Linkages

Newsletter of the Institute for Ecological Health **Issue No. I, Fall I995**

LOOKING TO OUR FUTURE

By John Hopkins and Glenda Edwards

People who have lived in California for the last 25 years have witnessed a rapid and intensive human alteration of the state's natural environment and agricultural lands. And we are building communities that do not work well for people, but create additional economic and social problems.

"California cannot support a population growing past 30 million people based on existing housing and transportation patterns without unacceptable economic, social and environmental costs," stated the governor's Growth Management Council in 1994.

Our natural world and our human communities face interrelated threats today because we have not discovered effective ways to both preserve nature and provide for people. We try to solve the problems in piecemeal fashion, but end up divided and polarized within our own communities.

IEH's Principles--
Provide for Both Nature and People

- Develop a regional vision for the future.
- Integrate land use issues, looking for solutions that benefit the environment and humans.
- Meet the needs of healthy ecosystems, biodiversity, preservation of agricultural lands and well-being of human communities.

The results of this impasse are recorded in study after study showing the rich diversity of California species and habitat in sharp decline. This is especially important because our state possesses one of the richest varieties of species and plant communities in the temperate world. Our redwood forests and oak woodlands, our mountain, desert, and valley landscapes are extremely important to most citizens for their physical beauty and variety and their natural resource and recreational values. The state's largest industry, tourism, relies heavily on the magnificence of our natural landscapes.

The biological toll in a 1987 report included 33 percent of mammals at risk, 40 percent of amphibians at risk, 57 percent of plant communities either naturally rare or threatened with extinction (*Sliding Toward Extinction*, Jones and Stokes for The Nature Conservancy, 1987). Renowned biologist E.O. Wilson tells us that our non desert lands, collectively called the California Floristic Province, are among 18 forest and scrubland regions in the world at risk of losing entire ecosystems and masses of species unique to the affected habitats (*The Diversity of Life*, E.O. Wilson, 1992.)

The Central Valley and surrounding foothills provide vivid examples of the human problems we face. The Valley is the nation's most threatened food producing area, with coastal California third on the list (*American Farmland*, Summer 1993 and US Census Bureau, Dept of Agriculture cited in *USA Today*, July 15, 1993). Planning consultant *Continued on page* 4

The Institute for Ecological Health

We founded the Institute for Ecological Health in 1994, to promote integrated and proactive solutions to key land use issues that effect nature and human well-being. Our initial focus area is central California, from the Sacramento region to the northern edge of the Los Angeles Basin, from the Pacific to the Sierra. This wide and varied landscape is experiencing rapid growth, with many rural areas facing sprawling urbanization in the decades ahead unless we change patterns of development, our attitudes toward human living spaces, and our relationship to the natural environment.

A prime goal of IEH is to build regional citizens groups and help them develop and promote a sustainable vision or framewok for the future of their regions. For such a vision to become a reality, it must encompass the needs of a broad range of people and interest groups, reaching far beyond the traditional environmental community.

In the Santa Clara River Basin of Ventura and Los Angeles counties we work closely with the Friends of the Santa Clara River, focusing on critical biological areas and the cumulative impacts of proposed urbanization. In the southern Sacramento Valley and adjacent Sierra foothills we are beginning a sustainable landscape project, working in conjunction with land-use and transportation expert Bob Johnston of the University of California, Davis. In the San Joaquin Valley we will develop the San Joaquin Valley Bioregion Task Force, devising and promoting a vision for a sustainable Valley and the south Sierra Foothills. We will promote projects for the Diablo Range and the southern Sierra Nevada when our resources permit. As IEH develops we will build other educational and policy research programs, including working with the media, holding workshops, developing informational materials, and analyzing key issues and policy options.

Linkages

This newsletter will provide information on California land use topics, including conservation biology, planning and economics, development, urban design, and agriculture. We will also discuss techniques important to citizens groups, from mapping to city and county general plans. We wish to explore the needs of different interests and creative solutions. Readers are encouraged to submit articles, ideas, or letters for future issues to IEH, 409 Jardin Place, Davis, CA 95616.

WILDLIFE HABITAT AND CLEAN FARMING CAN BE COMPATIBLE

By John Anderson.

