RESTORATION PLAN

This section identifies restoration opportunities, makes estimates of potential benefits, and classifies the restoration efforts into feasibility categories. Restoration opportunities include improving and enhancing the stream corridors themselves; land use practices and other activities outside of the stream corridor that would benefit the watersheds are suggested as well. All actions necessary to restore habitat for Southern Steelhead to Ojai Basin streams are identified and considered, even though the likelihood of implementation is considered infeasible.

Since restoring and improving instream and adjacent habitats for Southern Steelhead in the City of Ojai will vary considerably from site to site, the Limiting Factor Analysis was used to identify restoration projects for implementation as part of this restoration plan. This plan identifies the necessary restoration elements for each stream in the City; however, some elements of the suggested restoration approach may be infeasible and/or not cost-effective. Therefore, a phased project approach is presented here, which focuses first on the restoration projects that are both feasible and that have a high level of potential benefit. Regardless, a matrix of the range of actions available to the City that would directly and indirectly benefit Southern Steelhead is provided. A qualitative assessment of the level of benefit to City streams and stream habitats is provided for each identified project or recommendation.

The reaches that are identified as consisting of one or more habitat limiting factors are assigned specific recommendations for restoration and a feasibility assessment. Since the main objective is simply to restore a means for Steelhead to pass through Ojai to reach otherwise suitable spawning and rearing habitat upstream, this restoration plan focuses on removing barriers to Steelhead migration upstream and downstream.

CDFG'S FOCUS ON RESTORATION

Many streams and rivers exist in California where water has been over-appropriated, which is a major cause for the current decline of Steelhead in California. Adverse watershed effects from human activities - such as logging, grazing, road building, improper construction practices, and hydraulic mining - have historically contributed greatly to instream habitat degradation and continue to do so. In addition, impacts to instream habitat, from gravel mining, dredging, flood control, and bank stabilization/protection projects, are a major cause of current habitat loss and degradation. Natural events, such as floods, droughts, and forest fires, can also contribute to habitat degradation, though not as severe in scope as human-induced activities. Finally, most streams throughout California include artificial barriers that eliminate access to historic spawning and rearing areas. (CDFG 1996).

According to the *Steelhead Restoration and Management Plan for California* (CDFG 1996), the CDFG's focal point for efforts to restore Steelhead populations throughout California is watershed restoration, watershed protection, and maintaining sufficient flows. Watershed restoration and protection are basic prerequisites for restoring and maintaining naturally produced Steelhead and other Southern Steelhead. Establishment of conditions, constraints, and practices that maintain watershed integrity, and restoration of problem areas that continue to degrade aquatic habitats, are of the utmost importance to restoring Steelhead populations. Restoration to correct past and ongoing localized environmental perturbations is a necessary and valuable component of fishery restoration if

incorporated into overall management and restoration objectives. However, restoration does not substitute for habitat protection.

Since protection for Steelhead habitat can be partially achieved by maintaining and protecting adequate stream flows, the best solutions to the problem of declining populations of Steelhead in California are (1) an aggressive enforcement of Fish and Game codes and other laws designed to protect instream flows and spawning habitat (the responsibility of CDFG), and (2) augmentation of instream flows through acquisition of riparian lands with water rights. Maintaining streambank stability, keeping sedimentation at normal levels, and protecting riparian vegetation are also necessary. Restoration priority, either throughout all of California or in more localized areas, should also be given to identifying and correcting the habitat problems that are most limiting to the target population. Finally, habitat improvement should be focused in streams that historically had significant Steelhead populations and areas where Steelhead habitat is severely degraded and restoration work is greatly required. For example, habitat restoration that attempts to correct problems created by watershed damage, or that restore access to historic habitats through barrier modification/removal, should have the highest priority. (CDFG 1996.)

OJAI BASIN STREAMS RESTORATION OPPORTUNITIES

As described in previous sections of this report, the wetlands and floodplains in the tributaries of the San Antonio Creek watershed are significantly degraded, particularly in the lowland areas, due to urbanization of those lowland areas. Degradation of watershed wetland functions generally increases downstream as a result of upstream impacts of urbanization. Regardless of the level of wetlands and riparian habitat degradation, restoration potential exists for several portions of the watershed, including within the City of Ojai.

The streams and drainages in the City of Ojai can be grouped into two basic categories: (1) natural but impacted, and (2) highly modified and impacted. The streams that are in a natural condition can be improved relatively easily. The condition of the highly modified and impacted streams can also be improved; however, the cost and level of effort to do so is much higher.

It is not likely that the grand scheme of restoration and protection suggestions, discussed above in the CDFG's Focus on Restoration subsection, can be implemented within the scope of this project. It may not even be feasible to completely restore optimal Steelhead habitat or to provide adequate migratory paths for Southern Steelhead in most streams flowing through the limits of the City of Ojai. However, many actions can be taken to improve habitat condition and water quality within the Ojai Basin streams, especially in the Stewart Canyon Creek, Fox Canyon Barranca, San Antonio Creek, and Thacher Creek watersheds. Habitat improvements would also benefit the flora and fauna of the area and would positively influence downstream aquatic habitats as well. It is with these facts in mind that a set of restoration goals and projects are identified and describe below. Implementation of any of these projects would result in improvements in:

- Water quality;
- Aquatic habitats;
- Aesthetics;
- Nonpoint source pollution control; and
- Fisheries habitat.

Restoration Goals and Projects

Examples of actions that can be taken to restore and enhance Steelhead habitat conditions include the following:

- Remove barriers to fish migration where feasible, especially on streams that provide spawning and rearing habitat upstream of the City;
- Establish minimum-width buffers between urban land uses and streams;
- Restore riparian vegetation along streams that pass through the City;
- Eradicate invasive exotic plants from City streams and drainages;
- Develop minimum stream crossing requirements[20] to ensure fish passage and habitat quality are not adversely affected;
- Minimize impervious surfaces on all parcels; and
- Establish regular water quality monitoring stations at key locations on streams that flow through the City, and monitor them at least annually.

The primary objective in this report, and that of CDFG and the City, is to maintain and/or restore City stream habitat conditions and migratory paths for Southern Steelhead within the City. To accomplish this objective, a number of goals need to be identified that if achieved, will accommodate that objective. Specific goals need to be identified and established as a means to evaluate which projects or actions the City or other interested parties may wish to consider for implementation. Restoration goals occur at various levels, with one or more components necessary to achieve a specific goal. That is, if the primary goal is to provide Southern Steelhead access to spawning and rearing habitats upstream from the City, a number of elements (specific projects) may need to be implemented. Implementation of any of the restoration projects presented in this report is designed to have a direct or indirect benefit to Southern Steelhead or habitat for Southern Steelhead, which will benefit other species as well. The restoration goals are presented below in a hierarchical fashion, with the goals that offer the most direct positive impact on Southern Steelhead listed first.

