STUDY PROJECT

SABBATICAL REPORT

ACADEMIC YEAR 2003-2004

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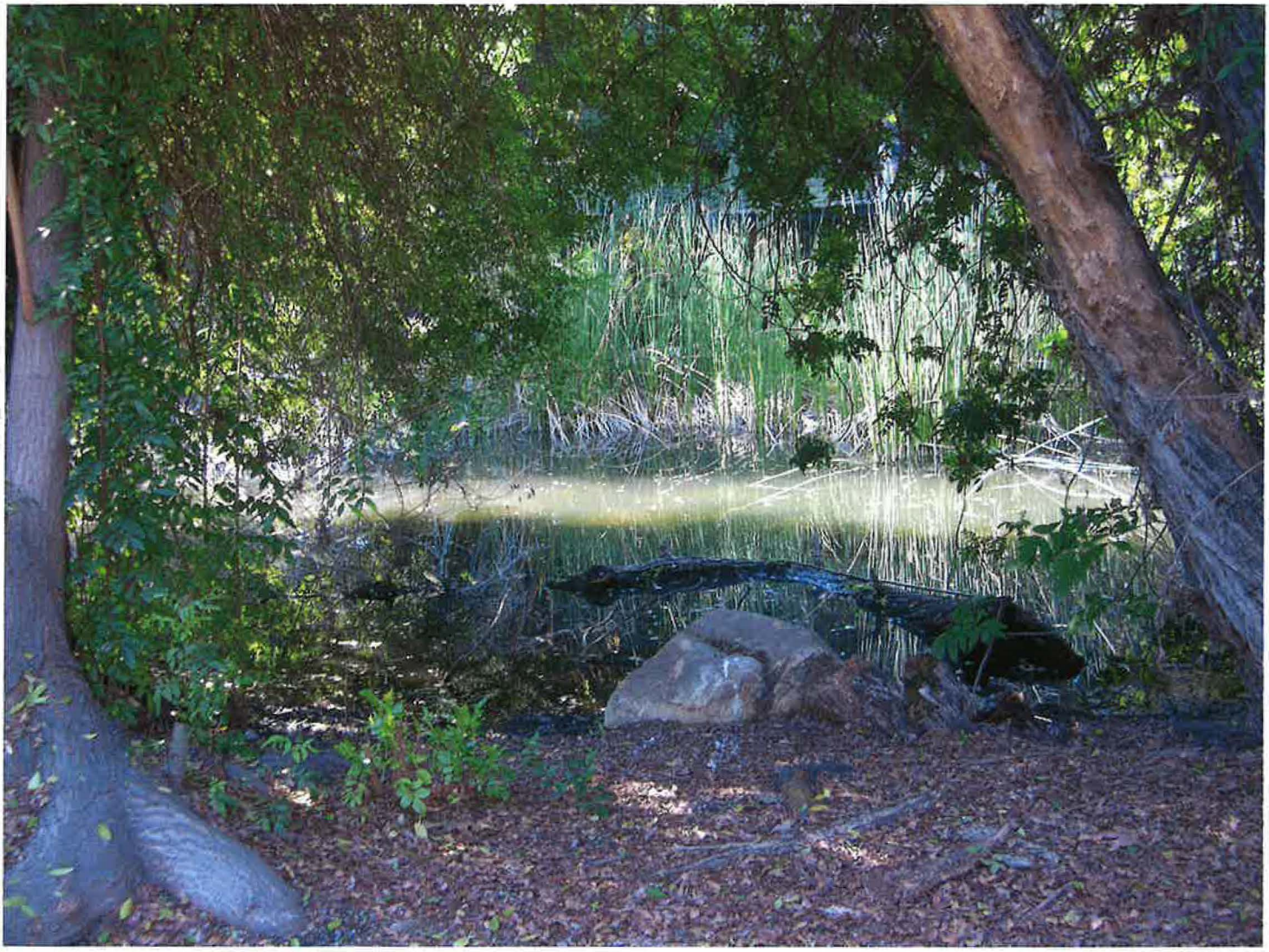
BIOLOGICAL SCIENCES

MOUNT SAN ANTONIO COLLEGE



Mount San Antonio College Wildlife Sanctuary – a haven for wildlife and botanicals

I see skies of blue and clouds of white

The bright blessed day, the dark sacred night

And I think to myself, what a wonderful world.

From the song "Wonderful World" by George Weiss/Bob Thiele

Most of all, the twentieth century will be remembered as the time when we first began to understand what our address was.

From A Natural History of the Senses by Diane Ackerman

ACKNOWLEDGEMENTS

Without the approval of the Mt. San Antonio College Board of Trustees, this project could not have been completed. I would like to thank the Board for having the foresight to see that an investment in its faculty is an investment in its students, and for having the faith in its faculty to encourage us to assess our own study needs and design learning programs best suited to our stage of development.

I would also like to thank Natural Science Division Dean Larry Redinger and Assistant Dean Debbie Boroch for their support throughout this project, and Biology Department Chairperson Loni Nguyen, as well as my other department members, for adjusting for my absence and keeping me abreast of department issues and events.

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Unless otherwise identified, most of the photographs included in this report were taken by me (and I confess I am not a skilled photographer). However, I would like to express my thanks for photographs contributed by others for the purpose of enhancing the completeness of this visual representation of my project: Mt. SAC Professors Karyn Kakiba-Russell, Cindy Shannon and Sherry Schmidt; California State Parks biologist Callie Hurd; San Bernardino County Museum of Natural History biologists Todd Hoggan and Mike Rathbun; Los Angeles County Sheriff's Deputy Steve Macias; friends Jennifer Hoggan, Mike Pujals, and Wayne Stines; and the US Department of Agriculture.

Several times when I experienced computer problems, the staff of the Information and Educational Technology unit were very responsive to my needs, and I am most grateful to them for that.

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STATEMENT OF PURPOSE

The purpose of my sabbatical leave was to design and complete two independent study projects. In the first, I proposed to investigate the concept of nutriceuticals. "Nutriceuticals" is a relatively new and general term used to describe foods that have health-related properties beyond the known macronutrients of protein, carbohydrates and fats and micronutrients of vitamins and minerals, or newly discovered applications for micronutrients. Their medicinal qualities can be either preventive, palliative, or both. I was interested in learning more about nutriceuticals in several areas - as they pertain to general health; mood and mental health; fertility and pregnancy; and sexual function. I designed a study project that included an online search and reading of selected articles; an extensive reading list of related books with a written summary of each; and interviews with a few known local experts on various aspects of nutrition and/or nutriceuticals. My goal was to increase my knowledge in these areas in order to enhance the two courses I teach - Biology 5, Contemporary Health Issues, and Biology 15, Human Sexuality. Biology 5 includes components on nutrition, stress and mental health, and reproductive health. Biology 15 includes units on reproductive health and sexual function. I felt that my increased awareness of the role of nutriceuticals in these areas could help to educate and motivate my students to evaluate their diets. Young students in particular are resistant to change, as they have yet to experience the health problems that result from an inadequate diet. Older students may be struggling with compromised health but find it difficult to alter lifelong habits. Finding interesting ways to illustrate the complex interactions of nutrients may more effectively result in the promotion of longevity and quality of life for my students and their families.

In the second part of my project, I proposed to study environmental health, particularly the role of species and habitat, from the unique perspective of primarily one animal, the coyote. Most environmental health education efforts have focused on issues such as air and water pollution or recycling, but they rarely address the equally crucial areas of population, urban sprawl, habitat loss, and endangered species. As a non-biologist (of public health background) teaching in a biology department, I wanted to better understand how these issues connect and inter-relate. I designed a study project that included a brief class at a national park; an online search and reading of selected articles; a brief reading list of related books with a written summary of each; extensive interviews with colleagues and other experts on various aspects of ecology; a visit to a field research station; and several field trips to varied habitats. My goal was to enhance an environmental health unit in Biology 5, Contemporary Health Issues. I chose the coyote as the focus of my study not only because it is an example of a successful and proliferate animal, but also because it is more visible to students than most predators; it evokes very different responses from various groups such as farmers, hunters, animal rights activists, etc.; and yet it is also biologically close to a much-beloved species, the domestic dog. In light of the varied and complex environmental crises we now face on a local and global level, I wanted to find more interesting and effective ways to assist students in preparing to make the environmental decisions of the future. I also wanted to be a more informed member of the Biology Department.

I began my sabbatical leave independent study projects in August 2003. I followed the timeline estimated in my original proposal as closely as I was able, and I kept records of my activities. Some events which slowed my progress at times included:

1) locating new sources and having to find time to integrate them into my already full reading schedule; 2) lack of availability of identified experts whom I planned to consult; 3) the Grand Prix fire, which burned next to my home in October and resulted in unexpected damage and clean-up; and 4) several bouts of computer problems. However, I believe I was still able to meet and in some cases exceed my goals and objectives. The following pages detail my activities and their applications.

BODY OF REPORT – NUTRICEUTICAL RESEARCH

Online Search – The first half of my independent study project was to learn about the concept of nutriceuticals – foods that can be used as preventive or palliative medicine – as they relate to several areas of health. I began by doing online searches of these subjects. My preliminary search conducted the year before when preparing my proposal yielded the following 'hits' (sites concerned with related topics): nutriceuticals 7,850; nutriceuticals and mood and mental health 856; nutriceuticals and fertility and pregnancy 2,880; and nutriceuticals and sexuality 106. As is often true with an unfocused search, these numbers were unwieldy, and furthermore, they reflected mostly products, such as vitamins sold through catalogs. Since my search was meant to be selective rather than exhaustive, I began by trying to focus this search; but as I was still using the Google search engine, I continued to find sources which were often too general, not scientific, and often even unrelated to my subject. In September I met with Mt. SAC Librarian Deb Distante to learn how to better focus my search.

Then I began using more specific, science-based search engines. My system was to generate a list of articles, select those whose abstracts I wished to read, and then further refine my list to articles I wished to read in detail. See the Bibliography in Appendix A for references. In my research, I found an alternate spelling for nutriceutical – nutraceutical – as well as a term that is sometimes used synonymously, functional food. I added these to my search, and the following is what I found. Searching for nutriceuticals generated 25 hits. I reviewed all the abstracts and selected three articles to read in detail. I then researched nutraceutical and generated 290 hits. I reviewed abstracts for 72 articles and read 28 articles in detail. Finally, I researched functional

food, which generated 331 hits. Since most were the same ones I'd already encountered, I selected four more articles to read in detail. The first thing I discovered was that nutraceutical seems to be the more popular spelling. The second thing I discovered came as quite a shock: While there were both scientific journal articles and consumer alerts represented, the vast majority reflected commercial trade magazines, such as for readers in the chemical, snack food, beverage, and cosmetic industries. Their focus was the immense market value of these foods (new products, mergers, advertising, etc.), rather than the science, health benefits or risks. Furthermore, the foods themselves played a rather small role; instead, supplements and products, as well as the tastes of their consumers in the American public, were by far the object of attention. This showed me a side of the issue that I had not previously thought much about. Living in a capitalist economy, perhaps I should not have been surprised. But suddenly I became very aware of how much is at stake in the exploding nutraceutical market. These products include everything from teas containing gingko biloba for memory, to pet foods containing glucosamine for joint health, to "cosmeceuticals" (cosmetics containing healing botanicals) – even a rather ominous-sounding program for the Armed Services, the "metabolic dominance program," to identify and test performance-enhancing snacks for America's "warfighters." In other words, if manufacturers and ad agencies have anything to say about it, people will not eat carrots for beta-carotene, but will consume pills, drinks and packaged foods containing this nutrient. I found it disturbing to think that the diet and subsequent health of our populace is an unwitting pawn in this economic manipulation. Other countries even fear that the American nutraceutical blitz will invade and overtake their citizens' perception of healthy habits.

I did learn more about research into the role of antioxidants and other phytochemicals in fighting diseases related to nutrition and aging (e.g., cancer, heart disease, diabetes), phytochemicals being the colored pigments in fruits and vegetables; evidence that spices and mushrooms are more than just flavor enhancers but also antibacterial, -fungal and/or -viral; and that nearly all nutraceuticals have plant-based substances as their source. And therein also resides one of many controversies about nutraceuticals: Herbs and other plants and naturally occurring nutrients cannot be patented, but a mixture of substances can be protected under the term "proprietary blend." Companies are falling over each other to produce and market these compounds, and the Food and Drug Administration little regulates them.

Searchng on nutri/aceuticals and mood and mental health turned up no hits, so I used nutri* to include nutrition and got 53 hits; I reviewed 11 and read five of them. I also tried mood and got 35 hits (some the same); I reviewed eight and read four. The focus here seemed to be primarily on achieving nutritional balance. In particular, carbohydrates, as the precursors to the neurotransmitter serotonin, have been found to be most directly related to mood, although consumption of protein in conjunction with a healthy diet is also important. This concerned me for the popularity of low-carb diets such as Atkins, Zone and South Beach. Even the fetuses of carb-deprived women evince higher levels of stress hormones, which may set them up for lifelong mood disorders; the individual and societal implications from this trend are immense.

In researching fertility, pregnancy and sexual function, I continued to find few to no hits for nutri/aceuticals, so I continued using the shortened version that would also locate nutrition-related articles. For fertility and pregnancy, I found 614 hits, reviewed 32

and read 13, with the dietary recommendations that have been found to be safest for mother and fetus predominating. The findings showed that a healthy diet with adequate calcium, and supplemented with iron and folic acid, is ideal. But here again, one of the controversies in nutraceuticals appeared: How much is too little, and how much is too much? Pharmaceuticals are rigorously tested for dose-response criteria, but nutraceuticals are not. Excess nutrients may be eliminated – a waste of money if they come in the form of expensive supplements – or stored, which can result in dangerously toxic levels. Nowhere is this more important than in the area of phytohormones, plant estrogens and androgens, and their effects on fertility and fetal development. There is a tendency in popular opinion to negate the harmful effects of "natural" substances; but as some of the articles showed, there can be a fine line between food, drug, and poison. For sexuality I found only seven hits, and interestingly, none of them was applicable. I did locate at a later date an article on the testing of one proprietary blend for female sexual response.

I also tried the synonym functional food and found 52 hits; I reviewed 10 and read five. For some reason, more of these articles were from scientific journals, and many were also repeats. I learned more about the recently identified "metabolic syndrome" (a combination of high blood pressure, cholesterol, triglycerides, and/or blood sugar) and links between glycogen storage and disease, as well as leptin and male reproduction. I also discovered two new terms, zoochemicals (such as omega-3 fatty acids found in fish, as well as some plant foods, and being tested on populations with disorders such as bipolar disorder and personality disorder) and the self-descriptive immunoceuticals.

In summary, the literature shows that nutraceuticals hold great promise for human health and well-being. What was once 'old wisdom' can now be tested by modern scientific methods. But the controversies need to be resolved, and the marketing hype reduced, before we can truly trust and use this information effectively. Until then it behooves us to use nutraceuticals in moderation (see Appendix D for recommendations).

I accidentally stumbled upon a personal experience with what appears to be one current marketing tactic. I ended up at a website that would not 'allow' me to disengage until I had chosen one of a group of products and agreed to try a "free" 30-day sample – after charging shipping handling to my credit card, of course; since I was researching this very subject, I decided to do it. What I did not know until I received the product ("Hydroderm," an anti-aging gel made from a proprietary blend) was that my order "enrolled" me as an ongoing customer. I would continue to receive the product on a monthly basis and be charged $39.99 each time, unless I called to discontinue. I have since come to realize that three other products are being aggressively marketed on television by the same company, Berkeley Premium Nutraceuticals – Enzyte for "natural male enhancement" (and with a very humorous advertising campaign), Avlimil for female sexual response, and Altovis for energy – and are provided in the same way, a free trial followed by automatic enrollment. Considering that a person might wish to use more than one product, they come at a pretty hefty price (for example, if I wanted to obtain younger skin, energy, and better sexual response, my monthly bill would total $120!) Incidentally, I tried Hydroderm and did not see any noticeable improvement; and using it on only two small areas of my face, not even my whole face, I barely had enough

to last the month. See Appendix F for the enrollment and cost information that I received.

Book List - I had compiled a reading list of books that were intended to build one upon another and help me to understand these concepts. Of course, this involved some educated guessing, as I didn't know exactly what information the books held. In some cases I was surprised at how accurately I had organized my course of study; in others, I was disappointed in my selection. See Appendix B for more detailed summaries of each of the books I read. The following is a general overview.

The first book, Molecules of Emotion written by neuroscientist Candice Pert, details how various substances in body fluids and cells affect health. Both endogenous substances (those created within the body) and exogenous substances (those introduced from outside the body) have complementary areas called receptor sites on cells. These substances include everything from hormones to neurotransmitters to drugs to nutrients. The type and amount of substance, and the number of receptor sites that are available to it, are crucial determinants of the status within the organism, including cell metabolism, production of ligands such as enzymes and hormones, mood state, intoxication, even the growth of cancer cells or vulnerability to bacteria and viruses. I learned that these chemical reactions are the basis for the effects of nutraceuticals. One factor which further complicates the picture is that the chemical reactions also take place differently in different media, for example a more or less saline environment; therefore, possibly the most important difference in media is the individual's biochemistry. And there is growing evidence that unresolved stress or trauma 'blocks' the neuropathways required

for homeostasis to occur. These groundbreaking findings are the basis for the scientific explanation of mind-body health.

Next I read The Natural History of the Senses by Diane Ackerman, followed by The Natural History of Love by the same author. Ackerman is a creative writer who also brings a background in science to bear. In the first of these two books, she goes over each of the five senses, explaining the biology of how it works, as well as some of its historical and cultural lore. I learned more about the complex interplay of the senses, their integrated rather than isolated natures. Some decidedly new information was the concept of synesthesia, in which individuals truly have two senses combined; they may tend to be especially creative or achievement-oriented people. Ackerman's information built upon what I learned from Pert in that the five senses are the means by which the brain receives input to control actions, including chemical actions. And all of the senses are involved in the seeking, enjoying, and benefiting from food. The section on taste, in particular, applied to my study in that it details the social and nurturing roles of food, as well as interesting bits about nutritional medicines, aphrodisiacs, unusual foods, and even the new concept of nutritional risk-taking behaviors (such as knowingly eating dangerous foods.)

In the second book, Ackerman delves into one of the most elusive of human experiences. She touches upon evolution, biology, and human history and literature. I learned about what happens to love when people live below basic subsistence level, as in the story of the Ik, a people who are starving to death and cannot muster even basic emotion. This second book by this author, although fascinating, did not pertain to my study project as much as I'd hoped. However, she does delve into some intriguing

subjects to share in Biology 15, Human Sexuality, in chapters such as "Women and Horses," "Men and Cars," and "Perversion as Fashion."

Next on the list was The Botany of Desire by Michael Pollan. This book turned out to be quite different from what I had inferred from its title. I expected it to be a source that would educate me about whether plants can be aphrodisiacs. Instead it is about the coevolution of human want and the biological development of plants. However, that does not mean that it was a waste of time to read or impertinent to my study. Pollan focuses on four plants that have become popular in human cultures for various reasons – the apple for sweetness, the tulip for beauty, marijuana for intoxication, and the potato for sustenance. He introduces a novel concept to me, that of a plant's evolutionary strategy of making itself so desirable that it is able to get another animal (in this case humans) to propagate its genes. Most educational, and alarming, to me were his explanations of how monoculture farming has contributed to the need for and use of chemical pesticides, herbicides and fungicides, and how genetic engineering is being used to ameliorate the dependence on those chemicals while fostering dependence on the patented new genes – almost all of both monopolized by one company, Monsanto.

The next two books I read had much in common. They were both written by physicians and turned out to be self-help books regarding nutrition. One was Dr. Gary Smalley's Food and Love, which I expected to have direct relevance to one of the main topics I hoped to better understand, that is, nutrition and emotions. The other was Dr. Morton Walker's Sexual Nutrition, which I hoped would illuminate the subject of nutraceuticals for sexual enhancement. The books turned out to have even more in common. Both had something to teach, but both were much more elementary than I had

expected and failed to use either detailed science or consistently appropriate references. Of course, I was gratified to learn that Dr. Smalley recommends the same diet that I do (and we are not alone - Dr. Walter Willett of Harvard, discussed more in the Interviews section, being another among our company). This diet is low in saturated fat proteins and high in fibrous proteins and phytochemicals. He also gives a powerful weapon against the current trend of low-carbohydrate diets, explaining the role of B vitamins (found especially in whole grains) in regulating the neurotransmitter serotonin, and therefore, mood.

Lastly, I read a most uplifting book, Tales of a Shaman's Apprentice by ethnobotanist Mark Plotkin. Dr. Plotkin is a true applied scientist, meaning that he not only has earned top-notch academic credentials but also that he uses them to carry out ground-breaking work in the field. Following in the footsteps of his Harvard mentor, Plotkin began traveling to the Amazonian rainforest to study medicinal plants. Along with discovering an astounding array of useful botanicals – to treat everything from skin fungus to ear infection to diabetes to sexual dysfunction – he learned of the dire situation of the indigenous people of the forest, whose cultures, along with their shamans' botanical wisdom, are dying out. Plotkin created the Shaman's Apprentice Program to train young people within a tribe to study with their elders. Besides being fascinating to read, his book is packed with information about the healing effects of plants. I learned about inert vs. active compounds, varied applications such as ingestion vs. making a tea, a poultice, etc., and, in a vein similar to Pert's mind/body health book, the ancient role of belief, ritual, prayer, and touch in facilitating healing.

I also perused and read sections from several books that I did not read in entirety. These include four books on medicinal plants, each book with its particular strengths and weaknesses – a field guide, a book of Native American recipes, an overview of herbs believed to affect sexuality, and one very detailed work that includes most of these topics and was written by a former USDA botanist. Two cookbooks I reviewed each had a particularly interesting property. One features recipes that include foods historically believed to have aphrodisiac properties; it quotes from several sources, including the previously discussed Diane Ackerman. And one is devoted to recipes that use the sweetening herb stevia; it gives some fascinating background on FDA regulation of food supplements, including hypotheses that stevia's former ban by the FDA was orchestrated by the sweetening chemical industry. I reviewed two books on the natural approach to problems of aging, especially menopause; while they discuss many of the same issues regarding supplementation with phytohormones (plant, as opposed to pharmaceutical, hormones), they seem to contradict each other in some ways. Lastly, I reviewed a somewhat whimsical book that combines bits of science, 'ancient wisdom,' and new-age mysticism to make recommendations for sensuous foods and cosmetics. These books are also summarized in Appendix B.

Although some of the books on my list turned out not to be as applicable as I had hoped, generally I was very pleased with my selections. I think that together they embody a holistic, multidisciplinary approach: Most of the writers have more than one academic background and/or profession, and many include arts as well as sciences. I also consulted the occasional text or reference book as needed, and these are included in the Bibliography.

Interviews – Although the first part of my independent study relied heavily on reading articles and especially books, there are a few individuals who are knowledgeable about neutraceuticals whom I hoped to interview. First I interviewed Dr. Mark Meskin of the Food and Nutrition Department at his office at Cal Poly Pomona in November. I selected Dr. Meskin because of his involvement in phytochemical research. Phytochemicals are the colored substances found in plant foods, especially fruits and vegetables. They are the next step in research that first uncovered the macronutrients - proteins, carbohydrates, and fat that are needed in large quantities in order to build tissue, produce energy, and store energy - and then the micronutrients - vitamins and minerals that are needed in smaller quantities in order to support these processes, as well as maintain proper chemical balances. Mark explained some of the chemistry of food (how these nutrients are metabolized); the factors in individual needs (from genetic variation to environmental context); and the biochemical basis of common diseases such as cardiovascular disease and cancer. I learned about how phytochemicals help to prevent some of these leading causes of death in several ways, such as by serving as antioxidants that reduce the production of free radicals (free-floating oxygen molecules that damage cells and promote aging); activation of protective detoxification enzymes in the liver; etc. He discussed the pro's and con's of the controversial 1994 DSHE Act, which required that consumers be provided with food labels but also removed FDA regulation of nutraceuticals, homeopathic treatments, and food supplements. He also gave his informed opinions about "nutritional anthropology," food history, what constitutes a healthy diet, and even suggestions for how to deal with children who don't eat vegetables!

