OVERVIEW OF OPPORTUNITIES TO DESIGN FUTURE URBAN WILDLIFE HABITAT IN THE SAN JOAQUIN VALLEY, CALIFORNIA

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ABSTRACT: Every year in California, tens of thousands of hectares of natural and agricultural areas that are wildlife habitat are planned for conversion to early-successional stage urban and suburban development, with concomitant changes in characteristics of wildlife habitats in the affected areas. In California, these changes are generally subject to public and agency review, under the California Environmental Quality Act (CEQA). The CEQA review process is intended to promote public disclosure of decisions, and adequate impact assessment and mitigation based on substantive information and analyses. It is difficult to address urban wildlife issues substantively under CEQA due to the general lack of information on the ecology of urban wildlife. Urban wildlife data are needed to support impact analysis and mitigation design for projects ranging in scale from urban fringe expansion, through parcel splits in rapidly suburbanizing foothills, to 49,000 ha "new towns," and county General Plans. Urban wildlife issues can be categorized by their association with 3 zones of urban structure: urban core, periphery, and landscape. These zones can change location as development occurs. Issues that require application of information on urban wildlife ecology include habitat loss, fragmentation, and degradation; and incremental impacts to rare plants, and game and nongame animals. These concepts are illustrated with recent examples from the San Joaquin Valley.

Key words: urban wildlife, CEQA, California, development, city planning, impacts.

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In California, the role of resource agencies is primarily to influence rather than regulate land use decisions made by local governments. Resource agencies are not exerting strong influence on the management of urban wildlife in the context of ongoing urban growth. Urban areas affect wildlife in the urban core, at urban edges, and outside the urban and suburban area, through habitat loss and fragmentation, disturbance, pollution, changes in vegetation and hydrology, and other ways. These impacts on local and regional wildlife populations are not well understood, nor are the means to avoid or compensate for the impacts. In light of ongoing urbanization in California, there is a need to provide a body of rigorous science-based information that can be applied to planning for urban wildlife in situations where future urban areas are now being designed or created (VanDruff, in prep.). This paper presents some of these effects and other issues associated with planning for urban wildlife in future urban development, in the context of current urban planning in the San Joaquin Valley of central California.

BACKGROUND

The portion of the San Joaquin Valley considered in this paper consists of 9 counties (Tuolumne, Stanislaus, Mariposa, Merced, Madera, Fresno, Tulare, Kings, and Kern), covering about 7.5 million ha. This area is bounded by the Sierra Nevada crest to the east, the Interior Coast Range foothills to the west, and the Transverse Range to the south. To the north it merges with the Sacramento-San Joaquin delta. Major regional land uses are agriculture, oil production, grazing, mining, forestry, and recreation. The major population centers are on the valley floor, and reflect historical patterns of land grants, water supply, agriculture, and transportation (Preston 1981). Regional population is about 2.2 million, with about 1.3 million living in incorporated areas. Over one-half of the population of incorporated areas lives in 2 urban regions, Fresno and Bakersfield (Fay 1993). There is significant growth of existing urban areas and creation of new urban centers. For some San Joaquin Valley counties, the projected growth rate until the year 2,000 is 23-40%, which is substantially greater than the projected 18% statewide population increase (Dangermond 1992).

The valley climate is mediterranean, with cool wet winters and hot dry summers. On the valley floor, where most of the population centers are, summer highs reach over 38° C, and winter lows are generally above -1° C; montane temperatures are cooler. Average annual rainfall is 12.5-25.0 cm on the valley floor, and higher in the mountains. Most precipitation falls during winter months, and in the mountains as snow (Twisselmann 1967). All major rivers and streams entering the valley floor possess dams or are otherwise linked to flood control and water storage systems; the bulk of mountain water yield is transported throughout the region for agricultural and municipal uses. Substantial use of groundwater for these purposes also occurs (California Department of Water Resources 1994).