- Goa1 A – Remove fish migration barriers within the City of Ojai:
  - Replace road crossing barriers (A-1)
  - Remove debris dams/construct fish ladders (A-2)
  - Construct site-specific fish passage devices (A-3)
- Goal B – Improve aquatic habitat conditions with City of Ojai streams:
  - Remove invasive exotic plants (B-1)
  - Remove trash and debris (B-2)
  - Prevent fecal material and other pollutants from entering streams (B-3)
  - Establish vegetated buffers between streams and urban land uses (B-4)
- Goal C – Preserve existing riparian and instream habitats within City of Ojai:
  - Restrict incompatible activities within streams and drainages (C-1)
  - Acquire parcels with stream habitats (C-2)
  - Preserve parcels upstream of Ojai that contain Steelhead habitat (C-3)

[20] Procedures and guidelines have already been developed by NOAA Fisheries and CDFG for fish passage, and should be incorporated into City stream crossing requirements.

- Goal D – Prevent aquatic habitat and water quality degradation within and downstream of Ojai:
  - Conduct water quality monitoring in City streams and drainages (D-1)
  - Educate landowners to prevent nonpoint source pollution entering drainages (D-2)
  - Provide technical assistance to landowners (and residents) to control nonpoint source pollution (D-3)
  - Modify zoning codes to minimize impervious cover for each parcel (D-4)
  - Modify building/land use codes to prevent nonpoint source pollutants from leaving parcels (D-5)
  - Modify building/land use codes to require stream/drainage crossings to be sized to prevent adverse changes to fish or aquatic habitats (D-6)
  - Preserve undeveloped upland portions of watershed (D-7).

Each of these goals and projects are described further below, with specific actions that the City can consider for implementation, grouped according to general types of actions, such as: land use changes, instream restoration actions, habitat enhancements, and preservation of upland portions of the watershed. Table 31, Matrix of Potential Stream Habitat Restoration Actions by the City of Ojai, provides a matrix illustration of the types of actions the City can take or consider that will accomplish one or more of the restoration plan goals. Each of these projects can be grouped into four basic categories: instream restoration; habitat enhancement; land use changes; and habitat preservation.

Goal A - Remove Fish Migration Barriers

The greatest benefits towards improving conditions for Southern Steelhead in the City of Ojai and the Ojai Valley is to remove existing fish migration barriers, and to protect and enhace existing aquatic and riparian habitats. Three basic types of actions would need to be taken to remove existing fish barriers: replace road-crossing barriers; remove debris dams/construct fish ladders; and construct site-specific fish passage devices. These types of actions are difficult technically and financially. They require significant modifications or replacements of existing man-made structures that serve specific functions that did not consider their effects on fish migration when they were built.

ROAD CROSSINGS

Road crossings often create barriers to fish migration due to poor design (as related to stream flow) by creating significant drop-offs from the upstream portion to the downstream portion of the stream. The resulting wall can be too high for fish and other aquatic wildlife to overcome. Often these drop-offs are created intentionally to provide a barrier to upstream channel erosion, but cause excessive water velocities and a lack of sufficient water depth for Steelhead. (Projects A-1, A-2)

Soule Golf Course Creek Crossing (A-1)
One road-crossing barrier to fish passage occurs on San Antonio Creek at Soule Golf Course. This is the only significant road-crossing barrier within the City. However, the golf course is owned by the County of Ventura Parks Department, operated by a private concession. Several Southern Steelhead were trapped below this barrier in the spring of 1997-8, and failed to reach spawning habitat upstream. Soule Golf Course Arizona Road Crossing (Photographs 51 and 52 shown above in the San Antonio Creek Watershed Modifications subsection) is a barrier created on San Antonio Creek that effectively prevents Southern Steelhead from migrating to historic spawning grounds in the Ojai Valley and on Nordhoff Ridge.

Table 31. Matrix of Potential Stream Habitat Restoration Actions by the City of Ojai

Category	Restoration Goal Item No.	Description	Feasibility	Benefit to Steelhead	Cost Estimate[21]
Instream Restoration	A-1	Soule Golf Course Creek Crossing	High	Direct/High	$0 to $30K
Instream Restoration	A-2a	Stewart Canyon Debris Basin Fish Ladder	Low	Direct/High	$2M
Instream Restoration	A-2b	Fox Canyon Barranca Debris Basin Removal	Moderate to High	Direct/Moderate to Low	$500K
Instream Restoration	A-3a	Modify Fox Canyon Barranca Channel	Low	Direct & indirect/ Mod. to Low	$2M
Instream Restoration	A-3b	Modify Stewart Canyon Creek Underground Culvert	Moderate	Direct	$5M
Habitat Enhancement	B-1	Eradicate Invasive Exotic Plants	High	Indirect	$175K initially; $25K/yr
Habitat Enhancement	B-2	Remove Trash	High	Indirect	$30K initially; $10K/yr
Land Use	B-3	Prevent Fecal Material and Other Pollutants from Entering Streams	Moderate	Indirect	$100K
Habitat Enhancement	B-4	Establish Vegetated Buffers Between Streams and Urban Land Uses	Moderate	Direct & indirect	$300K
Land Use	C-1	Restrict Incompatible Activities Within Streams and Drainages	High	Direct & indirect	$15K
Preservation	C-2	Acquire Parcels With Stream Habitats	Moderate	Direct & indirect	$20M
Preservation	C-3	Preserve Parcels Upstream of Ojai That Contain Steelhead Habitat	Moderate	Direct & indirect	$20M
Instream Restoration	D-1	Conduct Water Quality Monitoring in City Streams	High	Indirect	$25K to $50K/year
Land Use	D-2	Educate Landowners to Prevent Nonpoint Source Pollution Entering Drainages	High	Indirect	<$25K
Habitat Enhancement	D-3a	Provide Technical Assistance to Landowners to Control Nonpoint Source Pollution	High	Direct & indirect	$50K
Land Use	D-3b	Provide Technical Assistance to Horse Owners	High	Direct & indirect	$10K to $50K
Land Use	D-4	Modify Zoning Codes to Minimize Impervious Cover for Each Parcel	High	Indirect	$30K
Land Use	D-5	Modify Building/Land Use Codes to Prevent Nonpoint Source Pollutants from Leaving Parcels	High	Indirect	$30K
Land Use	D-6	Modify Building/Land Use Codes to Require Stream/Drainage Crossings to be Sized to Prevent Adverse Changes to Fish or Aquatic Habitats	High	Indirect	$30K
Preservation	D-7	Preserve upland portions of watershed	Low	Direct & indirect	$20 M

[21] Cost estimates are best guestimates and have only been broadly calculated.

Replacing this road crossing with a bridge or culvert to allow fish-passage would allow access to historic fisheries habitat that has been isolated since the construction of this structure. Bridge replacements are expensive, costing from $250,000 to over $1,000,000 each, depending on the width and length of the crossing.

The City would need to find outside funding sources to pay for these projects. The benefits achieved for fish passage by each creek crossing replacement should be evaluated before project initiation or work spent on seeking funding. Fortunately, the Ventura County Parks Department has scheduled a project to fix this problem, scheduled for Summer 2005, after creek-flows have ceased. Fortunately for the Parks Department, the storm of early January 2005 washed much of this structure away, removing the barrier to fish passage, even though portions of the crossing (concrete slabs) remain in the creek bed.

