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Appendix - 1

SENSITIVE BIOTIC RESOURCES

OF THE

LAGUNA DE SANTA ROSA ECOSYSTEM

Prepared for

Congressman Bosco's
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THE FUNCTION AND SIGNIFICANCE OF LAGUNA DE SANTA ROSA WETLANDS

Wetlands in general are considered sensitive by CDFG and other resource agencies because of their rapid decline since the turn of the century (Airola and Messick, 1987). The types of wetlands occurring in the Laguna that may be subject to irrigation include seasonal wetlands, perennial freshwater marshes and riparian woodlands. Seasonal wetlands include vernal pools, as well as the fringes of perennial marshes where the wetted edge, or perimeter of the marsh recedes during the drought of summer. Freshwater marshes are composed of emergent vegetation, such as bulrush and cattails, adapted to perennially saturated soils fed by subsurface groundwater irrigation, seeps or in-channel moisture. Riparian woodlands can exist wherever freshwater marshes are found, but are commonly associated with stream channels where the trees form a dense woodland corridor along the banks.

For the purposes of this study wetlands are considered sensitive because they are habitat for migratory waterfowl, rare and endangered plant and animal species, and function to provide a biological water treatment and flood control. The Laguna is noted for its wetlands and concentration of rare plant species which persist in the face of a regional and statewide decline in wetlands. (Sonoma State, 1977; Laguna Advisory Committee, 1988). Most of the rare plants in the study area are found in vernal pools, although some also occur along the fringes of freshwater marshes.

The importance of the Laguna de Santa Rosa for its biological, recreational and flood retention benefits make it a critical resource worthy of County, State and Federal preservation and management programs. The history of land use does not recognize these inherent values of the Laguna. The relevancy of these issues is highlighted by the fact that Santa Rosa irrigates four thousand acres in the Laguna de Santa Rosa area. Windsor, the Airport and Santa Rosa are seeking several thousand more acres in this watershed for irrigation in the future. Factor in lands converted to vineyards and urbanization and it is plain to see that only isolated remnants of the original native ecosystem are left as fragments between areas that have been permanently alterred. This process of habitat loss and degradation eventually leads to plants and animals being listed as endangered by federal and state resource agencies.

THE IMPORTANCE OF VERNAL POOLS IN THE LAGUNA DE SANTA ROSA ECOSYSTEM

Many of the species found in vernal pools are known as "endemics", i.e. their distribution is limited to the temporary aquatic environment provided by the vernal pool habitat. Geographically, vernal pool flora is inherently uncommon because the unusual combination of soils, climate and hydrology necessary to form the required habitat is limited to portions of

California, South Africa, Chile and Australia (Thorne, 1981).

For the vernal pool habitat to exist, the soil profile must have a restrictive horizon which causes ponding by preventing rainwater from percolating downward to an aquifer. These soil conditions are represented in the Laguna area by the Huichica series, which has a claypan restriction (Miller, 1972). Hydrologically, this restricting layer acts to provide a shallow, perched water table which appears as surface water in the depressions of the hummocky topography. The prevailing Mediterranean climate provides seasonal input to the hydrologic regime with precipitation occurring almost entirely during the cool winter months. Evaporation during the following summer drought results in a successively diminishing pool of water with different plant species sprouting, growing and blooming in "rings" around the retreating zone of moisture. This zone provides conditions where each species microhabitat requirements are met.

Vernal pools have been diminished by 90% in the Central Valley (Holland, 1978) and are rapidly disappearing in San Diego County (Bauder, 1986). The Santa Rosa plains have undergone a similar land use history and vernal pools are subject to ongoing habitat loss (Waaland et al, in prep.) Urbanization, intensive agriculture (orchards, vineyards) and summer irrigation have historically reduced much of the original vernal pool habitat in the Santa Rosa plains. Urbanization physically removes habitat in the process of grading and construction. Vineyards and orchards are managed to remove all competing plants, including vernal pool species. in addition, drainages are altered, disrupting the hydrologic regime necessary for vernal pool formation. Where summer irrigation occurs, lands containing native vernal pool flora undergo a conversion from natural plant communities to a more uniform assemblage of introduced pasture grasses. In the process native plants, including rare and endangered species, are crowded out in the competition for space to grow. As a result of these impacts, reductions in the populations of some characteristic vernal pool species in the Santa Rosa Plains have brought about official protection for the rarest plants.