CALIFORNIA ENVIRONMENTAL QUALITY ACT

Most local land-use decisions are made by appointed and elected officials of counties, cities, or special districts, such as those formed for irrigation, flood control, and public schools. Under the California Environmen-

tal Quality Act (CEQA; Remy et al. 1993) and Subdivision Map Act (Curtin 1992), many land use decisions are considered "projects" requiring some level of environmental review, at a level of detail corresponding to the expected magnitude of the project's impacts. The CEQA review process includes provisions for disclosure of project design, potential impacts, and proposed mitigation; and for circulation and public review of environmental documents. The agency authorizing the land-use decision (usually a county or city) is the "lead agency" and is responsible for the content of CEQA documents and compliance with prescribed processes for content and circulation. Both the language of CEQA and interpretations by local governments create a strong standard for substantive, specific information, particularly as the basis for establishing adverse impacts, and proposing changes in projects or other mitigation measures.

CALIFORNIA DEPARTMENT OF FISH AND GAME INVOLVEMENT

The California Department of Fish and Game (CDFG) is charged with preservation and management of biological resources held in the public trust. The CDFG role in local land-use decisions is largely advisory, with little or no direct control or regulatory authority. Staff in the CDFG Environmental Services unit review about 1,200 CEQA projects annually in the San Joaquin Valley-Southern Sierra Region discussed in this paper. Those projects of interest here include a range from lot splits and small parcel maps, to subdivisions, city expansions, "new towns" (planned new communities, some with > 40,000 people), and county General Plans. Comments are provided to the lead agencies through early informal consultation, and the public comment opportunities in the CEQA process. Local governments are not required to consider agency evaluations differently than other public comments, unless there is some associated statutory authority. Strong technical arguments are usually necessary for consideration of and action on comments regarding impacts to biological resources.

CASE STUDIES: EFFECTS AT CORE, EDGE, AND LANDSCAPE LEVELS

Inspection of a typical city land-use plan reveals different human densities and activities in three zones: the urban core, periphery, and external or landscape zone. These zones indicate real-world locations; a relative scaling of ecological effects; and differing assemblages of habitat conditions, species, and human influences. Most urban wildlife issues that we see in planning and project review also assort roughly into sets associated with each zone. The following cases from the San Joaquin Valley of central California illustrate some of the urban wildlife planning issues associated with each zone.

Urban Core

Bakersfield is a city of about 370,000 population, located in the southern end of the San Joaquin Valley. The city has an existing urban core, and has planned an extended urban system, based on the conversion of surrounding lands currently used for agriculture, grazing, and petroleum production. Average annual growth is about 2.6 % (Bakersfield Chamber of Commerce 1994). The rate of growth, presence of a river, canals, transportation corridors, and other internal habitat and corridor features, plus the character of the surrounding area create an interesting situation for studies of future urban wildlife habitats. This situation is enhanced by the presence of several species of state and federally threatened or endangered plants and animals in and around Bakersfield. Some of these, such as the San Joaquin kit fox (*Vulpes macrotis mutica*) can be found in the developed urban area using vacant lots, parks, golf courses, canals and highway margins (Metropolitan Bakersfield Habitat Conservation Plan Steering Committee 1994).

To reconcile urban development with state and federal endangered species laws, local governments, state and federal agencies, and local business groups collaborated on a multispecies Habitat Conservation Plan (HCP) per section 10a(1)b of the federal Endangered Species Act (Metropolitan Bakersfield Habitat Conservation Plan Steering Committee 1994). A key feature of this HCP is that most endangered species' habitat in the Bakersfield 2010 General Plan Area (about 5,700 ha of the 19,500 ha area) may be converted to other uses, with fees assessed to establish and manage large preserve areas outside of the General Plan Area.

The Bakersfield HCP is a significant achievement, and provides a pathway to reconcile urban development with endangered species management. However, it does not address urban wildlife issues. As the urban core and peripheral zones develop, existing wildlife habitat will be destroyed or fragmented. The size of the urban core and peripheral zones, and their area of impact, will increase significantly in relation to the potential movements of animals. What will happen to existing urban populations of wildlife, including the threatened or endangered species of concern in the region? What will be the effects of eventual city design on regional populations; what is the potential viability of urban populations of listed plants and animals; what is and what will be the functional relationship of urban wildlife populations to those in the surrounding landscape? These and other questions have not been answered. Another question that has not been asked is: what are the effects on

current and future urban wildlife from a plan that relies on and promotes loss of wildlife in developing urban areas, and the creation of an exurban preserve system? Answers to this question must deal with not only animal and plant population ecology, but also with questions of trends in wildlife management, and the education and decisions of a growing urban constituency that will affect the political aspects of resource management.