DAMS (A-2)

Two dams across two creeks occur within the City of Ojai: Stewart Canyon Debris Basin Dam on Stewart Canyon Creek and a small debris dam on upper Fox Canyon Barranca. Both dams represent significant and impassable barriers to fish migration. Removing one or both of these debris dams or constructing fish ladders over them would greatly improve access of migrating fish past existing barriers to historic upstream habitats.

Stewart Canyon Debris Basin Fish Ladder (A-2a)

As described previously in this report, the reaches of Stewart Canyon Creek upstream of the debris basin is the largest stream and drainage system that flows through the City besides San Antonio Creek, and provides the second longest length of Steelhead habitat of all the streams flowing through the City. Stewart Canyon Creek enters the City just above the Stewart Canyon Debris Basin, from a natural stream channel with 29,116 linear feet of streambed upstream, with a watershed area of 1,160 acres. The creek is channelized below the debris basin with concrete walls and bottom for 1,468 feet, and then covered by Cañada Street ada Street for 2,554 feet until it daylights just south of Carrows Restaurant (south of Ojai Avenue and between Santa Ana and Blanch Streets), channelized for another 719 feet, for a total length 4,741 feet. The creek does not have a natural channel until south of the Ojai Bicycle Trail.

Since Stewart Canyon Creek provides the greatest amount of historic and suitable fish spawning and rearing habitat north of the City, fixing this barrier would provide the greatest benefit to Southern Steelhead. Constructing a fish ladder over the debris basin dam would be necessary to remove this barrier. Photograph 88, Stewart Canyon Debris Dam Spillway, illustrates the height and length of the spillway of the dam of this large debris basin. Southern Steelhead are not capable of swimming up this spillway into the debris basin when flows are sufficient for migration as the ramp is smooth concrete and too high to leap over. No plunge pool exists at the base of this spillway either.

Removing the debris dam is not considered an option since it provides important sediment control functions during large flood events, such as occurred in late December 2004 and January 2005, as shown on Photograph 50, Stewart Canyon Debris Basin filled by winter storm event (shown above in the San Antonio Creek Watershed Modifications subsection).

The cost to construct an adequate fish ladder here would range from $500,000 to $9,000,000[22]. However, the construction of any fish ladder over this debris basin dam would be ineffective unless

[22] The fish ladder at the Robles Diversion on the Ventura River, which was completed in 2004, cost approximately $9,000,000; however, it is a much larger and likely a more sophisticated structure than would be needed for the Stewart Canyon Debris Dam.

the channelized portion of the creek downstream of the basin were not also modified to allow fish passage, which is discussed later in this report.

Photograph 88. *Stewart Canyon Debris Dam Spillway (28 January 2005).*

Fox Canyon Barranca Debris Basin Removal (A-2b)

The small debris dam on Fox Canyon Barranca, Photograph 61, Fox Canyon Barranca Debris Dam (shown above in the San Antonio Creek Watershed Modifications subsection), was built in late 1985 or early 1986 to retain sediment material that washed down from Nordhoff Ridge after the Wheeler Fire of 1985 and has completely filled in. This structure prevents any fish from migrating upstream to any suitable habitats on the south slope of Nordhoff Ridge. Since this stream is ephemeral in nature for most of its length north of the City, the benefit achieved by removing this debris dam or constructing a fish ladder over it would have only minimal benefit to Southern Steelhead.

MODIFY CONCRETE FLOOD CONTROL CHANNELS (A-3)

The concrete channelized portions of both Stewart Canyon Creek and Fox Canyon Barranca through the City has created an effective barrier to fish passage. Both channels were constructed to provide flood conveyance through the City, but perform no other wetland functions. Solutions to removing the barriers consist of three options: removing the concrete channels and replacing them with natural substrates; modifying the channel bottoms to create artificial pools at regular intervals; and constructing fish passage devices, such as water flow baffles. When water is flowing in these concrete channels, because of their length and slope, fish cannot swim these long lengths to reach natural stream habitat north of the City. The fish need to rest periodically to swim against strong currents, and the currents down these channels are likely too strong[23] when enough water is present.

These floodways are operated and maintained by the Ventura County Watershed Protection District (VCWPD), specifically to convey floodflows to protect life and property in Ojai. The VCWPD has stated that it is willing to allow these culverts to be modified to accommodate fish ladders as long as flood flow capacities are not changed (Jeff Pratt pers. comm.).

[23] CDFG staff have observed Steelhead migrating long distances up concrete channels successfully, such as in the San Gabriel River, and to a lesser extent in Ballona Creek and the Santa Ana River.

Modify Fox Canyon Barranca Channel (A-3a)

Replace Fox Canyon Barranca culvert with natural substrate and riparian vegetation, or install features to create pools or areas with still water to allow migrating fish to rest. Removing the concrete bottom would be more practical, or necessary to best achieve the channel morphology to create resting pools, but would still be very expensive. Since no Steelhead Trout habitat occurs upstream, the benefit to fish is minimal except for water quality and general habitat condition improvements. (Refer to Photograph 54, Meander Pattern in Fox Canyon Barranca Channel, shown above in the San Antonio Creek Watershed Modifications subsection.)

Originating on the south slope of Nordhoff Peak in the Los Padres National Forest, the Fox Canyon Barranca follows a natural course and bed until just upstream of North Montgomery Street, after which it is diverted into a large underground pipe to Grand Avenue. The abovementioned debris dam is located upstream of North Montgomery Street. Fox Canyon Barranca channel (concrete sides and bottom) extends from Grand Avenue southward to the south end of Fox Street, after which it returns to a natural stream channel.

Restoring either stream to natural channel conditions is not feasible since there is little undeveloped land available to provide adequate flood conveyance without removing both streets and houses, both unacceptable actions, not to mention very costly.

Modify Stewart Canyon Creek Channel (A-3b)

The Stewart Canyon Creek flood control channel represents a significant barrier to fish migration or movement between lower and upper reaches. At present, the flood control channel provides only one function, floodwater conveyance, which it does well. However, the flood control channel, as constructed, eliminates the 13 other functions Riverine wetland systems typically provide (See Introduction Section for discussion of Riverine wetland functions).

Replacing the Stewart Canyon Creek underground culvert with fish-friendly channel would be the most significant effort to restoring historic spawning and rearing habitat for Southern Steelhead in the City of Ojai. Removing the existing barrier to fish passage would restore 29,116 linear feet of stream upslope of Ojai that is currently inaccessible, as described earlier in the Restoration section of the report.

Approximately 2,000 linear feet of Stewart Canyon Creek is channelized into an open box culvert. Approximately 2,850 linear feet of the creek is in an underground box culvert, under Cañada Street. Photograph 56 (Stewart Canyon Creek flood control channel and box culvert shown above in the San Antonio Creek Watershed Modifications subsection) illustrates existing conditions of the channel and culvert. These three connected reaches, and the Stewart Canyon Debris Basin Dam, represent the largest barrier to Steelhead Trout migration through the City of Ojai to upstream spawning and rearing habitat.

