Linkages

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SPECIAL FOCUS: CONSERVATION PLANNING

REGIONAL CONSERVATION PLANNING TAKES HOLD ACROSS CALIFORNIA AND OTHER WESTERN STATES

California is a global hot-spot of endangered biodiversity, with hundreds of plant and animal species and many types of wildlife habitat at risk. Continuing rapid growth at the fringes of metropolitan regions results in repeated conflict between the conservation of nature and proposed developments. But we do not have to choose between protecting our natural heritage and providing homes and vibrant communities. The shift to Smart Growth, with its focus on revitalization of existing communities, will reduce the magnitude of this conflict in many areas. A companion movement, the development of regional scale conservation plans by local governments, can ensure the long term survival of species, habitats and healthy ecosystems. This approach will only succeed if citizens and various stakeholders participate in the very complex and time consuming process of preparing the regional conservation plans and following their implementation.

Many stakeholders, particularly those representing environmental and agricultural interests, as well as many scientists, are leery of these conservation plans - unconvinced that they will effectively protect species and habitats on the one hand and concerned about potential impacts on agricultural operations and property rights on the other hand. (See "Perspectives on Conservation Planning", *Linkages* Issue #5, 1997.) However, the nature of conservation planning has evolved over time, most recently through the 2002 enactment of a new state law, and the evolution will continue. The earlier plans offer many lessons regarding what works and what does not. Our society is now at a point where, given the will to do so, we can develop and implement sound, effective conservation plans, complete with implementation mechanisms to ensure they work over the long term.

The Basis of Regional Conservation Planning

The 1973 Federal Endangered Species Act (FESA) did not allow any loss, or "take", of endangered species except under very narrow circumstances such as scientific research. This restriction became a political issue in the early 1990's, because of a major development proposal for the habitat of an endangered butterfly on San Bruno Mountain, just south of San Francisco. Congress reacted to this conflict by amending FESA to provide for the issuance of incidental take permits upon agency approval of a Habitat Conservation Plan (HCP). Incidental take permits allow for some destruction of listed species and their habitat in the area designated by the plan. The federal law requires that an HCP ensures the impacts of this take are minimized and mitigated to the maximum extent practicable and that it will not appreciably reduce the likelihood of survival and recovery in the wild.

The California Fish and Game Code has a similar provision for incidental take permits. California also has a Natural Communities Conservation Planning Act (NCCP) that provides for development of plans to protect natural and (*Continued on page 3)*

Inside this Issue

News from IEH

Understanding Conservation Planning

When stakeholders first become involved in regional conservation planning they often face a bewildering array of new topics. The Institute for Ecological Health is now preparing a *Citizens Guide to Regional Conservation Planning* in order to help individuals who get involved in the process. This is a collaborative project with the Institute for Local Self Government, the non-profit research arm of the League of California Cities. The Great Valley Center generously provided a seed grant to start this process and we are obtaining additional small grants and also organizational sponsorships. Our grateful thanks to all the financial supporters of this project. We plan to have this Guide ready by the end of August, and will distribute it in various ways, including the Web and a CD.

The Guide will provide background on the various components of developing and implementing a regional conservation plan. It will also explore the key concerns of the different stakeholder groups, since we consider understanding these concerns to be essential to the development of an effective plan. In addition, there will be brief explanations of some key biological concepts that form the basis of conservation planning.

Decision-makers, local government staff and a wide array of citizens also need to understand the basic notions of regional conservation planning. We will address this need through an expanded executive summary that we propose to distribute widely.

Regionalism and Land Use Planning

The next issue of *Linkages* will focus on the roles of regional and inter-regional perspectives and approaches to land use planning and related topics. Past issues of *Linkages* have touched on some of the problems, such as sprawling development in southern California's Inland Empire and Bay Area home-seekers moving to the Central Valley.

Regional government per se is dead on arrival. There are clear ways in which it could provide effective land use planning that curbs sprawl, integrates land use, transportation and air quality. However, it is anathema to the local legislators that make land use planning decisions, and to many neighborhood activists who find even existing local governments too distant. Instead, we need to explore other ways of achieving the needed regional cooperation, together with regional scale information and analysis.

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Linkages

Providing information on California land issues, including conservation biology, planning and economics, development, urban design, and agriculture. We explore the needs of different interests and creative solutions. We welcome articles, story ideas, and letters.

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Regional Conservation Planning - from page 1

semi-natural communities and to sustain and restore those species and habitats covered by a plan.

Conservation planning began in the 1980's with small-scale HCPs covering one or two species and an individual landowner. It expanded during the 1990's into large scale plans that cover an entire county or a major portion of a county and address the needs of many species, including special status species not currently listed under federal and state endangered species laws. (Special status species are those that one or more agencies have identified as being in trouble). These large-scale plans usually focus on resolving conflicts between future urban/suburban growth and the imperiled species and their habitats.

The initial regional-scale plans were in southwest California and centered on coastal sage scrub habitat and its large suite of listed and other special status species, driven by the federal listing of the California gnatcatcher as a threatened species. They utilized both federal HCP and early state NCCP laws. Broad scientific guidelines for the conservation of coastal sage scrub and its species, developed in the early 1990's by a committee of scientists, provide an umbrella for development of 10 subregional plans, such as the City of San Diego's Multi-Species Conservation Plan. Several of these subregional plans have yet another layer of more detailed subarea plans.

An effective plan provides a suite of biological, regulatory, fiscal, land-owner protection, and public participation provisions

During the late 1990's the development of regional scale HCPs spread to other locales, such as San Joaquin County, California and Pima County, Arizona. At the beginning of the 21st Century, a new generation of planning efforts emerged in several counties across central and northern California.

What Should a Regional Conservation Plan Achieve?

An effective plan provides a suite of biological, regulatory, fiscal, land-owner protection, and public participation provisions that will work over time. The regulatory permits are for a defined time, for example 30 years, while the biological conservation is in perpetuity. A periodic review system, agreed upon by the stakeholders, allows examination of the effectiveness of biological strategies, fiscal system and landowner protections from time to time, and adjustments that gain stakeholder support.

