OPPORTUNITIES AND RECOMMENDATIONS

Ridge Dam on Malibu Creek Presents a Barrier to Fish Migration.

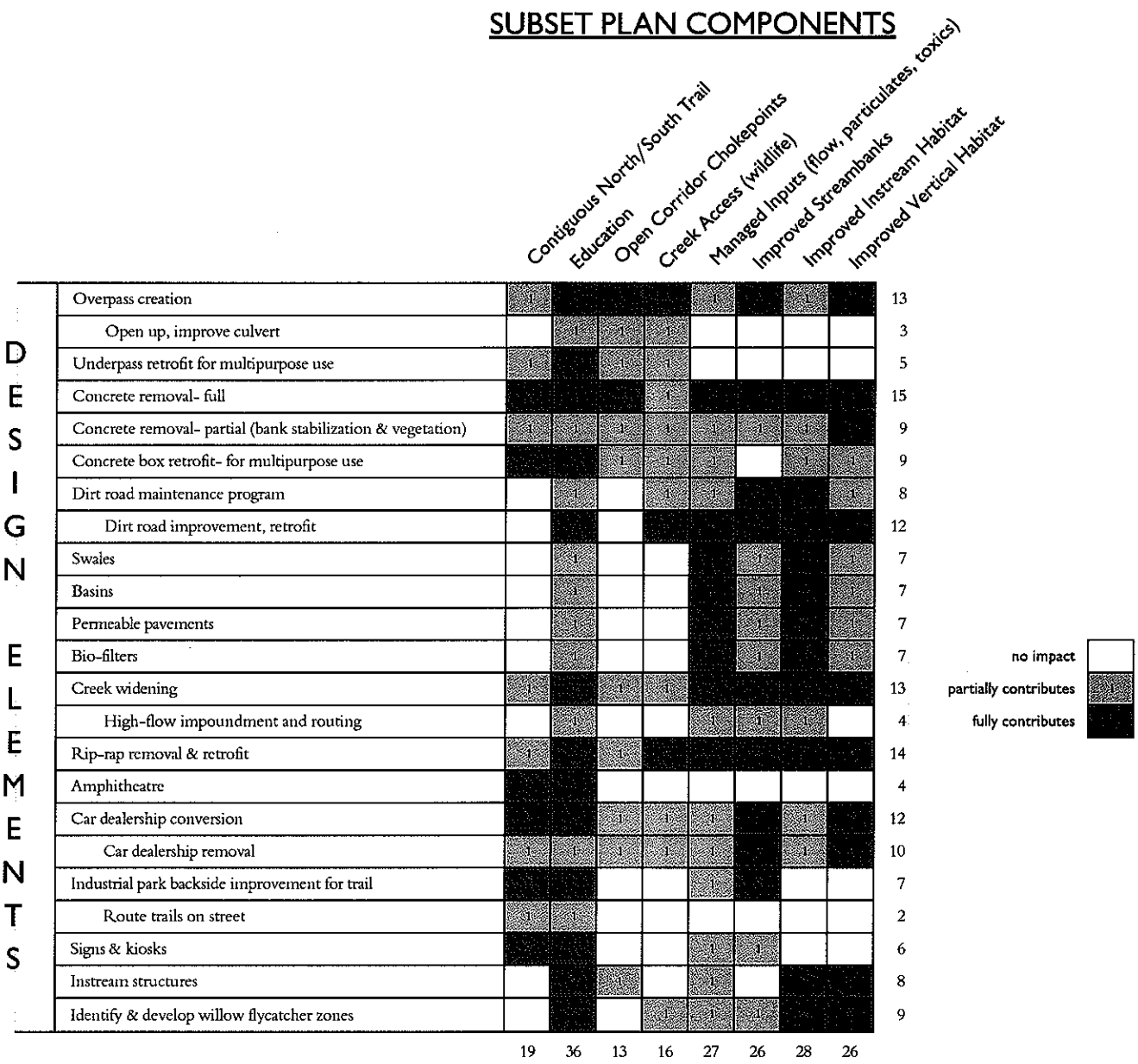


Figure 4–2. Matrix Showing a Method Used to Prioritize and Target Design Solutions for Las Virgenes Creek Watershed.

OPPORTUNITIES AND RECOMMENDATIONS

INTRODUCTION

Watershed design requires moving from large to small scale in order to maintain relevance to the processes that function in, and shape, the watershed.

In the recommendations that follow, the designs that address the large scale will be presented first, then move to the small, or site scale, thereafter.

The matrix on the facing page is used to show how the individual treatments effect the objectives. In the case of this chart, the three plan components— habitat linkage, creek protection, and riparian greenway— are represented by subsets to give more detail. Although the numbers are subjective, the matrix is a useful tool for evaluating the recommendations against the objectives.

WATERSHED-SCALE DESIGN

Three plan components comprise the design at the watershed scale:

- habitat linkage
- creek protection
- riparian greenway (recreation and education)

Habitat Linkage

This study will focus on three indicator, or target, species. These species— bobcat, steelhead, and willow flycatcher— were chosen because the habitat they require will encompass a diverse spectrum of habitat for many other species as well, thus, securing habitat for these species will be beneficial for an extensive and healthy ecosystem. (See section on "Natural Processes" for elaboration on the selected species). Accordingly, when evaluating an ecosystem, targeting certain species will lend a degree of confidence about others expected to be present therein.

The three aforementioned species require these designs:

- bobcat corridor
- steelhead run
- willow flycatcher zones

The **bobcat corridor** is an attempt to link the expanses of existing habitat to the north and south of the watershed. Fortunately, there is broad area of open land straddling Las Virgenes Road, but the Ventura Freeway (US 101) and development along the creek near the freeway pose severe restrictions to corridor continuity (see Figure 4–1).

Design recommendations focus on the corridor barriers at Crummer Canyon and Liberty Canyon. The extent of development along the creek (north of the freeway) is such that a solution is deemed impractical due to the enclosed, nonlinear configuration of the creek which bobcat will not use (because of lack of sightline).

At Crummer Canyon, the barrier is at the crossing under Mureau Road and the Ventura Freeway. The creek running through this canyon is directed through two impassable culverts; the recommendation is to create a greenway underpass by removing the fill that the roads are built on.

At Liberty Canyon, there is an existing freeway overpass with adjacent frontage roads and a small commercial building. The barrier condition is primarily due to the lack of separation between the passing vehicles for safe crossing of bobcat; the recommendation is to create a clear delineation.

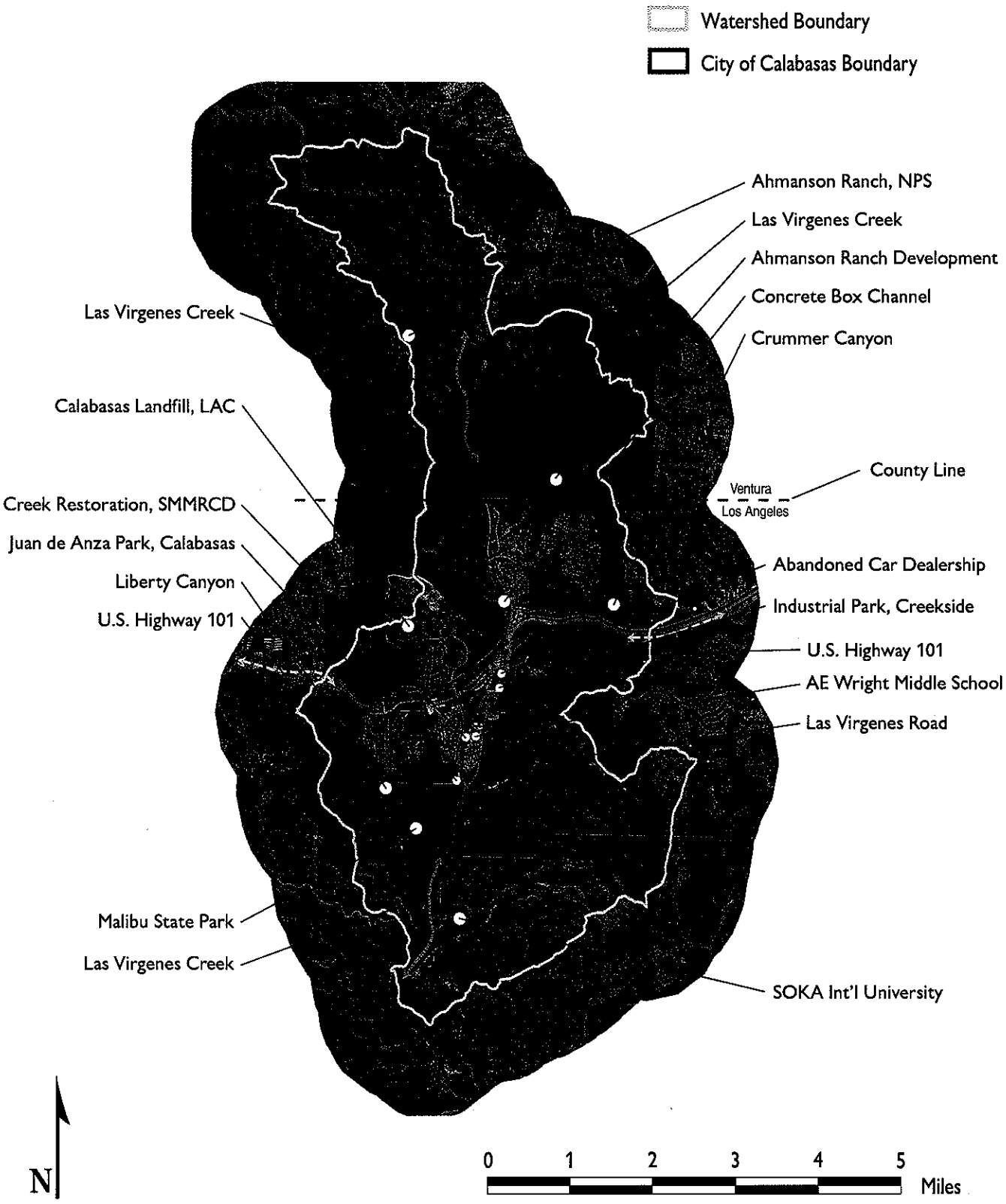


Figure 4–3. Map Showing Important Places in the Las Virgenes Creek Watershed.