Modifying the flood control channel to accommodate fish passage would be extremely expensive and challenging, but would provide the most significant migration barrier removal project in the City. Periodically, the City could evaluate technical advancements that could potentially make significant restoration efforts like these feasible in the future.

Goal B - Improve Aquatic Habitat Conditions

As part of the Ventura Countywide Stormwater Quality Management Program, the City of Ojai has implemented the following specific components/projects to reduce nonpoint source pollution generated from within the City:

- Labeled all stormdrains with "Don't Dump, Drains to Ocean" signs;
- Instituted a Junior High Service Club Stormwater Patrol program;
- Increased enforcement by City inspectors (but no citations are issued to violators);
- Increased hazardous waste collection disposal for small businesses; and
- Held education programs at Topa Topa Elementary School.

While these five projects are an important component to reducing nonpoint source pollution originating from within Ojai, additional tasks are required to significantly reduce this pollution and improve aquatic habitat and water quality conditions both within the City and downstream. Tasks to improve aquatic habitat conditions include a range of projects from eradicating invasive exotic plants, removing trash, preventing urban pollution from entering drainages, and establishing vegetated buffers from Ojai streams. Each task is described in the following paragraphs.

Remove Invasive Exotic Plants (B-1)
The City should lead a project to remove invasive exotic plants from all streams within Ojai. Figure 25, Map of Ojai Stream Reaches with Invasive Exotic Plants, illustrates the portions of streams that flow through the City that contain significant amounts of invasive exotic plants that should be eradicated. Approximately 47,370 linear feet of streams within Ojai with a natural bed contain invasive exotic nonnative plants. These stream reaches can be made "weed free" fairly quickly as some reaches are only sparsely vegetated, or the number of invasive exotic plants is relatively low.

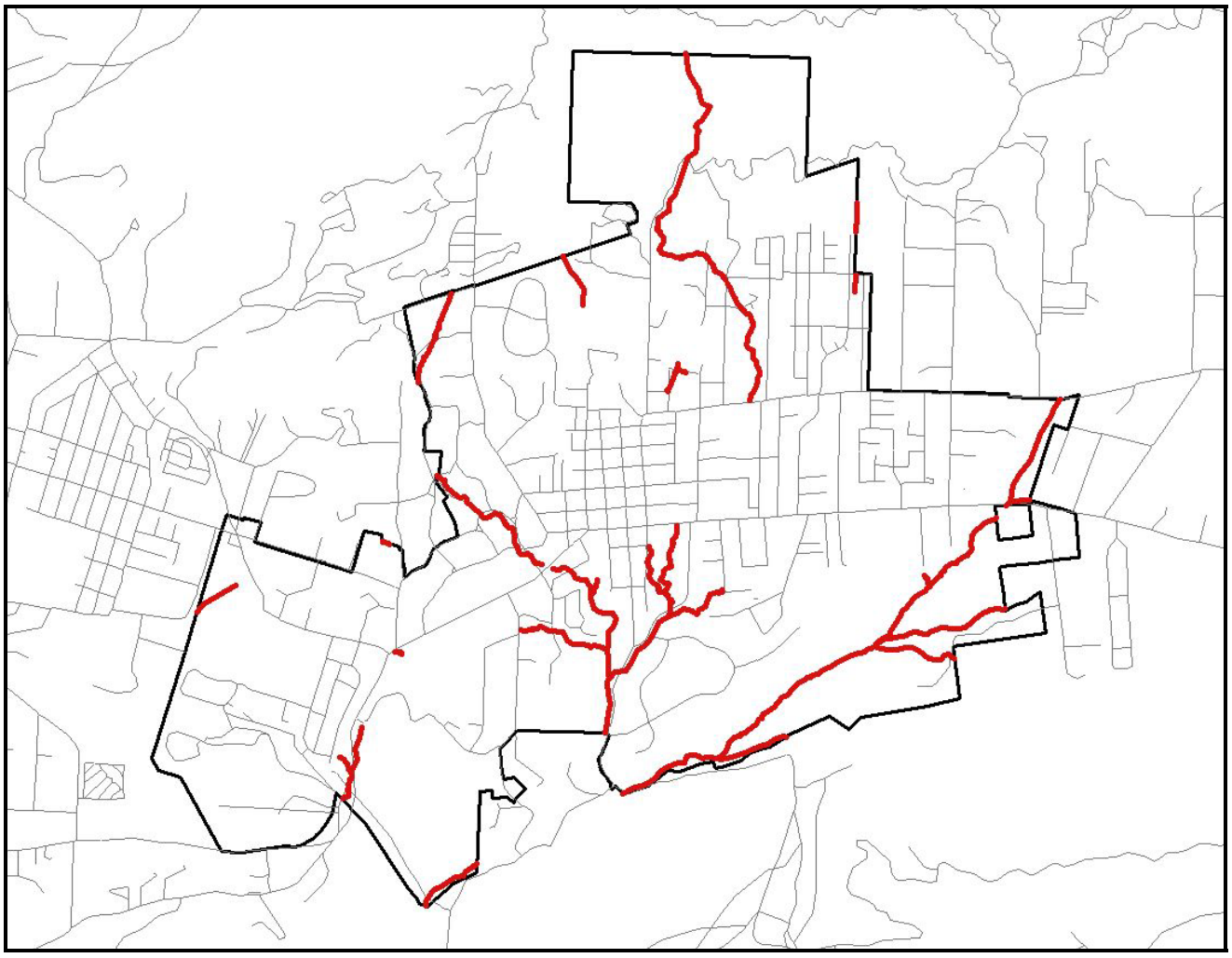
A small start on this type of restoration was started in Libbey Park with a grant from the California Department of Water Resources Urban Streams Restoration Program (Libbey Park Creek project - DWR #Z60154), a summary of which can be viewed at the following website (http://endeavor.des.ucdavis.edu/cerpi/ProjectDescription.asp?ProjectPK=5376).

Ojai citizens can be organized by neighborhood to use hand tools only to eradicate stream reaches in their neighborhoods of the invasive exotic plants present. Invasive exotic trees that need to be removed may need to be eradicated by professional tree trimmers or City maintenance staff.

All City parks (Libbey Park) that contain streams should be maintained free of invasive exotic plants. Focus should be placed on removing the most aggressive and problematic non-native plants[24], such as: Mexican Fan Palm, Canary Island Date Palm, Tree-of-Heaven, River Red Gum, Spanish Broom, Giant Reed, Sweet Fennel, Periwinkle, Algerian Ivy, Morning-glory, and Smilo Grass (see Table 20 in the Existing Conditions section for a complete list of plants, including invasive exotics). The most regularly encountered invasive plant in the Ojai streams is the Mexican Fan Palm, some of which are 5 meters tall, but most are less than 1 meter high, as illustrated in Photograph 89, Mexican Fan Palm Invading Oak Creek, as well as Algerian Ivy.

