for pre-development assessments to determine the amount of mitigation required. Presence/absence surveys are relatively quick and cheap, but run into trouble in areas of marginal habitat. That is, occasionally, the SKR has been found on steep slopes where soils and vegetation are appropriate. In these circumstances, it's possible that the sign observed could have been produced by the Pacific kangaroo rat (*Dipodomys agilis*). Thus to infer that these areas are occupied by the SKR may be erroneous, and provide a false sense of the real extent of occupied habitat. Currently, the only way to determine with any certainty which species is occupying these marginal habitat areas is to live-trap them,

Burrow Counts

The accuracy and precision of burrow count methodology is directly determined by the accuracy and precision of the presumed relationship between the number of diagnostic burrows encountered and the actual density of SKR on the site. Without exhaustive and expensive real-time behavioral observations, this relationship can only be surmised by attempting to relate observed sign to sampled population densities. By placing population densities into pre-judged categories as is frequently done however, one is transcribing continuous variation data into categorical data, and as a result may be loosing important trends in density that could be occurring. That is, a population may be categorized as "high density" for several years in a row even though its density could be slipping down. Without a more precise assessment of density, population trends may be missed and causes for density fluctuations cannot be ascertained accurately.

It is possible to treat burrow count data as a continuous variable. For instance, transects could be characterized as X number of burrows/100 M^2. This would be

appropriate if the number of burrows was the desired outcome. However, the SKR is known to utilize the burrows of ground squirrels and pocket gophers, and can [extremely quickly] re-work an old burrow for suitable cover if caught out in the open (Baxter per. obs.). Additionally, an individual may have several burrows. For instance, Taylor (1997 per. com.) reported an individual immediately constructing a new burrow upon release. Thus to directly equate the number of burrows observed to the population density is inherently weak. For instance, transects used to estimate desert tortoise densities are typically "corrected" for overlapping sign. This is not possible to do with the SKR because of their high vagility. Additionally, the relationship between this corrected tortoise sign and density is calculated and calibrated using data from complete grid censuses. By treating burrows counts as continuous data however does allow one to use them as a variable in linear regressions (discussed below).

To make burrow count categories more sensitive to detecting population trends, they would have to be re-defined on a finer scale (eg. high-1, high-2, high-3, medium-1, etc.) each corresponding to a finer division of sign abundance. An alternative approach is to regress the observed burrow densities against known population densities to determine a continuous relationship applicable for any sign density encountered in a particular habitat type. This has the distinct advantage of eliminating the arbitrary nature of assigning data into categories and allows the reserve manager to directly compare density across sites on a standardized scale (eg. number of individuals / 100 square meters).

The relationship between SKR burrows and population density can be determined by first live-trapping to establish an accurate estimate of the population, followed by burrow surveys across the same area, and then relating the number of diagnostic burrows encountered to the known density derived from the trapping. O'Farrell & Uptain (1987) first established this technique for the SKR, but performed it in reverse. That is, burrow counts were first performed, then trapping was performed in areas judged to exhibit high, medium and low densities.

This technique has now become a standard methodology for assessing large areas of occupied habitat. Unfortunately, O'Farrell has commented that much of the early work with this technique per se, including the proposed relationship between sign and trapping densities, may be wrong based upon inadequate trapping success due to the use of box traps rather than wire-mesh traps (O'Farrell, per. com., see O'Farrell et. al 1994).

A final point on transect sampling is that the blanket use of the same transect/density algorithm across all reserves may provide spurious results. No one is sure as to potential differences in behaviors of the SKR in different portions of its range or in different microhabitats. That is, burrow density at one reserve may not necessarily represent the same population density at another reserve 30 or 40 miles away (see

Price & Kelly 1992a). Similarly, estimates derived from burrow densities in non-native grasslands may correspond to different population densities on open slopes of *Encelia farinosa*. Therefore, it becomes clear that the relationship between burrow density and actual population density should be calibrated locally and by habitat type. Data so calibrated from each reserve can *then* be compared with data from other reserves. Should the pattern be consistent across all reserves within a particular habitat type, then perhaps a single regression equation could be used in similar habitats at all reserves. If not, then important information about regional SKR densities will have been elucidated, strengthening overall coordinated SKR management decisions.

Thus, burrow counts have the advantage of being fast, allowing the investigator to cover large areas relatively quickly, but are inherently inaccurate and imprecise unless properly calibrated.

Live-trapping

Live-trapping using mark-release-recapture protocols are more accurate in the determination of density than transects, and indeed are used to calibrate sign densities. Requiring at least four nights of effort, trapping is relatively more time intensive than transects. Additionally, traps can be somewhat expensive and hard to protect from vandals.