Design guidelines for eliminating barriers include the following (Haas, 2000, except where noted):

- location of crossing adjacent to habitat is the most important feature
- culverts are not a preferred mode of passage by bobcats
- as wide a passage as possible is necessary to ensure usage (width > 8 ft.)
- a length—width ratio of 2:1 has proven successful, and 8 ft. high (Land, 1996)

The **steelhead run** is for the lower reach of Las Virgenes Creek, below Juan Batista de Anza park (junction of Lost Hills Road and Las Virgenes Road). The main barrier exists below the confluence with Malibu Creek— Rindge Dam. The dam is on Malibu Creek and prevents a historic run of steelhead from passing above this point and making their way into Las Virgenes Creek.

Rindge Dam has been identified as one of many steelhead run-blocking structures that should be eliminated in California (Friends of the River, 2000), so planning for, and preparing Las Virgenes Creek for this eventuality is practical. In addition, steelhead have been known to remain resident within a reach (Flosi, et al., 1998), so planting this species in the creek above the dam is an interim possibility.

Aside from the major barrier that Rindge Dam presents, the current flow regime in Las Virgenes Creek, dictated by upstream development, makes it unlikely that a protracted habitat can exist for steelhead. Thus, a system of flow attenuation and pool-drop structures is recommended.

Design recommendations include creation of:

- several pool-riffle sequences
- pool-forming structures such as gabion weirs
- in-stream cover devices such as boulders, snags, and root wads
- water temperature moderation devices such as riparian trees

Willow flycatchers require heavily vegetated riparian zones approximately 20-30 feet wide (minimum) and no less than two acres of total area; they tolerate road adjacency, but not a high volume of human activity (Betty Courtney— Calif. Dept. of Fish and Game, Personal Communication, May 24, 2000). This set of requirements closely aligns with the riparian setting of Las Virgenes Creek below Agoura Road (south of the freeway), and north of the county line. In between is mostly concrete lined channel and unlikely to support this riparian species.

The design recommendations for improving flycatcher zones include (Finch, 2000):

- predator and parasite control program (cowbirds, cats, dogs, etc.)
- planting of proper vegetation structure, density, and type
- restoration of suitable stream hydrology (i.e., backwater pools)
- signage and information to alert visitors of sensitive habitat

Creek Protection

Protection measures for Las Virgenes Creek encompass habitat-supporting processes such as stream velocity, erosion, and vegetative bank stabilization. The design approach is geomorphic, relating to stream channel form and the processes that change this form over time. Effecting stream geomorphology is a basic building block approach for creating stable riparian ecology.

As with habitat linkage, there are three main areas to be addressed at the watershed scale:

- attenuate downstream peak flow effects
- improve streambanks
- control direct runoff

Peak flows in Las Virgenes Creek— the velocity and volume of storm events— are sudden, short in duration, and extreme. When development was planned in the Calabasas area north of the

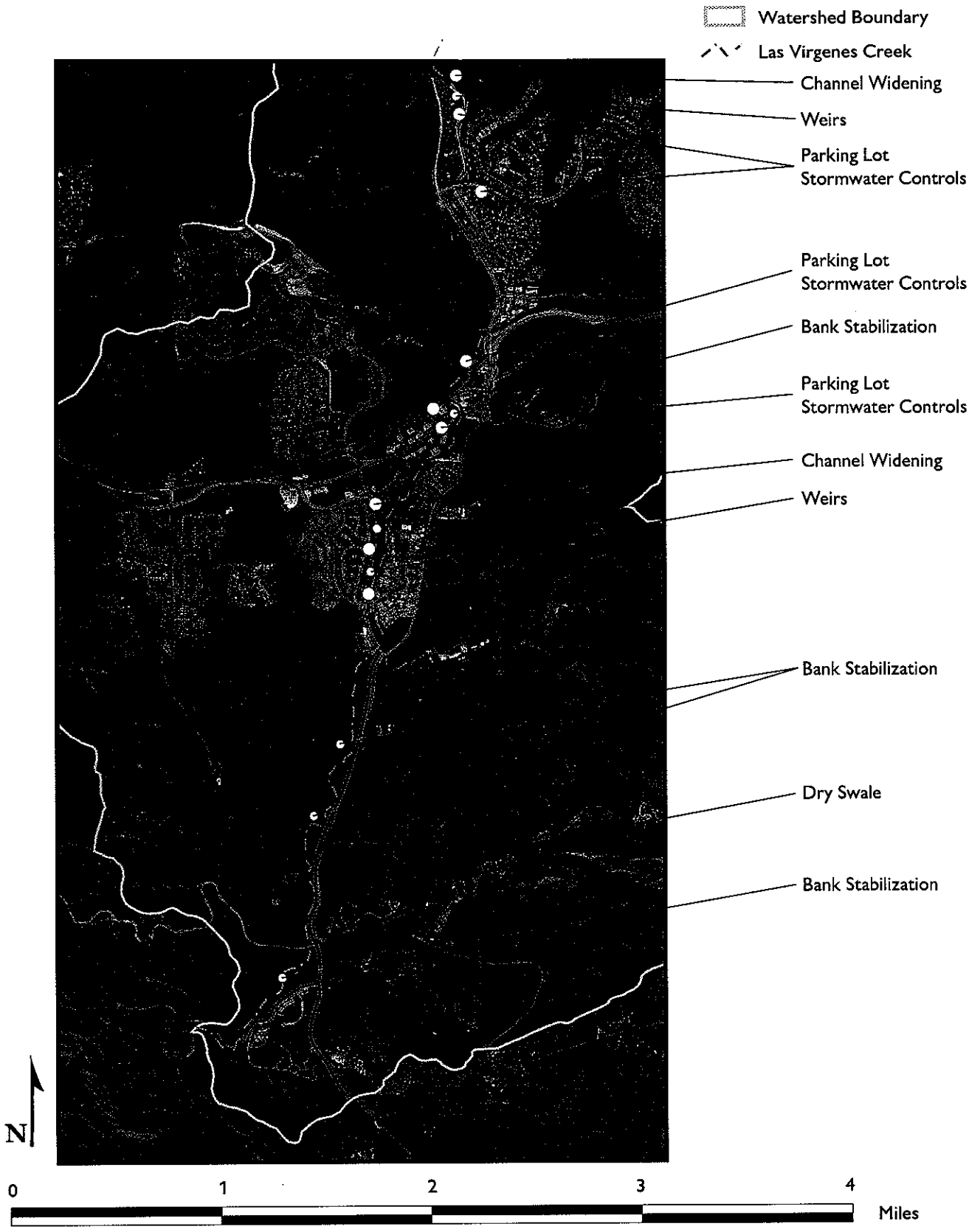


Figure 4–4. Map Showing Locations and Proposed Design Solutions for Las Virgenes Creek.

freeway, this peak flow regime was managed by encasing the channel in concrete and effectively moving the effect of a given storm event further downstream; however, this has caused accelerated streambank and channel erosion to the south.

Additional armoring treatments are noticeable further downstream, as well, where riprap is used to protect streambanks from collapsing in the face of flows more potent than the natural channel was (geomorphically) created to accommodate.

This transferred "bubble" of erosive energy is evident in the extreme way the stream has downcut in the reach below Juan Batista de Anza Park. For habitat to be improved and maintained, this energy will have to be dissipated more broadly throughout the riparian system. This can be accomplished by widening the floodplain in two key areas, and installing weirs in several locations (see Figure 4–4).

Streambank improvement refers to the locations that do not support vegetation due to riprap or solid concrete encasement. Techniques called "biotechnical" slope stabilization (Gray, 1996) are alternatives proven to support riparian processes and prevent bank failure. Visually, these streamside treatments are attractive, as well.

These techniques incorporate timber, or other structural components, filled with soil and wrapped or tied with organic materials such as coir. This combination provides an interlocked bank structure that can be planted with rooting vegetation such as willows to provide an ecologically functioning, and stable, streambank (Flosi, et al., 1998).

Locations that require stabilization are above and below the RCD restoration site, and at various locations within Malibu State Park (see Figure 4–3). These locations are noticeable by the undercut banks, and nearly 90 degree turns in the flow direction.

Direct runoff from roads and parking lots adjacent to Las Virgenes Creek contributes toxic-laden water and sediment during storm events. The resulting poor water quality and fine silts are not compatible with a healthy habitat for steelhead.