Six Steps for Effective Conservation Planning

- É Involve all stakeholders
- É Base plans on good science
- É Meet needs of different interests
- É Ensure long-term conservation and aid species recovery
- É Include extensive public involvement
- É Provide adequate funding for implementation

Biologically, the plan will lay out a set of goals and a conservation system, based on sound science, for the establishment of permanent conservation areas that will aid the recovery of listed species and ensure long-term survival of populations of other species covered by the plan. Conservation occurs by purchase, from willing sellers only, of either conservation easements or the land itself. The conservation areas are usually established over time as funding permits. This process must keep ahead of loss of habitat from the permitted activities.

The conservation system is at a landscape or ecosystem scale and involves natural habitat and, in many cases, farmland that is utilized by some of the key species. This system will maintain the ecological integrity of large habitat blocks, landscape linkages, ecosystem functions and the area's biological diversity over the long term. Monitoring and management provisions provide both for ongoing protection and enhancement of species and habitats, and ways to make changes when biological goals are not met or foreseen changes occur through an adaptive management program. The plan includes an administrative system to carry out all these activities, such as establishment of a conservancy or other type of conservation plan authority.

Approval of the plan by regulatory agencies results in issuance of several permits to the lead agency, usually the county or a multi-jurisdiction Joint Powers Authority. Incidental take permits under FESA, and the California Endangered Species Act or NCCP are the basic permits. In addition, there is strong interest by several jurisdictions to cover federal wetlands permitting under Section 404 of

the Clean Water Act, although to date this has not been achieved in a concurrent fashion. Other possible permits include California water quality permits and streambed alteration permits.

The permit approvals benefit local government and the development community. Without the conservation plan & permits, developers deal with the wildlife agencies on a project-by-project basis and make their own deals. This is time consuming, expensive and causes uncertainty.

An effective regional conservation plan also benefits nature and the environmental community. Some citizens erroneously believe that without such a plan development of wildlife habitat would grind to a halt. That is not the case. Instead, there are project-by-project negotiations between developers and agencies and eventual agreement on a conservation approach. This will likely include some on-site avoidance and heavy reliance on off-site private mitigation banks. The mitigation does not provide for functioning ecosystems and is likely to be inadequate for long-term survival of species.

Landowner protections are vital for the agricultural community, in whose landscapes much of the conservation occurs. Examples include adjacent landowner protections (for landowners whose neighbors sell an easement or land to the conservation authority) & reliance on willing sellers.

In addition, landowners who participate in the future development, as well as the local governments, are protected from future plan changes by assurances or "no surprises" provisions. These address future unforeseen circumstances, saying that the agencies are responsible for any increased conservation that might prove necessary. As no surprises carries the potential to make implementation biologically unfeasible many years after plan approval, we consider stakeholder approved provisions in a conservation plan, such as periodic review and adjustment, essential, in addition to the adaptive management component.

The fiscal system must provide adequate funding to carry out the plan goals. During the permit period, some of the income goes to creating an endowment, so that management, monitoring and other functions related to the conservation areas can continue in perpetuity. Funding may come from a variety of sources, or just from a fee on future development. If any of the funding is not assured (for example requiring a future local vote to set up a publicly funded income stream, or future federal appropriations) then the plan runs the risk of seeing permits suspended by the federal and state agencies. While the funding system will include an inflation factor, it will have to be revisited from time to time if it proves inadequate to meet plan goals.

Finally, plan implementation must provide meaningful opportunities for public participation and input, including the involvement of stakeholder groups. Even a good regional conservation plan will only result in the needed conservation and avoidance of conflicts if there is vigorous oversight and involvement.

Conclusion

As regional conservation plans spread across California and beyond, from their initial use in the southern coastal sage scrub areas, they bring the opportunity to provide effective conservation of species and habitats, and also to address the needs and concerns of local governments and the various stakeholders. The major shortcomings of earlier plans, and continued concerns of the agricultural, environmental and scientific communities, place the onus on those currently developing regional conservation plans to do the job right, provide genuinely adequate biological conservation and resolve stakeholder issues. This is not an easy task, but success is essential.

Further Reading

Hood, LC (1998) *Frayed Safety Nets: Conservation Planning Under the Endangered Species Act.* Defenders of Wildlife, Washington, DC. www.defenders.org/pubs/hcp01.html

Noss, R et al. (1997) *The Science of Conservation Planning: Habitat Conservation Under the Endangered Species Act.* Island Press, Washington, DC. www.islandpress.org

Pollak, D (2001) *The Future of Habitat Conservation? The NCCP Experience in Southern California.* California Research Bureau, California State Library, Sacramento, CA. www.library.ca.gov./crb/01/09

Witham, C (2001) *The Future of Regional Conservation Planning.* Fremontia 29:19-26. California Native Plant Society, Sacramento, CA. www.cnps.org

California Department of Fish and Game website. www.dfg.ca.gov

US Fish and Wildlife Service, Sacramento Office HCP website. http://sacramento.fws.gov//es/hcp.htm

MAKING REGIONAL CONSERVATION PLANNING WORK - FROM STAKEHOLDERS TO SCIENCE

An effective regional conservation plan is not a purely scientific document prepared by biologists. It incorporates constraints of existing local land use and the needs and concerns of the various stakeholders. While this may sound like unnecessary compromise to some citizens, the reality is that without this approach the plan will only create great friction and conflict and will fail at the implementation phase.

Development of a regional conservation plan is unavoidably a long, complex process. Three essential features are extensive involvement of key stakeholders through a steering committee and other bodies, an independent scientific advisory panel, and the active involvement of staff from federal and state agencies. These features are all critical to success. Without the stakeholders, a plan is likely to be seriously deficient in one or more ways, can well finish up in court, and will probably have major problems during implementation.

The independent scientists provide guidance on key features such as ecological needs of individual species, conservation strategies and monitoring. Federal and state agency staff participation increases the likelihood that the plan will meet the needs of the permitting agencies.

Development of a regional conservation plan is unavoidably a long, complex process.