A sometimes lively discussion has ensued regarding the effectiveness of wire-mesh (eg. Stoddard) versus box (eg. Sherman) traps (O'Farrell et. al 1994). Each trap type has advantages and disadvantages. Most small mammal biologists will probably agree that traps in which the target species can see through them generally will capture more individuals. This can be an important consideration in studies where the determination of density is important. However, for the general determination of presence or absence of SKR, box traps are completely adequate, and may have an important advantage. Wire mesh traps generally expose the target species to predators and the elements, while box traps do not.

AMOUNT & LOCATION OF SKR HABITAT ON THE RESERVE

The Lake Mathews Multi-Species Reserve encompasses approximately 11,200 acres of which about 4,200 acres (≈ 38% or 1,700 hectares) contain occupied SKR habitat (RCHCA 1996). According to O'Farrell & Uptain (1989), occupied SKR lands on the Reserve fall into three general areas based on burrow density; 1) most of the large occupied area around the lake support "trace" (≈52% of occupied habitat), 2), the areas south of Cajalco road, west of the old ASD groves and the isolated pockets of occupied habitat around Estelle Mountain (≈42%), and 3) a large area of high density around Black Rocks and a smaller one near El Sobrante & Cajalco Roads (≈10%).

Assuming these densities represent natural divisions in habitat/density types then transect calibration should attempt to be carried out in all three areas.

METHODS

The method to assess the SKR on the Reserve consists of four distinct steps. The basic approach is to:

1) Perform the live-trapping of 20, 0.7-hectare grids over a period of 5 consecutive nights during the fall;
2) Perform burrow counts on these same grids;
3) Assess the relationship between actual density (as derived from live-trapping) and burrow count, thus calibrating and correcting the burrow counts from Step No. 2; and
4) Test the burrow count/trapping density relationship to determine its accuracy.

Timing of Samples:

As is the case for all the reserves, budget constraints are a top priority for management. In a perfect world, the timing of replicate sampling depends upon what basic questions are to be answered by the protocol. For instance, if one is interested in obtaining data on seasonal variation in abundances, one should trap the same grids during the spring and fall of the same year. If on the other hand, one is interested in how differences in abundance occur as a result of year-to-year variation, then one should trap the same grids at the same time in different years. Sampling during different times of year between years can address both of these considerations simultaneously. Using this latter technique however, it would make it difficult to tease apart this combined variation into its respective components. This would only be possible if the same grid was trapped during spring and fall of both years. To do this one sacrifices an increase in sample size (ie. the number of grids trapped per year) due to person-hour & budget constraints, for a more precise estimate of how populations vary through time. These are important considerations because, as mentioned above, one cannot determine how much density has changed in response to management decisions without knowing something of this natural "background" change.

Faced with budget shortfalls, one way to increase the efficiency of monitoring for the long-term is to eliminate some of the information gathered. In this case, it is felt that the elucidation of seasonal variation, while certainly interesting and important in the complete understanding of SKR biology, could be sacrificed. Thus, it is decided that

sampling for the SKR should only occur during the fall months when the young have already been born and mostly recruited into the populations. By doing so, it is realized that data on seasonal variation would be lacking, but data on year to year variation could still be determined.

Specific Trapping and Transect Methodology:

Each trapping grid will consist of a array of 4 rows of 8 trap stations spaced at 15 meter intervals. Assuming each trap station to represent the center of a square whose sides are one trap interval (15 meters) long, each grid (120 meters x 60 meters) will sample an effective area of 7,200 square meters (0.72 hectare). There will be two Sherman traps per trapping station. Thus each night will yield a total of 64 trapnites. Permanent trapping grid locations will be permanently marked by suitable means (e.g. rebar) and the northwestern-most grid corner location will have the coordinates determined by the GPS for inclusion into a GIS database. Trapping will follow the USFWS's protocol for SKR trapping programs, namely the traps will be opened at dusk, checked at midnight, and checked again and closed at dawn. Each captured individual will have a series of morphometric measurements taken to assure proper identification to species, and will receive a temporarily mark on the belly by a non-toxic felt-tipped pen, and a small section of rump hair clipped (in case the mark is rubbed of during the trapping). All captured animals will be released at their capture site unharmed.