Implemented treatment strategies will slow the surface flows and direct these flows into filtration devices such as swales and biofilters. This will allow moisture to slowly percolate through plant and soil matter that can capture silts and absorb toxics, releasing cleansed water to the creek after passing through earthen substrate (SMRC Website).

A dry swale along the length of Las Virgenes Road south of Juan Batista de Anza Park is necessary, and biofilters should be installed in all parking lots that will generate runoff into the creek (see Figure 4–4).

Riparian Greenway

A greenway is a concept typically used in reference to a swath of contiguous undeveloped land with a developed area for recreation. Recently, in addition, greenways have been shown to be useful for ecological purposes such as wildlife corridors (Hellmund and Smith, 1993). When multiple non-conflicting uses can be applied to a landscape, the value to its users is maximized; therefore, that is the strategy set forth here.

A riparian greenway is a type of greenway that centers around a stream or creek environment. The concept for Las Virgenes Creek is a **North-South Trail** for recreation and education, and minimized habitat impact. The design will focus on the developed part of the creek because an acceptable trail already exists above and below this central area of the watershed.

Along the trail are several features:

- small amphitheater/gathering area
- bridge crossing
- commercial visitor center
- educational signage

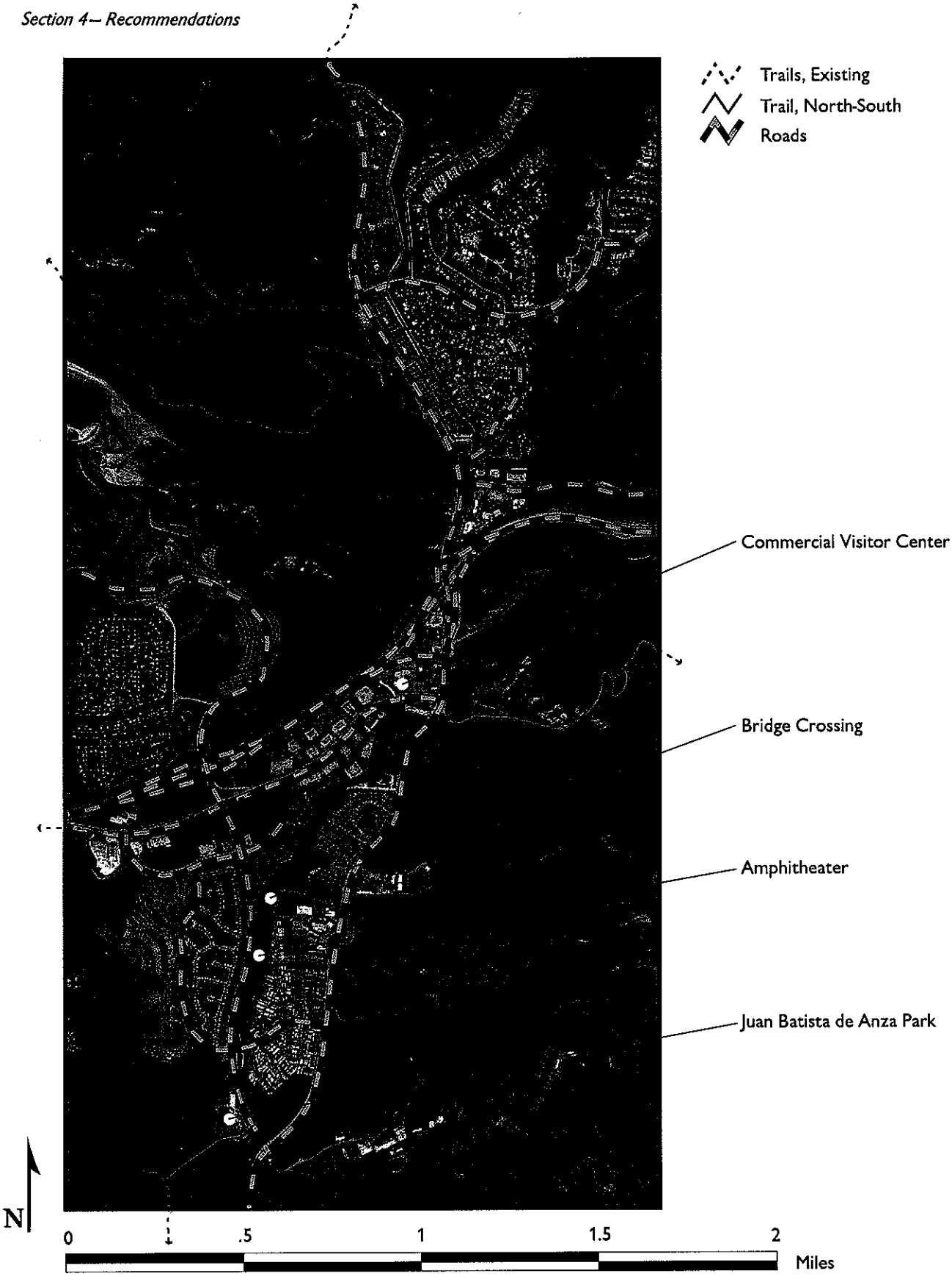


Figure 4–5. Aerial view showing the North–South Trail.

The trail is a linkage in itself by providing a way for people to enjoy the creek setting in a variety of ways by walking, jogging, biking, or riding from Malibu State Park in the south through to the former Ahmanson Ranch north of the county line.

Accomplishing this will require utilizing existing trails and easements, and converting single–use concrete structures into multiple–use corridors.

The **small amphitheater**, one–quarter–mile north of Juan Batista de Anza park, is an idea that came from a workshop held with local citizens to discuss concerns and potential creek uses. The amphitheater was conceived as a low use gathering area where students and others could observe the creek. This is a floodplain, so the installation is semi-permanent; when there is a flood event, some regrading and recompacting may be necessary afterwards. Also, since A.E. Wright Middle School is just across the creek, a **bridge** is proposed for crossing the stream. A flood control and bank restoration was undertaken here in 1997, but some signs of failure are evident (undercut slope toe, sparse vegetation), so further improvement will make this a long–term success.

The **commercial visitor center** is a utilization of an abandoned auto dealership site at the intersection of Las Virgenes Creek and Agoura Road just south of the freeway. This is a place where a short section of the creek is concrete lined, perhaps done in advance of similar treatment envisioned for further downstream (which will not occur).

By reconfiguring this short stretch of the creek, the site can be turned into an area where indoor-outdoor activities can be created. Such a site will have cafes, bookstores, bicycle shops, and other services/activities where the creek could be introduced to recreational users and serve as a departure point for other places and events in the watershed.

The creek offers an excellent setting for **education** about ecology, riparian processes, indigeneous habitats and wildlife, and sources of potential damage to these natural functions. Signs placed at sites along the trail will be the primary educational vehicle. This will provide a setting in which local schools can form class programs for their students. In addition, the casual observer will have educational opportunities when visiting. The envisioned result will be a system of self-perpetuating support for the work and attention necessary to protect such a natural area in this rural–urban setting (also called "rurban"— Fulton, 1997).

SITE-SCALE DESIGN

Within the three plan components— habitat linkage, creek protection, and riparian greenway— are site–scale recommendations, or designs, that elaborate enough on the overall plan to give it depth of meaning, and understanding for the reader.

In order to present the site–scale designs, the reader will be taken on a trip, so to speak, down the creek and each design site will be elaborated upon. There are two sites that are not on Las Virgenes Creek (Liberty Canyon Crossing, and Crummer Crossing), and these will be presented after those that are on the creek.

Converted Box Channel

The converted box channel refers to the area where the creek is encased in concrete; beginning exactly south of the county line, the channel runs in linear fashion along the [former] creek and adjacent to the apartment complex whose development condemned the stream to function merely as a drainage ditch.

This must be the most striking example of riparian conversion in the watershed, as the area northward is a nearly pristine example of southern riparian woodland.

Concrete Box Channel and Adjacent Apartments on Las Virgenes Creek

Photo Credit: Gary M. Lacy, Boulder, Colorado.