Stakeholder Involvement

We consider it essential to include representatives of key interests, particularly members of agricultural and environmental organizations and the development community, from the very beginning. Conservation planning will be new to many of these individuals. Also several may bring major issues and fears from items they have heard or read, including topics that are part of a conservation plan.

Accordingly, we recommend that as soon as a local government is seriously interested in developing a regional conservation plan it should assemble a steering committee and hold a series of educational meetings to provide basic understanding and several opportunities for extensive discussions. In our experience, some planning efforts fail to develop this solid knowledge basis and the result is unnecessary confusion and misunderstanding.

In addition, development of a conservation plan is a lengthy business that eats into peoples' volunteer time. Losing initial stakeholders can be a serious drain, as replacements can be hard to find, they are usually not up to speed, and continuity is broken for the affected stakeholder groups. When volunteers are unsure of where a process is going, do not develop a clear understanding of relevant issues, or have trouble seeing a worthwhile outcome, they are unlikely to stay the course.

Early convening of the stakeholder group also ensures that participants' key issues are incorporated into the plan development scheme and consultant work plans. The group should start by drafting a broad set of plan goals that address not only the biological issues but also key agricultural, landowner, developer and local government needs such as respect for private property rights. The broad biological goal needs to include aiding recovery of listed species and maintaining or enhancing populations of the non-listed species covered by the plan to ensure their long-term viability.

The stakeholder group should provide major input throughout development of initial materials, such as background studies, and the draft plan components. It should have the ability to obtain additional work which was not thought of early on and very substantial revision of draft materials, all of which can require significant additional funding.

Various subcommittees will be needed as time goes by. Examples are biological, economic and agricultural subcommittees, or short-term groups that address a discreet issue. These allow extensive and detailed discussion of important issues and help develop effective solutions.

In a stakeholder process it is essential for the participants to understand the issues and interests of the other stakeholder groups, and to treat their concerns as valid and important. Stakeholders need to develop a good working relationship and recognize that the plan has to meet their varied needs. This cuts all ways. For example, environ-mentalists have to recognize the concerns and needs of the agricultural industry and help seek effective solutions, while developers have to appreciate the environmentalists' view of effective conservation and need for sound science and help ensure that the plan provides this. The broad goals of a plan should reflect this diversity.

The Scientific Basis

A regional conservation plan will only work if it has a solid scientific basis, and utilizes an effective monitoring and management program, including adaptive management to deal with change and uncertainty (see following article on adaptive management). An essential basis is the relevant biology and the ecological needs of the individual species covered by the plan, together with biological goals and objectives and a conservation strategy for each species. This includes current knowledge of species occurrence and analysis to determine suitable habitat where it may occur. While conservation plans usually utilize a habitat-based approach, that will only work with this solid grounding on the species needs, and clear linkage of those needs to habitat conservation measures.

In most cases, our scientific understanding of a species' ecology and needs is very limited. Here it is necessary to take a conservative approach to conservation, using the precautionary principle, so that we do not realize later on that conservation is inadequate. Also it is important to identify key gaps in information and ecological understanding that can affect plan implementation.

The geography of the plan area is a critical basis for developing and implementing conservation strategies and addressing reserve design. Computer mapping (geographic information systems - GIS) is utilized extensively for landscape and habitat issues. A GIS map of land use and land cover type forms the basis for planning. This should be as up to date as possible, utilizing the latest available aerial photography, and should be periodically updated during the plan implementation phase. Some ground-truthing is essential to verify accuracy of land cover categories and map distribution.

While this GIS map will have information about broad vegetative cover types, locations of streams, larger vernal pools, known occurrences of species and other features, it will not include vital information on habitat quality, small-scale features and detailed associations of plants. This can only be obtained by extensive ground surveys which are not feasible for several reasons. Additional information layers such as soils, watershed and subwatershed boundaries, ownership parcels, general plan and zoning delineations are all essential.

Other basic scientific components include: an analysis of the habitat types and their relevant ecology, biological goals and objectives and conservation strategies; and a consideration of ecological processes and functions together with key conservation biology issues such as landscape linkages and reserve design. All this biological information and understanding comes together in the plan's conservation strategy, including the over-arching biological goals and objectives.

Scientific Advisory Panels

Independent scientific input is an essential part of the planning process and is now required for an NCCP under the California Fish and Game Code (Section 2800-2840). A science panel is comprised of individuals from a variety of disciplines, including experts in key covered species, conservation biology and community ecology, and local biology. It is important that the panel be credible to the different stakeholder groups, as well as to the agencies and local jurisdictions.

Why have an independent science panel? In theory the consultant provides the needed expertise, there are many opportunities for bringing in individual experts if the need arises (such as an expert in the ecology of an individual species) and the active stakeholders will bring up various issues requiring use of science.

Independent Science Panel Requirements in the New NCCP Planning Law [California Fish and Game Code 2810 (b)(5)]

- Recommend scientifically sound conservation strategies for species and natural communities proposed to be covered by the plan
- Recommend a set of reserve design principles that addresses the needs of species, landscapes, ecosystems, and ecological processes in the planning area proposed to be addressed in the plan
- Recommend management principles and conservation goals that can be used in developing a framework for the monitoring and adaptive management component of the plan
- Identify data gaps and uncertainties so that risk factors can be evaluated

Many of the past conservation plans, including some large-scale, multi-species plans, have had serious scientific deficiencies. There was either no science panel, or it was used inadequately. The onus is on the new planning efforts to both be scientifically sound and to be seen to be so. An independent panel provides outside advice and feedback to ensure this solid scientific basis. It also provides a way to reassure the stakeholder committee

and other interested individuals. The latter is important because of the varying perceptions among interest groups as to what constitutes "good" science.

Science panels have a couple of major functions. One is to meet very early in the process, address some fundamental issues in the context of the local landscape and biology and then produce a guidance report. This report will help the consultant, local government staff and the stakeholders. You can read some recent science reports by going to Fish and Game's NCCP web site *www.dfg.ca.gov*. For those plans that have already been under development for some years and are only just incorporating a science panel, this function may or may not be appropriate, depending on the level of science and biological understanding within the individual planning effort.