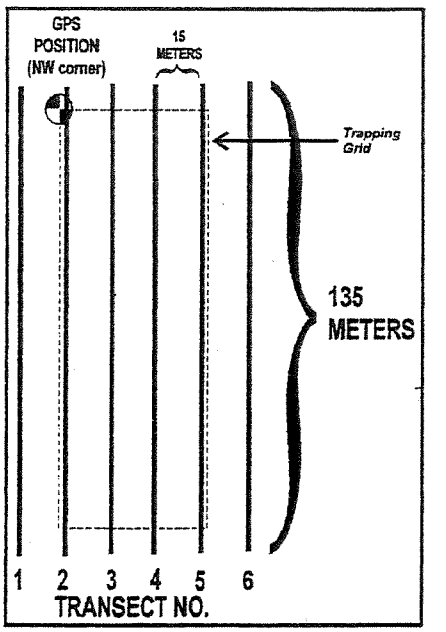


Figure 1. **SKR sampling grid lay out.**

The size of the effective trapping grid is 0.72 hectare (60 x 120 meters) and appears small. Based upon research of SKR home range size by Kelly & Price (1992), it is estimated that the effective size of the area trapped extends beyond the 15 meter trap interval distance of about 25 meters. This brings the effective trap area to 170 x 110 meters or about 1.9 hectares. This is more in line with the previously used sampling areas of 1 hectare (McClenaghan & Taylor 1991) and 2.25 hectares (Price & Kelly 1992a,b). Additionally, the small size allows one to increase the number of grids without a large increase in person-hours.

Each trapping grid will be systematically surveyed for burrows with a series of 6 transects running along the long axis of each trap line (4 lines) plus an additional two lines located 15 meters out from, and running parallel to, the long side of the trapping grid (see Figure 1). Each burrow transect will be extended 15 meters beyond the end

of the trapping grid. Each transect will search an area of 3 meters on either side of the transect line for active burrows. Thus each transect line samples an area of 810 square meters (135 x 6 meters), and all six transect sample an area of 4,860 square meters. The live-trapping grid is completely encompassed within this burrow count sampling area. Thus for each sampling site, data will include the population density (as determined by the trapping) and a burrow density (based upon the burrow count).

Analysis Scheme:

Data to be gathered from live-trapping grids will be used to estimate a realistic population density of the SKR using the U.S. Fish & Wildlife Service's CAPTURE analysis program. CAPTURE allows the computation of unbias population density based upon several different estimators each with a unique set of underlying assumptions. CAPTURE can also be used to estimate home range if the data gathered on individuals includes capture location over several nights. Since each SKR grid will have a burrow density associated with its unique population density, the number of grids determines the number of regression points available in each habitat/density area for burrow survey calibration. A minimum of six trapping grids should be complete to form any regression.

To relate trapping to burrow density, a linear regression equation of the form Y = (m)(X) + b, will be calculated in each density area (Y is the population density, X is the burrow density, m = the slope of the regression line & b = the y-intercept). Thus for any burrow density encountered in similar habitat, population density can be interpolated or extrapolated directly, and not assigned to an arbitrary category. In addition to doing away with subjective decisions of density categories by maintaining the continuous nature of density, this technique allows one to statistically compare two different areas, say the results from two different reserves or two different habitats, based upon the slope of the regression line (ie. "m"). Finally, this technique also calculates the coefficient of determination (R^2) which examines how much of the variation in population density is accounted for by variation in burrow density.

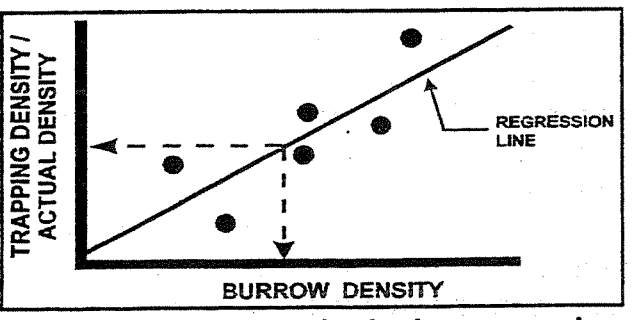


Figure 2. **Hypothetical regression relationship between burrow and trapping density.**

BUDGET CONSIDERATIONS

Budget constraints for small mammal work at the LMEM reserve are of high importance, as they are for all reserves. Unexpected budget shortfalls have forced Reserve Management to carefully scrutinize all person-hour commitments for management objectives. Thus, we are faced with how to best maximize our time in the field and still maintain meaningful and credible results. To sample even 1% of these large areas by trapping (ie. 17 hectares out of 1700) is far in excess ($\approx$ 34 grids) of funding limits for Reserve personnel. Grids could be increased in size, but additional person-hours would then be required to monitor them. As a result, we must rely primarily upon properly calibrated density transects

Sample Sizes:

The question then arises, how many survey grids are required to adequately characterize the SKR populations? Are these statistically sufficient to adequately characterize each density area? In order to address this question one must be able to estimate or calculate the number of samples required given some accepted level of uncertainty. Since the basic question to be asked each year is, "Has there been a significant change in density from the previous year?", we are basically testing for a significant difference in the mean (average) density area between years. Assuming the data are normally distributed, this type of analysis is normally completed by the "Student's t-test", which statistically compares two means. Typically, the "null hypothesis" (designated H_o:) for such a t-test is that there is no difference in the means.