Converted Concrete Box Channel and Residences in Boulder, Colorado

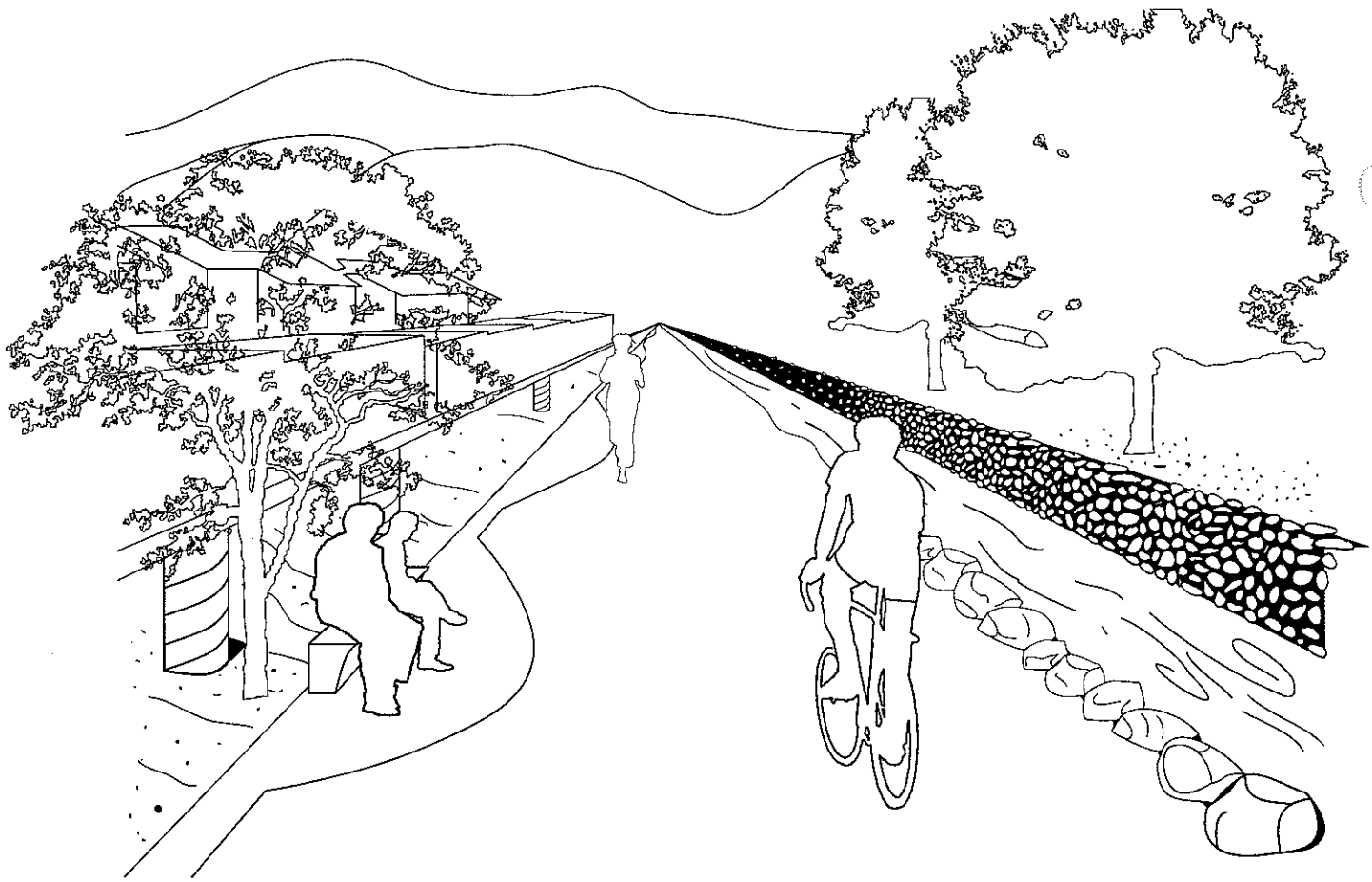
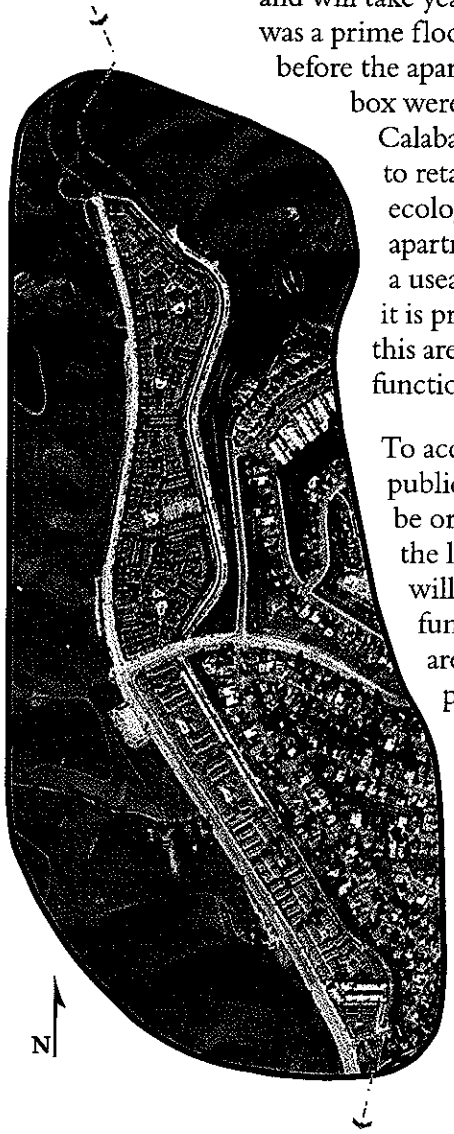


Figure 4–6. Proposed Channel Conversion for Las Virgenes Creek (including raised consruction and low flo channel).

The recommendations suggest ways to incorporate the channel into the North-South trail, and increase the flood capacity for peak flow attenuation downstream; to accomplish this, strategies to widen the channel are put forth. Three progressive recommendations are described:

- Near–term: box channel conversion for recreation (trail).
- Mid–term: channel widening by utilizing area under parking lots.
- Long–term: channel widening by redevelopment of flood zone.



The near-term solution is a way to bring some recreational value to the community by utilizing the corridor as a trail during most of the year when there is little water flowing. Inspiration for this idea comes from Boulder, Colorado, where they have converted many of their concrete box channels into attractive recreational corridors (Gary Lacy, Riparian Workshop— Society for Ecological Restoration, San Luis Obispo, 1999).

When flows are at such a level as to make recreation dangerous, they are closed off by city employees. Otherwise, the majority of the time they are accessible for walking, bicycling, etc.

For the mid–term solution, it is proposed that the concrete be removed and the peak flows be managed by widening the channel utilizing the area beneath the parking lots that currently hover along the west edge of the box wall.

Utilizing delta–like raised construction, these parking lots can be rebuilt on piers so that the high flow waters can spread laterally in this zone, thereby reducing downstream velocities.

The long–term solution is much more complex and will take years of planning. Since this location was a prime flood–prone area for the watershed before the apartments and associated concrete box were built, and because the City of Calabasas was incorporated with a vision to retain the natural beauty and ecological function in the area, and apartment construction such as this has a useable lifespan of less than 100 years, it is proposed that the ultimate future of this area be envisioned as an ecologically functioning flood–prone riparian zone.

To accomplish this, a partnership of public and private interests will need to be organized in order to put in place the legal and economic structure that will restore the land to its former function. Conservation easements are usually undertaken in order to permanently commit private land for public purposes; this is a unique situation because of the large number of apartments, but the basics of the transition are the same in that the land at some point will be have diminished value in terms of its development.

Returning a concrete channel to its former soft–bottom stream condition is not without precedent, and may be considered a trend. A term called "daylighting" is used when a creek which has be buried in an underground culvert is brought to the surface, as has been done in Berkeley, California on Strawberry Creek (Riley, 1998). Also, a section of the Trinity River in the Dallas-Ft. Worth area of Texas has recently been freed from its concrete constriction by the

View of the auto dealership on Agoura Road, just East of Las Virgenes Road (Spring, 1999).

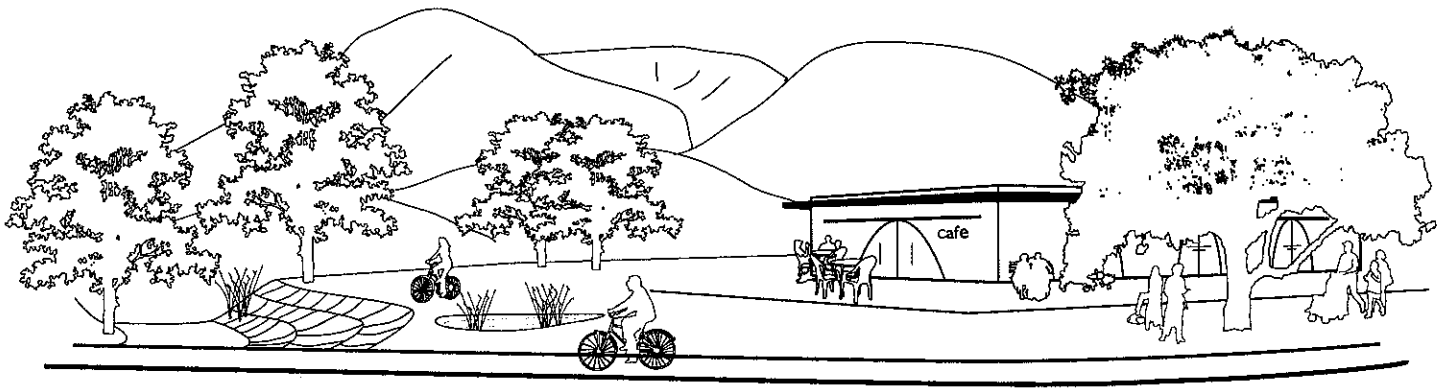


Figure 4–7. Proposed Commercial Visitor Center along Agoura Road.

US Army Corps of Engineers and the city of Dallas (Eli Kangas, Personal Communication, January 1999). Notably, the USACE is the same organization that has encased and dammed most of the waterways that are in concrete in the United States.

Commercial Visitor Center

This is the location of the former Jim Deal auto dealership located on Agoura Road just south of the freeway and across from a small commercial center; the site has been abandoned for several years. Since there is already a relatively high level of traffic, this is an ideal location for a place where people can meet and learn about the area when bicycling, walking, or visiting otherwise.