Current clean farming practices in most of Yolo County's intensively farmed areas have dramatically Xx reduced or eliminated wildlife habitat within the agricultural systems. The impulse to maintain borders berms, and roadsides vegetation free as well as keep in production every available square yard of soil has resulted in a barren, brown landscape from plowdown in the fall until spring planting.

A conservation manager from Iowa recently visited Yolo County and was shocked at the lack of vegetation on our rural roadsides. It is really sad to realize the lifeless state of such vas acreages that were once so important to the myriad of species that inhabited the Sacramento Valley. Yolo County used to boast one of the best pheasant populations in the state. Without winter cover, these birds cannot survive. How often do you see a snake or a toad on the road anymore? It is not because of increased traffic; it is due to lack of habitat. A further negative impact is the soil erosion and sediment problems that result from the bare dirt concept. And these practices are costing farmers dearly every year in labor, equipment, and chemicals

Reasons for bare dirt farming

The primary reason for bare dirt clean farming is to control the invasion of noxious weeds. This is certainly valid, since any area of bare and disturbed soil will be rapidly colonized by a host of nasty and unsightly vegetation. Star thistle, puncture vine, Johnson grass, and mustard, are but a few of the undesirables that we continually spray, disk and scrape to eliminate. A second reason for bare dirt clean farming is this has become the accepted & expected practice. Vegetation in a border implies sloppy farming -- what will the landlords, neighbors or bankers think?

What can be done to reverse the current scenario without impacting the Valley's agricultural livelihood ? Certainly most farmers appreciate wildlife and evidence is accumulating that suggests a biodiverse border of plant species provide habitat for populations of many beneficial insects.

Alternatives to bare dirt

An alternative to the bare dirt, high maintenance system is to establish a balanced, self-sustaining perennial grassland that simply out competes any weedy invasion. Corridors of mixed native perennial grasses along roadsides, berms, ditch banks, canals, filed borders and any non-cropped area can provide excellent year-round habitat for wildlife without having any negative impact on farming practices. Incorporating patches of native shrubs and trees into these corridors greatly increases the biodiversity and habitat value. With these ideas, we can promote dialogue & decision making based on long-term needs of people & nature.

These concepts are widely practiced in Midwestern farming areas, but for some reason have not been accepted by the Central Valley farmers. Can it be done? Hedgerow Farms between Winters and Madison has been incorporating and testing habitat corridor systems since 1978. Without question they provide weed and erosion control, reduce maintenance, & greatly enhance biodiversity & aesthetics.

Over 100 species of birds use the farm throughout the year. Dozens of rooster pheasants and dove are harvested during the hunting season. A healthy quail population has become established and a myriad of beneficial insect species have been documented. Bruce and Charlie Rominger farm much of the ground adjacent to the corridors and have not seen any significant negative impact on crop production.

The most difficult aspect of farming with corridors is training tractor drivers to recognize and not disk newly established vegetation. Another practice requiring careful attention is herbicide application. Once these hurdles are addressed, the rest is easy, especially for a farmer. It is a matter of farming the corridor to get it established.

A wide variety of native perennial grass seed is now available. Establishing a stand is similar to growing wheat or barley. The main difference is that perennial grasses grow much slower, so weed management the first year is important. Timing of planting, selective herbicide application and mowing are all important tools for success. The slow growing establishment period is also why these grasses are not invasive weeds and why they disappeared from much of California's agriculturally impacted areas. More and more we hear about the negative impact agriculture has had on the natural environment. For the most part it is true, but we also cannot survive without farming. Corridor hedgerows are certainly a very reasonable and doable compromise that could be the accepted and expected practice of land stewardship. The visual image of clean farming for the future should be borders of perennial grasslands, rather than borders of bare dirt. Clean should mean weed free. not vegetation free. Quality of the environment & quality of life would be significantly enhanced, especially for those of us that live & work in the agricultural landscape.

John Anderson *owns and operates the 500 acre Hedgerow Farms, a mix of valley floor and foothill terrain in western Yolo County. Since 1976, he has integrated wildlife habitat and biodiversity into an intensive field crop operation. He works to bring back the hawks and owls that eat the rodents which damage crops. John conducts farm tours & seminars on conservation practices and plant materials, & is a director of the Yolo County Resource Conservation District.*

Our Future, *continued from page 1*

Rudy Platzek points out that the Central Valley is projected to have a population of 15.6 million by the year 2040. By then, a third of the Valley's irrigated agricultural lands could be lost to development. Fresno, the nation's number one agricultural county, could have a population of 2.5 million. Will it follow Los Angeles, the number one agricultural county 50 years ago?