Hypothesis testing can have four possible outcomes given the truth or falsehood of the actual situation (Table 1). That is, assuming the null hypothesis is true, one can statistically reject it or accept it. Similarly, if the null hypothesis is false, one can accept or reject it. This leads to two possible errors, and two correct decisions.

Table 1. **Type of statistical errors in hypothesis testing.**

	ACCEPT H_o:	REJECT H_o:
H_o: IS TRUE	No error	Type I error = α
H_o: IS FALSE	Type II error = β	No error = 1 - β = "power"

Traditionally, statistical tests have only dealt with the possibility of committing a Type I error and have mostly ignored the Type II error. In recent years however, the assessment of the probability of making a Type II, or "beta" error, has increased in

ecological analyses, and tests have arisen to determine this probability - the so-called "power" or "beta" tests. The statistical "power" of a test is defined as 1 - β, therefore it represents the probability of rejecting a false null hypothesis (Zar 1974, Rotenberry & Wiens 1985, Glantz 1981, Cochran 1953, Heyek 1994, Conroy & Nichols 1996). Ideally, one would hope to minimize both α and β. Given this background then, to determine the necessary sample size for any sampling program, one must specify the amount (ie. probability) of committing these errors. Traditionally, the α level of significance chosen in virtually all scientific work is 0.05, or a 1 in 20 chance of committing a Type I error. Unfortunately, since the use of power tests is a more recent advent, no such tradition exists in the literature.

In addition to specifying the statistical levels of significance, to calculate the number of samples (ie. sign surveys) needed, one must also have some idea of the amount of variability in the data. This is often not known, and is estimated based upon the experience of the ecologist. At Lake Mathews many data exist on burrow counts. Thus to come-up with at least a "ball park" estimate of variability, we assembled the raw data on burrow counts from 40 transects completed by O'Farrell in 1992 at Lake Mathews. The average and standard deviation for these samples were calculated (mean count = 17.7, standard deviation = 17.1). This allowed at least some estimate of variability in transects. However, the locations of these transects are not known and could be from radically different density areas (as the high variation seems to indicate). It may be that by first defining such density areas, the variation in the data would be less, lowering the number of samples required at any particular power level..

Table 2. **Results of sample size calculations for a t-test for SKR burrow surveys at Lake Mathews. All tests assume an α level of significance of 0.05. Upper results are for an estimated standard deviation of 17.0, while the lower results are for an assumed standard deviation of 15.0. Table values are sample sizes (ie. number of survey girds) required at the expressed detectable difference and power levels. Calculations were performed using Sigma Stat statistical software (Jandel Scientific 1992).**

MINIMUM DETECTABLE MEAN DIFFERENCE (burrows)	POWER = 0.80	POWER = 0.85	POWER = 0.90
5	183 143	209 163	244 191
10	47 37	53 42	62 49
15	22 17	25 19	29 23
20	13 10	15 12	17 13
25	9 7	10 8	11 9

A final parameter needed to estimate sample size is a statement of the precision or discrimination one desires. In this context, one states that one is wishing to detect a minimum detectable difference in the mean number of burrows between the years. This value could be one burrow, or five burrows, or 100 burrows. We chose a number of values ranging from 5 to 25 burrows, and calculated the sample size needed to detect this minimum difference at three different power levels (0.80, 0.85 & 0.90). Additionally, because of the uncertainty in the variation, these tests were also calculated for two values of standard deviations (17.0 and 15.0).

The ultimate selection of how many grids to sample will be determined by budgetary considerations and the amount of precision desired. It was determined that the maximum number of grids for LMEM to sample was 20. This will allow a discriminatory level of being able to detect a difference in mean number of burrows of about 15 at acceptable power levels (Table 2).

CHARACTERIZATION OF HABITATS:

Although not discussed extensively here, habitat characteristic variables will also be gathered on each gird. These data provide the independent variables with which to predict background variations in populations.

Each trapping grid will have the plants assessed by a sampling protocol using both line transect and area components (see Section VI.C.2.b). This will determine the extent to which the small mammal densities are tracking changes in vegetative characteristics.

Weather patterns will be quantified by the establishment of a weather station at the Lake Mathews Reserve office.

Soils will be determined from published soil maps. This is particularly important for the SKR which has been shown to be sensitive to soil types (Price & Endo 1989, Minnich & Chou 1995). Additional soil sampling can occur, and is currently being proposed by a local university as a research project.