[24] See Subsection titled, "Biological Environment of Ojai Streams" and Table 20 (Predominant Plants of Ojai Streams) for a complete discussion and list of invasive exotic plants.

Figure 25. Map of Ojai Stream Reaches with Invasive Exotic Plants



The red lines on this map indicate stream reaches within the City of Ojai that contain invasive exotic nonnative plants that should be targeted for weed eradication.

This effort should have two components, an initial eradication phase, and a maintenance phase. Once the streams have been eradicated of the existing invasive exotic plants, keeping them free of such pests should be a relatively small task. Work groups such as C.R.E.W. and the California Conservatoin Corps are well suited for taking on this project, in conjunction with nonprofit groups such as the California Native Plant Society, Audubon Society, Friends of the Ventura River, and Matilija Coalition.

Photograph 89. *Mexican Fan Palm invading Oak Creek (11 January 2005).*

Remove Trash and Debris (B-2)

The City should lead a project to remove all trash and debris that has been dumped or washed into the streams within Ojai, such as illustrated in Photographs 90 and 91 below. This effort should have two components, an initial clean-up phase, and a maintenance phase. Once the streams have been cleaned of the existing trash and debris, keeping them free of such trash should be a relatively simple (but labor-intensive) task if performed on a quarterly or biannual basis, annually at a minimum. Work groups such as C.R.E.W. and volunteer organizations such as Trout Unlimited and the Sierra Club are well suited for taking on this project, in conjunction with nonprofit groups such as the Lions Club and public and private school students. An annual creek cleanup day can be used to maximize public participation.

Photograph 90 *(left). Trash in Grandview-Park Drain (27 May 2004).*
Photograph 91 *(right). Foreign material in Ayers Creek (8 February 2005).*

Prevent Fecal Material and Other Pollutants from Entering Streams (B-3)

All of the streams flowing through Ojai have been found to have relatively high levels of bacteria (*Escherichia coli* [*E. coli*]) associated with fecal material. Fecal coliforms are bacteria that are associated with human or animal wastes. They usually live in human or animal intestinal tracts, and their presence in drinking water is a strong indication of recent sewage or animal waste contamination. *E. coli* O157:H7 is a specific serotype of *E. coli* that causes watery diarrhea, hemorrhagic colitis, and hemolytic-uremia syndrome (HUS) in humans.

E. coli is used as a water quality indicator because large numbers of the bacteria are always present in the feces of humans and other warm-blooded animals, but are not naturally found in water. Since these bacteria don't live long in water once outside the intestine, their presence in water means there has been recent contamination through sewage discharges or other sources.

Water can be contaminated in a variety of ways. The primary sources of *E. coli* are municipal sewage discharges, runoff from failing septic systems, animal feed operations, farms, and feces deposited on the ground from warm-blooded animals. In urban areas, the *E. coli* from the excrement of warm-blooded animals (such as pets in a park or on the street) may be washed into creeks, rivers, streams, lakes, or groundwater during rainfalls. The contamination in water is often highest immediately following a storm, because of the runoff. In addition, swimmers and bathers can unknowingly contaminate water, or contamination can occur from boaters discharging wastes directly into the water. When these waters are used as sources of drinking water and the water is not treated or inadequately treated, *E. coli* may end up in drinking water.

There are hundreds of strains of *E. coli*. Most are harmless and live in the intestines of healthy humans and animals. Some, such as *E. coli* O157:H7, can cause severe illness. Infection often causes severe bloody diarrhea, abdominal cramps, and possibly fever (common symptoms for a variety of diseases). Young children, the elderly, and the chronically ill are at greater risk for severe symptoms. In some cases, infection can lead to kidney failure and possibly death.

There is limited information on the effects of *E. coli* (or any fecal pathogens) on the aquatic community. Fungus and virus strains are now being identified as a reason for declines in amphibian populations around the world, such as frogs in South America and tiger salamanders in Saskatchewan, Canada. Contamination from pathogens also leads to closing beaches for recreation, closing shellfish beds, and the contamination of irrigation waters for agriculture. (Data were obtained from the internet - http://www.ccme.ca/sourcetotap/ecoli.html.)

All stations sampled during 2004 and January 2005 were contaminated by *E. coli*. Sources of *E. coli* include fecal material from livestock, fowl, dogs, cats, and humans, as well as wild mammals. Domestic animals are the primary source in urban areas such as Ojai. This material enters Ojai streams from yards, street gutters, and corrals, unless the fecal material is properly disposed of into garbage bins or sewer lines. Photograph 92 (below) illustrates one example of a horse corral in close proximity to a creek within the City. Fecal material and urine from this small horse corral, and from similar situations elsewhere in the City, can easily enter the natural and man-made drainage systems within the City and introduce *E. coli* and other bacteria and viruses into the aquatic habitats downstream.

Photograph 92. *Fecal material source contaminating a stream within the City of Ojai (8 January 2005).*

Establish Vegetated Buffers Between Streams and Urban Land Uses (B-4)

Many studies have shown that buffers between streams and urban land uses are most effective if they contain natural vegetation. The vegetation works hard to filter out pollutants, stabilize soil, and reduce erosion, as well as produce free atmospheric oxygen. A number of the drainages in Ojai lack vegetation, or any substantial amount of natural vegetation. The City could implement a program to plant native plants along existing drainages in public areas and easements, and provide guidance to property owners to do the same on private property.

The upper reach of Ojai Creek just downstream of the bridge on Lion Street is an example of an ephemeral stream that generally lacks natural vegetation but has room for such planting, as illustrated on Photograph 93. Native riparian plants should be planted along the creek to provide: erosion control and bank stability, natural cover, shade, nesting sites, and structural diversity along this, and similar creeks within the city.

Photograph 93. *Unvegetated and compacted channel of Ojai Creek (8 January 2005).*

Restore Riparian Habitat to Del Norte Creek (B-4a)

Riparian habitat could be restored to Del Norte Creek on Ojai Valley Inn property. The riparian habitats that once occurred along this creek have been almost entirely removed over the years to accommodate the golf course at the Ojai Valley Inn and Country Club. The golf course fairways and greens often encroach to the very edge of the creek or even entirely over it.

Photograph 94. *Del Norte Creek through golf course; creek conditions lack buffer between the stream and golf course turfgrass. Using native Saltgrass here would be preferable rather than the existing high water-demanding grasses.*

Typical maintenance activities for facilities such as lawns for golf courses contribute high quantities of fertilizers and pesticides into downstream reaches. Furthermore, nearly all habitat functions have been eliminated. This can be rectified by removing or setting back lawns, fairways, and greens from the creek and replanting native riparian plants, such as Arroyo Willow, Mulefat, Pacific Blackberry, and California Sycamore.

Saltgrass (*Distichlis spicata*), a native perennial grass that is very tolerant of foot traffic, could be used as a substitute turfgrass in the vicinity of the creeks to provide a natural vegetation buffer between the golf course facilities while maintaining the general condition and playability of the course. Saltgrass also requires significantly less water than turfgrasses used in golf courses.