Current development patterns will result in the creation of vast mega-cities on former agricultural lands. One will stretch 125 miles from Marysville to Merced, another 100 miles from central Madera County to central Tulare County, says Rudy Platzek. We are contemplating an endless sea of separate housing tracts interspersed with shopping centers and business parks to house and employ those 15.6 million.

The Sierra foothills will catch the urban spill-over, especially along major state highways. The small communities of the Gold Country, Mother Lode and South Sierra Counties will follow western Placer County and turn into small versions of Sacramento and Modesto, forever altering the beauty and rural lifestyle of the foothill counties.

Valley and foothill air quality will suffer. The American Lung Association points out that the San Joaquin Valley has the potential to have the nation's most polluted air. Scientists state that projected ozone levels in the forests of the south Sierra will cause major damage to the trees.

Breaking the Deadlock

Our traditional approaches fail because they struggle with the fate of the landscape in fragments, deciding what will happen to each bit of land on almost an acre by acre scale, rather than integrating planning across large landscapes. And they address each issue separately, failing to seek and enact changes that would better meet the needs of both humans and nature.Proactive solutions go beyond the piecemeal approach to look at a range of biological and economic issues at the scale of watersheds, bioregions or landscapes. On these large scales, we can integrate ecological health and native biodiversity with the well-being of human communities in the region.

Local governments are on the opposite track. For example, city and county general plans in California project growth and determine land use patterns for 10 to 20 years. The planning assumption is that each city and county can continue these 10 to 20 year cycles until all the land is developed and producing at the highest possible tax rate, as has happened in many areas of Southern California and the Bay Area. Environmental and human quality of life are seen mostly as constraints to development and as limiting economic vitality in the short term. Very few counties or cities plan for permanent open space or large landscape habitat conservation, unless forced to do so by state or federal laws.

We are not seeking the kinds of formal, top-down regional government schemes which have been promoted without success for many years. Instead, we believe the citizens in a region need to come together and develop their own vision or framework for the future of the natural and human landscapes. The frameworks encompass protection of biological diversity and healthy ecosystems. They include ways to provide a high quality of life and healthy economies. We are seeking solutions that allow us to live with nature.

WHAT FUTURE FOR THE SANTA CLARA RIVER?

By Ron Bottorff

The Santa Clara is southern California's last major "wild river". There are few levees, only one diversion dam. The river channel retains its dynamic nature. For most of its length, it flows through natural and agricultural landscapes, including some of the best remaining riparian woodland in the south land. In contrast, the Los Angeles and Santa Ana Rivers, which rival the Santa Clara in size, long ago were converted largely to concrete channels.

Spreading urbanization in southern California has brought many species and entire biological communities to the brink of extinction. Streamside, or riparian, woodlands in particular have been reduced to less than 5 percent of their original extent. Riparian habitats are particularly important in these arid lands, providing critical habitat for a large number of birds and mammals. Many other types of natural community, including oak woodlands and various types of scrubland, will become rare in the years ahead if we continue with a pattern of unfettered urban sprawl. In addition to direct loss of habitat, the long-term biodiversity of the region is jeopardized by fragmentation of remaining natural areas into isolated patches, which conservation biology tells us will lose species over time. The Santa Clara river and its basin provide rare opportunities to protect and restore some of these critical habitats and provide a legacy..

Decisions made in the next few years will determine whether we retain the critical biological values of the Santa Clara River valley, including linkages to northern wildlands and, through the Santa Susana Mountains, to the Santa Monica Mountains. These decisions will also determine whether we provide a high quality of life for future generations living in the valley, with communities designed for people rather than important agricultural lands. The alternative will be an extension of Los Angeles sprawl, with loss of critical biological areas and farmland, worsening of air pollution and traffic congestion, and an impoverished quality of life.

The Institute for Ecological Health is building a major program to address the future of Santa Clara River in conjunction with a new umbrella group, the Friends of the Santa Clara River. The centerpiece will be a vision for the future of the south-central portion of the river basin that provides for natural areas protection and also people's quality of life.