MULTI-SPECIES ASPECTS & ADAPTABILITY OF TECHNIQUES

Since the Reserve is designated as "multi-species", how the above techniques can be used to assess other small mammals in other habitats is a consideration. The amount of time and effort put into the evaluation of non-sensitive (ie. non-target) small mammal species should be considered in the light of stated landscape-level management practices. For management purposes, less emphasis is needed for unlisted species

likely to be found in other habitats (eg. *Peromyscus spp.*), and a habitat assessment approach is more appropriate for these species. However, a clear understanding of habitat relationships of these species must be in hand for such habitat assessment techniques to be utilized accurately. Many of these relationships are already known, and can be found in the literature. How does the above scheme fit-in with these multi-species goals?

First, the sampling of the SKR habitat provides data on *all* small mammal species there, not just the SKR.

Second, by relying on burrow counts rather than strictly relying on expensive and time-consuming trapping programs, valuable time is freed-up for the sampling of other habitats.

Third, the use of aerial photographs and the regular monitoring of the extent of plant communities provides a direct assessment of the extent and relative health of the habitats. This can be further accentuated by 1) the establishment of permanent photodocumentation stations across the reserves, and 2) the yearly monitoring of vegetation in these habitat types.

With the completion of the three-year testing of this protocol, and assuming that these techniques do indeed provide an accurate calibration of burrow counts that in turn provide an acceptable estimate of SKR populations, it is anticipated that the focus of live-trapping at the Reserve can then be shifted to the assessment of small mammals in other habitats. Re-calibration of SKR transects would then occur on a three- to five-year cycle, with the monitoring of SKR populations occurring yearly by the performance of burrow counts only. In the interim, trapping in other habitats could begin to establish baseline numbers for the small mammal faunas there, thus providing a basis for the landscape level monitoring of habitats rather than individual species.

Although the program discussed here is designed to provide for the regular monitoring of SKR populations, it is understood that other possible techniques are available but as yet are unproven. For instance, not discussed here is the use of aerial photographs and high resolution digital satellite images. Great strides are being made almost daily in this realm of investigation. Currently however, the technique remains mostly unproven for SKR assessment. The use of these images will be tested at other reserves, and to a lesser degree at LMEM. It may be that in the future sufficient resolution and color banding could allow this technique to be used. Assuming that it is, the techniques here supply data that can eventually be used to understand the relationship between raster cell values and the amount of occupation by the SKR and other small mammals. Assuming it is not, then the procedures here continue with already proven techniques to assess SKR and small mammal populations. Additionally, it may be that new technologies become available to assess populations.

In the interim, the techniques proposed here provide a sufficient breadth of assessment until these new technologies are proven. It is thus felt the protocol is sufficiently robust to be able to adapt should the newer technologies fail to live up to expectation or others become available for testing.

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9.5.2 RMCC Draft Protocol

Although very similar to the protocol presented in Section 9.5.1, minor variances do exist between the two versions of protocol. This version has been prepared for use by reserves not presently having an established protocol. The protocols established by this document for the Sycamore Canyon Wilderness Park and the draft 5 year protocol established for the Lake Mathews - Estelle Mountain Reserve will be implemented at each reserve until such time that the RMCC determines which protocol(s) shall be implemented within the SKR reserve system.

INTRODUCTION

The pilot research program described in this proposal is intended to answer a number of critical questions regarding methods for monitoring the abundance and distribution of the Stephens' kangaroo rat (SKR). Furthermore, the proposed study will test a monitoring program conceived through comments supplied throughout a series of Riverside County Reserve Manager's Coordinating Committee (RMCC) meetings, subsequent discussions of the RMCC subcommittee, and comments received from various small mammal and statistical experts from the local consulting and academic communities.

The study, initially formulated for the Lake Mathews - Estelle Mountain Reserve, is intended to address how specific SKR monitoring techniques could be adapted to long-term reserve management strategies throughout western Riverside County. Its results will help land managers develop appropriate and cost-effective monitoring protocols, either independently or as part of a comprehensive multi-species approach. The methodological questions the study is designed to address include:

- Is there a reliable relationship between burrow counts and the results of more intensive survey methods such as trapping?
- Are there quantitative relationships between habitat characteristics and abundance and distribution of SKR?
- Will annual fall burrow counts over a series of fixed transects yeild meaningful data concerning SKR persistence within reserves?

Additionally, this study is designed to address a stated desire of the RMCC to attempt to standardize the data-gathering techniques for the assessment of the SKR across the reserve system. It is acknowledged that each reserve is a separate entity, but at the same time, is a part of a larger system of reserves. Each reserve has its own budget source(s), and each varies to some degree in its mandate(s). This pilot research program will examine a framework in which the individual reserves can begin to operate consistently together, but is not intended to force any individual reserve to comply with its suggestions.