Edge Effects

Bakersfield and other cities in the San Joaquin Valley also provide illustrations of urban wildlife issues associated with urban edges. For example, 1 class of effects is that of human impacts diffusing outward from urban edges: increased highway and off-road traffic; noise; light; runoff; and ecotones between landscaped area and natural habitats.

This diffusion of impacts from the urban edge is not a static process, but changes over time. For example, a parkway and trail system (Dangermond 1992) is planned for 30 km of the San Joaquin River, outside of Fresno (population 460,000). At this time, most land use, even where the river is adjacent to the city limits, is agricultural, although some residential uses are being developed. Urban wildlife issues currently associated with this area include impacts of lighting and recreation, nuisance wildlife, and water quality. Proposed development is likely to convert about 7,200 ha of farm and rangelands along the river, dramatically increasing the local human population. The effects of urban or suburban edges will thus change to those associated with an urban core. The river as an edge will change to the river as a corridor.

Developing urban edges are where most new parcel maps are created. From the edge of Fresno to the Sierra Nevada foothills, parcel sizes in existing developed and/or parcelled areas change from 0.2 acre (0.5 ha) through 2, 5, 10, and 40 acres (100 ha) within about a 10 min drive. Larger parcels of 300-700 acres (740-1,730 ha) not yet subdivided are present within 30 min of the urban edge. We may infer from general ecological principals that large parcels are better for wildlife conservation, but specific information adequate to consistently influence local planning decisions on parcel size requirements has not yet been developed.

Landscape-level Effects

Cities exist in a landscape. Broad-reaching effects of cities can be seen in the water quality, air quality, hydrology, local climate, and lighting of areas outside of the city core and edge zones. Indirect effects, such as regional wildfire management, flood control, and transportation systems also affect wildlife at the landscape scale. Significant issues in the San Joaquin Valley-Southern Sierra region include a number of rare plants and animals whose habitats are being lost or fragmented, degradation of migratory mule deer (*Odocoileus hemionus*) habitat, and impacts to downstream water quality and riparian flow regimes.

Existing cities and their expansion are not the only impacts on the landscape. A number of new towns have been proposed in the San Joaquin Valley. Typically associated with a major local development center (such as an industrial growth zone, transportation hub, or planned university campus) or at the fringes of the commuter zones of the San Francisco Bay area or Los Angeles basin, these planned communities range in size from 2,900 to 49,000 ha, and could create new population centers of 40,000 people (D. Johnston, pers. comm.).

New towns pose interesting problems, and tremendous opportunities for urban wildlife planning. Their design and land-use patterns will create large areas of urban wildlife habitat where none now exists. There is the opportunity to apply what is now known about urban wildlife management, and to structure research efforts to provide the information needed to design urban wildlife habitats. At the landscape scale, the effects of a new urban area on regional biota and landscape scale ecosystem processes are unknown, and warrant serious consideration. Relevant questions include those related to regional preserve goals and design; intensity of peripheral impacts; migration of waterfowl and large ungulates; relations of humans and large predators (e.g., mountain lion [*Puma concolor*] and black bear [*Ursus americanus*]); effects on groundwater, surface hydrology, and wetlands; and air quality impacts. These questions surpass the limits of our current comprehension of the ecology of the city.

CONCLUSIONS AND MANAGEMENT IMPLICATIONS

The examples presented here, in the context of scales of urban effect, provide a framework in which to further develop an understanding of urban wildlife. Of equal importance to a sound conceptual framework is a focus on influencing the land-use planning that determines internal urban structure, peripheral design, and situation in a landscape. One approach to exerting such influence is to develop sound, scientifically rigorous information and to effectively communicate it to local decision-makers and their constituents. This is the arena in which the science of urban wildlife ecology can make meaningful contributions to the creation of urban habitats that are ecologically, economically, and sociologically, productive.

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