A River as a Process

A natural river is ever changing. Periodic floods create a complex mosaic of water-loving vegetation within its floodplain. In wider and gentler valley stretches the river meanders, changes its course after major floods, and sometimes forms braided channels. The unfettered interplay of changing flows and the surrounding landscape's structure give a river its character and life. In the arid southwest, birds and other vertebrates rely on the river and its riparian vegetation, which in turn rely on these natural changes.

A river channelized and constrained within levees and walls is an artificial creature that cannot maintain its full biological richness over time. It no longer provides inspiration and solace to passing humans. It shoots floodwater down toward the ocean, waiting for the inevitable day when it will breach those constraints and return to its floodplain.

Water in an Arid Land

Dry for much of its length in summer, the river collects winter rainfall from a Delaware-sized watershed in north west Los Angeles and northern Ventura Counties. The flow rate can rise in winter storm periods to over 100,000 cubic feet per second.

Much of the watershed's higher elevations lie in the Los Padres National Forest. This is condor country, with dry forest and chaparral lands, and a last remaining steelhead run in a protected tributary, the mostly Wild and Scenic Sespe Creek.

The headwaters of the river originate in the Angeles National Forest, east of Soledad Canyon, which parallels Route 14 leading from Los Angeles to Palmdale. After flowing through this steep-walled canyon, the river reaches a small plain - the Santa Clarita Valley. Here the new city of Santa Clarita forms the only major urban stretch. Then the Santa Clara returns to a narrower valley. Flanked by some of the best remaining riparian woodland in southern California, it crosses into Ventura County, where it flows over broad sand and gravel

deposits past extensive citrus orchards and farmland. To the south lie the Santa Susana Mountains and Oak Ridge, coated with coastal sage scrub, oak woodland and chaparral. Several small towns dot its banks, but do not impinge on the natural, dynamic river. A single diversion dam (containing a fish ladder) blocks the channel, before the river passes between Ventura and Oxnard to reach the Pacific.

A Wealth of Natural Areas

The biological resources of the Santa Clara River are impressive. Downstream from Santa Clarita there are still very extensive riparian woodlands of willow and cottonwood, changing to riparian scrub in Ventura County. The river contains at least six recognized natural communities, many very rare - Southern Coastal Salt Marsh, Subtidal estuarine, Southern Riparian Scrub, Cottonwood-Willow Riparian Woodland, Alluvial; Fan Sage Scrub and Riverine.

Urbanization is the greatest threat to the health of the river ecosystem

The riparian forest is home for a host of bird species, including the endangered least Bell's vireo. The unarmored threespine stickleback, a small endangered fish, is in the river's upper reaches. The estuary supports the western snowy plover, least tern and tidewater goby, all federally listed as endangered. Overall, 14 resident bird species are listed as endangered or of special concern; 6 plant species are endangered or candidates for listing.

The recent University of California publication Gap Analysis of the Southwestern Region examines the biological gaps in protected lands in south west California. It states that "the Santa Clara floodplain, Sespe and Piru Canyons, and Oak Ridge to Santa Susana Mountains" represent "communities at risk" and "would seem likely candidates for extensive biodiversity management areas."

In addition, we need to consider the valuable agriculture of the valley. Orchards and row crops stretch across the wider valley floor in Ventura County, extending up adjacent slopes. The California coast is the third most threatened agricultural region in the nation. The long-term protection of these rich farmlands is of great importance to society.