The Subcommittee discussed various options available to monitor the SKR and small mammals, including presence/absence surveys, habitat assessment by aerial photographs, sign transects and/or grids, and live-trapping programs. It was generally agreed that presence/absence surveys did not provide the accuracy needed to fulfill monitoring requirements as stated the Habitat Conservation Plan for the Stephens' Kangaroo Rat (SKR HCP). Additionally, it was agreed that extensive live-trapping programs, because of budget constraints, are far too costly in terms of person-hours to be a sole monitoring technique. This led to the discussion of the use of burrow surveys and aerial photography as potential techniques which are relatively more cost-effective.

As a result, the subcommittee is making the following recommendations for an interim research and monitoring program for the SKR:

1) Continue with ongoing SKR programs and projects;
2) In conjunction with sampling described below, establish an SKR training program to train field workers in the consistent evaluation of SKR habitat data;
3) Establish the current extent of SKR populations on the reserves (if not already known);
4) Assess system-wide populations' extent every three years using qualitative walkovers;
5) Begin to phase-in the yearly assessing SKR populations on the reserves using burrow count transects;
6) Institute a pilot research program at Lake Mathews to determine the variability in burrow counts as they relate to estimated density as determined by trapping. This pilot program has been discussed in previous versions of this protocol, and will not be extensively discussed here;
7) Evaluate this pilot program to determine its costs and feasibility to eventually use it, or some deviation of it, across all reserves;
8) Finalize a system-wide protocol based upon the Lake Mathews results and recommendations;
9) Foster the inclusion of genetic research activities to assess the genetic diversity of the various SKR subpopulations.

1) ONGOING PROJECTS AND PROGRAMS

Several of the reserves are currently involved with SKR programs, some of which have been in place for several years. It was agreed that ongoing programs should not be affected by the adoption of this protocol. However, if possible, data should be gathered during these ongoing efforts to move toward the overall program as further discussed below. For instance, if a live-trapping program is currently underway, it would be advisable to perform burrow count transects on the trapping grid(s). In this way, additional data on the relationship between burrow counts and actual density is gathered; data which will eventually be used to calibrate burrow count transects.

2) SKR TRAINING PROGRAM

During its discussions, the Subcommittee agreed that a consistent sampling scheme should be instituted across the reserve system. In this way, data are gathered and presented at a similar scale across the system, allowing comparisons to be quickly and easily made. As a part of this effort to be consistent, the subcommittee recommends

instituting a training program for SKR field workers. This program, coordinated through the RMCC, can provide reserve field workers with 1) experience in identifying diagnostic kangaroo rat evidence (sign), 2) distinguishing between active an inactive burrows, and 3) examples of sites which represent the various qualitative abundance categories as described under Items 3 & 4 (below).

3 & 4) ASSESSMENT OF CURRENT POPULATIONS AND FUTURE SYSTEM-WIDE MONITORING OF POPULATIONS' EXTENT

The third and fourth goals of this protocol are to establish the current extent of the SKR on the reserves and to monitor this extent. Most of these initial data have already been gathered by the respective reserves, and may or may not be in need of field proofing. Additionally, the Riverside County Habitat Conservation Agency has GIS-based data on SKR extent available to assist in this effort. The eventual outcome of these efforts will be for each reserve to produce a map showing the location and extent of occupied SKR habitat and its relative quality. The centers and the extent of high density "source" populations should try to be identified. These data should serve each reserve as an updated baseline by which the reserve can judge range extensions and contractions in the future.

For the ongoing assessment of range, data are to be gathered by the performance of occasional qualitative walk-overs and mappings. It is currently recommended that these surveys be completed, in the fall, at least once every three years beginning in 1998. Since little comparative data is gathered if each reserve performs these surveys during different years, every effort should be made for these surveys to coincide across the reserve system so that potential changes caused by yearly differences in habitat quality can be elucidated and factored out. Thus, regional data on the response of the SKR to changing climatic conditions will be gathered if the reserves coordinate these efforts. During these walkovers, a qualitative assessment of abundance will be performed. Not intended to replace the yearly assessment of populations by burrow count transects, the qualitative abundance categories for these walkovers are shown in Table 1.