THE SIGNIFICANCE OF RARE AND ENDANGERED SPECIES IN THE LAGUNA DE SANTA ROSA

Potentially occurring rare and endangered plant species are listed in Table 1. Species of primary concern are those listed by DFG as endangered or rare. These species are white sedge (Carex albida), Burke's goldfields (Lasthenia burkeii), Sebastopol meadowfoam (Limnanthes vinculans), many flowered navarretia (Navarretia plientha) and Hoover's semaphore grass (Pleuropogon hooverianus). Plants appearring on CNPS List 1 qualify them as species of primary concern because CEQA guidelines state unlisted

species which deserve such status are to be considered as rare. These species are Baker's blennosperma (Blennosperma bakeri), swamp harebell (Campanula californica), Gairdner's yampah (Perideridia gairdneri spp. gairdneri) and showy Indian clover (Trifolium amoenum), a species considered to be extinct. The presence of these species can be considered to present significant constraints to the project.

The remaining plants, dwarf downingia (Downingia humulis), Douglas' pogogyne (Pogogyne douglasii spp. parviflora) and Lobb's buttercup (Ranunculus lobbii) are considerred species of secondary concern because they are not officially recognized by DFG or FWS. These species appear on CNPS List 4 because of their abundance or their tenuous taxonomic or rarity status. These plants may not be technically rare, but are actually uncommon, restricted to speciall substrates (i.e. vernal pools), patchily distributed or potentially threatened by various land uses or human activities. which present no significant constraints to project construction and operation.

The California yellow-billed cuckoo (Coccyzus americanus occidentalis) is a State listed endangered bird species associated with mature riparian forest habitat. It inhabited the Laguna de Santa Rosa in the past, but was last observed at the Stony Point Road bridge in the 1950's before channelization of th Laguna destroyed its habitat. Restoration and aquisition of riparian habitat is being pursued by the Department of Fish and Game to ensure survival of the species statewide. Natural or managed re-introduction of this species into the Laguna ecosystem should be a management priority.

The bald eagle (Haliaeetus leucocephalus) is a Federal and State listed endangered species that occurs in the Laguna. Bird species of special concern which inhabit the Laguna include the marsh hawk (Circus cyanus) and burrowing owl (Athene cunicularia). These species receive special management consideration by DFG in land use planning.

Laws Pertaining to Rare, Endangered and Uncommon species. A number of federal, state and local laws regulate rare plants that occur in the project vicinity. Table 1 lists the species of concern for this study.

Federal. Although most of the species of concern are federal candidates, they are afforded no protection under the mandate of the federal Endangered Species Act (ESA). However, federal involvement in a project usually involves interagency agreements specifying conservation maesures for candidate species (Bartel, 1986). Such species may also be formally listed as rare, threatened or endangered should an "emergency" situation arise.

State. State laws are the most important regarding this project because there is no federal listing for potentially occurring species. The three relevant laws follow:

1. The Native Plant Protection Act (NPPA). Passed in 1977 by Senator Nejedly, this law directed the California Department of Fish and Game (DFG) to "preserve, protect and enhance endangered plants of this State." Under Section 1900, Chapter 10 of the Fish and Game Code, a native plant is defined as "rare when, although not presently threatened with extinction, it is in such small numbers throughout its range that it may become endangered if its present environment worsens." A native plant is defined as "endangered when its prospects of survival and reproduction are in immediate jeopardy from one or more causes." NPPA involves provisions that prohibit the taking of plants from the wild and a salvage requirement for landowners.

2. The California Endangered Species Act (CESA). This act is the result of the combination of two Assembly bills, 3270 (Campbell) and 3309 (Costa), passed in 1984, The law expands upon, but does not replace the original NPPA. However, it created a new "Threatened" category of species, subspecies or variety "that, although not presently threatened with extinction, is likely to become an endangered species in the foreseeable future in the absence of the special protection and management efforts required by this Act." This act also adds State agency consultation procedures that discourage approval of projects under CEQA that would "jeopardize" endangered or threatened species. Memorandums-of-understanding are required for unavoidable impacts which will "take" listed species and attempt restoration as mitigation. However, "rare" species are limited to the protections in NPPA.