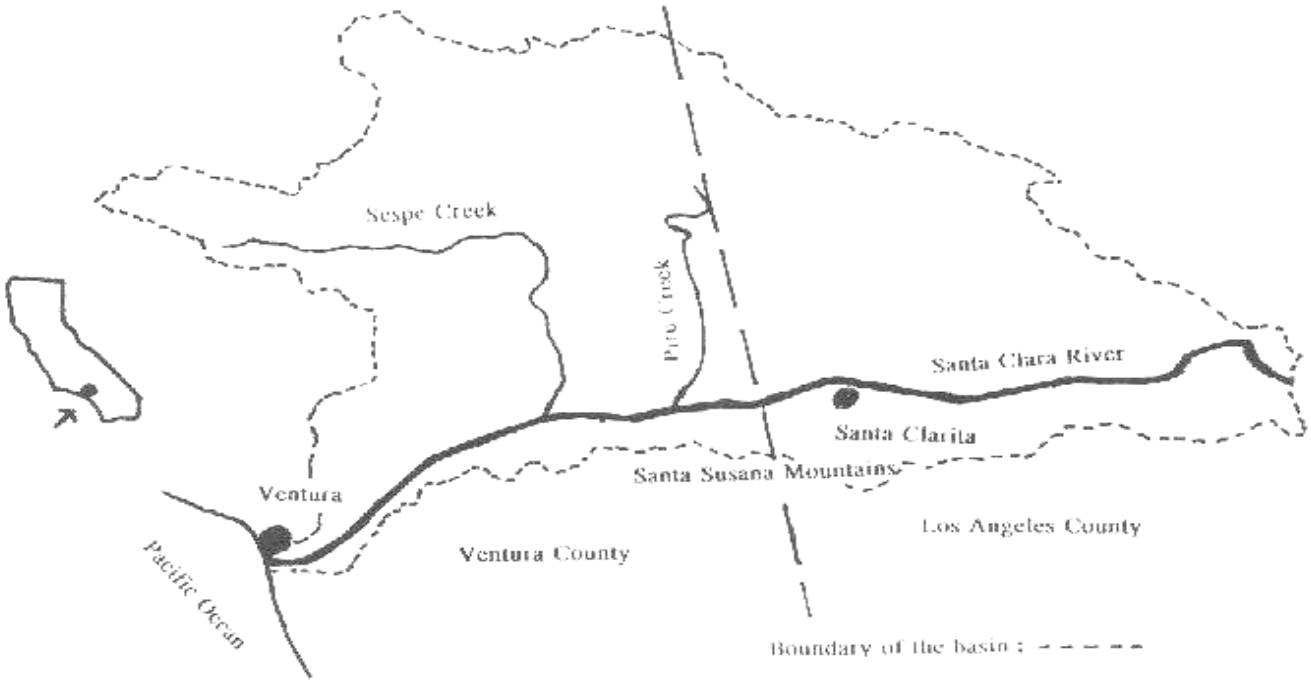
A Management Plan for the River Corridor

A Steering Committee with federal, state and local agencies is developing a Enhancement and Management Plan for the river. Property owner groups are well represented on the Committee, while Friends is the sole environmental representative. Subcommittees covering agriculture, aggregate mining, water resources, flood control, recreation and biological resources, recently produced draft reports. A complete plan is due in 1996. A sound management plan, that adequately protects the river and its resources and recognizes the folly of floodplain development, would be a major step toward providing for the future. Will this occur?

There is growing momentum throughout the country and within the U.S. Army Corps of Engineers for avoiding development in floodplains, except for light recreational activities. The January and March floods in California focused attention on the need to avoid further floodplain development in the state. It is far cheaper, in taxpayer dollars, not to build in floodplains than to cope with the inevitable damage. To paraphrase a January 15th news interview on National Public Radio, the Los Angeles basin could see a flood that is more expensive than the entire 1993 Mississippi flood. IEH and Friends strongly support the concept of allowing rivers to utilize their floodplains. An inviolate floodplain also helps to protect critical biological areas.

Spreading Urbanization

Urban development poses the greatest challenge to maintaining the health of the river ecosystem. Ventura County has policies restricting development to within existing city boundaries. The present Board of Supervisors by and large enforces these policies. In Los Angeles County, however, urban sprawl is accepted. Numerous development projects are either in the approval process or partly built near the already fast growing city of Santa Clarita. Current or proposed projects totalling over 77,000 housing units lie directly on, or within a few miles of, the main river. These projects are largely conventional subdivsion development. They will have significant cumulative the Santa Clarita Valley, including loss of open space, impacts on the quality of life of all current residents of



The Santa Clara River Basin

degraded air and water quality, increased traffic, and increased storm-water runoff.