5) PHASE-IN OF BURROW COUNT TRANSECTS

According to the SKR HCP requirements, yearly monitoring of SKR populations should be performed. Clearly, extensive live-trapping programs are far too costly and time-consuming to be widely used on all the reserves. As a result, the subcommittee has determined that yearly monitoring of populations could be accomplished using burrow count transects, which should be phased-in as budgets permit. It is acknowledged that such counts have the potential to be inaccurate, however, after proper calibration with data gathered from [less extensive] live-trapping efforts, and a consistent approach to

sign evaluation as provided by the training program, the accuracy of these transects could be significantly enhanced. It is the expressed goal of the pilot program to be

TABLE 1. **Qualitative Abundance Categories for use in tri-annual walkovers.**

Qualitative Abundance Assessment:	Description:
HIGH	Burrows very common and majority are active, scat abundant throughout habitat, runs & dustbowls common, forb habitat of good quality.
MEDIUM	Burrows fairly common and many are active, scat found mostly around burrows or dustbowls but obvious, habitat good but invasive grasses common.
LOW	Burrows present but relatively far between with many burrows inactive, scat hard to find accept around burrow openings, habitat often dominated by annual grasses.
TRACE	Burrows rarely encountered - vast majority are inactive, scat mostly absent or a few old ones found, habitat of poor quality with annual grasses thick and dominant.
POTENTIAL	Kangaroo rats are confirmed in the area, but habitat is marginal and unclear as to which species is present.
UNOCCUPIED	No evidence for kangaroo rat occupation could be found.

conducted at the Lake Mathews-Estelle Mnt. Reserve, to determine the feasibility and costs associated with such a calibration [trapping] effort (briefly discussed below). In the interim, each reserve will begin to move toward the use of burrow count transects for the yearly assessment of populations.

Technique:

A sufficient number of SKR-occupied sampling sites (i.e. grids) will be determined in each reserve. The location of the grids should represent a random sample within the available SKR-occupied habitat, with the additional constraint that areas of high SKR density, potentially representing colonization "source" areas (as identified in the initial mapping of occupied habitat), should try to be included. Areas likely to be the subject of future SKR habitat enhancement activities should also try to be included. To allow for repeated-measure analyses, these sites will represent permanent sampling sites for the SKR. The exact number of grids to be sampled will depend upon the amount of occupied habitat on each reserve that is encompassed within each qualitatively-determined abundance area (as determined in Nos. 3 & 4, above), and the statistical

power desired for future comparisons. This number must be determined by each reserve independently, but as a rule of thumb, for large, extensive areas of occupied habitat, at least 20 sampling girds should try to be accomplished.

Because of reduced budgets, it was agreed that burrow counts on the grids should be performed as expeditiously as possible. It is felt that complete counts of burrows across the entire sampling grid would 1) be too time intensive, and 2) lead to overcounts by counting the same burrow twice. As a result, it was agreed the burrow counts will be performed as parallel transects. Although the exact number and configuration of the transects across the sampling grid will eventually be determined by the pilot program at Lake Mathews, in the interim, a series of five burrow count line transects will be performed across a sampling grid.

The burrow sampling grids will be consistent with the live-trapping grids to be used in the Lake Mathews pilot program. At Lake Mathews, four rows of eight trap stations will be used, spaced at 15 meter intervals. Thus, assuming the trap to represent one 225 square meter (i.e. 15m x 15m) sampling square, the Lake Mathews trapping area encompasses at total trapping area of approximately 7,200 square meters or 0.72-hectare (i.e. 120m x 60m). The burrow count transects are designed to cover the area trapped, as well as some distance beyond the trapping area to include the burrows of animals which have moved into the trapping grid from outside its defined boundary.

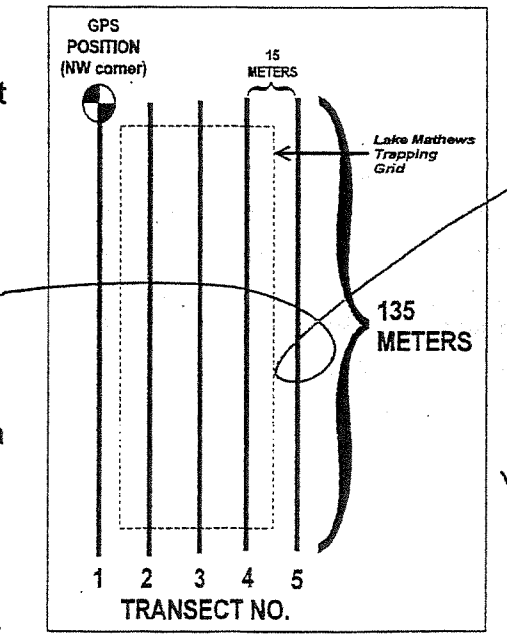

FIGURE 1. **Burrow Count Sampling Transect**

At each pre-determined sampling site, a sampling grid will be established by first determining its northwestern-most corner's position with the use of a Global Positioning Satellite (GPS) receiver. This location will be noted to provide the rapid finding of the site each year. The burrow sampling grid will consist of ~~five~~ six parallel lines. Although these lines should be oriented by randomly selecting a compass direction (with that direction noted), the overall grid will be laid-out to insure that it encompasses appropriate SKR habitat and does not stray into inappropriate habitat. Each of the five lines will be spaced 15 meters apart, and will have their ends marked by first pounding a section of re-bar into the ground, and then by slipping an 2.4-meter section of PVC pipe over the re-bar. Each of the five transect lines will be 135 meters long (Figure 1), a string can be connected to the opposite end poles, if necessary, to provide a straight line for walking. To sample, the investigator will walk along these five lines, noting the