Goal C - Preserve Existing Riparian and Instream Habitats

Land use is generally under the control of the City, as guided by the Ojai General Plan (GP) and its required elements. For the purposes of this restoration plan, land use is used in the broadest sense: how the city and its residents use the land. The GP provides the template for what types of land uses will occur where within the City. The GP includes numerous policies and guidelines that dictate or direct how new development will occur within the City. Changing existing land uses, as opposed to zoning, is generally not practical/politically extremely difficult, and expensive to accomplish.

Most citizens want to be good neighbors and live in harmony with their neighbors and habitats. However, due usually to ignorance of the consequences of their actions, many citizens' actions on their land result in degradation of the environment, both onsite and downstream. Educating the

citizens about such adverse impacts can be extremely helpful in modifying a citizen's behavior to reduce or eliminate the adverse impact. Providing technical assistance will generally also be well received by landowners.

The City can also develop specific policies and ordinances to regulate certain activities and land uses to avoid problems existing or potentially existing in Ojai city streams and drainages.

Restrict Incompatible Activities Within Streams and Drainages (C-1)
The City should prohibit incompatible land uses within streams and drainages to ensure high habitat functionality. Existing zoning codes provide mechanisms to maintain a minimum setback; however, there are many instances of strict violation of this code. Depending on the wetland function, a 25-foot buffer (setback) is not adequate to maintain high functionality. On small lots in areas of the City zoned for high or medium density, establishing a larger setback would not be practical. However, larger undeveloped lots could be developed adequately while providing additional setback distance. Some wetland functions are best maintained with a 100-foot buffer zone.

Enforce Article 10 of the City Zoning Code. Article 10 of the Ojai City Zoning Code, Section 10-2.1003 *et seq*. (Creekside Development Standards) states that development "shall be set back a minimum of 25 feet from a blue line creek's top of bank. Additional setbacks may be necessary to protect sensitive environmental resources." Section 10-2.1004(c) goes on to state, "Grading or filling, planting of exotic/non-native or non-native riparian species, or removal of native vegetation shall not occur within a creek or creekside setback area". While this code section clearly identifies natural stream conditions within the City as the preference, enforcement is generally lacking, and a 25-foot setback is the recommended minimum needed to provide any sort of adequate buffer between typical urban and suburban land uses to maintain even a minimum level of habitat and water quality. Regardless, if this code section where properly enforced, habitat conditions in the streams flowing through the City would be higher than they are at present.

The City should distribute a pamphlet to each property owner and address with a creek crossing it that educates the landowner and resident of the requirements and need to protect creek habitats, even ephemeral creeks, within the City. The 25-foot setback should be enforced through inspections to ensure compliance. The pamphlet should also explain that any changes to natural drainages also require a permit from the CDFG and the U.S. Army Corps of Engineers[25]. The reasons why City streams need to be protected should be included in the pamphlet. A copy of this pamphlet should also be made available on the City website.

Acquire Parcels With Stream Habitats (C-2)
Since intact stream habitats are relatively rare within the City, those remaining parcels that have yet to be developed should be acquired for the purposes of habitat protection. The City could endeavor to identify candidate parcels where preservation of stream habitats are desirable and designate them for purchase from willing sellers. The City could establish a fund to be used solely for the purchase of such properties.

Preserve Parcels Upstream of Ojai That Contain Steelhead Habitat (C-3)
Since suitable Steelhead habitat upstream of the City is vital to maintaining a viable Steelhead population in the Ojai Valley, the City should facilitate or directly work to preserve key parcels that contain suitable Steelhead habitat upstream of the City. If the City is to expend effort and monies to maintain and protect aquatic habitats in a healthy condition within the City, it is important to the City

[25] U.S. Army Corps of Engineer permits have already been written and "issued" for a variety of actions, called Nationwide or General Permits, which typically includes small projects such as might occur at a single-family residence.

to also protect the upstream habitats. Fortunately, much of the best habitat for Steelhead upstream of the City is located within the Los Padres National Forest, and generally protected. However, there are numerous parcels as in-holdings in the Forest and adjacent to the City that are in private ownership and future development could significantly degrade in-stream habitats. Key downstream parcels that contain high quality Steelhead habitat should also be protected.

Figure 26, Map of Potential Preserve Parcels, illustrates some of the parcels occurring within or adjacent to the City that are generally undeveloped and adjacent or including streams. None of these parcels are currently in public ownership and could be developed in the future. Preserving the natural vegetation on such parcels would benefit wetland functions and downstream water quality.

Goal D - Prevent Aquatic Habitat and Water Quality Degradation

Maintaining high water quality in the surface water flowing through and downstream of Ojai is very important to maintaining or restoring a viable Steelhead population. The City needs to take actions to prevent degradation of surface water quality within and downstream of the City. To prevent degradation, monitoring needs to be conducted systematically at key points to identify contamination sources and how surface water is polluted.

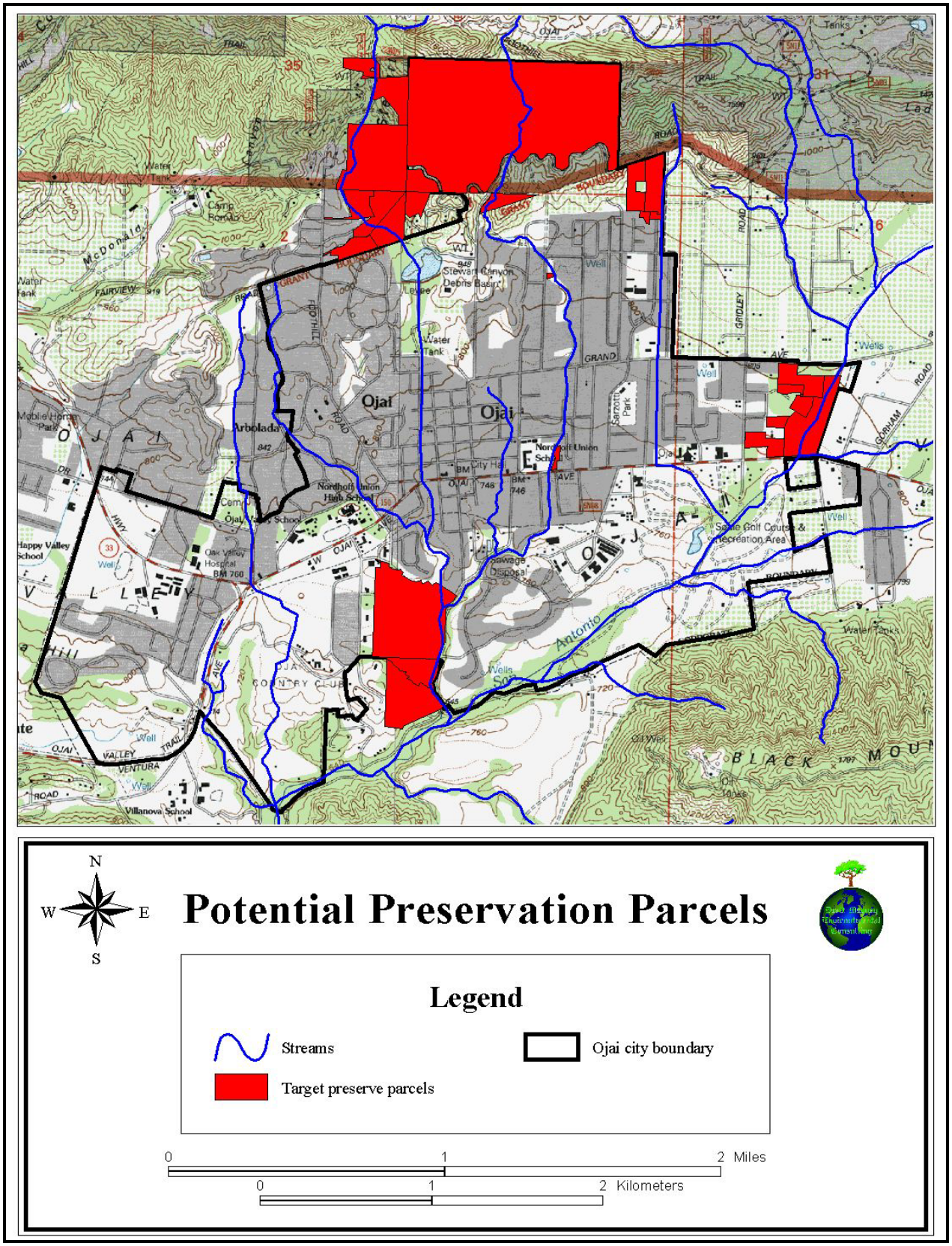
CONDUCT WATER QUALITY MONITORING IN CITY STREAMS (D-1)