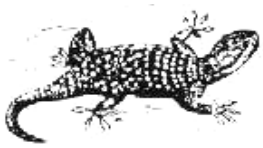
An equally important function of a science panel is to review draft materials as they are developed and to answer specific questions. This might be very ad-hoc, taking a specific point to an individual science panel member. Or it might involve the entire science panel in a series of meetings. The developing East Contra Costa HCP/NCCP provides an example. The science panel is given draft materials, and questions from a science facilitator and from the stakeholders. There is an extensive write-up of each meeting. (See meeting notes at *www.cocohcp.org)*

Coping with the Inevitable Uncertainty

Regional conservation plans suffer from some problems that cannot be overcome during plan development. Firstly there is often a great lack of knowledge about species occurrences and habitat quality across the study area. Extensive on-the-ground surveys are not possible because private landowners are unlikely to grant permission. Instead most plans must rely on additional information being gathered during the implementation phase.

Secondly, biological knowledge and understanding is lacking for many pertinent aspects of individual species ecology, the ecology of the biological communities, and ecosystem functions. It is important for the consultant to identify these gaps & research needs in the plan materials. Scientists will learn more during the implementation phase, partly through the plan's monitoring, partly through independent research that happens to take place at local universities and elsewhere, and partly through overall progress in our scientific understanding of key biological issues. A plan must be able to utilize future knowledge.

In addition, there will be surprises. Many of these can be reasonably foreseen, while others cannot. A conservation plan is required to identify reasonably foreseeable circumstances and outline measures to address them. When one of these circumstances actually occurs,



improved scientific knowledge and understanding will likely refine the measures.

Plan implementation addresses these issues by development of an effective monitoring and adaptive management system. The next article addresses this crucial topic.

Circumstances that cannot be reasonably foreseen are covered by an assurances or "no surprises" rule that says the permittee is not responsible for carrying out additional necessary measures - they are the federal and state government's responsibility, unless the permittee agrees to undertake the extra measures. For regional plans, local government is the permittee.

This provision has been an essential feature for the development-landowner community. Without it, this stakeholder group would not have come to the table. At the same time, the environmental community and most scientists oppose the "no surprises" rule because they recognize that such surprises are inevitable and could likely undermine long-term conservation.

The solution that we see is for stakeholders to agree their regional conservation plan will require periodic, public review of its biological and economic efficacy and make changes in the conservation strategies as necessary.

Conclusion

Regional conservation planning is a demanding activity. It is easy for stakeholders, particularly those in the environmental and agricultural communities, to feel threatened and decide to avoid the process and its time demands. However development of regional conservation plans now has great momentum, driven by years of growing activity, broadening local government interest and new California state law. The only effective solution is for extensive involvement by stakeholders, coupled with methods of plan development that fully engage the various interests and ensure scientifically sound plans which provide necessary levels of conservation while addressing stakeholder needs.

In addition, we must recognize that a successful plan is the result of successful implementation. Continued stakeholder involvement over the long term, together with public awareness and opportunities for input, will be essential.

ADAPTIVE MANAGEMENT, THE FUTURE OF HABITAT CONSERVATION PLANNING

By Mike Vasey

Recently, the fate of habitat conservation planning in California has been transformed by new requirements under the federal Endangered Species Act (ESA) (US Fish and Wildlife Service and National Marine Fisheries Service 2000) and the 2002 California Natural Communities Conservation Plan Act (NCCPA 2002). To qualify for future incidental take permits, federal and state laws now require that habitat conservation planning for threatened and endangered species include explicit goals, adaptive management, a monitoring program and sustained peer review.

Setting goals and monitoring are two fundamental requirements that fall under the umbrella of adaptive management. Peer review is also an important part of this management strategy. Why has adaptive management become the cornerstone of contemporary conservation management? What is it? Is it practical? Will it work? These are some of the questions that must be addressed by today's conservation practitioners, including public and private applicants that seek to obtain benefit from their properties at the potential risk to species protected under state and federal regulations.

Why has adaptive management become the cornerstone of contemporary conservation management?

Adaptive management arises out of the recognition that ecosystems are extraordinarily complex and inherently uncertain (see Meffe et al. 2002 for a good discussion). It is ironic that, while the "No Surprises" policy of the US Fish and Wildlife Service addresses property-owner financial uncertainty by providing regulatory assurances, until recently there was no regulatory consideration of ecosystem uncertainty that could assuage concerns of public stakeholders, such as environmental advocates and conservation biologists. Only tumultuous debates in the late 1990's over the scientific validity of Habitat Conservation Plans (HCPs) led the Services to modify their HCP handbook to reflect these concerns (Kareiva et al. 1999, US Fish and Wildlife Service and National Marine Fisheries Service 2000). While the No Surprises policy has helped to stimulate a dramatic rise in habitat conservation planning (Hood 1998, Wilhere 2002), it is hoped that the implementation of adaptive management in HCPs will help build their credibility and effectiveness as a tool that is consistent with the intent of the ESA.

Populations of at-risk species depend upon habitats that are embedded in ecosystems that are situated across landscapes. Habitat conservation planning must account for both the complexity and uncertainty of these species and ecosystems and, to the extent possible, influence target ecosystems and their surrounding landscapes to ensure the long term viability of at-risk species that are under legal protection.

Given that habitat conservation planning now requires explicit biological goals to protect listed species, two questions arise: what are the best ways to protect these species and what are the best ways to help them to recover? Adaptive management recognizes that we can't know the answers to these questions until we have gained some insights into the ecosystems in question, experimented with different approaches for habitat conservation and population viability, critically analyzed their benefits and costs, and ultimately learned from this process so that more refined approaches can be tested.

This learning process relies upon feedback generated by a monitoring program. In this sense, monitoring is not simply documenting existing conditions. Rather, it is specifically designed to provide data and information that answers questions in a management context. Elzinga et al. (2001) define monitoring as "the collection and analysis of repeated observations or measurements to evaluate changes in condition and progress toward meeting a management objective."