LAKE MATHEWS APPENDIX FOR REVISIONS

SEE LAKE MATHEWS APPENDIX FOR UPDATED FIGURE

presence of active kangaroo rat burrows within 3 meters of either side of the line. Thus the total burrow count sampling area of each grid will consist of approximately 4,050 square meters. Data from all five transects will be combined, and an average burrow count for the grid will be calculated, and used for comparisons.

6, 7 & 8) LAKE MATHEWS PILOT RESEARCH PROGRAM

Beginning in the spring of 1998, a pilot research program will commence at the Lake Mathews-Estelle Mnt. Reserve. This program, which will be described in the Lake Mathews-Estelle Mnt. Five-Year Management Plan, will be conducted to determine the costs and feasibility of calibrating burrow count transects to local reserve conditions. This program is scheduled to proceed for a three year period. At the end of this period, results will be presented to the RMCC as to the costs, benefits and constraints of such a calibration effort. Additional recommendations will be made regarding the structure and recommended number of burrow count transects, and it is anticipated a final SKR protocol will be completed at that time.

9) GENETIC RESEARCH

Understanding the need to maintain genetic diversity in isolated populations, the subcommittee acknowledges that every effort should be made to foster continued research into understanding the amount and nature of genetic variability of the SKR within the reserve system. Currently, time and expense mostly prevent the reserves from beginning such programs on their own, and it is hoped that academic researchers can fill this need. Regardless, the subcommittee recommends to make it a stated objective to foster this research in the hopes of maintaining genetic diversity though the management of populations.

TIME ESTIMATE FOR BURROW COUNT TRANSECTS

Actual costs of performing the burrow surveys will depend upon the hourly rates of the personnel performing the surveys, and the number of surveys completed. Because budgets at each of the reserves are different and derived from different sources, only an estimate of time spent for a single burrow sampling grid is presented here. The total cost of sampling must also include the additional costs of travel time to and from the sampling grids, time spent selecting the sampling grids, and time spent entering and analyzing the data. These are values best understood by each reserve's personnel and are only roughly estimated here.

Initial set-up time: Travel & establish grid position, GPS NW coordinate, establish transect lines & pound re-bar. This expense is expected to be primarily during the first year only; subsequent years can be expected to be less. **1.00 hour**

Estimate of time spent surveying five 135-meter lines for burrows: **1.00 hour**

Return time: This will vary directly with the size of the reserve, and the distance between randomly selected sample grids. **0.30 hour**

Data entry: Time spent on entering data into database per sampling grid (location, calcs, # burrows): **0.30 hour**

Analysis: Time spent analyzing the data (does not include eventual calibration - will vary with the type(s) of analysis(ses) performed). **1.0 hour**

TOTAL TIME SPENT FOR EACH BURROW SAMPLING GRID: **3.60 HOURS**

SUMMARY OF PROPOSED PROTOCOL

STEP	Institute Training Program	Extent of SKR Occupation & System-wide Periodic Walkovers	Burrow Count Transects	Lake Mathews Pilot Research Program	Evaluation of Lake Mathews Program, Re-Evaluation of System-Wide Protocol	Genetic Research
1	Determine needs and available resources. RMCC to coordinate.	Assemble literature on SKR abundance in the reserve - produce updated maps	Establish the number of permanent sampling girds necessary to adequately sample each reserve.	Pilot program to be carried out at Lake Mathews-Estelle Mnt. Reserve to determine costs and feasibility of calibrating burrow count transects for each reserve.	Pilot program will be evaluated and results applied to other reserves. Recommendations for final protocol will be supplied.	All reserves to encourage research to understand genetic variability of SKR populations.
2		Field truth extent of occupied habitat by walkovers. System-wide walkovers to include qualitative determination of abundance.	Perform burrow counts during the fall along transects across these sampling grids using suggested scheme.		RMCC to determine final protocol to be used on all reserves.	
3		Redefine maps accordingly - incorporate into GIS systems				
TIMING:	**Summer 1998**	**Beginning in Fall 1998. System-wide every three years thereafter.**	**Beginning in Fall 1998 or as soon as budgets permit. To be performed yearly.**	**Beginning 1998. Will continue through 2000.**	**2000/2001**	**Ongoing**