Lastly, Mark referred me to several books (three of which he has co-edited, summarizing research presented at phytochemical conferences held at Cal Poly), as well as the Physicians' Desk Reference for Herbal Medicines. He informed me that noted Harvard nutrition researcher Walter Willett was to be speaking at Claremont McKenna College's Fortnightly, a visiting scholar program, the week after we met. I attended Dr. Willett's presentation, held in the Athenaeum. I was already familiar with the subject of his talk, his belief in the need for the government to revise the current USDA Food Guide Pyramid. However, in person he gave more specific information on the types of research that have been conducted and the nature of their findings. In summary, the current Pyramid, designed 15 years ago to replace the misguided "4 food groups" promoted by the meat and dairy industries, recommends a diet high in carbohydrates and low in sweets and fats. However, there are no distinctions made about the types of carbohydrates and fats. An impressive number of scientifically sound prospective studies indicate that these issues are crucial, with a diet high in whole grain carbohydrates and vegetable fats projected to reduce major illnesses by 40-80% (depending on the illness). As a result, Dr. Willett advocates a replacement pyramid that features these recommendations, summarized in an excellent Newsweek article published in 2003 (see Appendix D.)

Another of my interviews was conducted with edible wild plant specialist Christopher Nyerges, who directs the School of Self-Reliance in Eagle Rock and Altadena (see Appendix F). Mr. Nyerges gives workshops on finding and preparing edible plants, the study of Native American skills, and the use of survival skills in the wilderness; he is a regular speaker in the Mt. SAC Earth Week activities. Our meeting was supposed to take place in the fall, but due to schedule conflicts, we did not meet until

January. At his suggestion, we hiked a trail in Altadena. I took the 210 W to the Arroyo Windsor exit and met Mr. Nyerges near the Arroyo Seco golf course. Along the side of the golf course is a little-used trail. It was interesting to note the difference between the very cultivated developed area – from a nutritional standpoint, useless – and the much wilder overgrown trail – from a nutritional and medicinal standpoint, hugely valuable. Christopher explained the binomial classification system and the functions of plants in ecosystems. He touched upon plant reproductive and defensive strategies. We discussed the many advantages of wild plants in nutritional and nutraceutical benefits and the social and agricultural barriers to their use, as he pointed out the wide variety of edible and medicinal plants in this very small area. Some examples of nutraceuticals that we saw included California sagebrush, used for seasoning, bathing, and to stop bleeding; mugwhort, which helps with menstrual cramps or a hangover; milk thistle, whose seeds strengthen liver function; chickweed, a diuretic; white sage, a stimulant; fennel, a digestive aid whose seeds are breath fresheners; horehound, used for bronchial congestion (I remembered being given horehound throat drops by my grandmother); cascara coffeeberry, whose bark is a laxative; and many more. I photographed some examples of these edible and/or nutraceutical wild plants (see Appendix E). He also gave me some examples of plants that improve mood (such as St. John's wort, damiana, and passionflower), and told me of the early use of carrot seeds as a "morning after" abortifacient.

I had planned on interviewing Dr. Karen Magarian, a chiropractor interested in holistic women's health; however, when I subsequently learned that nutrition is not a strong suit in her background, I decided my time would be better spent elsewhere.

I interviewed Dr. Marie Caudill, also from the Nutrition Department at Cal Poly Pomona, about her involvement in research on the role of folate in preventing birth defects during pregnancy. Due to schedule conflicts, we met in her office also in January. Folate is a B vitamin found in a variety of green and yellow fruits and vegetables. Dr. Caudill explained its chemical role in synthesizing certain amino acids, DNA and RNA. A diet low in folate has been found to increase the risk for birth defects, especially neural tube defects such as spina bifida, in the fetuses of pregnant women, as well as the risk for heart disease and cancer in all adults. The folate-poor diet of the typical American - particularly young women of childbearing age - has been identified as a possible large contributor to the high rates of these problems in our population. According to Marie, the FDA in 1998 mandated the addition of folic acid (a synthetic form of folate) to common foods such as bread and orange juice. This has been a huge national public health undertaking involving neutraceuticals. However, one interesting point, and which brings up a crucial issue again and again, is that the studies leading to this action involved only folic acid and not natural folate – probably because a pharmaceutical company can patent a manufactured substance but not an herbal one. Also of interest is the fact that the addition of folic acid has been to enriched (white) grains but not to whole grains. She explained the stages that the research had to go through before such an intervention was made. She also discussed folate deficiency as a contributor to male infertility; high homocysteine (one of the amino acids synthesized by

folate) as a risk factor for spontaneous abortion; and the role of amino acids, carbohydrates, and the neurotransmitter serotonin in mood regulation.

When I designed my study program, I was not sure how much these interviews would contribute to my understanding of the concepts I wanted. Specifically, I was not sure I could design interview questions that would focus the information toward what I needed. Certainly some of my questions turned out to be too elementary, and some of the answers too detailed for a non-nutritionist to fully grasp. However, I think that overall the interviews added a valuable dimension to my research and were quite illuminating. I used this learning technique even more extensively in the second part of my project.

Behavior Change Project – After completing my research, I started designing a preliminary set of recommendations for use both in my classes as well as on the Behavior Change website I created with Professor Revell. These recommendations have been added to the website as a link under the topic of nutrition.

In retrospect, the most unwieldy aspect of this part of my studies was the book list. Normally I would not have difficulty reading approximately a book a week. But I think I failed to take into account my other assignments, such as the online search which also took longer than expected, as well as the fact that my sources led me to other sources which I then wished to read. As a result, I fell behind in my reading and ended up completing it during the spring semester and summer.

STATUS OF NUTRICEUTICAL OBJECTIVES

Original Objectives and Current Status -

1. To conduct an online search of current, pertinent research and opinion (selective rather than exhaustive) and to read appropriately from these sources.

- Objective met. I located 1400 sources as described above, read abstracts from 162, and read 62 articles in more detail.

2. To read at least six primary and peruse at least two secondary selections from a list of 11 books already located.

- Objective exceeded. I read seven primary and perused 11 secondary selections as described above. I also read sections from several reference texts included in the Bibliography.

3. To interview at least two expert sources.

- Objective exceeded. I interviewed Drs. Mark Meskin and Marie Caudill, researchers from the Cal Poly Pomona Nutrition Department, and Christopher Nyerges, owner of the School of Self-Reliance. I also attended a presentation by Harvard researcher Dr. Walter Willett that was held at Claremont McKenna College.

4. To write a sabbatical report for the college and otherwise disseminate my research to colleagues.

- Objective in progress. My sabbatical report has been submitted. I will notify department and other personnel about the availability of my information after it has been approved.

5. To update the behavior change website created by myself and Professor Tim Revell.

- Objective met. Nutraceutical information has been added to the website.

CONCLUSIONS – VALUE TO THE COLLEGE

The value of this project to the college lies in the following – enhanced learning for students through classes and resources; available learning for faculty and staff via presentations and access to materials and resources; and enriched learning for myself, one of the college's instructors, through experience and reflection.

In Biology 5, when we study nutrition, perhaps the most frequently asked question from students is, "What should I eat?" It seems a simple enough question, but with no background in the area save a cursory treatment in graduate school, I had found this question daunting. I taught a variety of nutrients and the importance of caloric balance, but I didn't know much beyond that. Furthermore, questions and controversies in the nutrition field plagued me. Is the low-fat or the low-carb diet preferable, and why? Does a vegetarian diet offer enough protein to sustain proper health? Why should one take vitamins, and is vitamin-loading helpful? Why do so many studies seem to contradict each other? And how can foods play a role in specific activities such as mood regulation, fertilization, or sex? I now feel that I have sensible answers to these questions and more, adding depth and richness to not only the unit on nutrition, but also stress and mental health, sexuality and reproduction, and even substance use and abuse. I can outline the pro's and con's of various nutritional programs and interpret the experts' opinions. I can explain some of the ways in which chemicals are absorbed and used by the body, and the benefits of enhancement vs. the risks of deficiency. I understand some of the contradictions, and I can warn of the dangers inherent in being passive consumers who follow the latest commercial trend. I can make recommendations to students in class

and create a useful handout for them (see Appendix D), and add the recommendations to the already created behavior change website.

The Biology 15 curriculum does not include a specific objective for nutrition, but my experience has been that students are interested, and not just in the aphrodisiacs that once might expect. Because they will probably not be taking Biology 5 or another nutrition-related course which fulfills the same requirement, they are just as concerned about extending life and enhancing well-being. Some of this same information will be passed on to them, enhancing instruction on reproduction, stress, relationships, and aging.

I will present my findings in whatever media I'm asked. I expect I will make a brief presentation to the Board of Trustees and a more detailed one to the Biological Sciences Department. I will notify other appropriate departments of opportunities to benefit as well. Of course, faculty and staff can access the behavior change website. And this Sabbatical Report will be available in the library.

For myself, I believe I had a one-of-a-kind opportunity. For the first time in my life, I was able to design a course of self-study that matched my interests and needs, rather than someone else's outline. I selected the books and articles that I wanted to read and the experts I would talk to. And I decided whether I was meeting my objectives and goals, while revising them appropriately along the way.

Some of the concepts I learned went far beyond merely that of food as medicine. I had to learn some of the 'big picture' of food provision – from monoculture agriculture to genetic alteration to wild vs. cultivated plants – as well as chemical reactions within organisms. I came to better understand why we need plants and why the compounds they contain react differently in each of us. I learned about the delicate chemical balances in

the body and the factors that promote as well as inhibit homeostasis. I studied how foods have been used through history and how, amazingly, some new science mirrors the wisdom of the ancients. I learned more about mind-body health, the interaction of food, stress, and even mental illness, and the interplay with such seemingly unrelated things as religious ritual and childhood trauma. I began to conceive of the fine line between food, medicine and drugs and to design recommendations for maximizing benefits while minimizing dangers.

In fact, my whole approach to food, medicine and drugs in my own life has changed as a result of this project. I agree with Candace Pert when she admonishes us to reduce our exposure to exogenous ligands (chemicals made outside the body), and I plan to limit and research my use of supplements and medicines, rather than believing advertising hype or just accepting the allopathic medical model "Doctor knows best." A healthy diet is no longer a fantasy that does not coincide with my McDonald's desires. I have adopted a food plan that focuses on plant foods but is moderate enough to make room for an occasional steak. Thanks to my research, I better understand the importance of organic foods. I make most of my own food and enjoy both the preparation and consumption. Small feasts of color, scent and explosions of taste should be one of the most joyous of human experiences. This is diametrically opposed to the North American mentality with which I was raised, which says, "Eat whatever you want but regret it and feel guilty about it; then try to lose the weight you've gained by trying deprivation diets; and finally, give in to the health problems that come from that kind of lifestyle."

In short, I believe I've been given the chance to learn and teach about something of the highest import – the nutritional health of myself and others. I was at first

dismayed to find that I concluded the project with nearly as many questions as I had going in – until I realized that the quality of my questions has risen, and reflected upon what it means to be a lifelong learner. And to my surprise, my assumption that the two segments of my project are separate and distinct has been challenged. The opportunity to reflect and synthesize has shown me that in fact they are related at the deepest level, as I shall describe in "Value to the College" in Part II.

APPENDICES

APPENDIX A – BIBLIOGRAPHY

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APPENDIX B – BOOK SUMMARIES

The following are summaries of seven books that I read in their entirety.

SUMMARY 1

Molecules of Emotion by Candace Pert, PhD

In this book written for the educated general public, Pert describes her and others' findings in neuroscience that substantiate the mind/body connection in health and even posit a biological basis for a spiritual connection, or 'God.' Pert was one of the early discoverers of the opiate receptor on nerve cells, pioneering the way for an understanding of chemicals called ligands. Ligands include neurotransmitters, sex hormones, and especially the peptides that make up much of the chemical side of electrochemical neuronal message transmission. She explains how endogenous chemicals (those manufactured within the body) work to direct physiological activities by locating and binding with receptors that fit their particular molecular structures, as well as how exogenous chemicals (those introduced from outside the body) can work to mimic, redirect, or repair faulty endogenous systems. This has implications for virtually every life process, many of which were the focus of her work - for example, how psychoactive substances 'pretend' to be neurotransmitters that direct mood; and how peptides could be designed that would bind with and occupy the receptor used by a cancer, or the virus HIV, thereby reducing tumor growth or infection.

One subtext in Pert's book details how she came to an understanding of the mind/body connection. She aligns her findings with some of the historic forms of non-allopathic (non-western) medical and spiritual belief systems and explains how, unlike

the often toxic side-effects of modern medicine, those treatments work to maximize healthy peptide production and transmission and thereby create a unified organism. Another subtext describes her struggle to succeed and be recognized in the mostly male-dominated world of high-priced science, and the cost she paid for refusing to bow to the 'good ol' boy' network. Finally, she includes sections on recommendations for healthy body/mind living, as well as referrals to agencies that disseminate body/mind information and treatment.

Although written for, as I've described it, the educated general public, with its dense science relieved somewhat by Pert's historical and personal musings, I found her book to be at times very difficult to follow. If one is not a biologist or chemist, the workings of the nervous system and other body systems, as well as the chemical basis for research and theories in this area, will at times elude the reader. I allowed one week to read it, but I started it early and it took nearly three. However, I also feel that there is at least one area of her theories that for me was poorly explained, and that is the question of why some exogenous peptides can be harmful (such as the peptide nicotine used to achieve a cigarette 'high'), whereas others can be helpful (for example, the peptide Zyban created to bind with nicotine receptors and reduce cigarette addiction). On the one hand, Pert seemed to be saying that all exogenous ligands are to some extent bad, yet she also recommends and even is paid to develop them; isn't that allopathic (and contradictory) in the end? Or is this contradiction what she refers to as the agonist/antagonist question (why some chemicals bind with receptors and have effects, while others bind with fewer or no effects), and is this something that is still not very well understood?

At first glance, this book may not seem to be as relevant to my nutraceutical research as I might hope, yet I believe it laid a necessary foundation for understanding some of the additional reading I am going to be doing (which is why I tackled it first!) I feel I have a deeper understanding of the chemistry that underlies many of the topics I teach – for example, substance use and abuse (exogenous peptides), stress (endogenous peptides), and biological development (steroid ligands), as well as how the chemistry of food may play a role in all aspects of our health. I also feel I still have questions and need to acquire a better comprehension of where nutrition fits into the peptide picture. I plan to contact Candace Pert for her recommendations in this area.

One issue that is personally disturbing to me is how easily Dr. Pert dismisses the criticism that is sometimes leveled against the use of animal experiments in science. Her reason seems to be that since the animals were bred for research purposes – e.g., the laboratory rat – that this is justified. Yet, just pages later, she is indignant at how readily male scientists justify 'using' women in science, that is, taking their work without giving them full credit for it. It seems to me to be an example of human arrogance (not just male arrogance) that anyone might think it appropriate for him or her to decide whom it is and is not OK to use, much less kill, for their contributions.

SUMMARY 2

A Natural History of the Senses by Diane Ackerman, PhD

This book was a particularly good choice to follow Molecules of Emotion in that it applies Pert's understanding of the route of biochemical messages to the specific senses that allow their transmission. Once again, although the link between this subject and my research into nutriceuticals does not at first seem obvious, it provides background for a deeper understanding of how foods are able to influence the chemical balances in the body.

The book is organized into units on the five senses, each divided into about 20 mini-chapters, followed by a chapter titled "Synesthesia." Ackerman's style is quite different from Pert's and reflects her dual backgrounds in the fine arts as well as the sciences: As opposed to Pert's scientific analysis, broken up by her personal musings and reflections, Ackerman's writing is the lyrical writing of the poet, beautiful enough to at times bring one to tears.

Ackerman's science details the parameters of how the senses function, for example, the categories of smell, the number of taste buds in the mouth, the types of touch receptors in the skin, how sound is heard, and how eyes evolved in organisms. But many of the mini-chapters place the science within the context of culture, human interaction and experience. To enhance our understanding of smell, she travels to a nearly secret laboratory in which deliberately anonymous 'artists of the nose' use a few ancient ingredients (flowers, spices, animal urine) to mix most of the world's famous perfumes. To illuminate vision, she details what is seen during a launching of the space shuttle. To help us experience the complexity of hearing, she ties the sounds of music to

the heartfelt emotions they engender, for example, how in singing the Christmas hymn 'O Holy Night,' the sweep of notes in the line "Fall on your knees" reenacts the overwhelming feeling of supplication to a higher power. She triggers mouth-watering responses when she details the rich histories of chocolate and vanilla. And she explains such touch phenomena as pain, fingernails on a chalkboard, and mosquito bites.

The unit on taste is particularly interesting for my research into food, as it details the history of some common foods, foods as aphrodisiacs, and how foods influence moods and mental health. But woven throughout all of the units is the role of the senses in reproduction and evolution, which are useful for my understanding of biology and teaching of human sexuality.

The chapter on synesthesia was a new concept for me, a term I had not previously heard. Apparently there are individuals with sensory combinations, in which they can 'hear colors,' or 'taste sounds.' Many of these have been famous artists, musicians and writers, such as Benjamin Franklin, Voltaire, Rimsky-Korsakov, and Poe, and practiced eccentric behaviors to deliberately stimulate their synesthesia and creativity.

SUMMARY 3

A Natural History of Love by Diane Ackerman, PhD Is there anything more ephemeral to try to examine under a microscope than our experience of love? Diane Ackerman makes a valiant effort. In this book, the scientist/poet explores love from many sides of its prism. She starts by tracing its presence through written history. Egyptian love poems anonymously written around 1300 BC express many of the same themes we see today. Trends are given historical context, for example, Greek and Roman pederasty flourished in an era when young females were kept invisible. The chivalry of the European knight was usually directed at an unattainable (in theory, at least) married woman. And some of the effects of the spread of Christianity are detailed, for example the pursuit of the soul over the pleasures of the body, originally demonstrated in a disdain for lusty pagan rituals and festivals.

The physiology of love is outlined, not in terms of sex organs but rather the neurophysiology of brain response, and even biochemistry (such as oxytocin, the "cuddle chemical"). Ackerman touches upon evolutionary underpinnings, such as animal behavior and the benefits of sexual reproduction. She also discusses the effects of social movements such as the changing status of women.

Finally, erotic or romantic love is not the only kind of love explored; the author also examines parent/child love, religious love, and even the love of pets. Because of the issues I teach in Biology 15, Human Sexuality, I must admit the most affecting section for me was one on the relatively recent concept of attachment theory (parental acceptance setting the stage for an adult's ability to love), and her description of the love impairment that occurs to abused and neglected children.

Ackerman's second book had little to do with my neutriceutical research, although there is a chapter on aphrodisiacs, and I learned many things I can share in Biology 15. I do think Ackerman, like many historians, tends to identify history as written western history and fails to include much about the fascinating array of cross-cultural findings on love, sex and marriage.

SUMMARY 4

The Botany of Desire by Michael Pollan

Subtitled "A Plant's – Eye View of the World," this book turned out to be quiet different from what I expected. The title led me to believe that the book dealt with plants as a source of neurochemicals that stimulate desire, presumably sexual desire. I thought I would be learning whether there is any fact behind beliefs that certain foods are aphrodisiacs. I even wondered why the book dealt only with "botany," since some supposed aphrodisiacs are animal foods (e.g. oysters). The author is an environmental journalist and home gardener. He had chosen four plants about which he planned to dissect the botany of desire – the apple, the tulip, marijuana, and potatoes.

What I found was that the book was not about aphrodisiacs at all. By "desire," Pollan is referring to any desire – not necessarily sexual – the fulfillment of which has motivated humans to choose to cultivate these particular plants. The desires that pertain to these specific four are sweetness (the fruit), beauty (the flower), intoxication (the drug), and control (the staple). He introduces the concept (not new to my biologist colleagues, I'm sure, but new to me) of "coevolution," that is, when two species grow cooperatively to advance the spreading of their own genes by also spreading the other's, such as the relationship between insect and flower. He describes how we, the "human bumblebee," are experiencing coevolution with the plants we choose to propagate. His fascinating premise is that while we humans feel we are in control, by deciding which plants' genes to promote for our uses, it may be that actually the plant is in control, by 'deciding' (through natural selection) which qualities to evolve to make themselves attractive enough for us to want to cultivate.

For each of his subjects, Pollan gives a brief natural history. He describes what is known about its origin, and the physical characteristics that allowed it to develop in that time and place, such as its hardiness or means of reproduction. He traces its interaction with human biology and culture, illustrating the body's ability to process it for energy, appreciate it through our senses, or use it for toxic or intoxicating effects. Lastly, he details an apocryphal event in history that to him most illustrates human desire for the plant, including the cultural, political and religious climate within which it took place - the stories of Johnny Appleseed in 1700's North America, "tulipomania" in 16th century Holland, the U.S. government's current "war on drugs," particularly marijuana, and the 19th century Irish potato famine.

Elements of the book turned out to pertain to my independent study more than I at first thought they would; for example, the chapter on apples includes information on how the body uses glucose for energy, and the chapter on marijuana discusses plant chemicals and their receptor sites in the brain, differences between helpful and harmful plants, etc. In addition, the book is full of fascinating anecdotes; I didn't know that the origin of the famous saying, "An apple a day keeps the doctor away," was actually a temperance movement slogan to induce people to eat apples rather than drink them in the form of cheap applejack liquor! As a home gardener, Pollan kept returning to the personal uses for his information. One of the most useful for me was the segment on the current practice of genetically altering food, and how frightening it is to realize that, once again, our science (and its use in service of corporate greed) may be way ahead of our ethics – with lasting destruction to the world (especially plants!) on which we so desperately depend.

SUMMARY 5

Food and Love by Dr. Gary Smalley

I looked forward to reading this book, because I expected it to hone in on one of the specific topics of interest to me – the connection between nutrition/nutraceuticals and emotional health. And in fact, in some ways it does do so. I became somewhat concened when, while reading just the acknowledgements page, I noticed a line in which the good doctor thanks his agent for 'creating a contract that glorifies God.' First of all, I found it a somewhat ludicrous statement; whether one believes in organized religion, God, etc., or not, I certainly hope that if there is a God, s/he has better things to worry about than Dr. Smalley's contracts. Secondly, I feared that the book might have a religious more than scientific bent, especially when he then goes on to state on the first page, "This is not a scientific book."

My concern turned out to be about half true. Dr. Smalley's main premise, with which I agree, is that if a person eats a healthy diet, s/he will be more likely to function at optimum capacity. By functioning at optimum capacity, the individual has the available resources one needs to respond both physically, emotionally, and relationally. By the same token, a person who eats a diet that is deficient in good nutrition is lacking in these resources. And of course, many people overeat in an effort to fill an emotional void in themselves, or a longing for emotional intimacy with another, rather than true hunger and the body's need for fuel.

He then goes on to describe what that healthy diet would be. He consults other references and generally describes current nutritional wisdom. He focuses on fibrous grains to deliver adequate amounts of B vitamins, essential to healthy functioning of the

nervous system. He recommends small portions of lean proteins and vegetable fats to aid in the proper metabolism of the carbohydrates. Like most nutritional advisors these days, he criticizes the eating of large amounts of saturated fats and processed white flour and sugar. Dr. Smalley also understands the foundation for good relationships. He describes being emotionally healthy within oneself and emotionally available for, communicative with, and generous toward one's partner. He also strongly recommends the use of faith and prayer to find the strength to practice these skills. And faith and prayer have been shown to be effective techniques for those who believe in them. If more people followed Dr. Smalley's advice, I have no doubt that the incidence of ill health, as well as divorce, could significantly decrease.