Decisions regarding one proposed project, Newhall Ranch, will be critical to the future of the River and Valley floor. The project, as proposed, would encompass 12,000 acres straddling the river from I-5 to the Ventura County line. A 24,700 unit community of 70,000 people would border the best remaining riparian woodlands, as well as part of the Santa Susana Mountains with their magnificent oak woodlands. Salt Canyon, a major wildlife corridor, passes through the proposed project before joining the river in the Ventura County portion of Newhall's property. The project would impact two of LA County's Significant Ecological Areas (SEAs) encompassing the Santa Clara River and the Santa Susana Mountains. Village centers and residential subdivisions would line the river corridor. They would cut the gradient from riparian to upland habitats and produce numerous degrading edge effects on the river's woodlands. More subdivisions would lie along the lower slopes of the Santa Susana Mountains.

The transformation of the central Santa Clara River valley west of I-5 from its current rural/ natural setting of open landscapes to an urban zone is a process leaving one with the inescapable feeling that something of great value is being lost, regardless of how well designed individual projects may be.

Opportunities for the Future

The conversion of the Santa Clara River and valley from a rural valley and prime natural area to an urban area has already begun. It is moving swiftly through the heavy development in the Santa Clarita area. With the Newhall Ranch proposal, the process continues to the Ventura County line, building long-term pressure for continued development toward the ocean.

But, we still have an opportunity to preserve a natural and fully functioning river and to maintain the environment and human quality of life in the overall basin. IEH, working with the Friends and other concerned citizens, will prepare a draft vision for the future of the critical

central portion of the watershed, from the I-5 corridor into Ventura county and including the Santa Susana Mountains and Oak Ridge. This vision will outline the actions needed to preserve and restore the important natural areas of the region. It will consider the cumulative impacts of development proposals in the Santa Clarita area and indicate how, by changing the pattern, locations and extent of future growth, we can better provide for present and future residents. With these positive ideas, we can promote dialogue and decision making based on the long-term needs of people and nature.

For further information on these issues, and the work of the Friends of the Santa Clara River, contact Ron Bottorff at 660 Randy Drive, Newbury Park, CA 91320 or (805) 498-4323.

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BUILDING LIVEABLE COMMUNITIES

By John Hopkins

People need liveable communities and a high quality of life. The attractiveness of older small towns and a scattering of newer developments demonstrate the appeal of certain characteristics. Lively downtown areas, streets designed for pedestrians as much as autos, a scale and pattern of development that allows us meet everyday needs by walking, are all key factors in ensuring cities provide a high quality of life.

By contrast, the standard style of urban development since the 1950s produces less liveable communities. Uses are rigorously separated into housing subdivisions, shopping malls, and business parks, which are then segregated by walls and wide collector streets. Residents must depend on cars for all their shopping, family and recreational trips. Traffic congestion is the norm. A sense of community is often lacking.

We are building sprawling mega-cities that provide this lesser quality of life, while consuming vast acreages of farmland and wildlife habitat. Fifty years ago, Los Angeles was a delightful place to live — a sunny city surrounded by stunning mountain ranges, and the nation's number one agricultural producer. Now it's a vast mega-city stretching 50 miles in all directions, with commuters driving 50 miles between their job and affordable housing. Traffic congestion reduces mobility, but lack of public transport-

Cities that work for people

- É People-friendly streets
- É A mix of uses in an area
- É Provide the benefits of density
- É Build on a human scale
- É Provide public places, civic amenities

Development patterns to avoid

- É Segregated uses
- É Strip commercial
- É Buildings surrounded by parking lots
- É Office parks
- É Ribbons of development into rural areas

ation and scattered services and jobs mandate auto travel.

Air pollution remains a major problem, despite dramatic reductions in individual auto emissions. Agriculture has all but vanished. Many species & habitats are rare or imperiled.

A variety of fiscal and social problems accompany this sprawl. Inner cities, and then inner suburbs, decay as growth moves outward like an ever-expanding doughnut. Peripheral growth incurs tremendous costs for constructing and maintaining infrastructure, costs which are rarely internalized into the price of new development. Low density development is particularly expensive — new infrastructure on the edges of urban areas can cost up to $30,000 a house. Meanwhile, localities cannot afford to maintain existing infrastructure in older communities. More and more people endure ever longer commutes between jobs and distant affordable housing. Family and local government economies suffer. Decisions are made on the basis of short term fiscal needs, rather than the long-term good of the communities.

People move out of the Los Angeles area, often to get away from these ills and find new homes with better quality of life. But because we have not learned that sprawling development causes so many problems, their new locales are on the same path to becoming dysfunctional cities.