Envisioned is a creekside setting that has food services and literature about Las Virgenes creek and watershed. A visitor center run by a group, say, "Friends of Las Virgenes Creek," might have maps, pamphlets, and group activities. A bicycling club might use this location as a stopover for coffee, bagels, or cold drinks. Perhaps a bike shop could offer repairs at such a strategic location (see Figure 4–7).

The concrete lining is not an attractive feature, so utilizing alternative bank stabilization techniques would be necessary, as well as runoff remediation from the parking lot. These techniques in such public locations would further educate visitors about methods of creek protection.

People driving by would notice others relaxing and socializing in close proximity to a small, attractive location on the creek, open for all to see. This would inculcate a message of the creek being a vital component in the community.

Many communities across the United States and the world have incorporated vital commercial zones in streamside settings helping to revitalize and protect such valuable resources. San Luis Creek in downtown San Luis Obispo, California, and the Riverwalk on the San Antonio River in San Antonio, Texas, are good examples of towns that have intertwined their commercial and riverine resources (Riley, 1998).

Industrial Park/Restaurant Creekfront

This site is the home of La Paz Restaurant, a long–time watering hole for locals, as well as an office building. Opportunity awaits, as both facilities turn their back to the creek, figuratively speaking. Parking lies between the creek and the back of both buildings; also, the creek is rip-rapped here where the creek makes a sudden turn. Whether this bend is man-made, or a geomorphic creation is unclear, but it is clear that it will remain for quite a while.

The remedy for this "backside indignation" is to incorporate an extension to the businesses in the form of an outdoor cafe and break spot. What better place to enjoy a margarita, or a lunch break than in the shade of willow trees? A general cleanup, and biotechnical bank stabilization will make this site into a beautiful secluded nook along Las Virgenes creek.

Amphitheater

As mentioned previously, this site is where the Resource Conservation District of the Santa Monica Mountains sponsored a stream restoration project in 1997. This short stretch of the creek had been used as a dumping ground for fill material during the development of Lost Hills across the street (Bill Millar— City of Calabasas, Personal Communication, October 1998). The bank was laid back to provide more floodplain area, and native vegetation was planted.

The proximity to de Anza park to the south, and the proposed visitor center to the north, makes it an ideal location for gathering and education. In addition, the floodplain can be widened, and trails added by narrowing the adjacent Lost Hills Road to free up surface area for recreation from formerly impervious hardscape.

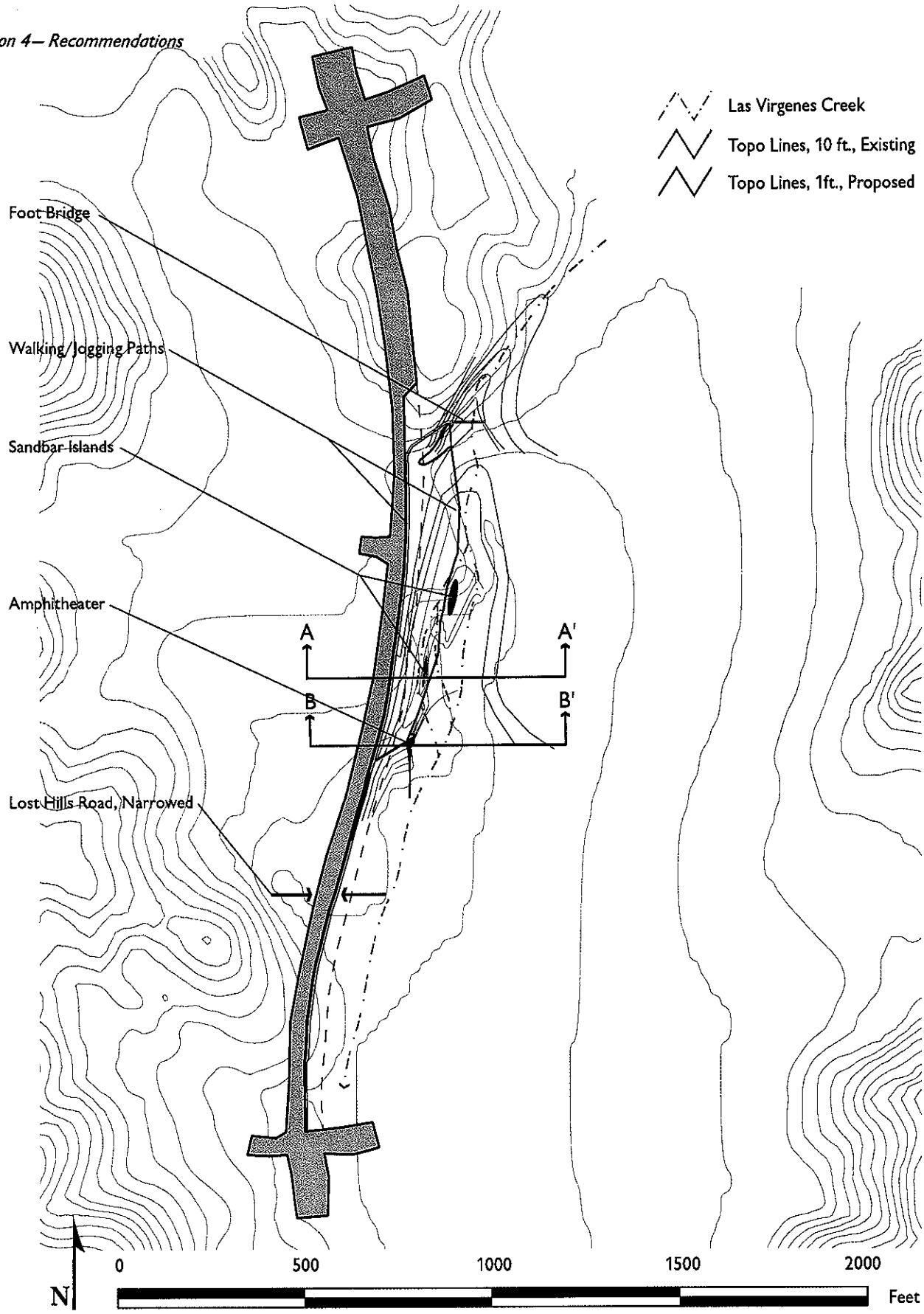


Figure 4–8. Layout of Amphitheater and Vicinity. The Path is Part of the North–South Trail, and the Low Flow Stays Along the Main Stream Course.

This road was built two lanes in either direction, with a median, in anticipation of heavier thru–traffic based on old Los Angeles County development plans (see Appendix D); the extent of these plans have since been curtailed by the City of Calabasas and neighboring Agoura following incorporation. Reducing this width for floodplain expansion will add territory for desired amenities, and peak flow capacity that will protect downstream riparian functions (see Figure 4–8 and 4-9).

The additional width will accommodate a small, informal gathering area in the form of an amphitheater for no more than 15 people (see Figure 4–10). The amphitheater was an idea spawned during a community workshop (see Appendix C) in which this site was deemed ideal for such an amenity due to its proximity to the park and A.E. Wright Middle School. It was noted that the amphitheater should attract people only such that the creek wouldn't be negatively affected, and be suitable for educational activities. The location, size, and informal nature will accomplish these goals.