My problems with the book are, first of all, that he is correct in saying it is not a scientific book; and considering that he has medical training, I find this disappointing. He is not judicious in his selection of references, using at times scientific articles that do give research results and at times popular books that simply espouse an individual's opinion, unsubstantiated by empirical data. Secondly, although he briefly describes the role of nutrients in health and emotional health, he does not give the level of detail that I think would make the information much more accessible and believeable. For example, I would have liked to see more about how the chemical makeup of the food reacts with the body's own chemicals to stabilize mood – not in scientific jargon, but in language made comprehensible to the average reader. Dr. Smalley counts too heavily on the reader's faith in his credential as a physician without providing the supportive evidence for what he is espousing.

Finally, I found the religious aspect of the book off-putting. The book was not advertised as a handbook for Christians, and yet Christian doctrine clearly permeates the advice. The use of spirituality to support difficult behavioral change could have been described in a much more scientific and nonsectarian manner. Unfortunately, I did not learn much that I didn't already know from Dr. Smalley's book.

SUMMARY 6

Sexual Nutrition by Morton Walker, D.P.M.

Dr. Walker became part of a larger controversy when he co-wrote one of several books about health problems related to "systemic yeast" in 1986. His premise in that book is that the large amount of white flour and sugar we are eating is contributing to a national epidemic that saps our health and energy. I have not read that book nor its criticisms, but I have asked my doctor about the likelihood of my suffering from systemic yeast. It was her opinion that I would be in a much more unhealthy state if I were! Adding to my concern about Dr. Walker's theories is his bio in the back of this book, which cites a medical career as a podiatrist; it's quite possible that he has since gone on to become an expert in nutritional health, but he does not seem to have any additional credentials in that area.

In this book Dr. Walker gives nutritional advice and ties it into sexual functioning. Once again, I eagerly looked forward to reading it for the specificity of information I hoped to add to my proposed quest for knowledge. It's amazing how similar the nutritional advice for sexuality in Dr. Walker's book is to the advice given by the previously reviewed Dr. Smalley for mental health. However, I suppose this is not so surprising, since their advice also closely mirrors that recommended by most nutritionists, as well as Harvard researcher Dr. Walter Willet when I went to hear him speak at Claremont McKenna College about nutrition and general health. At least this is an indicator that all of these sources to some extent are engaged in promoting the diet that many now believe, based on scientific evidence, to be the most healthy, whether the

information is reported in a scientific manner and publication or not. It is basically the same information that I teach in Biology 5, which gives me confidence.

Like Dr. Smalley's, this diet recommends complex carbohydrates, lean proteins, vegetable oils, and lots of fruits and vegetables. It recommends against processed flours and sugars and saturated fats. It uses a great deal more scientific jargon to explain biochemical processes. It gives lists of nutrients to accomplish certain sexual goals, for example herbs to reduce "impotence" (erectile dysfunction) – including black cohosh, damiana, and ginseng - and an extremely long list of foods containing B vitamins to reduce menstrual cramps – .including aloe, fennel, and mugwort. One of the things that is being confirmed for me as a basic principle in nutrition is that there is always more than one, and often many, nutrients that can accomplish a nutriceutical goal. It can be confusing, but what may make the difference is availability as well as interaction with an individual's body chemistry.

I found some of Dr. Walker's information fascinating. In particular, he claims to have traveled to the mountains of Ecuador to study the population that supposedly has the greatest longevity and sexual functioning, theVilcabambans ("*Los Viejos*" – the Old Ones). He discusses in detail their diet, lifestyle, and sexual practices.

On the other hand, I find some of his information to be suspect, or at least requiring further confirmation from scientific sources. Like Dr. Smalley's, his references are few and run the gamut from medical journals to the National Enquirer! For example, although in many ways he recommends a holistic approach, he also suggests the use of "glandular extracts" from farm animals and "chelation therapies" which he admits are not

approved by the FDA. Is he a highly sophisticated, although alternative, practitioner? Or is he a bit of a crackpot? Both? I'm not sure.

Summary 7

The Shaman's Apprentice by Mark Plotkin, PhD

Mark Plotkin is a Harvard-trained ethnobotanist who has made his life's work the study and preservation of indigenous cultures' knowledge of botanical medicines of the South American rainforest. I found Dr. Plotkin's book to be most uplifting for two reasons. First of all, it contained more useful information in the first few introductory pages than the previous two books I read had provided in their entirety. But in addition, it also has a much more lofty intent. While physicians writing self-help books may be trying to motivate change on a small scale with their patients and readers, they nonetheless often do so by liberally repackaging what is mostly general knowledge, and usually with a profit motive in mind. Plotkin, on the other hand, sacrifices much to effect profound global change, not only in his own lifetime, but into an uncertain future. Thanks to the efforts of my Biology Department colleagues a few years ago, Dr. Plotkin came to speak to students at Mt. Sac. Due to a conflict, I was not able to hear him, and after reading his book, I regret that even more deeply.

I say that Plotkin sacrifices much, but in truth he is an adventurous soul who also obviously gains much from living larger than life. His sacrifices come in the form of facing physical discomfort and at times even danger in traveling to areas, interacting with cultures, and even participating in ceremonies seldom seen by a white man. Within the native cultures he visits, in countries such as Suriname and Brazil, he gains trust until he is referred to the shaman or "witch doctor," usually an elderly person whose knowledge of healing has been passed down through hundreds of years. Their awareness of the jungle plants and their healing properties is often very sophisticated, encompassing not

only the plants themselves but also highly complex compounding, or mixing. And yet even their own tribespeople have come to believe that it is inferior to the "white man's medicines;" as a result, the young people of the tribes have very little interest in learning and passing it on to future generations. One of Plotkin's projects is that of the book's title, the shaman's apprentice program. Plotkin's project selects, trains and pays young apprentices in the tribes to learn the botanical medicines; he also assists them in recording the information in their own, often unwritten, languages. Perhaps most admirable of all, Plotkin does not attempt to pre-empt this knowledge. Rather he leaves it up to the tribe to decide whether to share it with the rest of the western world - with all its inherent risks and potential benefits.

Plotkin explains the botanical concepts behind the plants he studies. He consistently places the plants within the context of their habitat and their interaction with the other species there. He discusses the different ways that plants are used by human cultures to treat or prevent conditions as diverse as diabetes, high blood pressure, fungal infections, respiratory tract problems, menstrual and pregnancy conditions, impotence, etc. He projects what may happen in the future as regards the politics of ethnobotany, the rainforest, and even our global existence.

The Shaman's Apprentice is a good read, filled with adventure, danger, humor, grief, and humility. It is also an excellent source of information about the history and variety of jungle nutraceuticals.

The following are summaries of 11 books I perused.

SUMMARY 8

Sex Herbs by Beth Ann Petro Roybal and Gayle Skowronki

This book was not on my original reading list, but was recommended to me. It synthesizes information from a variety of books about medicinal herbs, and the references are listed although not specifically cited in the text. The references do not include scientific journal articles. The book is well-organized. It gives introductory information defining herbs and their uses, goes on to identify sexual nutraceutical effects of specific herbs according to the identified problem (increasing desire, maximizing pleasure, treating specific dysfunctions, etc.), and concludes with general health recommendations; it also includes appropriate cautions.

Two of the things that stood out to me as I skimmed this text were: It reinforces the general notion I have been acquiring throughout my research that not only can the same effects can be generated by many different nutraceuticals (for example, 24 different herbs were listed for the relief of female menopausal symptoms), but also that most nutraceuticals have multiple effects (for example, the menopause-relieving herb black cohosh was identified as having nine other uses). This to me is part of the intricately beautiful design of nature, that should one nutraceutical not be available, or not work with a particular individual's body chemistry, there is always another – the health insurance policy of the natural world.

Summary 9

Field Guide to Medicinal Wild Plants by Bradford Angier

One of the things that distinguishes a field guide is the visual representation of its subject. This book includes detailed, color drawings of the plants, which would be very useful in trying to locate them (in the "field," as it were). The book is packed with information; in fact, just the list of plants alone runs 21 pages of small print. For each plant, the author includes its scientific name, common names, location, characteristics, and uses. The one thing that is missing, in my opinion, is the credentials of the author. He has an impressive list of previous publications, on various outdoor and wilderness topics, as well as others involving plants. But without knowing more about his research methods, or having the book recommended by a field guide publisher (e.g., the Audubon Society publishes a series of field guides), I would be reluctant to use this book without cross-checking the information with other sources.

Summary 10

The Green Pharmacy by James A. Duke, PhD

This book was recommended in one of the others I read. And on its cover is a recommendation from previously reviewed ethnobotanist Mark Plotkin! The author gives a detailed history of his background, including advanced degrees in botany and many years' work for the U.S. Department of Agriculture. Like the authors of the other herb books, he begins with some background on herbal healing. But unlike them, one of the first issues he addresses is safety (this is not to say the others don't discuss it, only that they do so later). This book is dense with information, the paperback edition being over 600 pages. Each health problem he addresses, once again an extremely varied list, is discussed in detail, with behavioral as well as herbal remedies and suggestions given.

Summary 11

Secrets of Native American Herbal Remedies by Anthony J. Cichoke, DC, PhD

The author of this book is a chiropractor with a doctorate in nutrition. Although some of their methods are controversial, the philosophy of chiropractic does tend to lean more toward the holistic and nature-based. This book gives some background on Native Americans' use of healing herbs, discusses each herb individually, and then provides actual recipes for teas, salves, etc., that may be helpful for complaints as varied as hangovers, hemorrhoids, and hay fever. In many cases, there are several recipes for a problem, each utilizing different herbs. This repeats a trend I've noticed, which seems to take into account the availability of different plants as well as the individual biochemistries that may respond better or worse to one remedy or another. The author also includes a glossary and sources for purchasing the herbs.

Summary 12

Intercourses by Martha Hopkins and Randall Lockridge

This book is primarily a cookbook whose recipes feature foods that have historically been considered to have aphrodisiac properties. The book has beautiful photographs of foods such as avocado, honey and figs, placed in the context of the nude human body (artfully, not pornographically). Some cultural, historical and/or biological information begins each section, including quotes from Diane Ackerman (one of the main authors I read) and others. The book is a coffee table book, and the recipes appear to be varied and interesting.

Summary 13

The Stevia Cookbook by Ray Sahelian, MD, and Donna Gates, MEd

This is another cookbook that I became interested in first because of my recent introduction to stevia and then because of the information in the book about some of the politics of FDA regulation of food supplements. The FDA does not regulate in terms of requiring testing, but it can regulate marketing practices and even whether a supplement is permitted to be sold. Stevia is an herb with sweetening properties and no calories. According to the authors, who are a medical doctor and a nutritional consultant , a ban between 1991 and 1995 had no scientific basis in terms of consumer safety, but was likely motivated by pressure from the no-calorie sweetener industry. The recipes for replacing stevia for some or all of the sugar in cooking appear to be interesting; the owner of the health food store who sold me the book recommended that users reduce the amount of stevia by half to avoid over-sweetening.

Summary 14

Potatoes Not Prozac by Kathleen DesMaisons, PhD

This book was recommended by one of my other sources, Gary Smalley. Written by an addiction specialist whose PhD is not identified (just as Smalley's "doctoral" training is left unclear), it seems to be a combination of science, opinion and recommendation. The premise of the book (which interestingly to me has a foreward by Candace Pert, the neuroscientist author I read who identified the opiate receptor and later moved into work in mind/body health) is that sugar acts like a drug in the brain. It causes "addiction," cravings and withdrawal that lead to binge-eating and obesity, as well as depression. The author explains brain chemistry, especially as regards serotonin and mood, and her opinion that the proliferation of psychotropic drugs might be reduced by dietary changes. She recommends how to choose a diet that promotes mental and physical well-being and includes a bibliography.

Summary 15

Food and Mood by Elizabeth Somer, M.A., R.D.

This book has a similar premise to that of Dr. DesMaisons' (above), and the author's training as a dietitian is noted although not explained further. She also documents the role of simple carbohydrates in brain chemistry (with extensive citations), and describes a pattern of dependency, craving, and compromised mental and physical health. She recommends a diet of reduced simple sugars and increased whole grain complex carbohydrates. The fact that this type of diet is so clearly recommended by so many of my sources makes it all the more perplexing as to why "Atkins" and other faddish low-carb diets have become so prevalent in our culture.

Summary 16

Natural Hormone Balance by Uzzi Reiss, M.D.,OB./GYN.

I reviewed this book on the recommendation of a friend who is using Dr. Reiss's methods for managing the symptoms of aging and especially menopause. A bit of an anachronism, Dr. Reiss combines classical medical training with an interest in mind/body medicine and a specialty in the use of plant-based hormones, e.g. phytoestrogens. Dr. Reiss's program involves hormonal blood tests followed by the conservative addition (if needed) of individually tailored hormone blends prepared by a compounding pharmacy. His views are especially interesting in light of recent controversies over the use of pharmaceutical hormone replacement therapies.

Summary 17

The Wisdom of Menopause by Christiane Northrup, M.D., O.B ./GYN.

This book has a lot in common with Dr. Reiss's book. The author is also a classically trained physician with an interest in mind/body health who recommends an holistic, natural approach to menopause and aging. Her book addresses many more issues than just hormonal imbalances, such as healing traumatic memories and coming to terms with changing notions of beauty. One interesting difference is that while Dr. Reiss claims that phytohormones must be compounded and applied, not ingested, she recommends that very ingestion of those foods to supplement the diminishing hormones.

Summary 18

Botanica Erotica by Diana de Luca

In a way, this book embodies one of the primary dilemmas I found in researching this topic. The author owns a nutriceutical/cosmeceutical company, and the book does not list any specific credentials. The information appears to be a combination of herballore and ancient wisdom combined with new age mysticism and sex-positive encouragement, and it includes a smattering of recipes, artistic photographs, and literary quotations. She does list a bibliography, which interestingly also features the oft-quoted Diane Ackerman. The book can be enjoyed for its charming nature, but the dilemma lies in not knowing how accurate all of the information is.

APPENDIX C – INTERVIEW QUESTIONS

Interview Questions for Dr. Mark Meskin

1. Let's go over the process of digestion, to make sure I understand. We take in foods for nutrients, digestion begins with chewing, saliva, enzymes. In the stomach it is turned to chyme. Proteins are broken down into amino acids, carbs into glucose, fats into lipids. In the intestines, blood removes the nutrients and carries them to the cells. The remaining solid waste exits the bowel. What would you add to that?

2. What are amino acids, glucose, lipids? Why does the body need them in these forms? Is all of nutrition a matter of chemistry? What would you recommend I understand about chemistry to better understand nutrition?

3. The question of what diet should we be eating is a confounding issue today. I brought these 2 articles that both discuss the hunter/gatherer diet yet seem to contradict each other. One says the H/G diet was high in meat, the other doesn't. What do you make of this difference?

4. Some other things mentioned in these articles are vitamins, minerals, phytochemicals. How would you define each of these? What are enzymes? What are ligands and peptides?

5. Regarding phytochemicals, how are they different from vitamins and minerals and antioxidants? Are they in all plants? Where are they found in the plants? How many are there? What is the role of the color-coding? Will they be available in pill form?

6. How do cancerous cells grow? How do phytochemicals stop them from growing? What amounts of phytochemicals are needed to do this? How do we measure them?

7. Tell me how some of the research into phytochemicals is conducted.

8. What is the difference between fruits, vegetables, herbs? Why do so many seem bitter to many people, especially kids? What are the implications of this?

9. How does food preparation affect nutrients and phytochemicals? E.g. steaming vs. microwave, freezing, etc.

10. What are the implications of genetically altered foods?

11. What else would you tell me to help me understand digestion? How do you see the interaction between brain, chemistry, and digestion?

12. What are your thoughts on some of the eating problems we've developed? Eating disorders, overeating, etc.

13. Do you think humans were 'meant' to be herbivores, omnivores, carnivores?

14. What materials can you refer me to?

15. What else would you add regarding nutrition and phytochemicals?

Interview Questions for Christopher Nyerges

1. How is a wild plant different from a cultivated one?
2. What are the advantages of using wild plants? Why aren't they used more?
3. What are the disadvantages of using wild plants?
4. How did people first acquire their knowledge of plant uses?
5. How are wild plants characterized?
6. What main functions do plants provide?
7. How do you see the concept of plants as nutriceuticals?
8. As nutriceuticals, what plants cure or treat disease? What plants prevent disease?
9. Do you think there is such a thing as a plant that has no nutriceutical value?
10. Do you know of plants that influence mood; fertility or pregnancy; sexuality?
11. Are there references you would recommend?
12. Is there any more you'd like to share about wild plants?
13. Why did you choose this particular site to meet?

Interview Questions for Dr. Marie Caudill

1. What do I need to understand about chemistry to understand nutrition?

2. What are macronutrients vs. micronutrients?

3. How have we learned the science of nutrition? How do we know how much of various nutrients we need?

4. Could all foods be considered nutriceuticals?

5. How do micronutrients support macronutrients in promoting optimal health?

6. How did we learn about the role of folate in preventing birth defects in pregnancy? How does this operate? What else does folate do? How was this research done? Is it still going on? Are there any new findings?

7. What other nutrients (macro and micro) are important for pregnancy? How?

8. What knowledge do we have about what nutrients are important for stabilizing mood? How does this operate?

9. What knowledge do we have about what nutrients are important for sexual functioning? How does this operate?

10. What knowledge do we have about what nutrients are important for menopause? Change of life in men? How does this operate?

11. What knowledge do we have about the use of nutriceuticals in treating health conditions? What knowledge has been lost? What knowledge is still to be found?

12. What would be your recommendations about a healthy diet to prolong life and delay the onset of health problems?

13. What other resources would you recommend or share with me?

14. Is there anything you would like to add?

APPENDIX D – COURSE MATERIALS

DRAFT

DIETARY RECOMMENDATIONS

Synthesized from Lynda Hoggan's 2003-2004 Nutraceutical Research

1. The best advice is still to eat a variety of foods and control caloric intake. A varied diet provides the maximum in nutrients your body needs, and high calories/obesity are implicated in many of the most prevalent diseases, such as heart disease, cancer, stroke, and diabetes. Control calories by reducing portion sizes and cutting out fast food and unhealthy snacks.

2. Stay away from fad diets. They are usually the brainchild of one self-styled "expert" who wishes to market a product, such as a book or supplement. Seldom are they based on proven scientific research.

3. Your body needs an adequate amount of protein every day, to build tissue and metabolize carbohydrates appropriately. Try to include more plant sources of protein, such as nuts and legumes (dried beans). For animal sources of protein, choose lean meats and reduced-fat dairy products.

4. Your body needs an adequate amount of complex carbohydrates every day, to supply long-lasting energy to your brain and muscles and maintain the chemicals that control mood. Include more whole-grain sources of complex carbs that contain fiber for good digestion, such as bran cereals, whole wheat breads and pastas, and brown rice, and try some less well known grains such as quinoa and bulgar wheat. Limit foods made with white flour.

5. Your body needs an adequate amount of simple carbohydrates every day, to supply quick energy, fiber, and a vast array of chemicals that direct activities and protect you from disease. Eat simple carbs in the form of fruits and vegetables, and eat the widest array of colors that you can; the colors contain antioxidants (anti-aging chemicals) and phytochemicals (cancer-fighting chemicals). Limit foods and drinks with a lot of sugar and corn syrup, including fruit juices because of their high fructose levels.

6. Your body needs an adequate amount of fats every day, to absorb vitamins, store energy and produce hormones. Limit saturated fats from animal sources. Avoid trans fatty acids found in most margarines, fast food and processed food. Eat fats that come from plant sources, such as olive oil, peanut oil, and avocadoes.

DIETARY RECOMMENDATIONS PAGE 2

7. Your body needs an adequate amount of vitamins and minerals every day, to enhance every system and metabolic process. Taking a multivitamin each day may help and probably won't harm, but don't expect supplements to make up for an unhealthy diet. Try to get most of them from a variety of nutrients, especially fruits and vegetables.

8. Your body needs an adequate amount of water every day. Plain filtered or spring water is best. Use sports drinks only if you are exercising or perspiring a great deal. Drink teas for their antioxidants.

9. Be wary of supplements. Many are expensive and tend to eliminated from your body before you can even utilize them. Some can build up to toxic levels.

10. Do your homework: Before trying a supplement, research it using scientific sources such as the Physician's Desk Reference for Herbal Medicines or German Commission E. See if more than one source recommends the same thing. Check with your doctor before using it. Consider consulting an expert in Chinese medicine. Choose health food stores that display the American Botanical Society's certification that employees have been properly trained.

11. If you use supplements, use only the recommended dosages. It can take weeks to see results. If you don't see results, these may not be the proper compounds for your body chemistry. Try something else that is suggested by more than one source for the same thing.

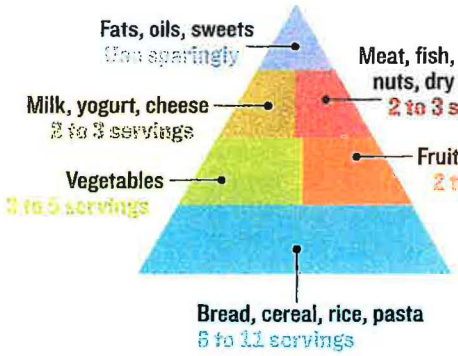
10. Place food in the proper perspective. Don't expect it to fill other needs, such as the need for love or an antidote to boredom. Don't let eating become plagued with guilt and regret. Eat healthy food, and savor it immensely. Make your eating environment pleasant, and enjoy good company. Allow room for occasional treats, such as chocolate – you'll enjoy them more when they're not so commonplace!

To be continued...

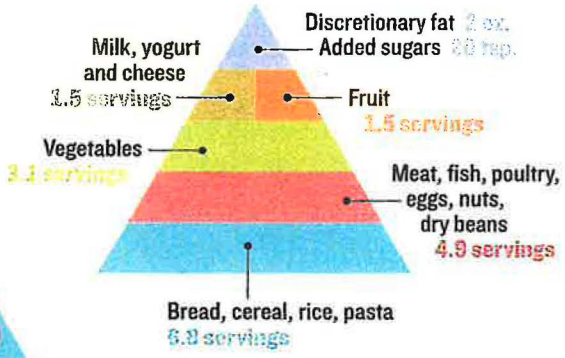
Harvard researcher Dr. Walter Willett's proposed food pyramid

Redesigning the Food Pyramid

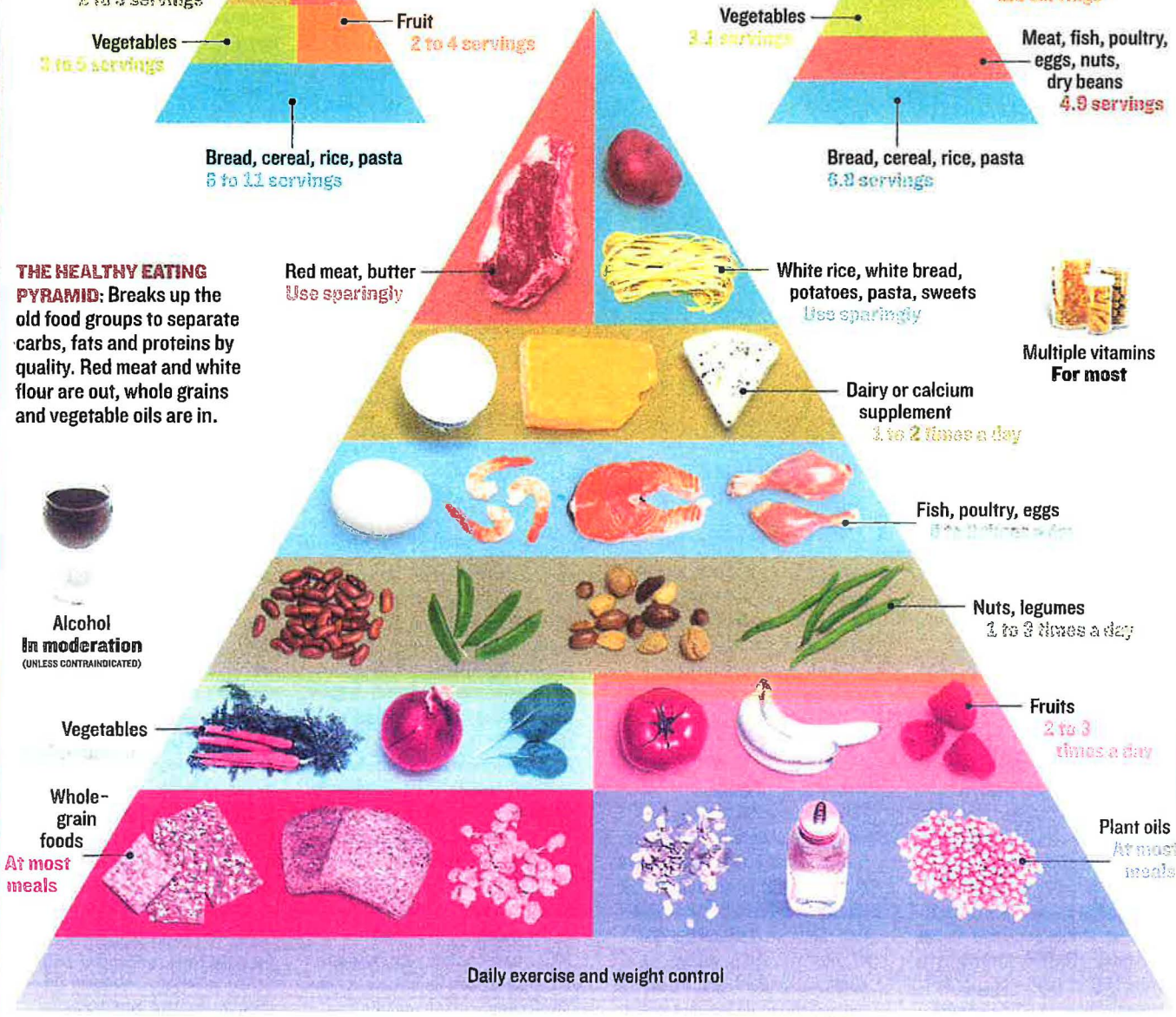
THE FOOD GUIDE PYRAMID: The government's 1992 effort to wean us from fat conveyed a sense that all carbs are harmless.