Solutions

A growing number of planners and architects are learning from communities that work. Leaders like Andres Duany and Peter Calthorpe promote design principles and work with developers to produce model communities. Here are some of the key principles.

- Mix uses, rather than segregating them. Designs like dwelling units placed above shops, and streets with a mix of stores, offices and housing are a basic feature of these cities and towns.
- Change street design and relationships of buildings. People-friendly streets have some common characteristics. They are narrower, lessen the overwhelming presence of speeding vehicles with trees, parked cars, and traffic calming devices. Shops and businesses front directly on to sidewalks, while any parking lots lie behind. Houses present front rooms and verandas onto the streets, rather than a line of garages.
- Provide the benefits of density. Well planned, dense mixed use development gives vibrant communities and opportunities walking on errands, and allows cost-effective public transit.
- Build on a human scale. 'Everything in these coveted neighborhoods is built on a smaller and therefore more intimate scale' states a 1993 Sacramento Bee editorial on neighborhoods which work. From narrow streets, to homes pulled closer together, to lively retail businesses that people walk to, these areas provide real communities.
- Provide public places and civic amenities, including small city parks, and civic buildings. A collection of large stores surrounded by parking do not make a 'town center'!

We also need to address two other issues in order to obtain successful communities and curb urban sprawl:

- Changes in local ordinances and building codes 'Under today's zoning regulations, most of the standard practices of good town planning are against the law' says James Kunstler in his 1993 book *The Geography of Nowhere.* This is a major stumbling block. We need a concerted education campaign and the promotion of model ordinances and zoning regulations that will allow liveable communities. In California, the Local Government Commission does a superb job in promoting the need for change to local government officials.
- Firm urban boundaries. There are many schools of thought on urban limit lines, some claiming that they are not an effective way of addressing growth. Urban boundaries are a natural feature of compact cities, are common in Europe, and are a centerpiece of the successful Oregon land use planning law. We can combine these boundaries with conservation or agricultural easements and transfer of development rights programs for lands outside the urban growth boundaries.

Finally, there are things to avoid. They include ribbon development, strip commercial, malls with buildings surrounded by parking lots, and office parks.

Change Must be for Real

Unfortunately, these concepts can become buzz-phrases, providing attractive packaging without substantive changes. This is reminiscent of those billboards, peddling housing developments with scenes of oak studded rural valleys, or wildlife-laden ponds. Currently, the term 'mixed-use' is subject to abuse. Architect Peter Calthorpe provides a guide for spotting fake 'mixed use' planned communities. They still separate uses into individual zones segregated by major arterial roads. They isolate pedestrians from the street. They use a hierarchy of streets, so causing congestion of feeder routes and continue to design streets for autos, not people. And they fail to provide effective public places.

The writings and lectures of reformist planners and architects have increased awareness. California's Local Government Commission educates local officials and promotes the Ahwahnee Principles for planning communities that work. But still it is largely business as usual. The 'Beyond Sprawl" report of the Bank of America and others states the problem. 'Little constituency exists beyond groups of government reformers, some local government leaders, community groups and conservationists. Political alliances must be forged between environmentalists, inner-city community advocates, business leaders, governments experts, farmers and suburbanites.' An essential task for the years ahead.

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Local Government Commission, Sacramento. *Anwahnee*

PROTECTING BIODIVERSITY

By John Hopkins

Effective conservation strategies utilize principles of conservation biology, landscape ecology and other disciplines. We will explore some of the key topics and ideas in *Linkages*. First we must ask what biodiversity means, and the conservation implications of its definition.

One basic problem in promoting biological diversity protection is that few people have heard the term, while those who have routinely misuse it. Biodiversity has come to mean species richness to many in the public policy arena. People equate loss of biodiversity with species extinction.

But species richness is only one component of biodiversity. "Policy built on flawed conceptions could contribute to the erosion rather than the conservation of biodiversity" points out Paul Angemeier of the National Biological Service. If our efforts to protect biodiversity just focus on whether we protect populations of all the species native to a region, we may lose other attributes of biodiversity that are essential over the long-term.