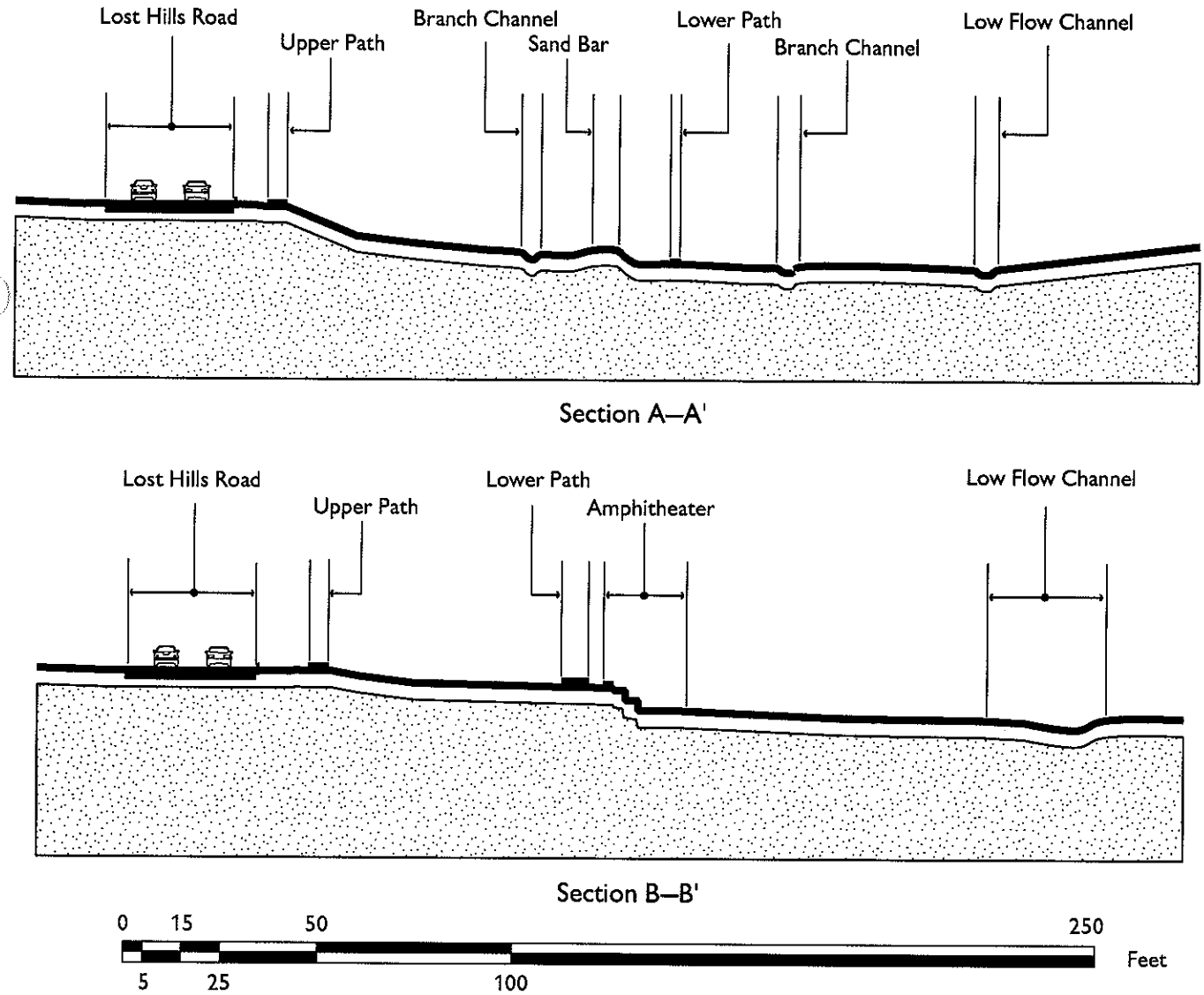
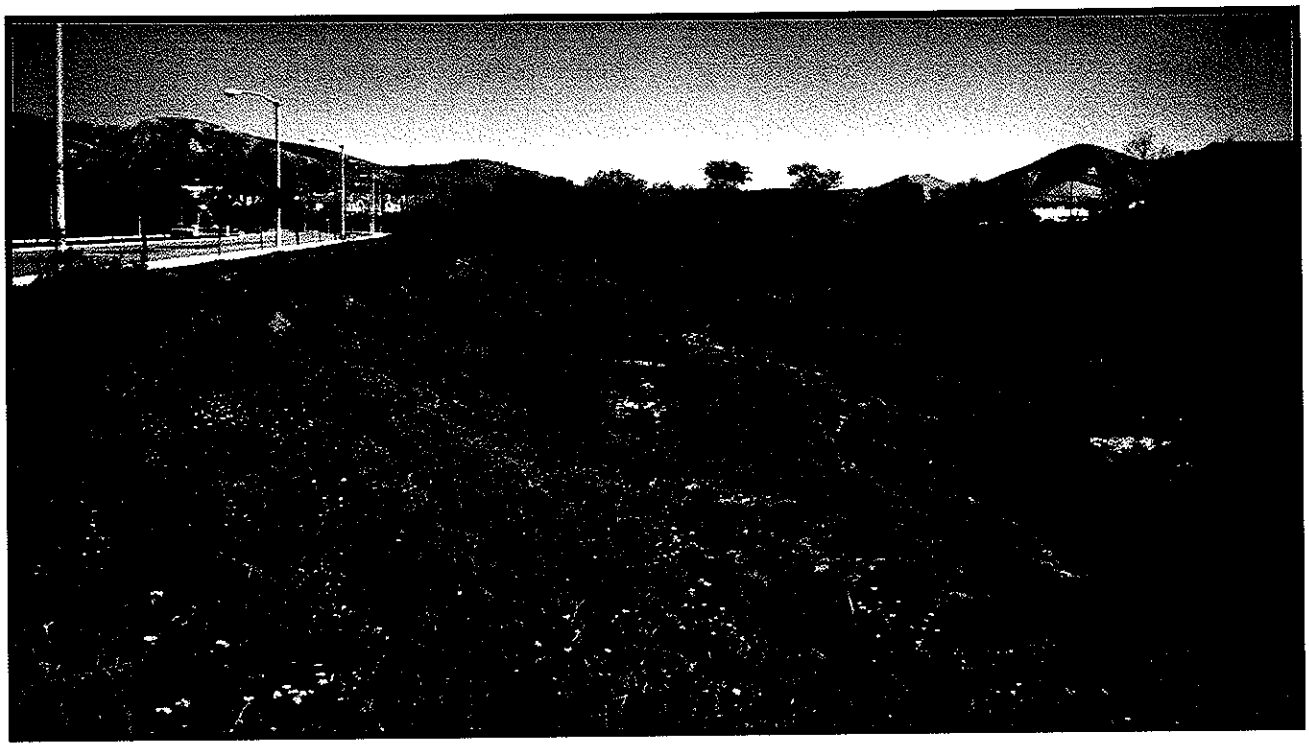


Figure 4–9. Sections Showing the Amphitheatre and Paths in Relation to the Narrowed Lost Hills Road.



View of the Restoration Site on Las Virgenes Creek Adjacent to Lost Hills Road (Spring, 1999).

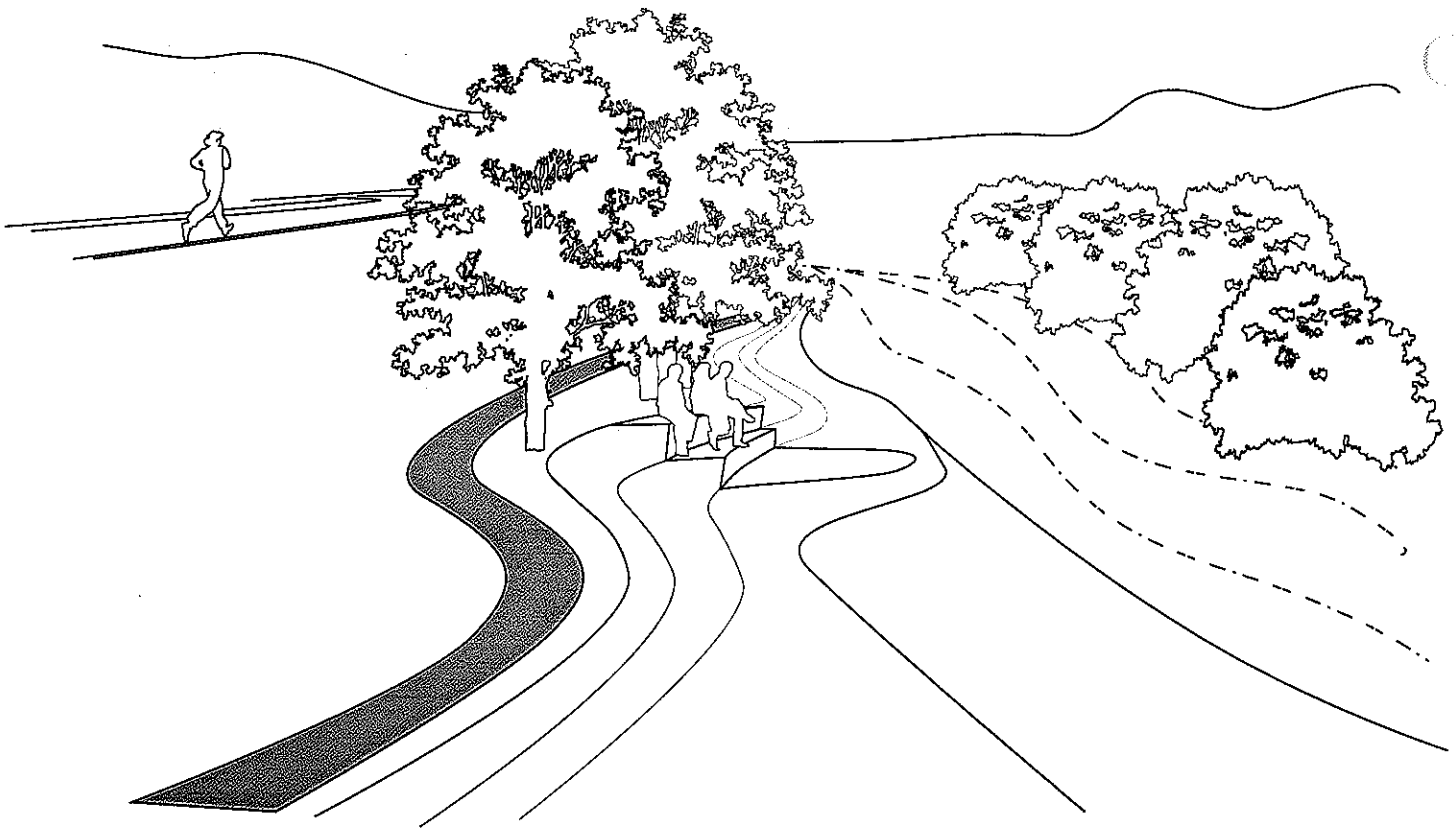


Figure 4–10. Sketch of the Amphitheater.

A walking/bicycling bridge was also recommended at the workshop. A.E. Wright Middle School is located just upstream and on the opposite side of the creek. Often, young students will shortcut across the creek on their way to school and this can be dangerous depending on the flow in the creek. So, a bridge at this location will be a practical and visually appealing element.