THE AVERAGE AMERICAN DIET: With a cherry on top. Sweets and meats are a bigger draw than healthful fruits and vegetables.



THE HEALTHY EATING PYRAMID: Breaks up the old food groups to separate carbs, fats and proteins by quality. Red meat and white flour are out, whole grains and vegetable oils are in.



ALL SERVINGS ARE SERVINGS PER DAY. DISCRETIONARY FAT INCLUDES FAT GAINED BY CHOOSING RICH FOODS SUCH AS FRIED CHICKEN OVER A MORE HEALTHY CHOICE LIKE BROILED, SKINLESS CHICKEN. SOURCES: USDA, "EAT, DRINK, AND BE HEALTHY" BY WALTER C. WILLETT, M.D. RESEARCH BY JOSH ULICK. PHOTOGRAPHS BY DAVID N. BERKWITZ FOR NEWSWEEK. GRAPHIC BY BONNIE SCRANTON.

APPENDIX E – PHOTOGRAPHS

Some plants with medicinal properties …

Agave cactus protects against diabetes.

Horehound soothes throat and respiratory ailments.

Is passion vine an aphrodisiac, or does it merely relax one for intimacy?

Black elderberry also helps flu symptoms.

Stinging nettle aids the vascular system.

Oakrot fungus has anti-microbial properties.

Foods, Nutrients and Nutraceuticals

Whole grains provide fiber and the building blocks for serotonin, a mood regulating chemical.

Home gardening is an excellent source of fresh, organic fruits and vegetables – which contain healthy phytochemicals.

Phytochemicals are in the colored substances, and each color group seems to protect against its own set of diseases.

Olive oil in salad protects the heart.

Herbs and spices add flavor to foods, but they also have anti-microbial properties.

A meal should be a treat for all the senses.

Saturated and trans fatty acids contribute to cardiovascular disease as well as other illnesses.

Monounsaturated fats are a healthier option.

Vegetable sources of protein also contain little to no unhealthy fat.

Nutraceuticals can help to balance a diet and treat many health conditions, but the first choice should always be to try to obtain nutrients from healthy foods:

One can take a multi-vitamin, but vitamins are more effective when delivered directly from fruits and vegetables.

Instead of taking caffeine in pill form …

…tea combines it with antioxidants, which can lower blood pressure and cholesterol, and fight heart disease, cancer, and the effects of aging!

You can prevent a cold with vitamins and herbs…

… or fight the symptoms with a plethora of expensive medications.

Some expensive commercial nutraceuticals
using "proprietary blends":

APPENDIX F – MISCELLANEOUS

SCHOOL OF SELF-RELIANCE "WHERE THERE IS NO STRUGGLE, THERE IS NO MERIT

Box 41834, Eagle Rock, CA 90041 -- (323) 255-9502 -- (626) 797-7365 www.self-reliance.n

Since Jan. 1974, we have offered Wild Food Outings, lectures, field trips, and workshops to over 22,000 people. Our classes were originally sponsored by WTI Inc. Call us if you would like to have a class, lecture, or walk for your group. *Classes led by Christopher Nyerges, and staff.*

WILD FOOD OUTINGS These are more-or-less leisurely walks lasting about 3 hours. We focus upon identifying the plants we encounter, and learning how they can be utilized for food, medicine, or other needs. We collect enough wild foods to make a sample sala Bring water, a bowl, and a notebook. Cost is **$20** (unless otherwise noted).

WILD FOOD COOKING WORKSHOP Minimal walking. We collect wild edibles that are in season, and then we go into the kitche (or campfire) and cook. We make omelettes, bread, salads, drinks, desserts, etc. At some of these classes, you can bring your camera an have your picture taken with Otis, our pot-bellied porcine pal. Cost is **$34.**

SURVIVAL SKILLS INTENSIVES AND WORKSHOPS We try to keep hiking to a minimum, and in 5 to 6 hours, you'll get hanc on in the areas of primitive fire-making, making soap and fibres, finding and using wild foods, water purification, shelter building, etc. Sometimes we focus on one skill area. Cost is **$51**. (unless otherwise noted)

OVERNIGHT TRAINING. We do just a few of these each year. Hiking to the site is minimal. We will focus on all the outdoor skill: that we teach on the Survival Skills Intensives, and we will spend more time on food collecting (that's where our meals will come from!) and on shelter building (we'll sleep in the shelters we build). We'll also have time for practicing other skills and crafts, depending upon the interest of the participants. Cost is **$150.**

T CERTIFICATES are available for all our classes.

ONSULTATONS (PERSONAL OR GROUP) AVAILABLE.

2003 SCHEDULE OF EVENTS

All dates and locations are subject to change, updates, and additions. ALWAYS RSVP -- at least one wee in advance. Note: Thomas Brothers Map co-ordinates are given in brackets for some locations.

LOCATIONS:

1: Upper Arroyo, meet at west end of Altadena Drive, Altadena, 3 blocks west of Lincoln [pg. 535, F4].

2. Hahamongna Watershed Park; entrance at Foothill and Oak Grove Dr., Pasade Meet at southern end of the upper area (across the street from La Canada High School). [pg. 535, E5].

3. Switzer's Camp, Angeles National Forest. From the 210 freeway in La Canada, drive up the Angeles Crest Hwy. 10 miles to Switzers. Meet near the bridge.

4. Angeles National Forest. From the Angeles Crest Highway and Foothill (or fron the 210 freeway), drive 2 miles up the A.C. Hwy. (above the large new houses) until you see the turnout on your right. [535, C1] .

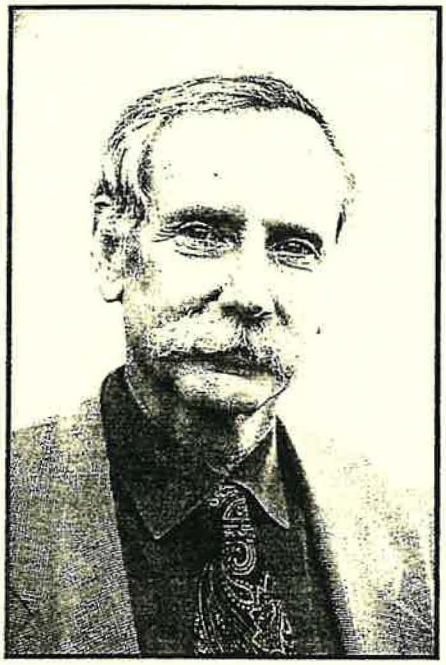
5. Millard Canyon, Altadena. From Loma Alta in Altadena, go north on Chaney Trail all the way to the campground.

6. Arroyo Seco, north of the Rose Bowl, Pasadena. Meet at the SW corner of Washington and West. [pg. 565, E1].

The Fortnightly

THE PROGRAM NEWS OF THE MARIAN MINER COOK ATHENAEUM AT CLAREMONT McKENNA COLLEGE

10 November 2003 Vol. 19, No. 4



Walter C. Willett, M.D.

Is the U.S.D.A. Dietary Pyramid a Threat to Public Health?

WALTER C. WILLETT, M.D.

TUESDAY, NOVEMBER 18

In many ways, you are what you eat. Unfortunately, America's expanding waistline suggests we are consuming large portions of the wrong foods, and without much exercise. In fact, two-thirds of all Americans are overweight. The epidemic of obesity is a critical public health concern and all of us are paying the price. As health insurance premiums rise, preventative nutritional medicine is vital to lowering both our cholesterol and medical copayments.

Yet the government is still not doing its part to encourage healthy eating. Dr. Walter Willett, Professor of Epidemiology and Nutrition, and Chairman of the Department of Nutrition at the Harvard School of Public Health, points out that the Food Guide Pyramid was created using questionable scientific data and has not been modified since its inception. Dr. Willett will share his groundbreaking research and present an updated dietary pyramid that has already proven to be nearly twice as effective in reducing risk for major chronic disease.

Willett grew up in Madison, Wisconsin, studied food science at Michigan State, and graduated from the University of Michigan Medical School before obtaining a Doctorate in Public Health from Harvard. He has focused much of his work over the last 25 years on the development of methods to study the effects of diet on the occurrence of major diseases. He also lectures at Harvard Medical School.

In addition to publishing over 800 articles, primarily on lifestyle risk factors for heart disease and cancer, Dr. Willett's recent book for the general public, *Eat, Drink and Be Healthy: The Harvard Medical School Guide to Healthy Eating* (2001) has appeared on most major best seller lists. Dr. Walter Willett's lecture is sponsored by the Athenaeum and Health Education Outreach with a grant from the Meatless Monday organization, a public health campaign to lower the average American's saturated fat intake by 15% by 2010.

ATHENAEUM ETIQUETTE

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BODY OF REPORT – ENVIRONMENT RESEARCH

The second half of my independent study project was to investigate the concepts of environmental habitat and wildlife ecology. My research using the coyote as the central species would include a brief class, selective online search, short book list, extensive interviews, and several field trips. Because real life is unscripted, there were two unexpected events that also added dimension and richness to my studies.

Class – Joshua Tree National Park Desert Institute offers a series of classes to the public. The one I took for this project was called Coyote 101 and was offered at the main Visitor Center (see Appendix F.) I took the class in March 2003, earlier than planned because park personnel informed me that it would not be likely to be offered again. It was taught by a park biologist who was leaving and was meant to give an overview of the natural history of the coyote. I saw a display of coyote skulls, bones, fur, and scat (feces – particularly interesting because of the coyote's varied omnivorous diet). I learned about the basics of coyote population distribution, originally the west but extended by the near extinction of the larger predator, the wolf (19 recognized subspecies from Alaska to Central America); anatomy and physiology as similar to and distinct from other canids, including skull, skeleton and dentition; diet and hunting/ scavenging patterns; social organization (monogamous mating pairs, small packs of parents and offspring); and reproduction and rearing of pups (mating once annually in January/February; whelping in April; average litters of 5-6.) Our instructor told several anecdotes, including stories from Native American lore, usually featuring the unusual craftiness of this animal. Students also shared stories about their experiences with coyotes. We briefly discussed problems in coyote/human interactions. The class also included a field trip into the park

to view an abandoned coyote den. See Appendix E for a picture of the den, now occupied by a wood rat's nest.

Online Search – Next, I began by doing online searches of these subjects. My preliminary search conducted the year before when preparing my proposal yielded (as is often true with an unfocused search) the following 'hits' (articles about related topics): habitat loss 228,000; California habitat loss 67,500; coyotes (*canis latrans*) 5,920. Using the skills I gained in the first semester, I continued trying to focus this search, and my results were: 54 articles on habitat loss, of which I reviewed 27 and read 15; 19 articles on habitat loss in California, and oddly, nearly all of them from the above list; and only one article on coyotes and coyotes in California (again, the same). I was somewhat perplexed by this and tried using another search engine. This one turned up 1974 articles on habitat loss, which I found overwhelming. I then tried habitat loss in California and found 822, a bit more manageable, of which I reviewed 60 and printed 12; 175 on coyotes, and 27 on coyotes in California, some of them articles that were authored and provided by the researchers at the station. I reviewed 37 and read nine

Of course, I came across a plethora of environmental, ecological, and speciation issues. Most of them did not surprise me, although they may have discussed an endangered animal with which I was unfamiliar. But there were some surprises, too. For example, one article dealt with the need of oceanic fish for forest. At first glance, this doesn't make sense – until I read about seaside mangrove forest providing root systems for fish to spawn in; and the mangroves are disappearing. I learned more about the frightening numbers of threatened and endangered species – 1,265 plants and animals in the United States alone. I read about our disappearing Joshua trees and the threat of

invasive non-native plant species, such as tamarisk in the Grand Canyon. There are non-native invasive animal species as well, such as the brown tree snakes that have wiped out the avian population in Guam. And of course, in articles about coyote ecology, I learned more detail about some of the information presented in the coyote class, as well as an aspect that I hadn't thought much about but was about to see in person at a coyote research station – the controversial issue of "management" of a possible overpopulation of coyotes. See Appendix A for Bibliography and Appendix D for materials I plan to use in my class.

Book List – With the second half of my study project relying more heavily on interviews and visits to habitat, my book list for this subject was very short (see Appendix B for book summaries). It had been recommended to me to try to find a book called Skywalker, which might be out of print and difficult to locate. As it turned out, Skywalker is out of print, and I was not able to locate it. However, I also learned that it is a fictional account and as such may not be appropriate for my research. I had to change my mind about that stereotype, though, after I read the book Prodigal Summer by Barbara Kingsolver. Prodigal Summer turned out to be a work of fiction, and yet that did not prevent Kingsolver from making it an effective scientific and educational resource. Using a story about fictional characters as the means, she discusses the importance of having large predators in an ecosytstem – to cull the larger- numbered plant consumers (e.g., ungulates and rodents) as well as sicker and weaker members of many populations. The book also tells the story of the American chestnut, rendered extinct by a fungus brought in on introduced, non-native plants. This illustrates one of the dangers of invasive species that may have no natural predators or population control mechanisms in a new

ecosystem. Kingsolver also brings in a myriad of other environmental connections, including invasive non-native species, endangered species and even organic farming.

The only scientific book I found was Coyotes: Biology, Behavior and Management, edited by Mark Bekoff, published in 2001. This was somewhat surprising to me, but not as surprising as when I ordered the book and began to read it, only to find it was first published in 1978 – and continues to be reprinted with no new data! This was confirmed by the coyote researchers I visited with in February, but the book was recommended to me to read for background information nonetheless, to be supplemented by the more current scientific articles I would locate and/or they would provide. I noticed that Fred Knowllton, one of the researchers I interviewed and someone who is considered to be a top pioneer in the field, is cited but is not a contributor, and I wondered about that. When I asked him, he said that he was invited to participate but declined because he disagreed with the outline of the book. He didn't explain further, and I wonder if it is due to one of those 'insider' disagreements that those outside the field will never know about. I suspect that management is the source of most controversy within the field. I also wondered if there being no chapter on "benefits" to counter the chapter on "damage" might also be significant.

Another book that was recommended to me by the coyote researchers I visited was The Voice of the Coyote by J. Frank Dobie. Published in 1947 as a collection of anecdotes about the animals, it is nonetheless considered by experts to be an early attempt at accurate scientific description as well. Dobie is an English professor whose mother instilled in him a love of nature. As a former English teacher myself, I enjoy the

cross-disciplinary approach. Due to time constraints, I was unable to read this book, but I look forward to reading it in the future.

Interviews – Interviews were designed to be a mainstay of this segment of my project. I planned on first tapping the knowledge of my departmental colleagues, followed by experts in the field, and finally, scientists involved specifically in studying coyotes. I set up a schedule that allowed the information to build incrementally, however, due to scheduling issues with the many individuals involved, this could not always be adhered to. I don't feel it had a detrimental effect on my project. Whenever possible, I tried to prepare for the interview by designing a list of pertinent questions, and I knew that our discussion might diverge from my list.

First I interviewed Mt. SAC Biology Professor Sherry Schmidt. Sherry teaches the paired course Natural History of California with Geology Professor Damon Day. I suspected that the geology of an area is the primary determinant of the ecosystem of an area, and to a large extent, I was right. I learned about the ocean basins, levels of earth, and plate tectonics. Plate tectonics is currently the widely accepted theory of how one large body of land separated into several continents. How the plates shift and stabilize (via earthquakes, volcanoes, divergent and convergent forces) determines the type of rock composition of an area. The type of rock and its decomposition then determines the type of soil. Other factors, such as precipitation, sun exposure and evaporation, combine to allow the types of plants (producers) of an area. The consumers then are the animals that feed on those producers, and predators are the consumers that consume the consumers. Voila! That is an ecosystem. Since Sherry is also a zoologist, I asked her about the role of animals in habitats, especially coyotes. We discussed the types of habitats – desert,

mountain, grassland, woodland, wetland, and riparian – all of which can be found in Southern California, and in all of which coyotes proliferate. She taught me about corridors, pathways between two islands of land, which are an important factor in urban development because they can become blocked by freeways, etc., and alter the flow of wildlife, sometimes resulting in species isolation and extinction. She introduced me to the notion of keystone species, a species upon which others depend in an ecosystem. For example, coyotes are keystone species in wetlands because they prey upon the foxes that otherwise can wipe out a population, such as of birds, if allowed to breed and feed unchecked by any natural predators. Sherry also told me of the ecosystems we would see if I accompanied her on her and Professor Day's "Palms to Pines" field trip, which I later did.

Since plants are so crucial to the development of an ecosystem, I next interviewed Biology Professor Karyn Kakiba-Russell about botany, one of her areas of expertise. I learned about how soil is created from rock under the influence of weather, water and wind, and how the mineral composition of the soil will then differ. The soil and minerals, in addition to weather and sun exposure, support which types of plants can grow. I was reminded about the crucial role of photosynthesis in capturing solar energy and converting it to chemical bond energy, on which we all depend. This reminded me of my nutraceutical discussion with Mark Meskin about why we need carbohydrates. We discussed types of plants such as flowering, gymnosperm, etc., and the myriad ways in which they reproduce. This also reminded me of the book Botany of Desire and the theory of plants utilizing human desire as a reproductive strategy. Karyn taught me about the interactions between plants and animals, such as coevolution, mutualistic

relationships, and parasitic situations. We discussed kingdoms and types of plants, and key plants in ecosystems, especially California - such as sages, chaparral, conifers, etc. She taught me about the repercussions of endangered and extinct plant species on the other wildlife within a habitat and gave examples of endangered species. Karyn stressed how complex are the interactions within an ecosystem and told me of a planned biotic community that failed due to lack of knowledge of the complexity of connections, for example, microorganisms and contamination.

Next I interviewed Professor Cindy Shannon, who designed our majors biology course and is currently working on her doctoral research on bald eagles. She taught me about C. Hart Merriam's classification of life zones by biotic communities. We discussed the different types of ecosystems and qualities of each, and the role of elevation, precipitation, exposure, etc. Then we got into the specifics of the Southern Californian habitats. The Lower Sonoran desert from sea level to about 3,000 feet features *palo verde*, mesquite, Joshua trees, jackrabbits, roadrunners and coyotes; the presence of coyotes is somewhat unusual because mammals generally are poorer dispersers (one extinct mammal from this territory was a bison-sized rodent!) The Upper Sonoran from sea level to 4,500 feet features crossover, but also coastal sage, chaparral, oak woodland and grassland, quail, deer, reptiles, and of course, coyotes; competitive exclusion allows more than one habitat to survive in an area. The Transition Zone from about 5,000 to 7,500 feet features both mountain dwellers and arid occupants, depending on the side (sun exposure) of the mountain. From 8,000 to 10,000 feet lie the Canadian/Hudsonian areas with higher elevation conifers and flying squirrels. Finally, the artic alpine, above 11,000 feet, has harsh conditions such as sun exposure and rocky

soil, yet boasts sedge meadows. Cindy stressed, just as Karyn did, that there are so many interactions that are not yet known and that studies unfortunately tend to focus on pieces of an ecosystem rather than on the entire ecosystem. For example, in her own eagle studies, she will be looking at breeding patterns, but will still not be able to see all of the factors and behaviors that prepared for breeding.

These interviews were very useful to me. They set the stage for my field trips and more specific study of coyotes. I realized how much knowledge resides within my department that I can tap into.

I had already intended to interview Carla Wakeman, a fire ecologist with the National Forest Service. I knew that fire patterns could play a crucial role in the ecology of an area, and particularly in Southern California with its high temperatures, dry brush, and now, dense population. What I didn't know was that in between contacting and then finally meeting with Ms. Wakeman, a hugely influential event would occur. In late October 2003, Southern California residents experienced the largest firestorm in local history. A trio of simultaneous wildfires – the Grand Prix fire from Fontana to Claremont, the Cedar fire east of San Diego, and the Simi Valley fire burned over 750,000 acres of land in San Bernardino, San Diego and Los Angeles counties. 3,500 homes and 1,100 other structures were lost, and 18 people died. Interestingly, both Carla Wakeman and I live in areas that were evacuated, even though they are two very different and distant areas of the fires – she in Arrowbear and I in San Antonio Heights - but luckily, neither of us lost our home. I was out of town when the Fontana branch of the fire, fueled by Santa Ana wind conditions, suddenly spread west at an unbelieveably rapid pace. I became engaged in trying to get home to retrieve pets and personal

belongings. Unfortunately I was too focused on these tasks to even think about taking pictures, but later I obtained photographs from a neighbor of what we both had seen (see Appendix E). I knew that this astonishing event would enlarge the role it would play in my sabbatical study; I was going to have a greater personal interest in and opportunity to see what happens when fire devastates an ecosystem that then returns. This is discussed further at the end of this section.

I met with Ms. Wakeman in April on highway 18 between Lake Arrowhead and Running Springs. She wanted us to investigate an area that she knew had an interesting burn pattern. As I drove from the 10 freeway east to the 30 N to the 18 E, I noticed that the habitat changed dramatically from suburban to high mountains. I was struck by the vast expanse of mountain habitat that had been severely burned. The hills were black, and in some areas the trees appeared to be completely scorched; in others, there was a patchwork appearance. As I got into the rustic mountain communities, I saw cabin properties that had burned. I saw work crews engaged in fire cleanup – mostly sawing down and hauling away burned trees. On highway 18 there was even a detour because of the extensive amount of work taking place. We met at Peak's Arboretum in the San Bernardino National Forest and planned to hike some local trails. Unfortunately, due to fire damage, and even six months later, these trails were still closed. Instead, we viewed the outdoor nature displays as we talked, and I photographed examples of burn patterns, plants, animals, and scat, including both coyote and bear scat, the latter of which I had never seen before.