Develop a water quality monitoring program, including regular water quality sampling at selected strategic sampling stations. Water quality parameters would focus on parameters important in measuring and determining minimum water quality conditions for aquatic life, such as: dissolved oxygen, *p*H, salinity, total dissolved solids, nitrogen, bacteria, temperature, surface flows, turbidity, pesticides, total organic carbon, heavy metals. This project would require the purchase of water quality sampling equipment and water flow meters. Aquatic invertebrates would also be sampled as they are valuable indicators of habitat quality.

Why monitor water quality? Human beings are constantly dependent on intake of water to maintain our health and well being. Human bodies are 60% water. Most Ojai drinking water is taken from local streams, reservoirs, and groundwater. The groundwater supply is recharged by local streams. As a result, it is very important to establish that surface waters have adequate purity. To determine this, environmental scientists monitor many physical, chemical, and biological characteristics such as the water's temperature, turbidity, dissolved oxygen content, and abundance of fecal coliform bacteria.

Fecal coliform bacteria are used to assess the quality of water because their presence is well correlated with the many waterborne disease-causing organisms or pathogens. These include bacteria, protozoans, and viruses and can cause diseases such as gastroenteritis, dysentery, typhoid fever, and cholera. Although fecal coliform bacteria are not necessarily pathogenic, they indicate the likely presence of pathogens and hence are referred to as indicator organisms. Their abundance is typically expressed as the number of colony forming units detected in 100 milliliters of a sample or CFU per 100 mL. Federal and state governments have set acceptable levels of fecal coliforms to provide guidelines for evaluating water safety.

Figure 26. Map of Potential Preserve Parcels



Fecal coliforms are naturally present in the intestines of warm-blooded animals and hence in their solid wastes. Solid wastes from pets, livestock, and wildlife can enter water bodies after rains run waste materials off the land. Other sources of fecal coliforms include sewage treatment plant effluent and leaking septic systems and sewer pipes. Most fecal coliforms die within days of release into the water bodies although some scientists have reported that fecal coliforms can survive in sediments of river bottoms and even reproduce. The presence of fecal coliforms in high quantities is interpreted as evidence of fecal contamination from warm-blooded animals and indicates the possible presence of pathogens. High levels are also associated with other water quality impairments including cloudy (or turbid) water, unpleasant odors, eutrophication (nutrient pollution), and an increased oxygen demand.

See Section "Total Coliform Bacteria" beginning on Page 62 for more a more detailed discussion of fecal coliform bacteria, and water quality standards for this parameter.

EDUCATE LANDOWNERS AND RESIDENTS

The City should educate landowners and residents about reducing animal waste entering City streams and drainages. The City should develop and distribute pamphlets describing what activities and substances degrade Ojai streams, and what actions each homeowner and resident can take to avoid or minimize the adverse effects of their actions. An educated public is much less likely to allow unhealthy conditions to exist or continue if they have the resources and knowledge on how to avoid or reduce such pollution on their own property.

Educate Landowners and Residents to Prevent Nonpoint Source Pollution Entering Drainages (D-2)

Nitrogen and phosphorus contaminate water and lead to impacts on aquatic habitats. These two natural elements are present in the environment naturally; however, abnormally high levels of these elements, found in manufactured fertilizers and laundry detergent, can result in adverse impacts on aquatic habitats and water quality.

Nitrogen is an essential nutrient for plant growth, and is one of the primary components of manure and commercial fertilizers. However, although nitrogen is very productive when applied to crops, excess nitrogen can have negative impacts in our lakes, rivers, and groundwater.[26]

- Because of its fertilizing properties, nitrogen is a key contributing factor to algae growth in streams and lakes.
- Excess nitrogen in rivers and streams can be toxic to aquatic animals at high levels. This toxicity is due to ammonium hydroxide (NH_4OH), which is produced at greater rates under conditions that are common where waste spills have occurred (such as low oxygen levels, high pH, and high temperature). Toxic levels of ammonium hydroxide are usually due to pollution from manure and sewage spills, and can result in fish kills and loss of other aquatic organisms.
- Nitrogen pollution also leads to human health concerns about groundwater contamination. Unlike phosphorus, which binds to the soil's surface, nitrogen filters down through the soil easily and can enter drinking wells. Infants less than six months are most susceptible to nitrate poisoning. High nitrate levels in groundwater can reduce the blood's capacity to carry oxygen, causing a fatal condition in infants called "blue baby syndrome". For this same reason, deaths can also occur in livestock that drink from a water supply high in nitrates. Pregnant or nursing women are advised to avoid water with high nitrate levels. Adults with heart or lung disease, certain inherited

[26] Obtained from the Wisconsin Department of Natural Resources website (http://www.dnr.state.wi.us/org/water/wm/nps/ag/waterquality.htm.)

enzyme defects, or cancer may have increased sensitivity to the toxic effects, and adults with lifetime exposures to high nitrate levels may experience related health issues. The federal safety standard for Nitrate-N is 10 mg/L with a maximum contamination level (MCL) of 45 mg/L. Nitrate levels averaged 20.5 mg/L for Southern California Water Company groundwater in 1999 in Ojai (Southern California Water Company 2000).