3. The California Environmental Quality Act (CEQA). Where rare or endangered species are concerned, CEQA mandates consultation with DFG as a "responsible agency" (Sections 21080.3, 21080.4 and 21153) which has jurisdiction over "taking" of rare, threatened or endangered species under NPPA and CESA. Under the "mandatory findings of significance" in the Initial Study, any project which may "reduce the number or restrict the range of a rare or endangered plant" is to be considered significant, thereby requiring the preparation of an Environmental Impact Report (EIR) (Section 15065), or a mitigated Negative Declaration. Through consultation with DFG, alteration of project design or mitigation measures are developed which compensate for losses to rare and endangered species (Section 15091). Alternatively, the lead agency may adopt a "statement of overriding concern" which states the benefits of the proposed project outweigh the adverse environmental impacts

(Section 15093). However, such a statement does not exempt the lead agency from the "taking" provisions of NPPA and CESA.

CEQA also provides for considering impacts to species which are not officially listed but deserving of such status. Section 15380 states that species not on the Rare, Threatened or Endangered list shall nevertheless be considered if the species can be shown to meet the criteria for State listing.

THE ECOLOGICAL EFFECTS OF EFFLUENT IRRIGATION IN THE LAGUNA DE SANTA ROSA

Rare and Endangered Plants. Irrigation caused loss of native plants, rare or otherwise, follows the simple laws of competition in a drought environment where summer water is a limiting resource. Whereas annual plants, such as those mentioned above, existed in a competitive equilibrium where summer drought limited the potential for luxuriant growth of neighboring plants, the application of summer water has allowed for the aggressive, rapid growth of weeds (mustards, thistles) and introduced grasses (ryegrass, Harding grass, Dallis grass). The presence of high levels of limiting nutrients in the wastewater, such as available phosphorous, which is a nutrient more limiting than nitrogen (also increased), make a growth environment allowing for the crowding out and elimination of native species. A short walk through any wastewater irrigated pasture reveals the same repetition of fast growing pasture grasses and noxious weeds carpeting an area that was once a diverse, rich mosaic of native communities responding to local changes in topography, soil type and moisture gradients.

In essence, wastewater irrigation is eliminating the ecosystem function of vernal pools and swales, which are seasonal wetlands unique to Mediterranean climates. Essentially all of the rare plants in the Laguna watershed are restricted to these pools. A host of amphibians, shorebirds, waterfowl and other wildlife depend on these pools for reproduction and water as the landscape dries out. These wetlands are protected and regulated under Section 404 of the Clean Water Act. This federal law is administered by the Army Corps of Engineers (COE). Any placement of fill into these wetlands without a permit from the COE is a violation of federal law, subject to cease and desist, and can also be assessed for damages and fill removal.

Oaks Trees and Woodland Habitat. A considerable amount of valley oak (Quercus lobata) savanna exists within the Laguna de Santa Rosa ecosystem. Summer irrigation of oaks, regardless of whether it is effluent or not, is detrimental to these species of tree

(Gross and Schmidt, 1988). Summer irrigation of blue oaks will lead to death from 5-20 years after irrigation is started (Gross, personal communication). Valley oaks are subject to similar, but less pronounced effects. A root rot fungus (Armillariella mellea) becomes parasitic and life threatening to trees when a combination of warm summer temperatures and prolonged moisture prevail in an environment such as Windsor's where summers are typically very dry. The air in the soil is displaced by water and the anaerobic conditions stop root growth thereby allowing the fungus to attack the roots. Valley and blue oaks are suffering from a lack of regeneration on a statewide basis (California Board of Forestry, 1985). Irrigation will hasten this decline.

This loss has serious ramifications on an ecosystem scale because the trees provide mast (acorns) as a food resource for a variety of wildlife including deer, feral pigs, gray squirrels, ground squirrels, mice, Stellar's jay, scrub jay and pigeons (Connel et al, 1973; Barro and Lardner, 1988). The tree itself usually has holes and niches in the trunk and branches which provide critically important habitat for cavity nesting species of birds, which can comprise half the total number of bird species in a given area (Noon and Waters, 1988). The acorn woodpecker is entirely dependent on oaks for food and nesting. The insect life supported by the tree provides the base resource for species of insectivorous birds such as flycathers and nuthatches.

A thorough analysis of irrigation impact to woodlands in the study area should be conducted to determine the extent of adverse impacts. This analysis should extend to the indirect impacts degradation of the oaks will have on associated wildlife, including game animals such as deer. Lastly, decreased vigor of any individual tree can lead to a liability problem if irrigation causes the death of a tree resultin in personal injury or harm to property.

Habitat Transformation. Native plants in the study area have evolved by adapting to conditioons of summer drought and winter rain. After the introduction of livestock grazing to Sonoma County, many native plants, especially grasses, were made rare. However, many native wildflower species still exist. The introduction of summer moisture in the form of effluent irrigation is likely to eliminate most, if not all, of the remaining native plant species where irrigation is applied.