Carla taught me about the natural burn patterns of habitats in California – frequent cool ground fires that take out litter and shrubs, and infrequent (100-300 years) large fires

that crown the tops of and kill some adult trees – that are almost always triggered by lightning and fueled by factors such as temperature and wind. Unlike most of us, she has a positive outlook on fire. She explained that natural fire patterns are desirable because they clean out ecosystems that have become decadent. Fire makes nutrients available in the soil and activates seed banks. Seeds that need high temperatures in order to germinate can flourish, and non-native plants can be eliminated. As food sources increase, wildlife diversity also expands over time. In the short term, mortality is high, but eventually, the result is a healthier and more productive plant and animal community. Unfortunately, human interference has distorted nature's working plan. Population density, human encroachment into chaparral, fire management techniques and policies, and arson all contribute to the immensity and danger of current fire conditions, and wildfires that take a huge toll such as those that did last fall. And Southern California forest fire has been particularly fueled by the connected relationship between drought and infestation with both native and non-native bark beetles. Carla discussed what goes into land management agencies' decisions to enact controlled burns and gave her opinions as to which forests are currently being managed most effectively.

I had intended to interview Gerald Braden, of the San Bernardino County Museum of Natural History, about environmental research methods, and Glenn Stewart of Cal Poly Pomona, on mammalogy; however, due to availability problems, these interviews did not take place. I felt I learned a sufficient amount about environmental research and mammalogy from the other scientists I consulted.

Interviews with coyote experts took place during my trip to a field station and will be discussed in the following section.

Field Trips

Joshua Tree National Park

In January I returned to Joshua Tree where I had taken the Coyote 101 class. I wanted to see if I could locate and photograph the coyote den, as well as the distinctive granite monoliths and Joshua trees. I saw one of the coyotes that begs for food by the roadside. Visitors to wild areas are discouraged from feeding wildlife, as it brings them closer to human activity, often resulting in their death. (See Appendix F.) I camped overnight with some friends from my department at Cohen's Ranch, the only private property remaining in the park, and I was astonished at how cold it was. In southern California we refer to this area as the "high desert," but actually the Great Basin is the high desert, and Joshua Tree is medium by comparison, actually containing two desert habitats, Colorado and Mojave. We did some moderate scrambling up rocks to reach a Native American-style hogan that was built by the property owner in the 1940's, when he was already an elderly man. It was amazing to imagine anyone, much less an older man, moving large, heavy building materials up over the boulders and through the narrow crevices.

Predator Research Station, Utah

On the internet, I located a coyote research station in Millville, Utah – in the northeast corner near the Idaho border. The Predator Research Station, as it is called, is funded by the US Department of Agriculture and is affiliated with Utah State University in nearby Logan. So far, coyotes are the only predators that are being studied at the station. I emailed the station and was invited to visit by Director John Shivik. I opted to visit during mating season, which is in early February, and planned to stay for two

weeks.

I flew into Salt Lake City, rented a car, and drove up highways 15 N to 30 E into the mountains above the Great Basin at 4500 feet. After resolving some difficulty in locating the station – on the outskirts of town, fenced in, semi-buried under about four feet of snow, and devoid of passers-by as my arrival day was Superbowl Sunday - I was allowed through the gate by a security guard and directed to a trailer that serves as a 'bunkhouse' for visiting scholars. I was given keys and security codes to the facility and treated very generously. The next morning Director Shivik took me on a tour of the station and asked me to attend an afternoon meeting at which I could be introduced to various staff members – station coordinator and technicians who oversee daily operations – and graduate students who are conducting research. He discussed the "local culture," meaning the high proportion of members of the Church of Latter Day Saints throughout Utah and at the university. He explained the station's mission – to study effective coyote management techniques that can serve as humane, non-lethal alternatives to hunting and trapping, and that this involves both observation and experimental design. And he told me about unfortunate events at the station that had resulted in increased security, such as an alarm system, card keys, and a security guard from 6:00 p.m. to 6:00 a.m. on weeknights and for 24 hours on weekends.

One such event, and which apparently happened more than once, was attacks by supposed animal rights activists in which arson fires were started and coyotes were set loose. Two unfortunate elements of those attacks were that first of all, it seemed that the 'activists' misunderstood the purpose of the station, which is to help rather than harm the species; and secondly, that the released coyotes, having been born and raised in captivity,

either returned to the station or went to the town, approaching people and vehicles, which resulted in their being killed. That sad story certainly illustrates one of the central controversies about coyotes, the fact that they are viewed so differently by different groups – either as innocent animals that need to be protected from human cruelty, or as dangerous varmints that need to be eliminated for human safety, and everything in between. And this controversy is as close to home as Walnut, CA. In an effort to prevent suburban coyotes from being trapped and killed, Professor Tim Revell of my department at Mt. SAC wrote an article in the local newspaper about the relative harmlessness of these animals. The city council nonetheless voted to use lethal means, and this decision is mirrored in other communities.

The other incident that John informed me about was of particular interest to me because of my background in human sexuality; it also really made me appreciate his courage and openness in inviting an outsider to visit the station following these traumas. A former employee had apparently committed a murder on station premises three years before; in the week just prior to my visit, his trial had concluded with his being sentenced to life in prison without possibility of parole. Although shocked and saddened, I was also interested in this event, because one of the most difficult areas to teach in human sexuality is the study of sex crimes. Although only a few bones from the young female victim had been found, the murder was likely a sex crime because of evidence of other such crimes perpetrated by the same offender. This murder gave me many things to think about. I visited the local library and copied newspaper articles about it (see Appendix F), visited the site where the "accident" (as the perpetrator called it) supposedly took place, and viewed the area where he burned and buried her body. As an urban dweller, I rarely

spend time in a place as remote as the station. When the personnel left for the day, the icy landscape was desolate. I thought about what it must have been like for a young woman to be in such a place with a man who would turn out to be her killer. I must admit, on more than one occasion, I heard the sound of the coyotes howling and found myself peering watchfully out at the moonlit fields and shadowy buildings. I pondered the troubling fact that although there was considerable circumstantial evidence to convict the station employee, there was actually no forensic evidence linking him decisively to the crime. I realized how dependent our criminal justice system has become on DNA testing, available for only the last 20 years – both to convict the guilty and to free the innocent. Of course this unfortunate incident brought new meaning to the term "predator" research station, and I was informed that this had been insensitively dramatized in a cartoon in the local newspaper. I examined how, in some ways, I appreciate the characterization of certain types of sex offenders as predators, meaning that they often and repeatedly plan their actions and stalk their "prey." On the other hand, it disturbs me that healthy animals who are just doing what nature intended for (and what their biology directs) them to do, that is, killing for food, are compared with the evil that humans are capable of, that is, killing for pleasure.

John had asked me to consider making a presentation to his staff on a topic from my discipline. We discussed it and settled upon a combination of nutrition and stress management. We scheduled it for my second week during the station's regular staff meeting time, and we invited the graduate students and faculty from USU who are involved with the station. I like to cook when teaching about nutrition, so we set it up as a luncheon at my bunkhouse, during which I would lecture. I prepared a healthy

vegetarian meal consisting of 3-bean chili, salad, low-fat nachos, and a fruit and yogurt parfait dessert. Ten people attended the luncheon/seminar. I was concerned that, as biologists, my audience might already be familiar with my information; however, I quickly learned that they were not. I introduced the U.S. Public Health Service's Healthy Goals for the Nation 2000/2010, a huge, multi-disciplinary program for measuring leading causes of death and disability, identifying risk factors, and then targeting educational programs to the populations most at risk. Since three of the top four - cardiovascular disease, cancer and diabetes - all have both a poor diet and stress as risk factors, it was easy to direct my talk toward their health habits and stressors. I was able to incorporate the information I'd learned on the Food Guide Pyramid from attending Dr. Walter Willett's talk during the fall semester. I also directly addressed the stress of the recent murder trial that they had experienced, explained my background in human sexuality, and offered to be available if anyone wanted to discuss the subject. Afterward, I provided handouts on both nutrition and mental health. Both the talk and the food were very well-received. In the following days, several participants commented to me that they had begun making changes in their habits, but no one approached me to talk about the murder.

While visiting the station, I had the opportunity to speak with some of the world's leading coyote experts. Three of these I met when I attended a humorously named "carnivores' lunch" in the Biology Department at Utah State University. Professor Fred Knowllton is considered by many to be the premier pioneer in coyote research since his early work in fossil studies. Fred actually started the research facility. He currently has no teaching responsibility and is solely involved in publishing scientific articles. He

does not get involved much in the day-to-day activity of the research station. However, twice after a snow storm I saw him clearing snow with a large tractor, which he said he did for relaxation. John had pointed out to me that some of the oldest buildings on the property were poorly constructed because they had been built on a shoestring budget by biologists rather than architects or engineers. I like the sense of history and commitment that that conveys. I interviewed Fred and had a fascinating conversation with this 'coyote elder.' He wants the public to appreciate what a versatile and adaptable animal the coyote is, and he hopes one day to write memoirs about their intriguing behavior, including examples of animal altruism that contradict both popular and scientific opinion. He explained the difference between studies of captive versus wild populations – the findings being essentially the same, but the percentages different (as a result of interaction with humans). One of the key findings of coyote research has been the evidence that it is primarily the alpha coyotes who both mate and tend to kill livestock to feed their young; yet, it is typically not the alphas that are caught and killed. This has tremendous implications for coyote management programs. He described some of the main differences that have resulted in wolves being decimated while coyotes prosper – that they are high in "neophobia" (wariness of the new), while wolves are not. He also told me of some upcoming research on whether alpha coyotes bear alpha pups, with an interesting piece on what mates the coyotes would choose when given the opportunity (at present at the station, their mates are selected for them). We discussed the grim outlook for wildlife and habitat and his belief that society has not but must become willing to choose what is important to us. The local eastern mountains, he said, are a perfect

example – with much controversy over whether they should be used for timber, water, wildlife, or recreation.

Professor Mike Jaeger has been directly involved in supervising some of the aforementioned research. I interviewed him, and he gave more details on how the studies that Fred described have been carried out. He said that in spite of radio telemetry studies in the wild, very little is still known. His most interesting anecdote illustrated the true intelligence of especially the alpha coyotes –with a videotape capturing raids on a food source, the alphas were able to eat without being filmed! He plans to focus his future studies on animal cognition.

Professor Eric Gese is involved in both coyote and wolf research. I tried to interview Eric, but he came down with a bad case of the flu and had to curtail his activities. Professor Robert Schmidt from the Department of Environment and Society was recommended to me instead as someone who not only has been involved with wolf research, but also has a good grasp of the 'big picture.' I interviewed Robert, and he told me of many issues worldwide in which human desires with regard to animals are in conflict. For example, he asked me to name five foods I normally eat and then explained how those foods, although derived from plants, involve the killing of animals, for example through land cultivation.. He invited me to sit in on an interesting course he teaches on human/animal interaction. He showed a film called "Varmints," about the sport killing of prairie dogs in spite of the fact that prairie dogs are a keystone species in prairie habitat. Robert helped to conduct a study on the projected impact of the miraculously recovered Yellowstone wolves' moving toward Utah; the university's funding was actually threatened as a result of this project, with conflict between the

Board of Trustees and the state's Farm Association, which wants to prevent wolf reintroduction in the area. He gave me a copy of the report, the gist of which is the presumed recolonization., positive environmental impact, potential problems for residents, and management/education programs.

I also met several graduate students and learned about their projects. Ann Kitchen was doing her dissertation defense, and I attended her presentation on the "Social and Spatial Ecology of the Swift Fox" (similar to the protected kitfox). A great deal of her findings had to do with the effects of habitat loss on population density and social structure, including a 52% rate of extra-pair paternity (surprising since wild canids tend to be monogamous) – perhaps an adaptive strategy to ensure fertilization.

Debra Carlson was recommended as the station's leading expert in coyote reproductive behavior. She was in the process of analyzing her dissertation data. Debra introduced me to the observation posts for watching coyotes. Currently the roughly 100 animals are housed in one of three – and soon to be four – types of situations. The kennels are the oldest and the smallest. They still house the largest number of coyotes just because there are so many of them, but the mission of the station is moving toward providing the animals with larger territories. They will probably always be used for something, for example, separating a mating pair during the mating season to control fecundity, or keeping an animal under closer watch for a medical problem. I did most of my observation in what are called the "clover" pens, so called because they resemble the clover plant. Three chain-link pens emanate out from a center building that serves as a blind. From the blind one can quietly watch the coyotes through tinted glass, set up audio or video equipment to capture sound or picture when researchers are not around, and

access the coyotes for blood tests, medication, veterinary visits, etc. This access takes place through a barrel-shaped "den" which attaches the blind to the pen and also is where the female goes to give birth to her litter. I observed a 'capture' of a coyote for a blood draw; three technicians enter the pen from three different directions, the coyote moves into the den, the outside den door is sealed, and then from inside the blind the inside den door can be opened, and there is the coyote. I was very impressed with the tenderness with which the technicians handled the frightened animal. I spent many hours, both alone and with Debra Carlson, sitting in the blinds observing the coyotes. I probably would have stayed even longer had not the below-freezing temperatures finally driven me inside. The coyotes, however, seemed quite comfortable being out in the cold weather. This is interesting when juxtaposed against the temperatures of over 100 degrees that are commonplace for desert coyotes, and once again illustrates their vast adaptibility.

A pen called a "pie" pen consisted of a raised blind that oversaw several chain link pens on the order of slices of a pie. These slices were quite large and allowed the coyotes to have much larger territories during warmer weather; during colder weather, the slices were minimized with gates. I also saw a huge territory that was about to become the home of a pair of alpha coyotes for a number of studies. According to John, those larger territories were the goal to strive for, not only for the comfort of the present animals, but also because they afforded an opportunity to more closely approximate conditions in the wild, which makes for more accuracy of study.

Most of my observation time was spent in the blinds in the clover pens. These housed mating pairs of coyotes, and it was mating season. I observed a great deal of the behaviors studied by Debra, for example boundary-protecting behavior (e.g., patrolling

the perimeters, marking territory with urine and scratching), social behavior between pairs whose pens (and therefore territories) abutted each other (e.g., marking, growling, howling), mating behavior between the mated pair (e.g., following, touching, bumping, sniffing, licking, and mounting), and finally several "ties" – successful copulations in which the male's penis engorges to the point that the couple cannot separate, and they turn around until they are joined at the groin but facing in opposite directions. Ties are recorded so that the coordinator knows from which pairs to expect puppies, and I was asked to turn in these records as well. Pups would be born in April and would become the station's new generation of study coyotes.

I also conducted brief interviews with John and the station coordinator Doris (whose last name I apologize to have forgotten) about funding and operations of the station. The station's annual budget, including salaries and benefits, is $1.5 million. And I went out on the feeding rounds with one of the technicians (technicians are often working on their Bachelor's Degrees at the university). He explained that the coyotes are fed a high-protein commercial mink food, and I wondered about the effects of a diet lacking plant foods. He told me that in spite of the animal handlers' familiarity with the animals, because the coyotes are still unpredictable wild animals, all the technicians had been bitten at some time.

Prior to going to Utah, I purchased a digital camera. I assumed that this sabbatical project would probably be my one time-limited attempt at nature photography and thus bought a camera that is more suited to snapshots and portraits. That is a decision that I regret now, as I found I enjoyed photographing the animals and the beautiful snow-covered vistas. I took about a thousand photographs while on this field

trip and continued to take more when I returned home. The problems with many of my photographs are that, first of all, I was new at using the equipment and needed a lot of practice. Secondly, I discovered why the camera I selected was not the most appropriate – the mountains stand still, but the coyotes do not! I ended up with a great many shots of the hip or ear of a coyote. Some of my shots had nothing at all. This actually helped to illustrate for me this animal's high level of activity – constantly monitoring its territorial boundaries – as well as neophobia, fear of anything new and unfamiliar.

Besides the coyotes themselves, there were other issues and animals to consider. One was a row of elk resting up on hills high above the station. Had they not been pointed out to me, I probably would have assumed they were part and parcel of the pine trees that also stretched across that high landscape. But between 3:00 and 4:00 p.m., some of those 'pines' lumbered to their feet and began a long trek down the hillside. And at 4:00, a woman and her grandsons drove a tractor along a game fence that separated the station, and they unloaded large bales of hay. I learned that the station was formerly the winter grazing grounds for the elk. If not for this woman's generous intervention, what would happen? What is more important, the coyote research of the university, or the grazing of the elk? There is some concern among station employees about what will happen when the elderly woman passes away. This illuminated for me how complicated is the competition for resources in our world. In some ways it is not that different from the controversy over drilling the Alaskan wilderness for oil, or burning valuable South American rainforest for land to graze cattle for McDonald's hamburgers. Every constituency wants its piece of the pie.

Before leaving Utah, I drove northeast up Highway 89 through Logan Canyon, carved by Logan River. Logan lies in the Cache Valley at 4500 feet, between the Bear River Mountains to the east and the Wellsville Mountains to the west. The entire area is part of the Great Basin which stretches to the eastern side of the Sierra Nevada in California and includes mountains and true "cold" desert, based on the relatively high elevations; the desert is the largest in the nation. The Great Basin habitat is so called because the geology does not allow for mountain tributaries to flow to the sea, hence creating a "basin." It includes areas such as Mono Lake, the Great Salt Lake, and Great Basin National Park, and it dates back to the Pleistocene era. (See Appendix E for additional photos of Great Basin habitat.)

This canyon was beautiful, with its stark winter trees and icy water. I saw habitat from transition to Canadian/Hudsonian; in the winter, most of what was visible was conifers and rock edifices. There were cottonwoods, aspen, fir and pine. I didn't see wildlife, but deer, elk, black bears, beaver, and migratory birds supposedly abound in spring. These are the eastern mountains to which Robert Schmidt referred when he gave an example of our society's being in conflict about what we want to use land for. In spite of the cold temperatures (below zero Fahrenheit – and there were days during my trip when temperatures reached 30 below, not including wind chill factor), there was a fair amount of human traffic, and evidence of human recreation, such as signs for hunters, ski and snowboard tracks, and campgrounds. I didn't quite make it to Bear Lake at about 7800 feet. Due to time constraints, I turned around and went back to the station, where I spent my last hours watching and photographing the coyotes, the elk, the "accident"/murder sites, a beautiful sunset over the snowy plains, and the warm light

glowing from my bunkhouse. I did not want to leave, but the next morning, I drove my rental car back down the mountains and flew out across Salt Lake.

Later John sent me a picture of a coyote pup, since I wished I could observe their birth and nursing but was not able to. John also aspires to creative writing and gave me a copy of a story of his that will be published in a collection of biology field memoirs.

Besides the beautiful winter landscapes, I enjoyed being exposed to the culture of small-town Utah, so different from metropolitan Los Angeles. Twice I ate at the one local public bar, frequented mostly by university students and employees, and which served delicious bratwurst and sauerkraut, foods from my childhood in German-influenced Pennsylvania. I noticed that people of color seemed almost invisible in the human landscape, even at the university. I was surprised to see that religious meetings were held in public buildings, and one newspaper article about the murder reported that the jurors prayed before entering deliberations. A bout of muscle spasm led to a delightful interaction with a Mormon masseuse and mother who surprised me with her liberal attitudes about environmental issues. Robert Schmidt had told me that the original Mormon leaders were quite eco-friendly, but that the current church dogma has moved away from that stance.

I had hoped to contrast my experiences at the station with exposure to a radio telemetry study of predators in the wild that has been taking place in the Santa Monica Mountains. I contacted lead researcher Dr. Robert Wayne of UCLA (and incidentally, someone who has made controversial history in the field with his studies of canid population genetics.) He referred me to head field biologist Seth Riley, who informed me that the study had concluded and who did not seem to want to meet. I had also planned

on visiting Wildhaven, a rescue operation for wild animals in the San Bernardino Mountains that had a rescued coyote among others; but unfortunately, Wildhaven burned during the 2003 wildfires, and many animals, including the coyote, disappeared.

"Palms to Pines"

The "Palms to Pines" field trip took place in March. It is an excellent example of the diverse major habitats of California, nearly all of which can be accessed within one day! I thought the trip was named by the course instructors, but later I learned that it is a recognized nickname of scenic Highway 74. The trip started at Mt. Sac, traveled the 60 E to Highway 74 E, one of California's designated picturesque roads, passed Idylwild forest, dropped back down to go by the Salton Sea via highways 111 and 86, traversed what are called the "badlands" on Highway S22, and finally ended in Anza Borrego State Park. Near Anza Borrego I planned to leave the trip for awhile in order to visit relatives. Professors Sherry Schmidt and Damon Day led a caravan of vehicles and stopped at designated sites to point out the geology and biology of an area. The first stop was on Perris Plain, a *bejada* or alluvium deposition that now drops into farmland. We observed the pass – corridor – between the San Gorgonio and San Jacinto Mountains; unrestricted corridors allow wildlife to migrate and interbreed to enhance their genes. We could see in the distance the San Jacinto fault. We also found ourselves disturbingly close to a pesticide-spreading helicopter that suddenly appeared! It was a real reminder of the intrusion of human activity, and I thought about how many such chemicals are spread, and how they affect the plants, insects and other animals, as well as humans, in an area. I also thought about the alternatives to using artificial pesticides, and how little of this is being done.

At this point, because my vehicle was not as efficient as the rented vans, I lost track of the others. I feared that I would not find them and had a contingency plan to just abandon the field trip and go on to visit my family. But not too long after, I found them again. We were on Highway 74, and they had stopped by the side of the road to observe coastal sage scrub habitat at 2000 feet. We saw the key plant black sage with different levels of growth, also *yerba santa* and buckwheat, as well as stream terraces formed by rainfall in a step pattern. On our next stop, we were at about 3,000 feet. This was a lower ("warm") chapparral habitat with the dominant plant chamise. We discussed fire adaptation and the role of fire suppression. The instructors pointed out the difference in the plant life on north versus south facing slopes due to evaporation. We saw deadly nightshade and learned about buzz pollination, and the parasite "witch's hair" (unable to photosynthesize). Coyote scat marked their obvious presence here. Very nearby, we visited a riparian environment, with a stream, canyon live oaks, and various deciduous trees and flowers.

At about 5,000 feet we stopped on Lost Trail Road to examine the upper ("cold") chapparral. In a river canyon along the San Jacinto fault, we were high enough to view Mt. Baldy near my home. We viewed the less fire-adapted manzanita plants. Once again, we saw coyote scat. Next, at Pinion Flats, we stopped in a pinion/juniper woodland, where the wildlife migrate up and down with the seasons. We learned that this is an ecotome, between mountain and desert, with high species diversity from the proximity to two communities. We saw the juniper whose berries make gin, pinion pine, and scrub oak.

I was hoping we would stop in Idylwild, but due to time constraints, we passed it and ended this leg of our journey at Vista Point, overlooking the Colorado desert valley. Here we were moving back down and began to see cactus, cholla, and lizards. Our instructors pointed out the Mesozoic rock formations and informed us that at the time of the dinosaurs, these majestic mountains were underground. We saw a display about the native Cahuilla hunter/gatherer tribes that once inhabited the area. From here we went on to camp in the starkly beautiful Painted Canyon.

In the morning, we explored Painted Canyon, a dry sandy canyon wash that once contained rushing water. The rock formations are unique, as they include sedimentary, granitic, metamorphic, and sandstone, and are "painted" which means that bacteria cause minerals to stick to the rock. Due to water erosion, they rise dramatically and vertically from the floor of the wash. In spite of the stark habitat, I was amazed at the examples of teeming life. We learned about the concept of "model and mimic," in which one species evolves to resemble another in order to reap its benefits (here it was the ghost flower, which produces nectar, and its mimic, the blazing star, which does not and yet gets pollinated anyway.) We saw smoke tree, ironwood, ocotillo, a family of chuckwalla lizards, a scorpion, ravens nesting high in the rocks, and even some scat that more closely resembled fox than coyote – though coyotes would most certainly also traverse the canyon's natural sandy 'highway'. Our instructors pointed out the erosional surfaces that marked what was once the river bank.