How can nitrogen and phosphorus levels be reduced? For farmers, nutrient management is an integral part of business, and there are important steps that can be taken to reduce their nutrient loss to streams and lakes. The two main ways of reducing the nutrients that enter our waterways from agriculture are 1) decreasing the amount of nutrients applied to the landscape, and 2) preventing spills, runoff, and erosion from transporting those nutrients to our streams and drainages.[27]

- Decreasing excess nutrients applied to the landscape is the first step necessary for maintaining good water quality.
- Careful nutrient management planning can help farmers and landscapers determine how much nitrogen and phosphorus is in their manure and how much the crops on each field require to be productive. This planning can help fertilizer users apply only as much nitrogen and phosphorus as their plants will use, preventing excess runoff. In areas that already have phosphorus buildup in the soil or impacted waterways, applicators may need to manage specifically to reduce phosphorus levels.
- Use native plants to the maximum extent possible in landscaping. Plants indigenous to the Ojai Valley are already adapted to local soil and climate conditions, and generally do not need supplemental irrigation and fertilization. Reducing applications of both irrigation water and commercial fertilizers will result in lower levels of nitrogen and phosphorus from leaving the landscape and entering drainages and streams. Information about native plants can be obtained from nonprofit organizations such as the California Native Plant Society (CNPS – www.cnps.org, www.cnpsci.org), the Santa Barbara Botanic Garden, and from local water agencies (http://www.bewaterwise.com/). The Cluff Vista Park, at the intersection of Ojai Avenue, El Paseo, and Rincon Street, is an excellent example of how native plants can be attractively used as landscaping, many of which have low irrigation requirements.

Photograph 95. *Common Yarrow (*Achillea millefolium*) and other native plants are used exclusively at Cluff Vista Park in downtown Ojai.*

[27] Obtained from Wisconsin Department of Natural Resources website: http://www.dnr.state.wi.us/org/water/wm/nps/ag/waterquality.htm.

Provide Technical Assistance to Landowners to Control Nonpoint Source Pollution (D-3a)
The City is a partner in the Ventura Countywide Stormwater Quality Management Program, which provides direction on how to control pollution from runoff. Education of the public is a large component of this Program, which includes providing pamphlets and brochures to new homeowners. Information is also included for the general public in City newsletters that are mailed to Ojai residents.

While brochures, newsletters, and pamphlets are very useful, they do not provide site-specific technical assistance that a property owner may need. For example, a property with a small horse corral that contains a drainage can be, and likely is, a direct source of fecal coliforms during rainstorms. The City could provide the property owner with technical assistance on how to properly buffer and/or filter out the pollutants from the surface runoff. Such technical assistance would be focused towards existing residences, not new construction. Such technical assistance for new construction is best provided, and should be provided, by the landscape architects and contractors, and building designers/engineers.

Provide Technical Assistance to Horse Owners (D-3b)
The City could provide technical assistance to horse owners with corrals to develop runoff treatment structures, such as: buffers needed; drainage filters; and educational materials to horse owners and feed stores. Instructions on where to safely discard horse manure should also be developed and dispensed. The City could help design site-specific structures or facilities to reduce animal waste from entering City streams. Another option would be to implement horse manure recycling center that would remove waste from the site and recycle it back into the local agricultural community as a natural fertilizer.

DEVELOP CITY POLICIES/ORDINANCES

The City should develop and/or modify City policies/ordinances to improve water quality within and downstream of Ojai. The City could implement a watershed-based approach to zoning and land-use planning. This approach would be based on the urban stream classification system presented earlier, with zoning modified to preserve or improve the classification of the various subwatersheds. The intent would be to preserve or reduce impervious cover percentages in subwatersheds where necessary.

Another ordinance to be considered would be one that regulates livestock/horse corrals to specifically protect water quality of adjacent streams. The City could consider minimum buffer setbacks from all streams, similar to that by Ventura County, but with more details and specific conditions used to guide decisionmakers on appropriate setback buffers.

Modify Zoning Codes to Minimize Impervious Cover for Each Parcel (D-4)
Impervious cover eliminates any ability of rainfall to infiltrate the soil. Infiltration of rainfall serves several important functions: groundwater recharge, filtration of pollutants, stormwater retention, a reduction of nonpoint source pollution from entering surface drainages, amelioration of peak flood flow levels, and a reduction of flood flow levels. The City could modify zoning codes to minimize impervious cover on all land uses. Impervious surfaces in high to medium density land uses could use less impervious materials, such as reticulated block matting, that allow some water infiltration while providing the desired stable walking/driving surface. This could easily be applied to driveways and walkways that are now constructed of asphalt or concrete.

Modify Building/Land Use Codes to Prevent Nonpoint Source Pollutants from Leaving Parcels (D-5)

Currently, nearly all rainfall that falls on homes, commercial buildings, and paved areas of residences and businesses runs off into the City drainage system, which then discharges directly into City streams. Runoff from roofs could be collected in underground cisterns onsite and allow natural leaching underground, similar to how septic system leach fields function, but with relatively clean water. This would both reduce surface runoff, which at times exceeds the capacity of the City flood runoff collection system, and allow the soil onsite to filter any contaminants locally rather than being discharged to the streams. A change in the Municipal Code would be onsite runoff collection and retention.

Modify Building/Land Use Codes to Require Stream/Drainage Crossings to be Sized to Prevent Adverse Changes to Fish or Aquatic Habitats (D-6)

Several of the culverts on streams flowing through Ojai are not large enough to accommodate natural fluvial processes, or habitat for fish. They are typically sized to accommodate expected flood flows according to specific runoff calculations (see Photographs 32, 59, and 64 as examples). This problem is endemic throughout southern California watersheds, such as the Calleguas Creek watershed (DMEC 2000).

The City should adhere to guidelines developed by CDFG and NOAA Fisheries that specify how stream crossing are to be constructed to provide salmonid passage rather than serving only one function: flood conveyance. Also, the City engineers should attend the annual Fish Passage Workshops held in southern California to become more familiar with fish passage requirements and needs.

Preserve Upland Portions of Watershed (D-7)

Development imposes a variety of changes on stream networks. These changes have profound physical and biological implications, many of which are obvious even to the casual observer. Unfortunately, most restoration attention is directed toward the channel and floodplain systems. It is rarely recognized that the stream network itself drains a watershed and, therefore, the specific characteristics of a stream reach are products of the cumulative impacts in the contributing area. Thus, the cumulative impacts to the upland portions of the contributing areas are commonly ignored in spite of the fact that the National Research Council (1992) has clearly articulated a position stating that changes in uplands are important in determining overall stream function.

Several areas of the upper watershed are currently undeveloped (see Figure 26). Access is difficult and slopes are steep, so these areas often are of low priority insofar as development is concerned. However, development of these areas is an important recent trend, in part due to the scarcity of undeveloped land in the lowlands. Unfortunately, these upland areas are characterized by rapid runoff and high erosion potential, even in their undisturbed states, and development of these areas exacerbates these problems. The preservation of large tracts of upper watershed is critical to the effective, long-term maintenance of the physical processes of the stream network.