Because adaptive management is the new mantra in conservation, it has fallen prey to a multiplicity of definitions and meanings. Lee (1999) emphasizes that conservation activities that fall into the category of "learning by doing" are considered adaptive management. From this perspective, there are three relatively distinct forms of adaptive management: (1) trial and error; (2) passive adaptive management; and (3) active adaptive management (Lee 1999, Wilhere 2002, Meffe et al. 2002).

Trial and Error Adaptive Management

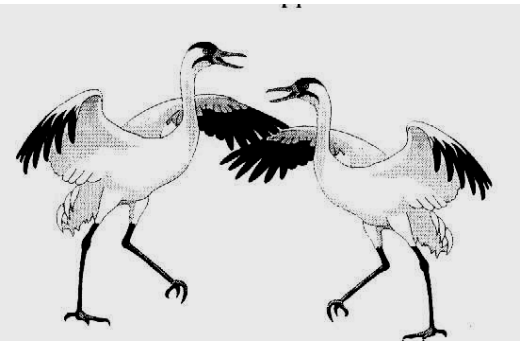
Trial and error adaptive management is problem-oriented observation that is designed to solve or mitigate particular problems (Lee 1999). It is the kind of management that is typical of many habitat conservation plans at this time. As pointed out by Wilhere (2002), "trial and error typically emphasizes the 'trial' which

entails resource utilization and produces revenue, but neglects error detection, which entails costly monitoring." Although trial and error is a form of learning, when relied upon exclusively, it can better be described as "reactive learning". Trial and error conservation minimizes the scientific process under the assumption that it is too expensive.

Generally speaking, information derived from this form of adaptive management is of poor quality and resists objective analysis. Despite this shortcoming, Meffe et al. (2002) point out that documented trial and error management can still provide important learning opportunities. We should always be questioning and looking for the best ways to accomplish goals, even if resources prohibit more rigorous science-based investigations. The process of questioning and testing can be helpful at almost any scale.

Passive Adaptive Management

Passive adaptive management falls within what Elzinga et al. (2001) characterize as observational studies. Observational studies use a science-based design to evaluate different kinds of effects based on alternative management practices. Elzinga (2002) defines this type of adaptive management as "a process in which management activities are implemented in spite of uncertainty about their effects, the effects of managements are measured and evaluated, and the results are applied to future decisions".



While passive adaptive management can provide excellent sources of information to help guide conservation management, it cannot address causation issues with any degree of confidence. The reason is that practical constraints prohibit an adequate research design. Research questions require adequate controls and a sufficient number of randomly chosen replicates to analyze causation issues. The irony, of course, is that discoveries concerning causation can amplify efficiency by a considerable degree. So, while passive adaptive management is useful in the short term, it doesn't yield as much information as is necessary to make break-through management discoveries that can ultimately be the most cost-effective (Lee 1999).

The Plum Creek Native Fish HCP: An Adaptive Management Example

Underlying Approach

- É Clear objectives and testable theories relating to HCP components
- É Credible design and study methods
- É Change management in response to new information

Three levels of projects

- É Continuous improvement monitoring
  eg: monitor bull trout redds
- É Experimental management
  eg: success of riparian restoration projects
- É Basic research
  eg: technique to suppress non-native brook trout

www.plumcreek.com/environment/fish/trout13.cfm

Active Adaptive Management

Active adaptive management is research-oriented conservation management (Meffe et al. 2002, Elzinger et al. 2001). It is specifically designed to answer important questions by implementing alternative management treatments that yield statistically valid information that can be used to evaluate alternatives and to formulate new questions.

Active adaptive management puts as much focus on learning as on doing. Once the general goals are identified, a conceptual model of the system or species (or both!) is formulated. This helps to identify gaps in knowledge and formulate research questions (Meffe et al. 2002). Resource objectives are agreed upon in a collaborative process using the best scientific information available. A research design is devised to test research questions by using alternative treatments and controls.

Monitoring is then the process of gathering data as the project is implemented. Pre- and post- conditions should be monitored. At appropriate intervals, data is analyzed and the relationship between results and management objectives evaluated. This analysis can also potentially yield insights into cause-effect relationships. Based upon the analysis, new methods may be implemented to test new questions. Monitoring is then modified to adjust to the new design.

The Practicality of Adaptive Management

Active adaptive management is the ideal approach to conservation and is arguably the most socially responsible method of implementing the ESA because it is information rich and best suited to promote recovery. This raises the next key question: is adaptive management practical? Lee (1999) points out that adaptive management so far has been more influential as an idea than as a practical means of gaining insight into the behavior of ecosystems utilized and inhabited by humans (as well as at-risk, legally protected species).

Clearly, in the preparation and implementation of HCPs there will be difficult trade-offs between how much should be spent on habitat conservation versus the gathering of reliable information (Wilhere 2002). Elzinga (2001) states that observational monitoring in an adaptive management framework may be sufficient. Observational monitoring and research are part of a continuum in confidence in attributing change to a particular causal agent. Doing large-scale project implementation with an appropriate research design to evaluate causation may simply be too costly and impractical.

Menges and Gordon (1996) offer an interesting approach to dealing with the cost versus information quality dilemma (Holloran 2002). In discussing rare plant monitoring, they take a hierarchical approach in which three different levels of intensity are applied in an adaptive management context. Level 1 simply tracks population distribution using GIS (geographic information systems) technology and periodic monitoring with GPS (global positioning system) coordinates. Trends in population size are described but not quantified. Level 2 monitoring measures population trends within populations. This could be applied to a random subset of populations that could help inform whether populations are increasing or declining. This is useful for hypothesizing mechanisms responsible for population trends. Level 3 uses more detailed demographic research to attempt to understand mechanisms for problems such as population decline. This hierarchical approach uses certain triggers to shift from low investment to high investment monitoring efforts.

Looking to the Future

Will it work? Now that adaptive management is required by the Services, it is likely that this concept will shift more to the realm of practice and, as we gain experience, it may well become more practical than currently is the situation.