After leaving Painted Canyon, I separated from the class and drove past the Salton Sea and through the "badlands" to Borrego Springs. The Salton Sea is a migratory bird habitat that is considered to be an environmental disaster because of pollution. The

badlands are made up of rolling rock formations up to 400 million years old, where mammoths and sloths once roamed. The habitat is unforgiving and isolated, but in spite of the harsh conditions, there were still ocotillo and other desert plants, and no doubt animals, although I didn't see any. This was a very lonely leg of the journey, as there are no human structures and few travelers.

I rejoined the class at Palm Canyon in Anza Borrego State Park. This park is the largest state park in the United States (600,000 acres) and the oldest in California., and its name is a combination of a Spanish explorer (Anza) and Spanish for the now protected bighorn sheep (*borrego*). The canyon is distinctive because it is hidden behind desert flatlands on an alluvial fan that is still being dissected by streams. The life of the rock formations spans from 3,000,000 to 80,000,000 years old - boulders, metamorphic rock, plutonic rock, as well as the beautiful 'varnish' left by the combination of minerals and bacteria. A trail that begins on dry sand begins to follow a stream and finally ends in a lush palm oasis complete with waterfall and boulder-formed pools that is nearly invisible from the dry desert beginning. This year the pools were nearly nonexistent due to heavy winter rains that moved the boulders downstream. It is mind-boggling to think of a stream being able to move boulders larger than a human being. On the way to the oasis we observed poisonous jimson weed, desert lavender, mesquite and *chuparosa*. We saw *metates*, round depressions in rock that were made by thousands of years of native peoples' using grinding stones to make grain. I learned that there are only 150 native palm oases left in the Southwest. One theory about the location of the palms has to do with coyotes – being omnivores, coyotes eat the palm dates; they need water to defecate

and therefore defecate the date seeds in a moist canyon area with a running stream; over time, the seeds then eventually sprout into the palm oases.

Anza Borrego has a unique visitor's center which is built under a slope so that most of it is underground. The center features an ongoing schedule of narrated slide shows. We watched the one on desert wildflowers and learned about the various factors that influence a 'bumper crop' of wildflowers, such as rainfall, fire, etc. Wildflowers are a tourist-attracting spectacle at this time of the year, and certain viewing areas had sweeping vistas of flowers and lines of admiring people driving by in vehicles.

I had intended to camp again with the class that night, but the instructors were concerned about my vehicle's tendency to get stuck on a sandy road (which had already happened once in Painted Canyon). So at this point I rejoined my family. However, the next day I took the same route home as the class, Highway S22 to 2 to 79 to the 15 Freeway. Highway 79 in particular is quite beautiful, very rural and lined with oak woodlands. I saw areas of oaks that were burned right next to some that were not. I learned later that when I stopped to photograph the oaks, the student caravan passed me by. I decided to return later to spend more time in the oak woodland.

Evey Canyon

I accompanied Professor Cindy Shannon to Evey Canyon in April. Evey Canyon is near my home (on the opposite, north, side of the San Antonio Dam) and had also burned in the October wildfires. I wanted Cindy to illustrate some of the habitat biodiversity we had discussed, and she wanted to examine the area for its appropriateness as a field trip site for her classes. The canyon is on the edge of the Angeles National Forest and would be similar in some respects to San Antonio Canyon which runs along

the road to Mt. Baldy. However, it does not go as high up as Mt. Baldy, and it is not developed at all. In the 1950's, the owner sold it for $1 to the Pomona/Claremont Colleges with the stipulation that it not be developed; instead it is used for instructional purposes requiring a permit. It consists of a small parking area with a 'no trespassing' sign and a trail. We did see a few other hikers there, as well as evidence of human use in the form of grafitti and trash.

The canyon had been known for its biodiversity. The rise in elevation allows for three of naturalist C.H. Merriam's five life zones – Upper Sonoran, Transition, and Canadian/Hudsonian. The ecosystems include coastal sage scrub, chaparral, riparian and mountain. So within a relatively short hike, one can see a wide variety of plants and animals. Since I hadn't seen the canyon before the fire, I had nothing to compare it with. However, what Cindy described was that it was extremely changed. There were trees and foliage, but apparently the foliage had once been a thick jungle that one could not even see, much less walk, through. We saw the same wild cucumbers that were proliferating in the area near my home since the fire. Cindy pointed out mugwort, which is the antidote to poison oak and is often found growing near it, but we did not see much poison oak yet. (This is one of nature's delightful sensibilities – providing a problem and its solution in great proximity.) Nor was there much of the bracken fern which had been prevalent before the fire. As Cindy explained it, fire is a natural part of this ecosystem; however, human fire management that allowed a buildup of underbrush had likely taken the water from conifers such as coulter pines, creating a much more severe burn pattern. It was gratifying to see that there was new growth high up in the coast live oak trees. As predicted after a fire, we saw a lot of colorful flowers, including Indian paintbrush,

morning glories, and lupin. Two plants that seemed unusually large were a purple lupin and a wild asparagus. The one white fir that had marked the Transition Zone from Yellow Pine to Upper Montane had been killed by the fire, and Cindy surmised that that was the likely fate of most of the Canadian/Hudsonian plant life.

We saw evidence of erosion, large buildups of rocks and branches that had been washed downward by the winter rains. Some of this is natural, but it was no doubt exacerbated by the fire and resulting lack of protective brush. In a populated area, these post-fire mudslides ruin homes and automobiles and even take human lives, such as the ones that killed 14 people attending a church camp in the San Bernardino Mountains after the October fire.

We saw little wildlife. We heard some birds high up in the trees but were unable to identify them. We did not see the expected ground squirrels or lizards. This is not to say that the wildlife was absent. It is likely that it was reduced by the fire and would return over time as food sources increased. The time of day – midmorning – as well as the time of year, and resulting chilly temperatures, were no doubt contributing factors to the lack of wildlife, too.

Cindy decided that she would use the site for field trips, because in spite of the fire, it still represents several life zones and an opportunity to discuss fire ecology.

Angeles National Forest

I also made a brief visit to the Wrightwood area in April. I traveled the 210 W to the 15 N to the 138 W. I planned on camping and exploring the yellow pine habitat, but I was surprised to find that what was a misty drizzle at home became a snowstorm in the mountains. I was worried about road conditions and did not stay long.

San Bernardino Mountains

My interview with fire ecologist Carla Wakeman took place in the San Bernardino Mountains in April and is described in the Interviews section. See also photographs in Appendix E.

Newport Back Bay

At the end of April, I went to Newport Dunes on a department camping trip. We try to do one trip a year together as a group, with family also invited, of course. It is always a challenge to select a place that will potentially meet everyone's needs, as some people will only camp, and others refuse to camp! In light of this, I suppose we are lucky to usually have an attendance of about 30. I traveled the 210 W to the 57 S to the 55 S to Highway 1. And although I enjoyed the trip, personally, I did not like the campground, as it is a very busy RV park. Some bluffs behind my campsite were pretty to look at, but above them was a noisy street, and there was the constant sound of RV's driving in and out of the park. We hiked a road that went along the marsh wetlands, but even that walk was disturbed by traffic and some rather dangerous competitive bicycle racers on the bike path. We did see a lot of avian species, including herons and snowy egrets, and as usual, I photographed coyote scat. This area is one in which the coyote is a keystone species, predating smaller animals such as foxes that would otherwise decimate the bird populations. In Southern California, an estimated 80% of wetlands are lost to development; in the central valley, that number reaches 96%, with agriculture being a prime culprit.

Some members of my department went kayaking in the bay, and I did not join them because I am a poor swimmer. In retrospect, I regretted this decision, as the water

was very calm, and being with experienced kayakers would have given me more opportunity to evade the RV's and get closer to the natural habitat. I did spend some enjoyable social time with my department members, however.

San Simeon State Park

In May I visited San Simeon. I traveled freeways 210 W to 5 N to 101 N, in order to reach historic and scenic coastal Highway 1. Along the way, I noticed how drastically the scenery changed from densely populated urban areas, to uninhabited mountain passes, and finally to the sparsely populated coastal bluffs. I noticed how much oak woodland seemed still to remain if one judged by the grassy, oak-spotted slopes along the inland section of 101 near San Luis Obispo; yet this is misleading, because a fungus has caused these trees to become threatened. The vegetation changed as I drove north into habitat that receives more rainfall, and I saw more pine and fir trees. Of course, the ocean shores are still beautiful, but one can't help but be struck by the proliferation of businesses, signs, and of course, vehicles that one sees there. At least the power of the ocean, the swells and caps, still seemed unsullied by human hands.

I camped in the Washburn primitive section of San Simeon State Park, which includes both coastal and Monterey pine forest habitats and has a view of the Santa Lucia Mountains. I was met by State Parks biologist Callie Hurd. I was surprised to see motorhomes in this section, as I had mistakenly assumed that these travelers camp either in RV parks or in the less primitive sections of campgrounds. Ms. Hurd explained that they can do without hookups by running their generators during daytime hours; this fact was then unpleasantly driven home to me by a neighboring camper who ran his extremely loud generator for what seemed an interminable time, annoying to me when I wanted to

hear the sounds of birds, the ocean, etc. This was one instance that got me to think about the policies governing wild and semi-wild lands, and how difficult it is to meet the competing needs of those who want to engage in comfort and recreation versus those who want to enjoy and preserve natural areas. We walked a trail that ended at the beach. Along the way we saw the coyote scat that marks their presence there. We saw the nesting area of the California plover, now protected because of its endangered numbers. It nests in the fragile shore vegetation, so signs warned about walking carelessly or taking dogs on the beach. Once again, the wants of humans versus the needs of wildlife were illustrated. Callie is a 'birder' who has worked on endangered avian projects involving the bald eagle in Canada and the willow flycatcher along the Colorado River. As we walked, she pointed out several raptors, including a peregrine falcon, as well as a struggle for mate or territory that took place between a ret-tailed hawk and another hawk. Raptors are protected because of the severe threat posed to their numbers by years of agricultural spraying with DDT. This is a good illustration of how seemingly unrelated things are connected in nature, because the DDT was sprayed on plants; rodents ate the plants; raptors ate the rodents; and they died. Callie also pointed out mud nests built by barn swallows under the highway bridge.

She invited me to accompany her and some colleagues on a tour of the Hearst Castle. Although I'd visited the castle once about twenty years ago, I decided to go again because it seemed the epitome of human opulence to contrast and compare with nature's simplicity and majesty. Once the playground of the rich and idle, the castle today is a State Parks tourist attraction, complete with a gift shop and docents who dress and pose in the styles of William Randolph Hearst's and the castle's heyday. As employees and

their guests, we were even allowed to swim in the Neptune Pool! This is a huge, spring-fed outdoor swimming pool, larger than my entire property I believe, inlaid with elegant tile and surrounded by Greek and Roman statuary. It was exciting to do, because apparently very few guests are ever permitted to swim there now. During a box lunch meal served in the quarters of the tour guides, we heard of the wildlife, including coyotes and a mountain lion, that still roam the wilder outreaches of the immense property. I love luxuries as much as the next person, but as the evening wore on and I saw room after room of the highest level of conspicuous consumption, I found myself longing to return to the campground. And when I did return, the generators were quiet, and the howls of coyotes greeted me.

King's Canyon/Sequoia

In June I traveled to King's Canyon and Sequoia National Parks. I had not visited the Sierra Nevada before. I drove the 210 W, 5 N, and 99 N freeways to Fresno, where I picked up Highway 180 E into the parks. As I crossed over the Grapevine, I saw the typical farmland that dominates the central interior, and whose product is a large part of the California economy, including crops such as grapes, olives, and avocadoes. Around Fresno I noticed a great many waterways that fed the complex irrigation systems, but only later did I realize that these were also the King's River and its tributaries, the source of which I was about to visit. Along Highway 180, I noticed how the vegetation changed as elevation increased, and how similar the change was to the Palms to Pines field trip as well as my day trip to the Lake Arrowhead area - from coastal sage to chaparral to transition and beyond. By the time I reached Grant's Grove, I was at nearly 7,000 feet. As before, I noticed how flat the land became in the tall tree forest, which could mislead

one about the altitude, and is obviously why 'settlements' - such as cabins, ranger stations, a few stores, inns and gas stations, and campgrounds – are found there. I was confused about the different stations I stopped or was stopped at – some being 'national forest,' some 'national park,' some 'campground,' and each with different fees, characteristics, and rules and regulations. At the Grant's Grove ranger station I realized that I must choose between the pine forest, the canyon and the river, or the sequoias; although tired, I decided to drive the additional hour into the canyon, and I was glad I did.

From the top of the canyon, one can see the two (north and south) forks of the King's River; from such a distance, it appears little more than a trickling stream. It disappears from sight as one winds down the canyon road, and then suddenly it appears again in all its raging glory. I followed it along nearly to the end of the highway and camped in the only open campground, Sheep's Creek in the Cedar Grove area. The creek was actually a trickling stream and bordered the edge of my campsite. I saw many conifers, such as cedar, Douglas fir, sugar pine and ponderosa pine, and around the stream, many ferns and mosses. I noticed that there wasn't much brush in the area; rather, a bed of pine needles and leaf litter. I saw gray squirrels, robins and Stellar's jays, and heard a woodpecker, most likely an acorn woodpecker, whose pecking ricocheted loudly off the tall trees throughout the day. There were literally hundreds of bright yellow and black admiral butterflies. The King's River was both majestic and frightening in its power, with churning white water and gigantic boulders; water recreation is not even allowed there because of the danger. This was the only habitat I visited in which I did not observe coyote scat; however, park literature confirms that they are part of the wildlife community. A much greater emphasis is placed on the black bear. I was

surprised and pleased by the effort to educate visitors through the literature, as well as providing bear-proof cupboards to store food and even cosmetics in. I am not used to camping in bear country and foolishly did not read the literature until my second day; at that time I discovered how risky it had been to store my cooler and food in my vehicle the night before, which I had thought was the proper thing to do! Apparently this effort is meant to prevent bears from scavenging campsites and becoming a nuisance, which in the past has resulted in their being destroyed.

On the way out of the canyon, I stopped for gas at an inn and gas station that obviously dated back to the 1930's or '40's. After punping for a bit, the attendant had to stop and wait for more gas to be sucked up into a clear cylinder by gravitational forces. It reminded me of how difficult it must have been to bring 'civilization' to these areas – to build the roads around the mountains and establish utilities such as telephone and electricity. It also made me appreciate the efforts of naturist pioneers - such as conservationist John Muir, writer Rachel Carson, and photographer Ansel Adams – who worked to preserve wild lands and attempt to protect them from the negative attributes associated with advancing population, and/or to document their beauty.

I did not go into Sequoia National Park proper, but I did visit the Grant's Grove display of the third largest tree in the world, the sequoia named for Ulysses S. Grant. I wondered why these trees were named for famed military personnel who I imagined never even saw them. I've never seen the sequoias before, and it was quite humbling to stand in the shadow of these silent giants. Once again I met with State Parks biologist Callie Hurd, who explained some of the natural history of the tree. Especially significant is its dependence upon fire to germinate its seeds; due to fire suppression, new sequoias

virtually disappeared until biologists made this connection. One thing I did not understand was why there was a pine forest down at the bottom of the canyon, and she surprised me by telling me that the canyon is actually at over 4000 feet elevation! Near the top of the canyon road I had seen a sign marking 4000 feet elevation, so I was confused by how these disparate areas – one seeming very high and one seeming very low - could be the same. Callie felt that the sign was probably erroneous. Park literature confirmed that the canyon's elevation is surprisingly high for such a deeply carved waterway. This indicates the height of these mountains, including the highest peak in the contiguous U.S., Mount Whitney at 14,494 ft. Callie identified the geologic formations as granitic rock polished by glaciers, hence their lighter color in contrast with granitic rock oxidized by the sun. Apparently some of the most beautiful sights in the Sierra Nevada are not accessible by car and must be viewed from horseback and backpack trips. Unfortunately, I am not that rugged, but I like knowing that there is still such wild land remaining. As I drove back down the western slopes, I couldn't help but be disappointed when the terrain turned back into the flat farmland of the central valley, decorated with complex irrigation machinery, tractors, and laborers working in the hot fields.

Deep Canyon

In June I also visited Deep Canyon, on the edge of Palm Desert in the Coachella Valley. Deep Canyon is an alluvial fan that stretches upward through several life zones to the San Jacinto Mountains. I traveled there via the 210 E to the 15 S to the 10 E and stayed at the University of California at Riverside natural reserve. I was accompanying Mt. SAC Professors Tim Revell and Sherry Schmidt for the purpose of surveying for desert iguanas for Tim's doctoral research; the reserve was one research site he was

considering. The iguanas are prolific in some areas, but as more and more of their habitat is developed for human use, this situation is likely to change. Even on this short visit, we noticed how new housing and a huge golf course come right to the edge of the reserve. My colleagues informed me that one golf course alone requires 18 million gallons of water per day to keep its non-native grass green! The golf course was in stark contrast to the habitat of the reserve, which after years of drought was so arid that even the cactus are dying. The cactus are mostly cholla but also include barrel cactus that are hundreds of years old. At the reserve, we saw only one desert iguana. This could have been due in part to getting a late start the first day; the desert iguana is an animal of specific habits, emerging from its burrow only during a short period in the morning, before the high desert temperatures drive most wildlife 'indoors.' For example, the temperature reached 106 that day, and it was still very early in the summer season. However, we did not see any the following day when we searched earlier, and Tim reported that he had seen few on previous visits.

We searched for desert iguanas primarily around creosote bushes. Creosote is a desert plant that protects itself with sticky sap and odors. However, the iguanas eat the spring flowers and perennial leaves and also make burrows in their shade. The iguana we found was not wearing a radio transmitter that Tim had installed on one just a few days before. Using an antenna to divine the location of the transmitter (and ultimately, hopefully, the lizards he studies), Tim found the transmitter just inside a burrow. I learned about the basics of radio telemetry research, which of course is used with many species in the wild, including coyotes. He discussed the difficulty in finding a delivery system that the lizard can't elude. At present he was using a type of 'backpack,' but

decided to try an elastic band system. I observed how many small logistics go into conducting research on animals, and how any variable that is not accounted for might invalidate the data. Tim plans to study the sleep patterns of the desert iguana. It is surprising how little is still known about the natural history of many animals. Politics and popularity play a large role in how research funding is allocated. Reptiles, not as 'beautiful' as birds nor as 'cuddly' as mammals, are often very low on the priority list. Another issue that must be considered is the safety of the researcher, especially when working alone; some isolated areas in which one might find wildlife may also be home to rattlesnakes or mountain lions, and encounters with homeless encampments or just odd, possibly dangerous characters are not unusual. Doing research at the reserve had the advantage of safety, as well as comfortable lodgings for staying over and escaping the blistering heat; but the tradeoff might be a limited study population of desert iguanas.

On the drive to the reserve, we saw a coyote trotting alongside the 10 freeway. At the reserve we observed coyote scat. We observed a variety of desert plants, such as indigo bush and *palo verde*; the skeleton of a bighorn sheep; a whiptail lizard; a banded gecko; two spotted toads; some jackrabbits; many insects, especially flies and grasshoppers; and even a speckled rattlesnake that apparently makes its home in the cement block base of the reserve office! The reserve is part of the UCR system of natural areas set aside for preservation and research purposes – for example, recent research has included photosynthesis of cacti, population biology of the endangered fringe-toed lizard, and health of the threatened bighorn sheep. The type of habitat is Colorado desert similar to that in Anza Borrego. In fact, scenic highway 74 (Palms to Pines) and Anza Borrego State Park are just on opposite sides of the San Jacinto Mountains.

After we left Deep Canyon, we stopped at a site on public land along the busy street of Gene Autry Trail in Palm Desert. The reserve director had suggested to Tim that there was a large population of desert iguanas in that area, and in fact, we observed six iguanas within five minutes. It was hard to imagine why this area of broken bottles, discarded trash, traffic, and few creosote would seem a more hospitable habitat according to the iguanas, or whether corridors blocked by development played a part. Of course, there was at least one sign of the omnipresent coyote's interaction with the human population, in the form of the skull and backbone of a cat.

During our drive, we discussed the difference between macroevolution and microevolution, current theories in evolution, and the role that DNA testing is playing in species identification. My colleagues also explained state and federal government involvement in protection of species, and terms such as protected, listed, threatened, endangered, and extinct. Apparently, politics plays a large role in which species get listed, and many go extinct while awaiting official protected status. After this discussion, I searched online for the lists of endangered species identified by the U.S. Fish and Wildlife Service. I must admit I was astonished at the numbers. In the U.S., 519 species of animals and 746 species of plants are currently listed as threatened or endangered; 23 species of animals and 1specie of plant are proposed for listing; and 137 species of animals and 143 species of plants meet the criteria as candidates for listing. Plants are also listed by state, and California leads all states with 299 protected species (the second highest is Alabama with 115). This reflects not only the great diversity of our state's wildlife to start with, but also perhaps the influence that a strong lobbying effort and a more educated populace can have. There are also lists that include other countries.

Oak Grove

In July, and again in August, I went back to Highway 79 east of Temecula for two brief visits to the oak woodland. I camped in the Oak Grove campground in the Cleveland National Forest, which I had passed on my way back from the Palms to Pines field trip. This is transition habitat between chaparral and yellow pine forest, and the whole area is dotted with oak woodlands. It is very rural and features many privately owned ranches. Development is the single largest threat to southern California's oaks, as well as many plant and animal species, but in northern California, as well as other states, a fungus (of the same genus that caused the Irish potato famine) is wiping out oak trees. Sudden oak death has claimed an estimated 100,000 oaks so far. The fungus was imported, probably from Europe, and lacks resistance in the California habitat. The fact that many of the trees are on private land has also made the fungus difficult to eradicate.

A wildfire had burned much of the chaparral between Temecula and the campground. The campground's main vegetation besides oak trees is chamise. I noticed that the chamise was a great deal more dry and dead-looking in July and August than when I had passed by in April. On my first trip, I saw that quite a few raptors appear to nest in some of the tall oaks, but they were too high for me to identify them. I saw a spotted bird that appeared to be an owl; this seemed unlikely, but I did also hear an owl. A pellet, such as an owl pellet, lay on the camp site table; it was unlike others I've seen in that it seemed to be comprised of vegetation rather than small bones. I heard quite a few bouts of coyote vocalizations through the night, and also visualized coyote scat. There were rabbits, lizards, and a variety of birds – such as scrub jays, a woodpecker, groups of gnatcatchers, and hummingbirds. Many insects – such as the large red Harvester ants

(one of which stung me), small spiders, a large black and yellow (unidentified) butterfly, and a chorus of locusts at night comprised more of the wildlife.

I saw and/or heard much of the same wildlife on my second visit, as well as some unusual (to me) lizards that I couldn't identify and a brown racer snake. There were some interesting weather patterns the second time; for the two days I was there, the surrounding mountains reverberated with the thunder and lightning of electrical storms (common in Pennsylvania where I grew up, but unusual in Southern California), but only one quick bout of rain fell in the campground. A small ranger station was empty but displayed the history of the area. Sleepy little Oak Grove was an important stagecoach stop on the way from St. Louis to San Francisco until the Civil War. Now, a fire station plays an important role in protecting the area during wildfire season. There was a notice about a smelly invasive plant, a sumac, that park personnel were trying to eradicate.

American River

While in Sacramento in July, I paid a brief visit to the American River which runs northeast to southwest along the city. This is a suburban riparian habitat in the midst of surrounding homes and agriculture, in which one might expect to see a great deal of disturbance relative to population and farming. On the contrary, there has in the past been some commitment to preserving the wild nature of this ecosystem as much as possible. From a residential neighborhood, a lightly cleared trail leads to the river banks. The foliage is quite dense, and I saw valley oak and riparian willow trees as well as wild berry bushes. Although small numbers of people were swimming and kayaking, there were very few signs of human activity, not even trash, and the water was surprisingly clean. Several raptors inhabited the tall trees. I observed a noisy 'argument' among a

group of three red-shoulders hawks. A mule deer came to the river's edge to drink. Of course, I saw coyote scat. Even an occasional mountain lion is not unheard of. Some recent editorials in the Sacramento Bee illustrate an ongoing controversy over whether to allow increased development of the area (see Appendix F). I thought it was a very good example of how a community can coexist with a relatively wild, healthy ecosystem for the benefit of both humans and animals. This is in contrast to Sacramento's other main river, which shares its name. The Sacramento has been highly channelized for agriculture and is heavily polluted by everything from early mining to modern-day motorized recreation. Wildlife is sparse, and some key populations such as salmon and sturgeon have all but disappeared.