Since this is a functioning riparian zone, the restoration should be revisited. The floodplain widening is one aspect of this, but the bend just downstream at this site takes a direct flow and is showing signs of failing. Here, biotechnical stabilization is necessary. Also, instream devices to pool flows will be helpful for fish habitat, and streambank devices for cover will provide habitat as well.

The west side of the floodplain will require revegetation regardless of widening. It is important that soil rehabilitation techniques be applied (i.e., mycorrhizal fungi), and effective irrigation be designed into the project to insure that the vegetation takes hold over a three year period. This length of time will require that a contracted (funded) maintenance program be in place to eradicate weeds and ensure that the site is progressing as expected.

Willow Flycatcher Zones

As outlined in the section on watershed-scale design, the willow flycatcher requires a heavily vegetated riparian zone approximately 20-30 feet wide (at least). The general locations found suitable for habitat are shown in figure 2–6. More exact siting is beyond the scope of this document, however, the look and feel of such a site is that of languid slackwater with an edge of dense multi–story vegetation, often complementary to steelhead habitat.

Pool-Drop Structures, Lower Las Virgenes Creek

Exact siting of instream and streamside features to enhance steelhead habitat is the beyond the scope of this document, but literature is available that makes it possible to depict what such an installation could look like in Las Virgenes Creek (see Figure 4-11). An extensive document created by the California Department of Fish and Game, called the "California Salmonid Habitat Stream Restoration Manual" (Flosi, et al., 1998) is an excellent comprehensive guide for creating stream habitat and, as such, is referenced here.

Figure 4-11 shows structures that will form a pool, backwater, and cover. Installed in series within the creek, these structures will form the necessary pool–riffle sequences necessary for steelhead migration. Additional streambank features will provide shaded cover for fish and other waterborne creatures, as well. Especially crucial for Las Virgenes Creek is the flushing of fine sediments from spawning gravels; of course, measures that prevent excessive erosion and sediment inputs throughout the watershed are complementary within an overall strategy.

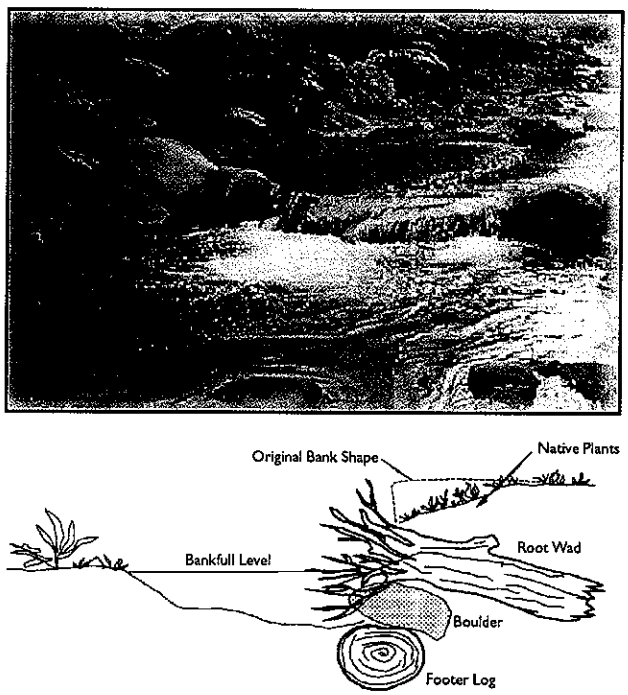


Figure 4–11. Instream Fish Habitat–Creation Devices

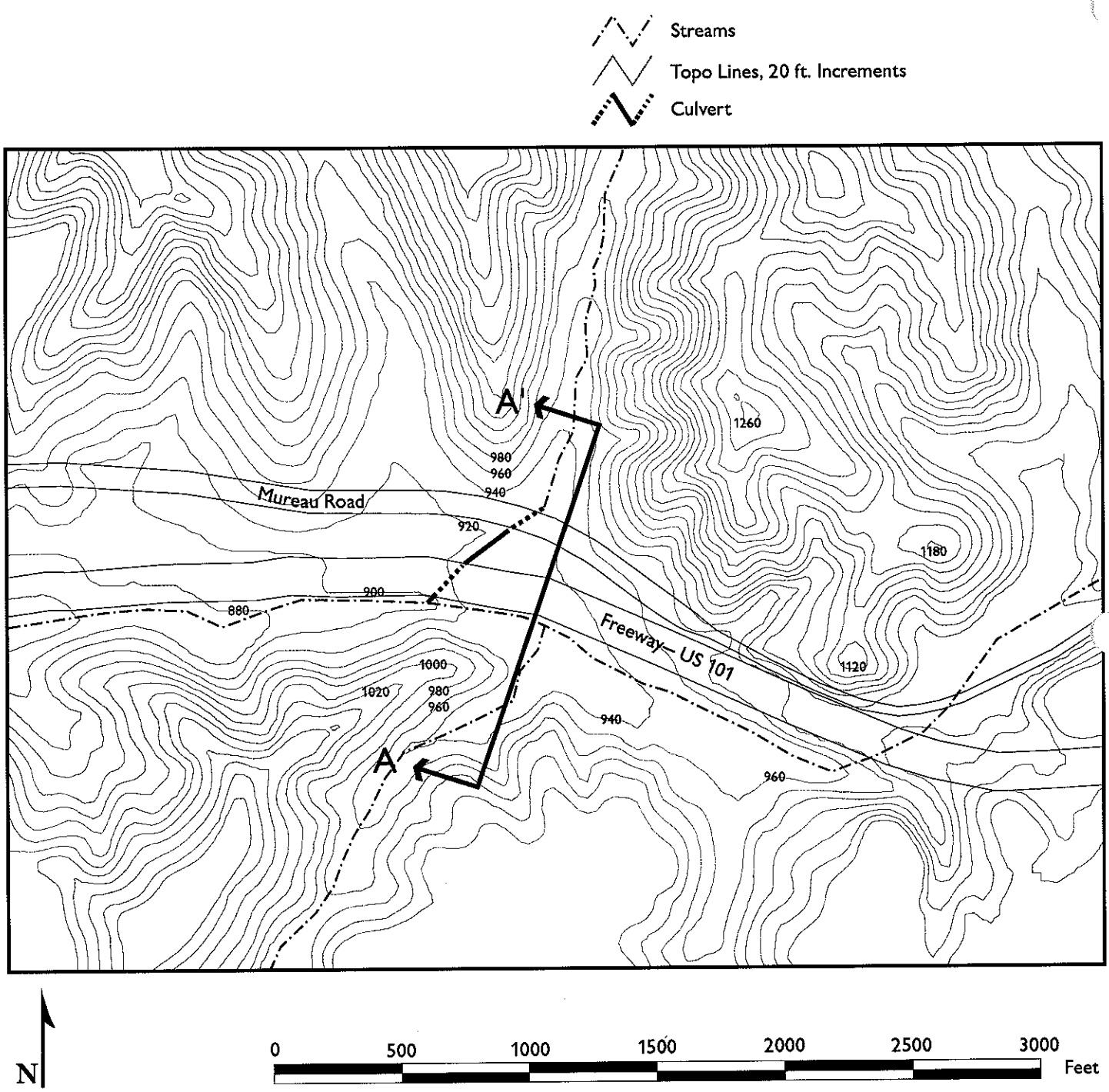
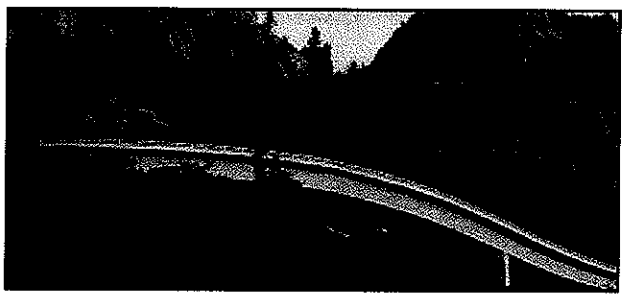


Figure 4–12. Current configuration of Crummer Creek at the junction of Mureau Road and US 101 (Ventura Freeway).

Crummer Crossing

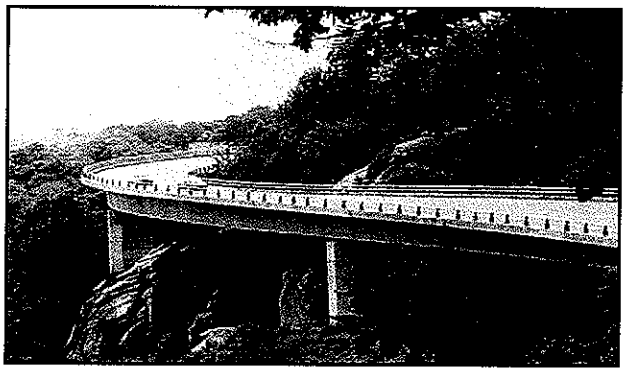
The goal at this location is to enlarge the passageway and shorten the covered lengths to make a strong connection under the freeway for wildlife between Crummer Canyon to the north and undeveloped land to the south (see Figure 4–12).

One method of accomplishing this would be to replace the current culvert pipe with a large tunnel. This tunnel— because of the length necessary to traverse the 160' freeway expanse— would have to be extremely wide in order to draw bobcat movement (2:1 ration, length to width). Because of the covered length, the predictability of wildlife usage would be low.