The elimination of native plants, rare or otherwise, follows the simple laws of competition in a drought environment. In a natural setting, the lack of summer water has historically been a limiting resource that maintains a competitive equilibrium which allows for co-existence of the native species and introduced weeds and grasses. Normally, these plants die or become dormant during the dry summer. When summer water is supplied by irrigation, the luxuriant growth of seeded and invading pasture

plants, such as weeds (mustards, thistles) and introduced grasses (ryegrass, Harding grass, Dallis grass) will agressively repalce previous inhabitatnts. The presence of high levels of limiting nutrients in the wastewater, such as available phosphorous and nitrogen, have a fertilizing effect, making elimination of native plants complete (Tillman, 1982).

A short walk through any wastewater irrigated pasture reveals the same repetition of fast-growing, introduced pasture grasses and noxious weeds that are managed for hay crops. This uniform assemblage of plants replaces the previous diverse, rich mosaic of native communities comprised of species that have evolved by adapting to local changes in topography, soil type and moisture gradients. The transformation of vegetation resulting from irrigation also change the wildlife habitat. Soil organisms such as insects and burrowing mammals (moles, gophers, mice) have life cycles requiring dry periods because they cannot tolerate prolonged moisture or flooded soils. The stress of constant wetness can make them susceptible to life threatening disease. It is doubtful whether dry-land reptiles can tolerate the changed conditions. Changes in populations of these animals will be reflected in the food chain because perturbations in the prey base directly affect their predators such as hawks, owls, foxes, bobcats and coyotes. It is likely a whole new sub-set of organisms tolerant of constant moisture conditions will inhabit the irrigated areas.

These changes caused by wastewater irrigation impacts should be studied to the determine the extent and significance of impact to the flora and fauna. There is no question that widespread application of wastewater effluent will have cumulative impacts on a region's biota. If research is needed to determine effect, then studies should be conducted or applicable research cited to verify clarify effects.

TABLE 1. Rare, endangered and uncommon plants occurring in the Laguna de Santa Rosa area.

Scientific Name (1)	Common Name	CNPS(2)	RED(3)	DFG(4)	FWS(5)	Flowering period(6)
Blennosperma bakeri	Baker's blennosperma	1B	323		C2	March - April
Campanula californica	swamp harebell	1B	223		C2	June -September
Carex albida	white sedge	1B	333	E	C1	May - July
Downingia humulis	dwarf downingia	4	123		C3c	March - May
Lasthenia burkei	Burke's goldfields	1B	333	E	C2	April - May
Limnanthes vinculans	Sebastopol meadowfoam	1B	323	E	C2	April - May
Navarretia plieantha	many-flowered navarretia	1B	323	E	C2	May - June
Perideridia gairdneri ssp. gairdneri	Gairdner's yampah	1B	123		C2	June July
Pleuropogon hooverianus	Hoover's semaphore grass	1B	323	R	C2	May - August
Pogogyne douglassi ssp. parviflora	Douglas' pogogyne	4	113		C2	May - July
Ranunculus lobbii	Lobb's buttercup	4	112			Feb - April
Trifolium amoenum	showy indian clover	1A			C2	April - June

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1. Species are listed as given by the California Native Plant Society (CNPS) (Smith and York, 1984).

2. The CNPS number as defined in Smith and York (1984):
   1A = Plants presumed extinct in Calllifornia.
   1B = Plants rare and endangered in California and elsewhere.
   4 = Plants of limited distribution (a watch list).

3. The R-E-D code from Smith and York (1984):

   R (Rarity)
   1 = Rare but found in sufficient numbers and distributed widely enough that the potential for extinction or extirpation is low at this time.
   2 = Occurence confined to several populations or one extended population.
   3 = Occurence limited to one or a few highly restricted populations, or present in such small numbers that it is seldom reported.

Table 1. Continued.

E (Endangerment)
1 = Not endangered.
2 = Endangered in a portion of its range.
3 = Endangered throughout its range.

D (Distribution)
1 = More or less widespread outside California.
2 = Rare outside California.
3 = Endemic to California.

4. As designated by the California Department of Fish and Game (DFG, 1984):
R = Rare, E = Endangered.

5. As listed by the U.S. Fish and Wildlife Service (FWS, 1980 and 1983):
C1 = Enough data are on file to support the federal listing.
C2 = Threat and/or distribution data are insufficient to support federal listing.
C3c= Too widespread, or not threatened.

6. Munz and Keck (1968)