San Antonio Mountain ("Mt. Baldy"), San Antonio Canyon, and San Antonio Dam

I live in the foothills just below these areas, which extend from city suburbs through coastal sage scrub, chaparral, and transition, to Hudsonian/Canadian. I became particularly interested in the coastal sage scrub area which burned in the fire next to my home. In the section on wildfire, I describe the changes the habitat has gone through in the last ten months. I also include many photographs in Appendix E. Coastal sage scrub is unique to California and has only recently been identified as an ecosystem separate from chaparral; unfortunately, nearly 80% of it has been bulldozed to accommodate urban sprawl.

California Wildfires

As mentioned, one event that most influenced this project and was completely unexpected was the series of California wildfires that took place in October 2003. I had already planned to interview fire ecologist Carla Wakeman and include a section on the

role of fire in California habitats. However, I was not prepared for the prevalence that this topic would take both in my personal life and in my studies. In late October, brush fires were raging in three separate areas of Southern California – both north and west of Fontana in the Inland Empire, Simi Valley northwest of Los Angeles, and to the east of San Diego (see Appendices E and F). These fires have since been described as the largest simultaneous wildfire infernos in California history. Two were set by arsonists, and one was started by a careless camper.

The Fontana ("Grand Prix") fire started on a Tuesday and moved north up the 15 freeway toward the San Bernardino Mountain recreation areas. Of course, these areas were of grave concern because of dry, windy Santa Ana conditions, as well as the large amount of tinder caused by drought and an epidemic of bark beetle infestation that destroyed pine trees. I was scheduled to go out of town on Friday, and when I left I never dreamed that the fire could be a danger to me. However, at 8:00 the next night, I received a call that my neighborhood in San Antonio Heights was being evacuated! Since there were pets still in my home, I immediately left and was about to experience one of the longest nights of my life.

My home is the last on my street and abuts the San Antonio Dam. The dam is a flood control dam for San Antonio Creek which runs from Mt. Baldy through the San Antonio Canyon. The entire area next to me is made up of coastal sage scrub. I've seen fire in the hills above, including one the previous year that resulted in the town of Baldy Village being evacuated. But I knew that the dam area had not burned in many years and was prime fire tinder.

Thanks to modern technology like cell phones and internet, I was kept abreast of what was happening. Friends who tried to access my home were turned away by authorities. I was also turned away when I arrived and finally entered the area through a back street that I thought would be unblocked, and it was. It sounds foolishly dangerous, and perhaps it was. I actually arrived just 15 minutes after the fire raged through the dam. The sky was orange, the ground was glowing embers, and trees and telephone poles still burned. Parts of my front yard were on fire. Telephones and electricity were out. Howling winds caused trees, fences and attics as far as two blocks away to suddenly catch fire. I entered my smoky home, located a kerchief and a flashlight, covered my nose and mouth, found some important papers, and then with my neighbor's help, tried to locate and remove my pets. We were there until 3:00 a.m. putting out fires around the yard and hosing down our roofs. The wind was so strong and unpredictable that much of the water ended up on us, which made the task even more frustrating and time-consuming. We never saw a firefighter. Personnel were just completely overwhelmed by the magnitude of need. As I drove away on Baseline Avenue, I saw them trying to stop the fire from crossing south of the 210 freeway. It was an unbelieveable sight, an orange blaze as far as the eye could see. I found out later that many of my neighbors had also stayed to protect their homes.

After leaving to sleep a few hours, I returned to see the blackened moonscape that had become my view. The ground still smoldered. Ash and smoke polluted my house as well as much of the southland. I had a great deal of cleanup to do, but I was grateful to still have my home. Several friends of mine had also had to evacuate from other areas.

The first thing I noticed in the coastal sage habitat next to my home was many dead small animals, such as birds and rodents. These disappeared rapidly, which was a positive indicator that larger species had survived and were desperate for food. I also had more small rodents around my yard, many of which survived the fire but not my cats' hunting instinct. Over the next several months, I hardly heard coyotes at all. I had only three sightings in ten months, when about one a month had been typical. Even coyote scat was very sparse, although after rain came, I did see and photograph prints of both canines and felines, as well as rabbits and raccoons. Only in the spring, after the mating season took place and pups were likely born, did I begin to see a lot of coyote scat. By then, some of the foliage had begun to return, and food was no doubt becoming more plentiful. I've seen ground squirrels and rabbits, scrub jays and toads, raptors and migratory birds, insects, lizards, and even two rattlesnakes – although these were in my and my neighbor's yards and could have pre-dated the fire; I haven't seen any in the scrub, whereas last spring and summer I had five encounters. More recently I have seen smaller coyote scats that are most likely from pups.

Wild cucumber was the first plant to begin growing, almost immediately – and I saw this in other burned coastal sage areas as well. Then after some winter rains, grasses and then wildflowers such as lupin began to sprout in early spring; they seemed unusually prolific. Some of the sages have returned. The yuccas grew, and some bloomed. The smaller bushy manzanita trees began regenerating at their bases, with their charred tops creating an odd visual juxtaposition of both life and death. The larger trees, such as a grove of California sycamores, have not regenerated yet, and I can only hope that they will.

STATUS OF ENVIRONMENTAL OBJECTIVES

Original Objectives and Current Status -

1. To interview at least three of my colleagues for background information and sources.

- Objective exceeded. I interviewed Professors Sherry Schmidt, Karyn Kakiba-Russel, and Cindy Shannon. I spoke with Professor Tim Revell on a field trip and heard some of Professors Sherry Schmidt's and Damon Day's course lectures on a class field trip.

2. To conduct an online search of current, pertinent research and opinion (selective rather than exhaustive) and to read appropriately from this list.

- Objective exceeded. I located 1088 sources as described above and read 37 of them. I also located four books and read and summarized two of them.

3. To complete Joshua Tree National Park course "Coyote 101," and/or to visit and photograph one or more research facilities to observe coyote behavior and interview expert sources.

- Objective exceeded. I completed Coyote 101. I visited the Predator Research Station affiliated with Utah State University. I interviewed coyote experts Professors Fred Knowllton, Mike Jaeger, and John Shivik, and wolf/environment expert Professor Robert Schmidt. I spoke with station staff and graduate students and spent many hours observing behavior alone and with graduate student in reproductive biology Debra Carlson. I also interviewed fire ecologist Carla Wakeman.

4. To visit and photograph at least four Southern California habitats in order to understand the varied biotic communities the coyote inhabits.

- Objective exceeded. On 13 different field trips, I observed and photographed the following habitats, including documenting the presence of coyotes when possible: I spent two weeks in Great Basin habitat in Utah in winter. I accompanied half of a four-day "Palms to Pines" field trip, traveling through coastal sage scrub, chaparral, transition, Canadian/Hudsonian to "low desert" and palm oasis on the way to and from Anza Borrego. I visited "high desert" in Joshua Tree National Park. I hiked in Evey Canyon with Professor Cindy Shannon, which also accommodates habitat from chaparral to Canadian/Hudsonian. I briefly visited the Wrightwood area in the Angeles National Forest, another Canadian/Hudsonian habitat. I went on a department camping trip to Newport Back Bay, a marsh wetlands. I camped in San Simeon State Park, a beach and coastal forest habitat. I traveled to King's Canyon/Sequoia, passing through central valley farmland and up the eastern Sierra Nevada, transitioning from chaparral to alpine forest, and camping in a mountain canyon ecosystem. I paid a brief visit to the American River suburban riparian habitat in Sacramento. I camped in oak woodland in Oak Grove Campground east of Temecula. I visited the low desert again to observe research near Palm Desert. I spent many hours hiking in the coastal sage scrub just below San Antonio Canyon.

5. To write a sabbatical report for the college and otherwise disseminate my research to colleagues.

- Objective in progress. My sabbatical report has been submitted, and I will notify department and other personnel about the availability of information when it has been approved.

VALUE TO THE COLLEGE

The value of this project to the college is again summarized in the following – enhanced learning for students through classes and resources; available learning for faculty, staff and the community via presentations and access to materials and resources; and enriched learning for myself, one of the college's instructors, through experience and reflection; and in addition, a more informed member of the Biology Department.

When I started teaching Biology 5, I knew about as much about the environment as I did about nutrition – only the most general concepts. I immediately sought help from my colleagues, who taught me about many of the issues I did not know, including that of habitat loss and its effect on species diversity. I also knew that they would continue to be a valuable resource in the future, which is why I decided to include some of them in my study project. When students learn about the environmental crises we face, the bottom line is that they want to know what they can do. Actions such as recycling and carpooling, although not always easy to accomplish, are familiar concepts to them. But our dependence upon other species and to the habitats that support us seem vague and somehow unconnected to them. They've been taught that humans are in control and are intelligent enough to make the correct choices. Nature is the local park, and wildlife is a hummingbird at a feeder. Predators especially, if they are considered at all, might fall into the classification of "varmints" that are dangerous and need to be exterminated.

I chose the coyote as a central animal because many people love dogs. I plan to create a slide show or powerpoint presentation for my class that shows the beauty, intelligence and quirky personality of this animal. From there I will extrapolate to other issues, such as the role of the predator in ecosystems, the concept of keystone species, the

web of life, habitat loss, non-native invasive species, and threatened and endangered plants and animals. There are many subtopics as well, such as water rights, fire management, and invasive species. I already utilize the college's Wildlife Sanctuary, and I will continue increasing my knowledge about its value and bounty (see Appendix D for a class activity I designed.) Even my Biology 15 students will benefit from understanding how fertility control relates to population dynamics. My goal is for my students to become the informed voters and parents who will carry their knowledge into the future, and may in fact help to save our beleaguered planet after all.

Other faculty and staff will have access to this information. Again, I expect I will make a brief presentation to the Board of Trustees and a more in-depth one to my department, and I would be happy to present to any others who invite me. This sabbatical report will be available in the library.

The value of this second project to myself is, I think, even more meaningful than my first semester's studies. Proving the need for laboratories, such as the ones taught by my colleagues, the importance of hands-on experience cannot be overestimated. To fulfill my objectives, I accomplished things I have never done before. I located and traveled to a strange place (the predator research station in Utah) as if I were an anthropologist going to study aborigines in Borneo. While many of my colleagues have engaged in field studies, this was a first for me. It might sound uncomfortable, but I can't even begin to describe the peace and privilege I felt as I sat quietly in a blind, observing coyotes frolicking and mating before my very eyes. I now have a dream of returning to Utah, volunteering at the research center, and camping in Logan Canyon.

Camping is another benefit that I have gained. I have camped for years, but usually pretty close to home, and never alone. For this project, I traveled as far as an eight-hour drive to Sequoia. I camped alone several times and faced many fears and challenges, such as the fear (unrealized) of breaking down on a lonely road, and the challenge (realized) of losing my vehicle key in a large campground. I gained an increased sense of independence and self-sufficiency, and appreciation of solitude. I have plans to see much more of our country in this way, as well as three non-camping trips scheduled for Vancouver, Alaska and Costa Rica.

I am much more informed and concerned about environmental issues. I have joined several environmental action groups.

When certain issues related to teaching ecology and environmental science arise in the Biology Department, I haven't always understood them enough to make informed comments, much less vote on decisions. I will probably never be as educated on these matters as my colleagues, but I do know that I am already more aware and informed enough to ask intelligent questions. I will look forward to being a lifelong learner in this awe-inspiring and increasingly crucial area. As I plan to tell my students, it's important to be concerned about such things as stress, heart disease, and violence – but what will they matter for future generations if there is no earth to walk upon?

Finally, as mentioned above, I was astonished to find how much my two very diverse topics actually intersected. Learning about the environment means learning about species and habitats, including us and our world. Learning about us and our world means learning about what sustains us, in the form of food and how it is produced and consumed - as well as how it affects our emotions, relationships, and even spiritual connections.

The interrelationships among food, plants and animals, environment and habitat, and us has given me much to ponder for some time to come.

APPENDICES

APPENDIX A – BIBLIOGRAPHY

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Windberg, Lamar A., et. al., "Population Characteristics of Coyotes in the Northern Chihuahuan Dsert of New Mexico," The American Midland Naturalist, July 1997, 197-207.

Other

Various park and research station brochures

APPENDIX B – BOOK SUMMARIES

Summary 1 – Prodigal Summer by Barbara Kingsolver

Barbara Kingsolver is one of our premier novelists and is probably best known for her deeply moving and disturbing bestseller, The Poisonwood Bible, which I've also read. Although the themes of these two books are quite different (one takes place in Appalachia, the other in Africa), they reflect a larger philosophy which I suspect pervades all her work – respect for the natural world and/or the indigenous people who lived in harmony with it for centuries, and dismay for the 'civilized' cultures who seem ready to destroy it/them.

Telling a story about a group of inter-related people in the Appalachian mountains, Prodigal Summer celebrates the discovery by a local woman forest ranger of signs of a pair of coyotes who have come to den and bear pups in the local mountains. As is typical, local ranchers believe that the coyotes are a danger to their livelihood, and they challenge a bounty hunter to track and exterminate them. Of course, because this is a work of fiction, the forest ranger and the bounty hunter bump heads and more. But the book is more profound than a mere love story. It also details the role of a large predator in an ecosytstem – that of culler of the larger- numbered plant consumers (e.g., ungulates and rodents) as well as sicker and weaker members of many populations, amid the ranger's uphill battle to re-educate the entrenched populace.

The book goes on to include the story of a local tree, the American chestnut, rendered extinct by a fungus brought in on introduced, non-native plants. This illustrates one of the dangers of invasive species that may have no natural predators or population control mechanisms in a new ecosystem. Kingsolver brings up a myriad of other

environmental connections along the way, and the human happenings beautifully mirror the cycles of life and death that are part of nature – including us.

Summary 2

Coyotes: Biology, Behavior and Management edited by Marc Bekoff

As mentioned previously, Bekoff's book was the only scientific book I found. Besides the surprise of the publication date (1978), I wondered why Dr. Knowllton was not one of the authors. I noticed subsequently that he is cited by nearly all of the others; in particular, a piece of writing he published in the Journal of Wildlife Management in 1972 (title uncited) seems to be one of the seminal articles.

In the section on biology, the authors discuss evolution, morphology, diseases, and reproduction. Under behavior, I learned more about pup-rearing, social interaction, predation, and communication; interestingly, coyote vocalizations are covered in a section separate from other forms of communication, which also include visual, auditory, gustatory, and tactile. The section on ecology differentiates between coyotes in different areas. And concerning management, various kinds of coyote damage and damage control are described.

The more I thought about the difference of opinion between Knowllton and Bekoff, the more I believed that the section on coyote management was probably the source of disagreement. In particular, I notice that although there is much about coyote damage, there isn't a complimentary chapter on coyote benefits. Since I better understand the role of the predator in an ecosystem, this seems like missing information to me – and leaves a negative rather than balanced impression.

APPENDIX C – INTERVIEW QUESTIONS

Interview Questions for Professor Sherry Schmidt

1. What is geology? What is the difference between geology, biology, ecology and habitat? What forces cause geologic formations?

2. Are there a finite number and kind of geologic formations? What are the major ones?

3. Do the geologic formations of an area dictate its habitat? How?

4. What are the major habitats? What distinguishes each of them?

5. What are the major habitats found in California?

6. Are coyotes found in all California habitats? What factors affect the prevalence and success of coyotes?

7. coyotes are now found in all of the lower 48 states. What factors have affected their spread? What is the role of the predator in ecological balance?

8. Give some examples of plant and animal species with which coyotes interact. What happens when these species become more and less prevalent?

9. What are some examples of other species that are doing as well and less well than coyotes? What factors have affected them?

10. What would you add about geology, ecology, habitat, and species?

11. When we take the Palms to Pines field trip, what will we expect to see?

Interview Questions for Professor Karyn Kakiba-Russell

1. How does a type of rock create a type of soil? How long does it take?

2. What are the major types of soil? What distinguishes them?

3. How does soil determine the type of plant growth? What are the types of plants? Is there a minimum number and type of plants that an ecosystem will have?

4. What other factors determine the components of an ecosystem?

5. Photosynthesis is described as the most important process on earth. Why, and how does photosynthesis work?

6. How do plants reproduce?

7. Do plants determine the animal life within an ecosystem? How do plants and animals interact?

8. Give examples of plants and animals that are doing well. Give examples of plants and animals that are not doing well. Why?

9. What are key plants in California ecosystems?

10. What occurs within ecosystems when plants are endangered?

Interview Questions for Professor Cindy Shannon

1. What are the major life zones and biotic communities?

2. What is the difference between a life zone and a biotic community?

3. What are the characteristics of the Lower Sonoran ecosystem? Give examples of this habitat. What plants and animals are significantf?

4. What are the characteristics of the Upper Sonoran? Give examples of this habitat. What plants and animals are significant?

5. What are the characteristics of the Transition Zone? Give examples of this habitat. What plants and animals are significant?

6. What are the characteristics of the Canadian/Hudsonian ecosystem? Give examples of this habitat. What plants and animals are significant?

7. What are the characteristics of the Artic/Alpine? Give examples of this habitat. What plants and animals are significant?

Interview Questions for Fire Ecologist Carla Wakeman

1. What are the effects of fire in a habitat? Do all habitats experience fire? Which do and which don't? Why and/or why not?

2. What triggers fire in the wild? What is a typical fire cycle in a California habitat such as this one? How would you describe this habitat?

3. Describe the factors that now control fire in Southern California. How is this similar to or different from other areas of the country?

4. If we are looking a burned area, how has plant life been affected? Are there new plants that weren't here before? Are there plants that haven't grown back yet? What is a typical cycle in terms of plant growth?

5. How has wildlife been affected? What signs do you see of wildlife patterns?

6. If we are looking at an unburned area, how is the plant life different? Are there effects from not having burn and new growth?

7. What signs do you see of wildlife patterns?

8. What do government and nature agencies do to compensate for the altered burn patterns in Southern California, if anything? How effective are these actions? If no such actions are taken, why not?

9. What else should I know about fire ecology? What would you most want to teach people about fire?

10. Are there any references or resources that you would recommend?

APPENDIX D – COURSE MATERIALS

Dangers to Wildlife in California

CAUSE	SPECIES AFFECTED	% OF SPECIES*
Urbanization/sprawl	188	66%
Interaction with nonnative species	132	46%
Outdoor recreation	123	43%
Domestic livestock and ranching	108	38%
Agriculture	97	34%
Road construction and maintenance	95	33%
Industrial or military activity	76	27%
Reservoirs and other water diversions	66	23%
Mineral, gas, oil and geothermal extraction	63	22%
Human-caused fires/fire suppression	57	20%
Aquifer depletion, wetland draining and filling	54	19%
Pollution of air, water, soil	44	15%
Intentional/incidental harm	43	15%
Genetic problems	38	13%
Interaction with native species	30	10%
Logging	24	8%
Disease	15	5%
Vandalism	10	3%

* Percentage based on 286 species federally listed as threatened or endangered in California.
Source: National Wildlife Federation

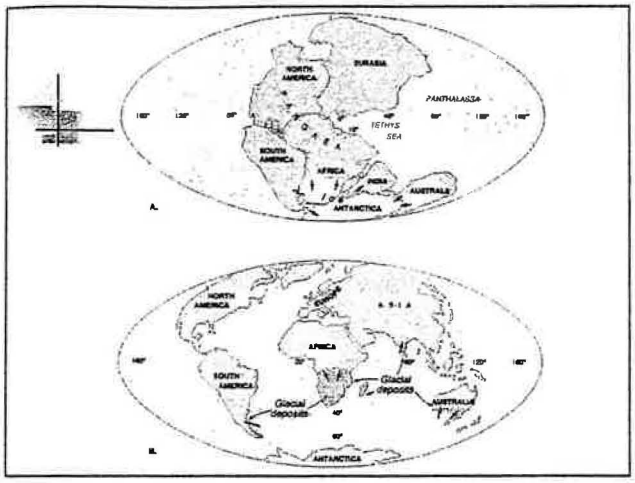
LYNN MEERSMAN / Los Angeles Times

Summary of Listed Species Species and Recovery Plans as of 06/29/2004						
Group	Endangered		Threatened		Total Species	U.S. Species with Recovery Plans**
	U.S.	Foreign	U.S.	Foreign		
Mammals	69	251	9	17	346	55
Birds	77	175	14	6	272	78
Reptiles	14	64	22	15	115	33
Amphibians	12	8	9	1	30	14
Fishes	71	11	43	0	125	95
Clams	62	2	8	0	72	69
Snails	21	1	11	0	33	23
Insects	35	4	9	0	48	31
Arachnids	12	0	0	0	12	5
Crustaceans	18	0	3	0	21	13
Animal SubTotal	391	516	128	39	1074	416
Flowering Plants	571	1	144	0	716	577
Conifers and Cycads	2	0	1	2	5	2
Ferns and Allies	24	0	2	0	26	26
Lichens	2	0	0	0	2	2
Plant SubTotal	599	1	147	2	749	607
Grand Total	990	517	275	41	1823*	1023

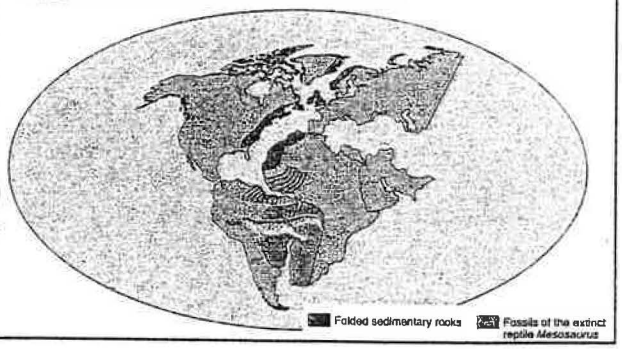
Total U.S. Endangered – 990 (391 animals, 599 plants)
Total U.S. Threatened – 275 (128 animals, 147 plants)
Total U.S. Species – 1265 (519 animals*, 746 plants)**

Evidence For Plate Tectonics

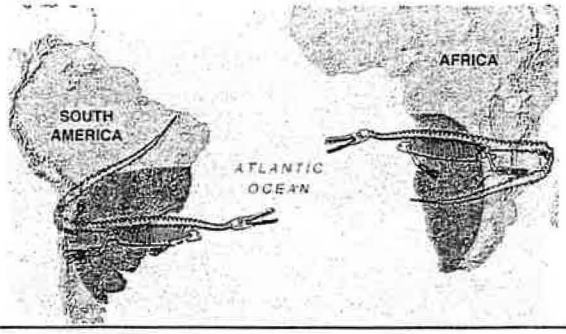
- Fit of continents
- Matching sequences of rocks
- Fossils
- Mid-Ocean Ridges
  - Sediment gets thicker as you move away from crest of mid-ocean ridge
  - Rocks get older as you move away form the ridges
  - Magnetic anomalies



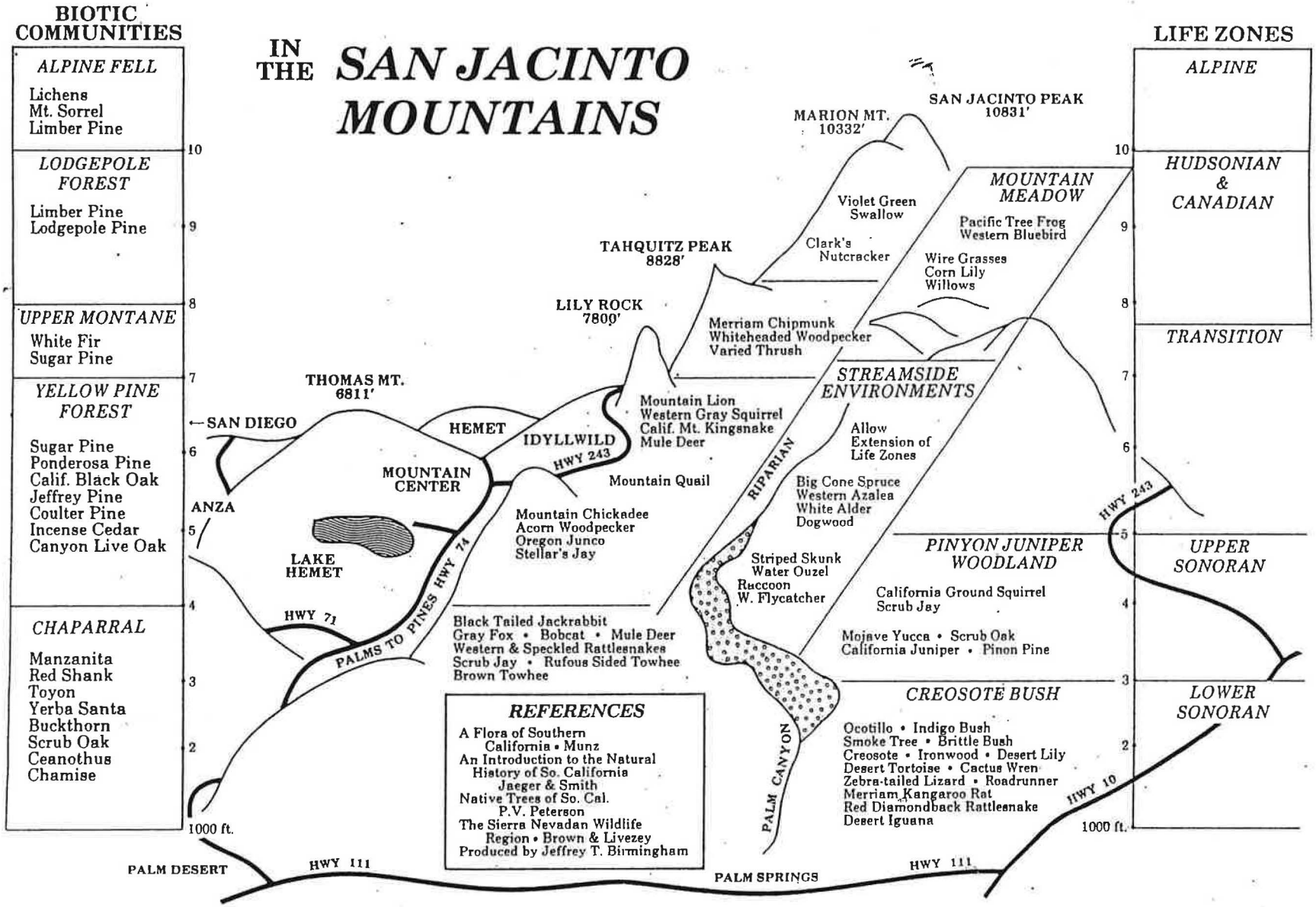
Fit, Rocks, and Fossils



Mesosaurus Fossils Link Africa and South America



LIFE ZONES & BIOTIC COMMUNITIES



WILDLIFE SANCTUARY SCAVENGER HUNT

Each group takes this list, a Sanctuary map, a clipboard and pencil, a plastic bag, and a plastic cup. One group has the even and one group the odd numbered items. Groups are to follow the map to the numbered items which correspond to those numbers on the map. **An asterisk * indicates that the group is to bring something back with them.** When finished, all meet at the lake shelter.