Linn Cove Viaduct, North Carolina's Blue Ridge Mountains

Considering this level of excavation and predictability, a more appealing alternative, albeit more expensive, would be to convert this short linear stretch of freeway into an overpass with a daylit median (see Figure 4–13). This would essentially split the length into two sections and provide a very conducive corridor. This strategy would follow the spirit of environmentally friendly road projects, such as Interstate 70 in Glenwood Canyon, Colorado, and the Linn Cove viaduct in North Carolina. In these projects, as a priority, the road was made to accommodate topography and natural functions. Conversely, at Crummer Canyon, the creek bed was filled and culverted to accommodate the freeway.



End-on Roadway Construction, Linn Cove Viaduct

With an overpass, the Crummer Crossing site could then be considered a corridor for people and wildlife because of its size, location, and open feel. In addition to the freeway passageway, Mureau Road, which runs parallel to the freeway, changes from a two lane road into a divided four lane road at this point. It is recommended that this short stretch be narrowed and converted into a bridge above the corridor; this bridge should have

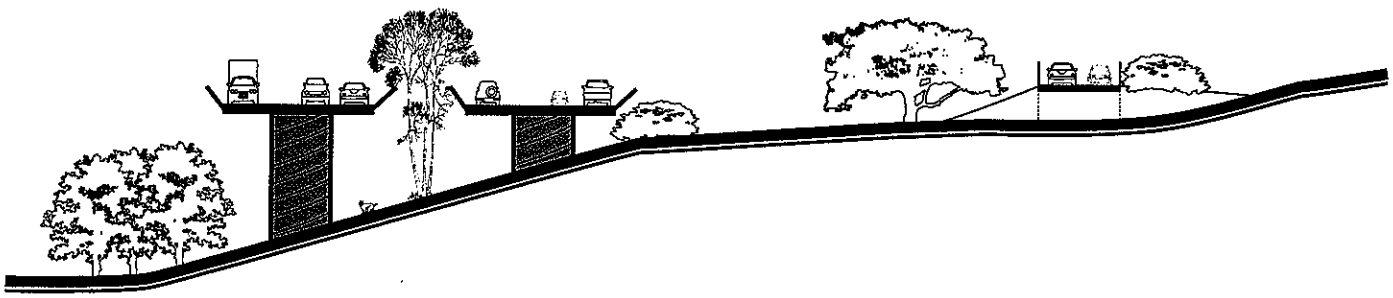


Figure 4–13. Profile of proposed corridor linkage at Crummer Creek (section A-A', looking west).

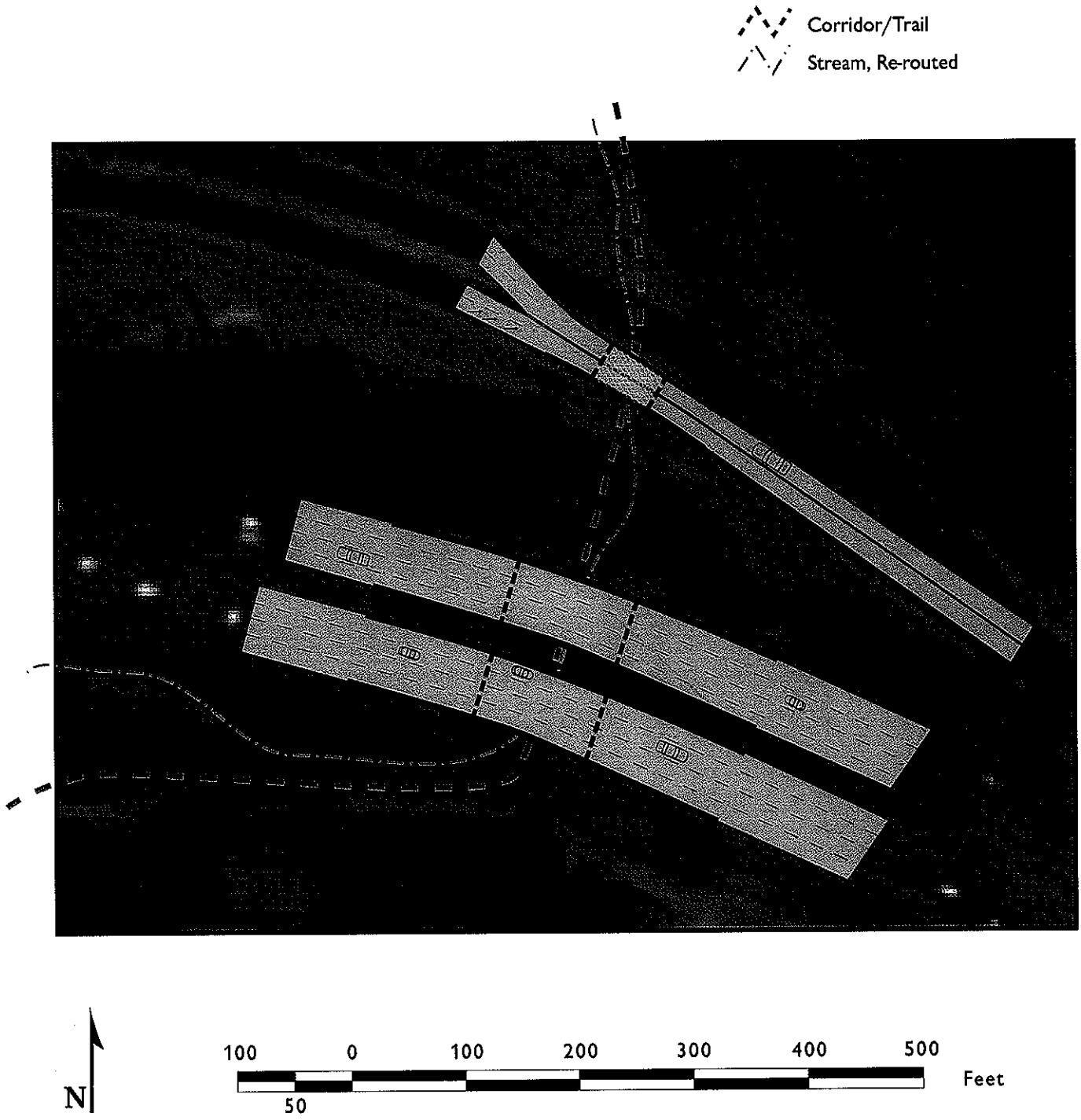
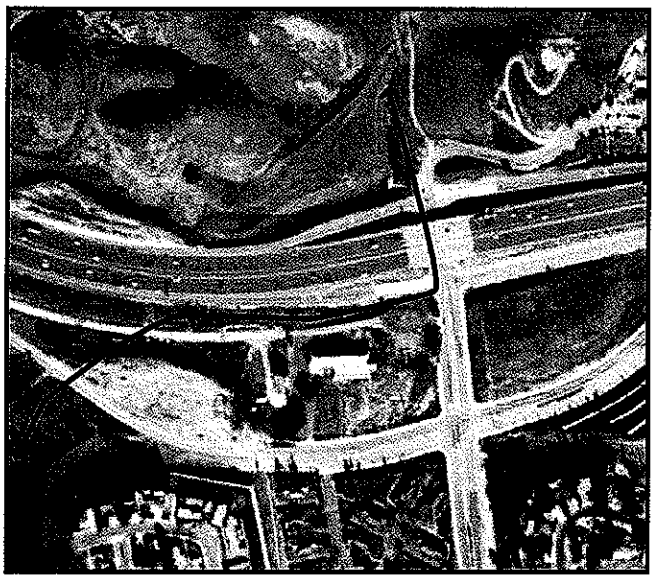


Figure 4–14. Plan View of the Freeway Overpass and Narrowed Mureau Road. Also, Note the Daylit Median in the Freeway.

a road bed that passes light to allow the corridor below receive natural light as a further inducement to wildlife (see Figure 4–14). Fencing would have to be placed on the road surface to guide animals to the passageway underneath.

Liberty Canyon Crossing

This location is fairly complex relative to Crummer Crossing. There is a developed parcel adjacent to the corridor linkage, and the roads align in several directions and locations. The good news is that the traffic here is low, and development plans have been reigned in; the



parcel to the north has been preserved as open space by conservation easement. Also, the passageway is a large, open underpass.

The remedy here would be to dedicate part of the underpass to wildlife by separating the west side of the thruway into a miniature corridor, and then routing animals behind the developed parcel on the south to cross a narrow stretch of Agoura Road; this will be accomplished with vegetation, fencing, and traffic slowing measures.

Since the scale of this freeway off and on ramps are over built relative to the development nearby, it may be practical to close a pair of the ramps and have drivers use an exit further to the east or west; this would reduce the crossing risk to bobcat, deer, etc., although traffic slowing measures would still be critical.

SUMMARY

The ideas set forth in this section are wide ranging. Some, like the Commercial Visitor Center, are very easy to gain support for because of the breadth of the community that would enjoy such an amenity. Others, like the box channel conversion, are much more intensive in planning, economics, and time.

Communities that are held in high regard usually have a long history, but someone or group had the insight initially to spark that momentum. This is the type of thinking that will have people 100 years down the road looking back and marveling at the foresight of today's Las Virgenes Creek stewards.

southern steelhead, *Oncorhynchus mykiss irideus*