The key for permittees, environmental advocates and the Services is to make a fundamental shift in how habitat conservation planning is approached. Learning must be given equal priority to doing. What we know, what we think we know, and what we don't know must be identified so that management questions, to the extent possible, can be investigated as conservation management and monitoring is implemented over time. This requires up front communication and collaboration, scientific design, and implementation followed by a commitment to learning and the flexibility to revise future implementation based upon what is learned.

Funds need to be set aside to promote this process and plans need to provide the opportunity to make adjustments and explore new questions as they arise. Wilhere (2002) is skeptical of how adaptive management will be practiced in habitat conservation planning because there currently are not adequate financial incentives for HCP and NCCP permittees to practice adaptive management once the incidental take permits are issued. Wilhere (2002) suggests that one effective means of promoting adaptive management would be to require an environmental assurance bond to control the behavior of an HCP applicant and to objectify risk. The interest-bearing bond would be recoverable by the permittee over time, based upon effective adaptive management performance. This would provide the incentive for more creative management approaches and the production of quality information to demonstrate performance.

In the Central-Coastal Orange County NCCP, a $10.6 million endowment was created to support monitoring and adaptive management. Other regional-scale conservation plans under development include building a monitoring and management endowment fund as a required activity during the permit period.

Clearly, some system of incentives will be necessary. Until this is established, it is most likely that large-scale adaptive management programs will be limited to regional-scale, HCPs or NCCPs where the permittee is a public entity. Here a commitment to reliable information & adaptive learning is likely to yield long term management cost-savings and optimal conservation outcomes.

Adaptive management is based upon principles of conservation biology that are put into practice as ecosystem management (Meffe et al. 2002). The more that small, medium and large scaled HCPs and NCCPs can be integrated into on-going regional ecosystem management, the more likely that the adaptive

management approach will be practiced as intended because there will be a shared learning process and the expense to individuals can be minimized. Ecosystem management is not yet mainstream in our society but, as the value of working landscapes to conservation planning and implementation becomes recognized, it is likely that this will change.

Regional academic institutions provide resources that could become progressively engaged in adaptive management because the goal of learning is best accomplished when practiced and the ethic of learning as practiced in adaptive management will benefit land managers and the public. Endangered species and deteriorating ecosystems are part of the public commons. Adaptive management stresses collaboration among stakeholders across property boundaries so that bioregional interests can be protected. The more that HCPs and NCCPs can be integrated into a bioregional framework, the more practical they will become. We need to find ways to provide incentives to HCP and NCCP applicants to practice adaptive management which, when practiced at all scales, should ultimately strengthen our confidence in ways that we can best practice conservation.

Conclusion

In summary, adaptive management prioritizes learning through doing, unlike more traditional management practices that prioritize doing and consider learning to be a fortuitous by-product. While uncertainty in complex ecosystems is a given, this approach seeks to minimize uncertainty, particularly with respect to at-risk species in the case of habitat conservation planning.

Adaptive management will help to bring some equity to HCP and NCCP implementation in the sense that No Surprises regulatory assurances against financial uncertainty will now be matched by management requirements that attempt to reduce biological uncertainty as well. It will bring about more cooperation at bioregional scales, more transparency on how and why conservation is practiced, and ideally more collaboration between parties to agree upon best management practices. With so much of our lands privately owned or managed by non-federal agencies, it is critical that we embrace the concept of adaptive management in future habitat conservation planning and implementation.

At any level of intensity, adaptive management is potentially a vast improvement over more traditional management strategies. But this must not be "just winging it". Rather, it must be a thoughtful, science-based approach to learning about the best methods to achieve conservation goals even while conservation implementation is practiced.

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PLANNING FOR QUALITY OF LIFE

Designing New Neighborhoods and Assessing Impacts

By Randall Fleming

The design of neighborhoods, including residential building types, commercial facilities, parks, and open spaces can influence quality of life as well as impact land consumption, density, transportation, natural systems, and public costs and revenues. New develop-ments have about 40% of their land dedicated to uses other than housing. Given the current development interest in low-density single family housing units, the average density for new development in the Sacramento Metropolitan region, for example, is about 2.2 homes per gross urban acre. This density, if continued into the future, will require considerable land. Should the Central Valley as a whole grow by the projected 6.5 million new residents by 2040, about 1,800 square miles of currently undeveloped land will be required.

However, there are alternatives to excessive land consumption. In addition to infilling and re-filling existing urbanized areas to accommodate population growth, new developments could offer land efficient housing types as well as offer typical single-family homes. Efficient housing types include single-family homes on small lots, single-family homes with second unit cottages, mixed-use buildings with housing over retail and commercial uses, as well as multi-story apartments.

The *Neighborhood Designer*, the interactive software developed at UC Davis by Brian Morgan and I, enables users to design a neighborhood and test the impacts of housing types and other land uses in six easy steps. The final sheet analyzes the design, and includes land consumption, density, fiscal, and other assessments. The fiscal measurements were developed with input from County and City financial administrators. The software clearly and reasonably demonstrates the relationships among building types, land use, density, and fiscal outcomes. Assumptions in the Neighborhood Designer formulas are based on City level costs appropriate in the Sacramento region; yet the formulas and assumptions are provided in the *Designer* appendix and can be changed by the user to suite local conditions. Some of the findings from using the *Neighborhood Designer* are very interesting. Subtle choices in housing types, amount of parks, etc. can have a significant impact on density, land consumption, and fiscal outcomes. Land consumption by current low-density development can be more than cut in half by simply adding second unit cottages and small lot single-family homes to current developments while keeping 50% of the houses single-family at low densities.

Fiscal issues, especially in our current economic climate, are important considerations. It is well known that current low-density housing developments usually do not pay for all of the public services they receive, unless they are higher end or have additional assessments added to base property taxes. At a cost of $250,000 for a single-family home, the average development with parks and open space amenities could produce a fiscal shortfall to the local government of about $130 per house per year, assuming the base property tax only. Increasing density (or cutting amenities) helps improve the situation. By adding cottages and small lot single-family homes, the $250,000 cost housing development can pay for its services and generate a small surplus of $30 per house, assuming the residents shop locally.