Biodiversity is the variety and variability among living organisms and the ecological complexes in which they occur - species richness is only one component

One useful definition of biodiversity was put forward by the Congressional Office of Technology Assessment in 1987 - 'the variety and variability among living organisms and the ecological complexes in which they occur.' This involves many levels of organization in

three main categories, genetic, species and ecological. In order to effectively conserve biodiversity, we need to conserve life at all these levels, not just maintain the array of species.

The genetic level includes genetic variations within a species, variations that will be essential for long-term survival and adaptation to changes in climate and other conditions. We know little about the extent of genetic diversity for most species, and we cannot determine it easily and cheaply, or for many individuals.

However, scientists are finding that some groups of organisms have a great deal of genetic diversity between populations, others show diversity within individual populations. An unsual genetic make-up that is of little importance now may prove to be crucial if global warming occurs and a population is subjected to change in temperature, moisture and other variables.

As a surrogate for actual knowledge about genetic diversity, conservation biologists assume we will conserve much of this diversity if we protect each species across its geographic range, and protect species living under different conditions.The ecological level includes ecosystems, habitats and communities.

Reed Noss and some other biologists suggest we also include ecological processes, including natural disturbance regimes. To conserve biodiversity at this level we need to protect examples of all types of native ecosystems, habitats and plant communities. And one of each is not enough, since a single area may succumb to a catastrophic event. Multiple examples, across their natural range, are necessary.

The maintenance or restoration of connections between these natural areas is also important. We may only maintain viable populations of animals with large home ranges, such as mountain lions, by providing connections between natural areas that individually cannot possess a viable population. Populations of many species naturally wink off and on - local extinctions produced by disturbances or chance, followed by recolonization. Recolonization cannot occur into an isolated natural area. And we need to maintain a flow of genetic material between populations, to avoid the deleterious effects of inbreeding.

Maintenance of ecological processes is essential to protect biodiversity over time. As well as the basic cycles of nutrients and water, there are other natural process and disturbance regimes. For example, new cottonwood trees sprout up along Central Valley rivers after spring floods leave areas of bare earth. Many of California's plant species are dependent on periodic low-intensity fires for reproduction or rejuvenation. Numerous birds and other animals use dead and downed trees for food and nesting. The riparian woodland and shrubs along streams form a complex and ever changing mosaic of successional stages. Floods and changes in stream channel maintain this dynamic state.

These issues are a far cry from merely ensuring that a region possesses its full complement of species within protected areas. Collectively they require that we plan for biodiversity protection at regional levels, carefully consider the various conditions of soils, topography and climate, and ensure preserves and other natural landscapes can maintain their biologically processes and disturbances. Without these additional steps, many of those species will disappear.

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Recent Reports

Maintaining Ecological Integrity in Representative Reserve Networks. Reed Noss, World Wildlife Fund Canada. 77 pages 1995.

This new report provides a very helpful overview and discussion of the concept of ecological integrity and related issue. Ecological integrity is an amorphous, but critical concept. It incorporates the notions of a healthy ecosystem, but also involves a low level of human influence, preservation of native biodiversity, and ability for evolution to continue. Noss provides tables with indicators of ecological integrity at three different scales: landscape, community-ecosystem, and species. There are many indicators. Select carefully those that will be most useful in our area. Noss also outlines how to identify and manage a regional reserve netowork that represents the variety of species, communities, landforms and processes.

To obtain this report, contact Jeff Kenney at WWF Canada. 90 Eglington Avenue East, Suite 504, Toronto, Ontario M4R 2Z7, Canada. Phone (416) 489-8800. Cost is $5 Canadian, including postage and handling, by credit card or international money order.

California Water 2020: a Sustainable Vision
Peter H. Gleick et.al. Pacific Institute for Studies in Development, Environment and Security. 113 pages. 1995.

This May 1995 report asks how can we use our water to protect and restore healthy aquatic ecosystems, protect ground water supplies and provide for urban and agriculture uses. It paints a sustainable vision for 2020. The authors consider we can provide for the needs of the environment and humans, yet have a 2.2 million acre feet surplus in 2020.

Gleick and his coauthors call for a 46 percent reduction in the average water use in each home, much greater use of reclaimed water, and more efficient use of water by industry. Agriculture could save 3.5 million acre feet a year through farm practices would increase farm income by $1.5 billion a year in 1988 dollars.

You can obtain this report for $15 from the Pacific Institute for Studies in Environment, Development and Security. www.pacinst.org

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