Retail spending behavior in fact remains critical in determining fiscal outcomes, and it has a greater financial impact on local government than housing density. If a city has only neighborhood level retail, or if residents of a new development will likely spend most of their retail dollars outside their city, the same average low-density example as above would result in a fiscal shortfall of about $460 per house per year.

From a fiscal and land consumption perspective, the more centrally located urban developments perform much better than suburban development built on the urban fringe. Part of this is due to the fact that urban center develop-ments offer greater urban amenities (shops, jobs, services, cultural, and entertainment) and less park and open space amenities. A neighborhood such as Midtown in Sacramento has considerable urban amenities yet less than one acre of parks per 1,000

residents (suburbs have 5 or more acres per 1000 residents). Midtown also has about 10 dwelling units per gross acre, almost 4 times denser than a typical suburb. Assuming a Midtown neighbor-hood would be built today near an urban center at an average cost of $250,000 per dwelling unit, it would generate a fiscal surplus of about $270 per dwelling unit per year.

You can use the *Neighborhood Designer* to test a neighborhood in your community or to design one you prefer. The software requires a PC that has Excel 2000 or greater. It can be ordered through UC Davis as well as IEH. The compact disk includes the software, a user's guide, plus a document on livable neighborhood development prepared by the Growth Alternatives Alliance of Fresno. Order from IEH at ieh@cal.net. A CD disk w/shipping costs $4.

Randall Fleming is an architect and urban planner, a researcher in community design, and a member of the Institute for Ecological Health's Advisory Committee

FLOODPLAIN MANAGEMENT FOR THE 21ST CENTURY

Floodplains are rich ecological and agricultural areas that also attract human settlements. For over a century our society has worked to "tame" rivers and alter floodplains. Most of California's rivers are now flanked by levees, divorcing them from their historic loodplains and increasing the elevation of floods. This destroys both the ecological benefits of floodwaters periodically spreading over floodplains and also a variety of natural river ecological and physical functions (Mount, 1995). The native vegetation of these floodplains has been largely replaced by human uses, first agriculture and then urban-suburban development. For example, over 95% of the Central Valley's riparian forests and 90% of the historic wetlands are gone. Vital natural functions of rivers and floodplains, essential for long-term ecological health and provision of ecosystem services to society, are ignored (See *Linkages* number 4, Spring 1997, for a set of articles on flood management ecological enhancements).

About 90 percent of the disasters in California have been floods

At the same time, flooding remains a major problem in California, and there have been several disastrous events since 1850. In January 1862, four weeks of rain produced vast inland seas across most of the Central Valley and in Orange County. Major floods occurred in 1907, 1909, 1937, 1955, 1962, 1964, 1986, 1995 and 1997. About 90 percent of the disasters in California have been floods and since 1950 each of California's 58 counties have been flood disaster areas at least three times. Most of the flooding is in the floodplains along rivers, but there are also problems with coastal flooding and the potential for catastrophic flooding of southern California alluvial fans, where fast moving water is mixed with rocks and large boulders.

The engineering approach to flood events and the use of floodplains fails time after time. The 1993 floods along the Mississippi river, which would had far worse consequences but for an excess of 1000 levee breaks in the upper river basin, woke society to these past errors and suggested a different approach to flood management (Galloway, 1994).

Furthermore, local governments and residents rely on an artificial system of determining what are floodplains that gives a false sense of security, belying the real danger of catastrophic flooding. The 1997 California floods showed the consequence of this, when most of the flooded areas were lands mapped as being outside the floodplains. Continuing the current approach to floodplain use over the next few decades of California's seemingly remorseless growth will exacerbate the current problems greatly.

Floodplain Task Force Report

Against this backdrop, the California Department of Water Resources (DWR) convened a state-wide Floodplain Management Task Force in 2002 to develop recommend-ations designed to reduce flood losses and maximize floodplain benefits. IEH was represented on this Task Force and played a very active role. The December 2002 report is available at the DWR web site (CDWR, 2002).

This was a short-term, consensus based, project involving a wide array of government, business, agricultural and non-profit interests. Several caucuses and subcommittees worked very hard to develop meaningful proposals which could obtain consensus support. The result was a set of

SUSTAINING AGRICULTURE

The Farm Economy Crisis

We are seeing welcome attention to the need to conserve California's farmlands, which include the most productive agricultural lands on the planet. It is encouraging that this interest is extending beyond irrigated crop and orchard lands to the state's 18 million acres of private rangeland. The latter provide a wide variety of both agricultural and societal values, including essential wildlife habitat.

There is much less attention to an equally important issue: farmers and ranchers must make money in order to survive. Cattle ranching has been a marginal activity for some time. The problem has now spread and family farmers are growing a wide variety of crops at no profit or at a loss. Shifts into higher value crop such as almonds and later grapes often turn out to be busts in the longer term as overproduction (domestically or globally) abolishes the higher value. Even the shift to higher value organic produce proves ephemeral for some, as organic food enters the mainstream and supermarkets turn to large-scale growers.

This precarious economic situation puts the family farmer and rancher at great risk, and in turn jeopardizes the future of farm and range land. "We are not losing to environmentalists, we are losing to economics and demographics. If the American public ever sweeps us off the land, it will be because we are not producing enough value for society" stated New Mexico rancher Jim Winder a few years ago. And while urban-suburban sprawl is a threat around the edges of towns and metropolitan areas, the five to eighty acre ranchette is an invasive creature that can grow almost anywhere.

There are several causes of this difficult problem. One is the merging of companies that purchase agricultural products. For example, there is now a handful of packing firms in the U.S., and while retail and packer prices go up, the prices paid producers are stable or declining. Similarly for crops as the food distribution network shrinks to a small number of huge supermarket chains and food processors merge into huge corporations. Do not assume, as you see the price of bread, fruit and vegetables climb ever higher, that the farmer is getting a better return for his crop. Indeed he may well get less.

A second problem is global production and lower overseas costs, coupled with recent international trade agreements. This works both ways, benefitting the largest agricultural businesses abroad and in the U.S. For example, peasant farmers in Mexico growing corn on small plots of land are now severely undercut by cheap subsidized corn from the U.S.

Is there is solution? Solano County sheep rancher and Farm Bureau leader Al Medvitz writes[1] "During this era of globalization of our economy and huge multinational food companies with near-monopolistic control over certain commodities, what we want is not only a free and fair trade, but also a level playing field when dealing with imports and large food-processing corporations, and realistic and practical environmental requirements that are fairly evenly and applied. Most importantly, through the market mechanism, society will put a higher valuation on our products at the farm gate and somehow recognize the nonproduction value of having us as the stewards of the rangelands and as a crucial ingredient in the fabric of the rural West."

The challenges are immense, but the conservation of California's agricultural economy is essential for a wide variety of reasons. These range from its world-class value as an immensely productive growing region, to the close relationship between farm and range lands and the conservation of a wide variety of native wildlife, to the maintenance of rural landscapes and a rural way of life.

1. Medvitz AG (2003) *California Grazing Lands : Wither They Go.* *in* Managing for Healthy Ecosystems, eds Rapport DJ et al. Lewis Publishers, Boca Raton, FL. 1055-1063.

38 recommendations, that are very compre hensive and far reaching. Many are recommendations to local jurisdictions, rather than the state, since land use planning and most flood management is carried out at the local level.

A number of additional topics, several of which are of great interest to IEH, were not taken up as there was not time to reach consensus on them.

The recommendations fell into three groups: actions to better understand and reduce risks from reasonable foreseeable floods, a multi-objective management

approach to floodplain management, and a set of items regarding local assistance, funding and legislation.

Beyond the Misleading 100 Year Flood Concept

Addressing reasonably foreseeable floods is crucial. Currently, local communities think in terms of the "100 year flood" as a result of the flood insurance requirements of the Federal Emergency Management Agency (FEMA) and its flood insurance rate maps. Flood insurance is required for properties within the 100 year flood areas of FEMA maps, but not for other areas. If land is protected from the 100 year flood, for instance by construction of a levee, then its properties do not require flood insurance.

A big mistake is thinking land outside these areas is not in the floodplain. In reality, the 100 year flood is a statistical phenomenon based on the levels of past recorded floods. If there is a big flood next year in an area, the level will be re-calculated. Flood protection from the 100 year event may suddenly be protection from only a 60 year event.

Secondly, this concept does not mean that such a flood it will only happen once every 100 years. It may happen two years in a row as the probability is always 1% a year.

Thirdly, lands outside the 100 year flood areas can easily be inundated by bigger events. This is what occurred on the Mississippi in 1993 and in Central Europe in 2002. The threat includes lands behind levees. (Levees can also fail, even during a smaller flood event than they should handle). The areas behind levees have a residual risk of a catastrophic flood which in some cases would be 20 feet deep. If that behind-levee land is in a basin, then much of the water will not drain away after the floods recede.

A better approach is to determine the "reasonably foreseeable" flood event, and use this for local land use planning and flood protection. This may be significantly greater than the 100 flood, or may be less. A variety of data is needed to make this deter-mination, including historic and paleo-flood data and hydrologic modeling. On many streams, it's important to consider the impacts of future development which will increase impermeable surfaces on a watershed and so increase the amount & speed of stormwater run off unless best management practices are used to contain extra runoff.

IEH recommends two broad approaches. One is to flood-proof existing communities against reasonably foreseeable floods rather than the 100 year event. This approach was supported by the Task Force through a number of recommendations. The second is to halt the continual encroachment of metropolitan development into rural floodplains and alluvial fans, the vast majority of which is unnecessary if society switches to true Smart Growth (see *Linkages* # 13 and several earlier issues). Not only is it expensive to keep expanding the geographic area requiring extensive flood protection but also this consumes high quality agricultural lands and wildlife habitat, while fore-losing opportunities for restoration of riparian areas and river functions. Unfortunately, keeping rural floodplains rural is a highly controversial issue for some stakeholders, so the Task Force could not address it directly

Multi-objective Management

The Task Force recognized the variety of positive values of undeveloped floodplains, including conservation of agricultural lands, wildlife habitat and groundwater recharge areas. It made important recommendations for promoting multi-objective management.

One recommendation is "flood management programs and projects, while providing for public safety, should maximize opportunities for agricultural conservation and ecosystem protection and restoration, where feasible." Another gets away from the mind-set of channelized streams narrowly bordered by levees. " In planning new or upgraded floodwater management programs and projects, including structural projects, local and state agencies should encourage as part of the design, where appropriate, nonstructural approaches and the conservation of beneficial uses and functions of floodplains". The use of setbacks levees, coupled with allowing a natural, often meandering, stream channel is an example.

Conclusion

It is vital that this report not gather dust, or wait until the next catastrophic California flood. Instead we need to find ways, despite the state's current dismal financial situation, to move forward with implementation. A key is education on flood realities and needed change.

Further Information

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This website is a service of the Smart Growth Network. It has several useful downloadable reports, including *Placemaking: Tools for Community Action* and *Getting to Smart Growth: 100 Policies for Implementation*. There is also Smart Growth news by state.

Congress for the New Urbanism www.cnu.org
This website promotes walkable, mixed used neighborhoods. It provides access to publications on a variety of topics, including many presentations at CNU conferences. It is well worth exploring this site.

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Information Resources - California

***Farmland Protection Action Guide : 24 Strategies for California* (2002)** Publications Dept, Institute for Local Self Government, 1400 K. Street, Suite 400, Sacramento CA 94814. www.ilsg.org $20.00
This very helpful and extremely well designed 153 page publication reviews the variety of key strategies for conserving agricultural lands, planning for agriculture, Ag-urban boundaries and program implementation. The excellent layout and very readable style make this an invaluable guide. There are a great many text boxes explaining key points, listing principles and sample policies, and providing examples. While prepared for local officials, it is extremely useful for farmers, ranchers and citizen activists working to protect agricultural lands.

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