1. The Sanctuary has 3 main purposes. What do you think they are? Why was the decision to set aside this land in 1965 a forward-thinking decision?

2. Several years ago, city construction workers dumped chlorine into the street at Temple and Grand. Where did it go? What did it do?

3. What are the small sucking fish in the swamp? What purpose do they serve, and what implications does this have for taking care of a problem that is common to wet places?

4. Find a cattail (preferably on the ground.)* Cattails are one of nature's indicator species – what are they an indication of?

5. Find a bullrush (triangular stalk – pull out of water.)* What did native people use it for? What should that teach us about nature and the needs of humans?

6. What do you think a riparian habitat is? Why is it an important ecosystem? What is happening to these ecosystems?

7. Find a piece of trash in the stream.* How did it get there? Where is it going? What does it do when it gets there?

8. Find a stalk of pampas grass near the pond (tall stalk with bushy light-colored plume in the center.)* Where did it come from? Why is it harmful to the environment to have it growing here?

9. Find the pines that have fallen over and then started to right themselves. What caused their poor health?

10. Find the grasses that are growing in metal containers. Why are they planted that way?

11. Find the displays at the amphitheatre. What is the difference between a producer, a consumer, and a predator? Give one example of each.

12. We're having to build a new amphitheatre in a different location because of an increase in pollution that we can't do much about. What kind of pollution?

13. If this is Southern California, do you need to be worried about rattlesnakes in the Sanctuary? Coyotes? Mountain lions? Why or why not?

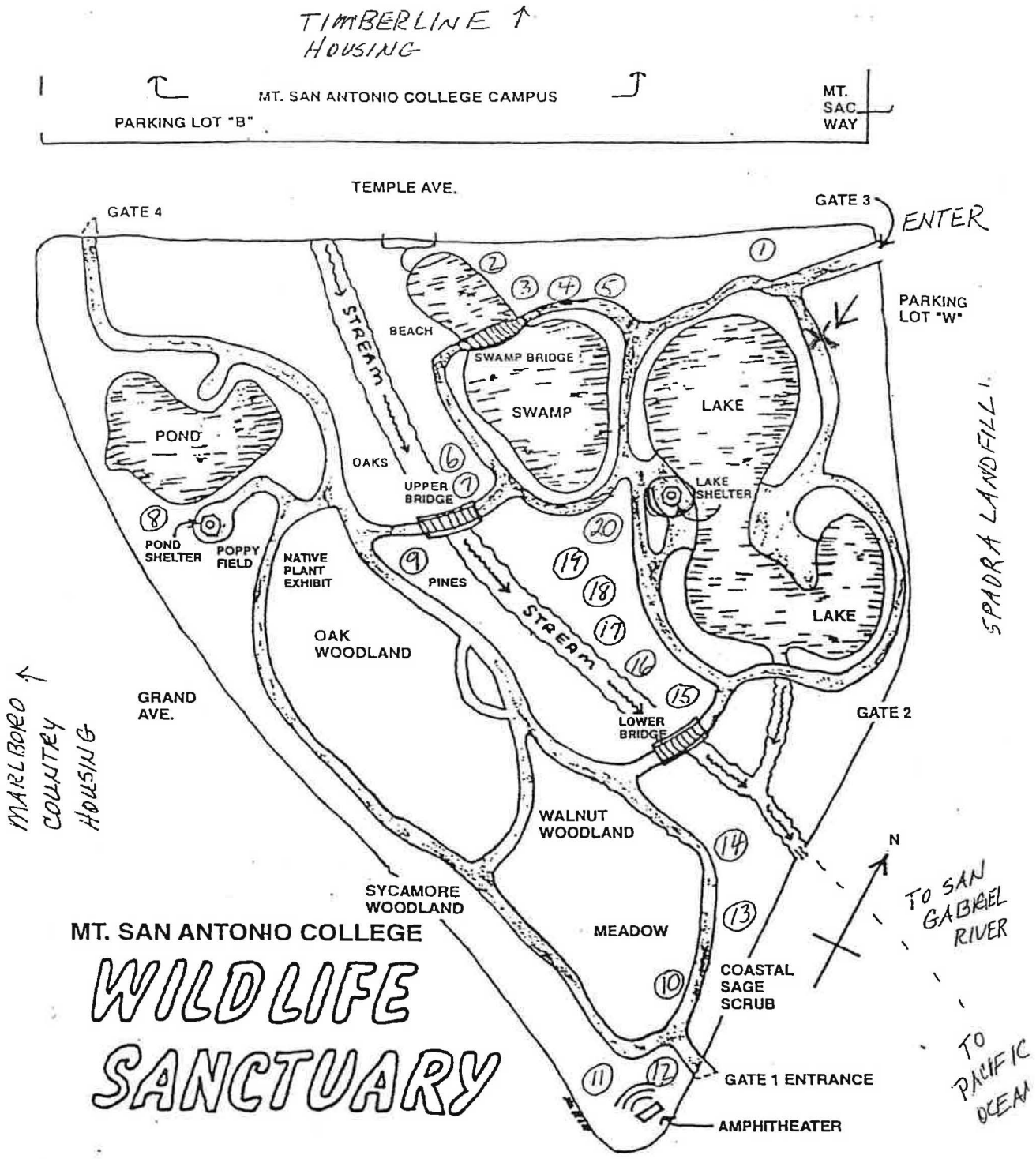
14. Find a small piece of dead vegetation.* Why don't we clean it up?

15. Find the duckweed in the pond (nature's smallest flowering plant – growing in the water.)* What is it an indicator of? Why is there so much of it, and what are the implications of this?

16. Have one brave person reach deep (deep!) into the muck on the bottom of the lake and scoop up a cupful*. What does it smell like? Why, what is in there?

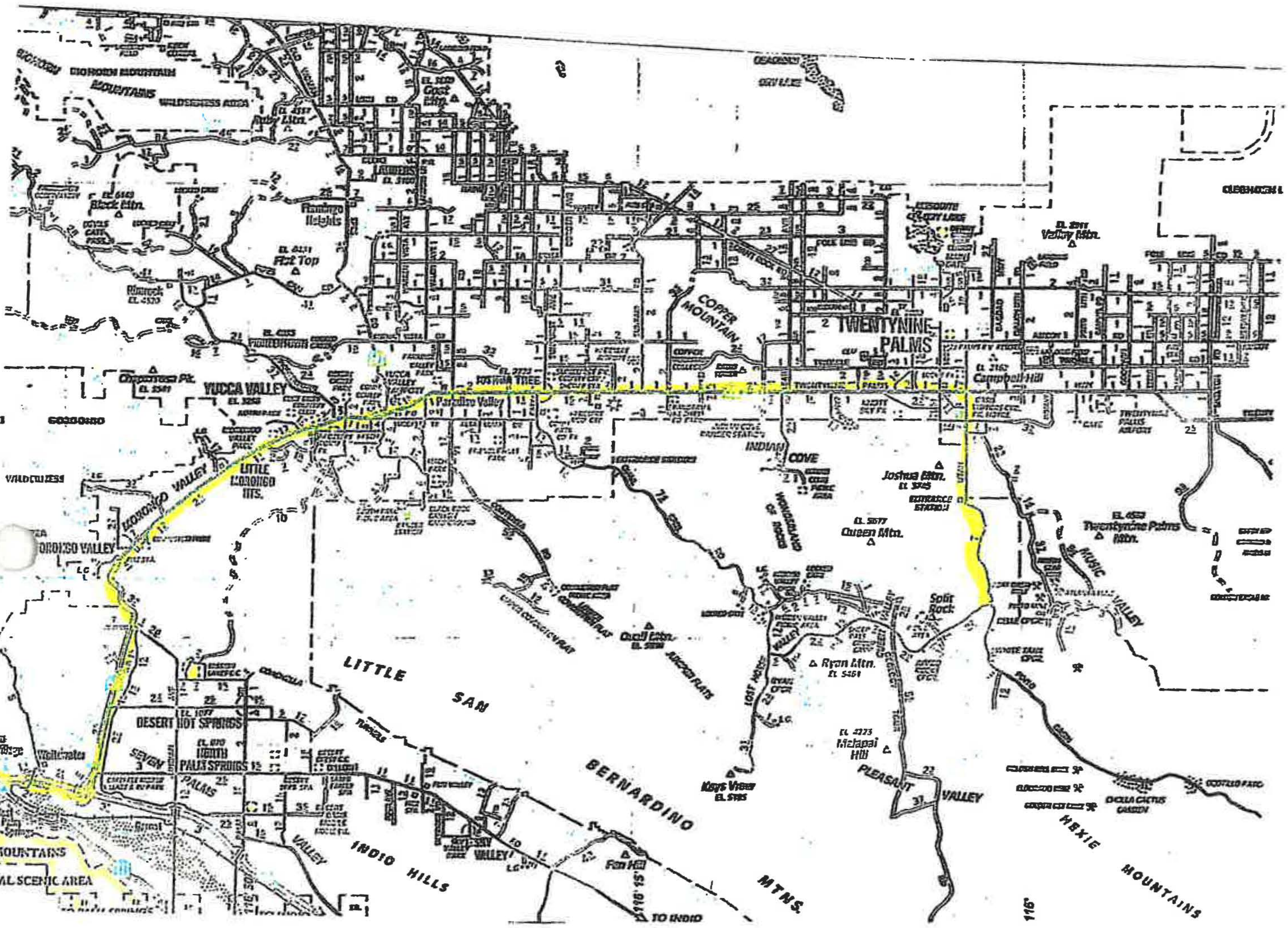
17. What animals, or signs of animal life, did you see? Why don't you see more?

18. What evidence of humans did you see? Why don't we open the Sanctuary to the public?


TIMBERLINE ↑
HOUSING
MT. SAN ANTONIO COLLEGE CAMPUS
PARKING LOT "B"
MT. SAC WAY
TEMPLE AVE.
GATE 4
GATE 3
ENTER
PARKING LOT "W"
STREAM
BEACH
SWAMP BRIDGE
SWAMP
LAKE
POND
OAKS
UPPER BRIDGE
LAKE SHELTER
POND SHELTER
POPPY FIELD
NATIVE PLANT EXHIBIT
PINES
STREAM
OAK WOODLAND
LAKE
SPADRA LANDFILL
MARLBORO COUNTRY HOUSING
GRAND AVE.
LOWER BRIDGE
GATE 2
WALNUT WOODLAND
N
TO SAN GABRIEL RIVER
SYCAMORE WOODLAND
MEADOW
COASTAL SAGE SCRUB
TO PACIFIC OCEAN
MT. SAN ANTONIO COLLEGE
WILDLIFE SANCTUARY
GATE 1 ENTRANCE
AMPHITHEATER
SNOW CREEK HOUSING ↓

APPENDIX E – MAPS AND PHOTOGRAPHS

Joshua Tree



Joshua Tree National Park – Mojave Desert

Distinctive Joshua trees and boulders

Abandoned coyote den

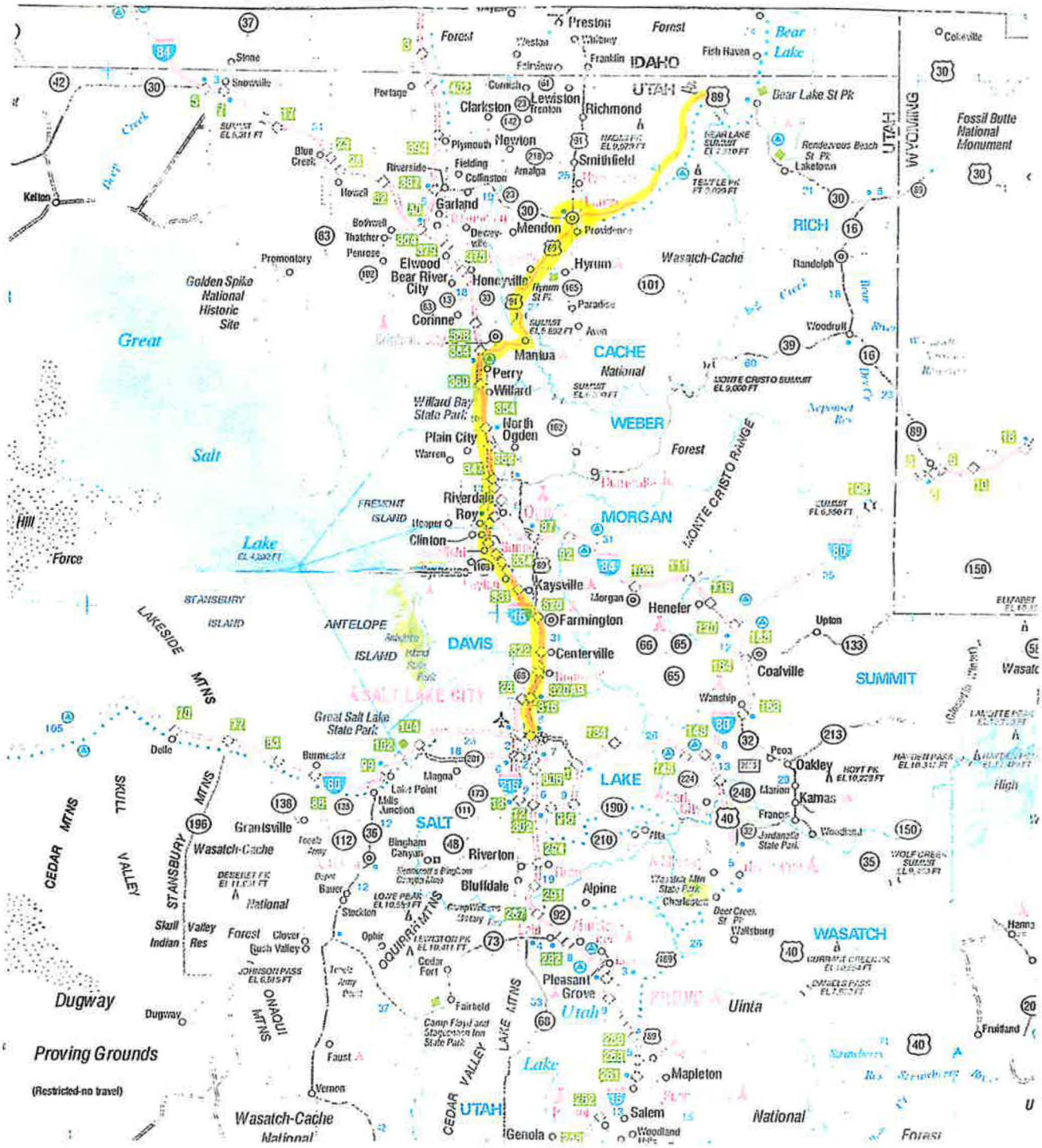
A wood rat now inhabits the den.

But coyotes are ever present.

Photographs by Karyn Kakiba-Russell

Professor Kakiba-Russell and Jim Russell enjoy the Joshua Tree habitat.

Predator Research Station – Utah State University



Coyote Research at Millville and Logan, Utah

Predator Research Station

Director Dr. John Shivik

Utah State University Biology buildings

'Visiting scholar' bunkhouse

Night and weekend security

Also funded by the USDA, the goal is to better understand coyotes so that management can be more efficient and less lethal.

Ranchers worry about their livestock

A trapping device that delivers an anesthetic so the animal won't feel distress

Coyotes live and breed in monogamous pairs.
Some look decidedly masculine …

… or feminine.

They play together …

… and alone.

The male is dominant …

but a female can call 'time out'.

Coyotes are territorial …

… and ever vigilant
even when they appear to be resting.

Their distinctive vocalizations are among many complex communications.

The male protects his female (in this case, he is trying to pull her back from where I am sitting in the blind.)

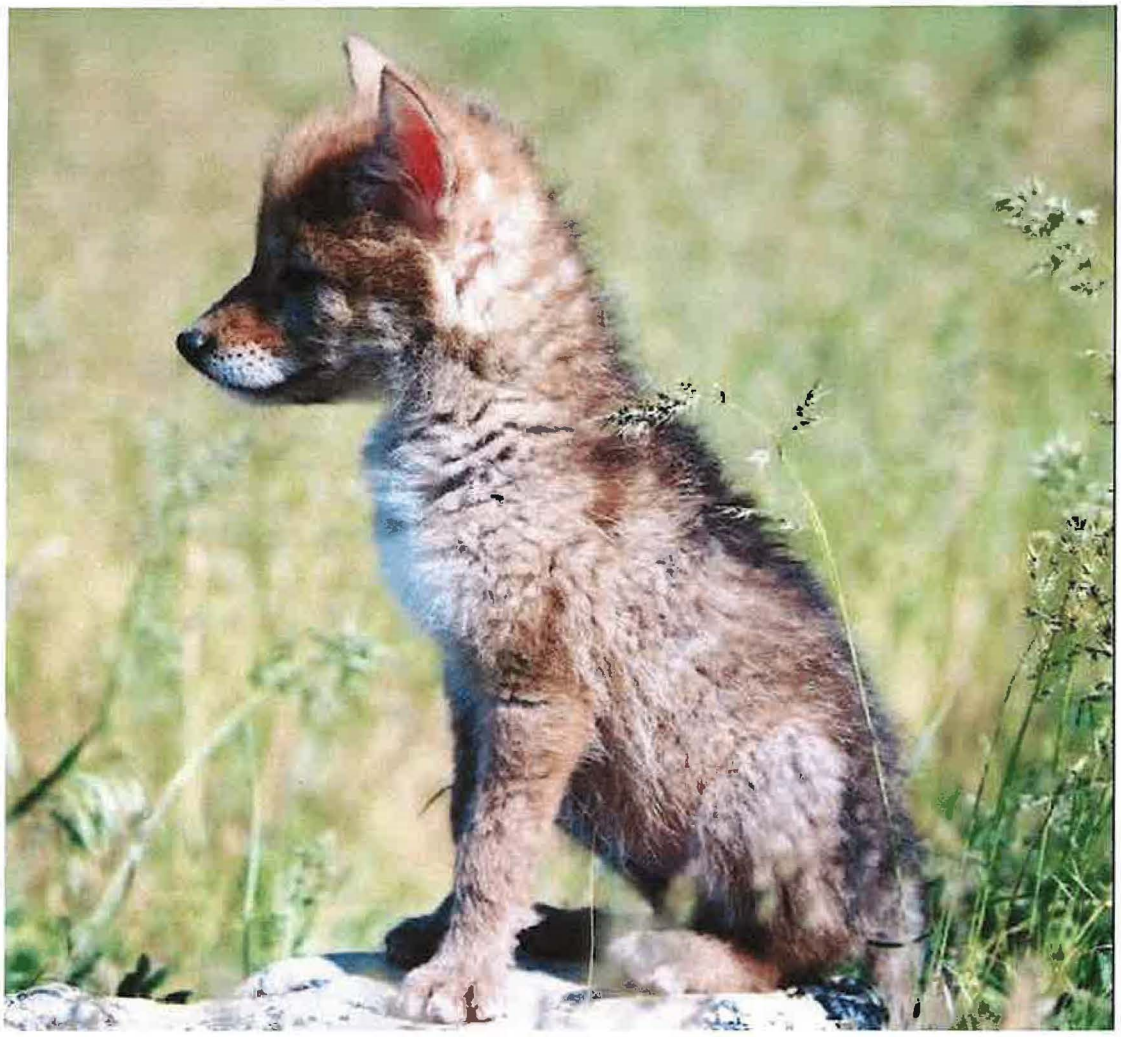
He urinates and scratches, marking his territory.

The female marks, too, and blood indicates her estrus .

The male assesses the readiness of her hormone levels by smell. .

He mounts and thrusts.

A "tie" = a successful copulation.



And a new generation of pups is born.

Photograph courtesy of USDA

It takes large equipment to deal with the heavy winter snowfall.

This 'den' provides shelter to mother and pups during birth and nursing. It's larger than it looks and connects to the clover pen blind.

A technician prepares to feed the animals in the harsh conditions.

A grad student watches hours of film assessing "neophobia".

What seem to be trees in the distance …

… are actually a herd of elk.

I was asked to present on nutrition …

…and prepared a healthy meal.

Stark Great Basin habitat in winter

Beautiful Logan Canyon

A human predator may have killed here …

…and a young girl's body was buried.

The perpetrator was sent to prison.

And ultimately, peace has been restored.

Their scat reflects the coyotes' omnivorous diet.

Fur

Fruit

Seeds and seed pods

Bones

Dog scat, however, is very processed.

Other photos of Great Basin habitat…

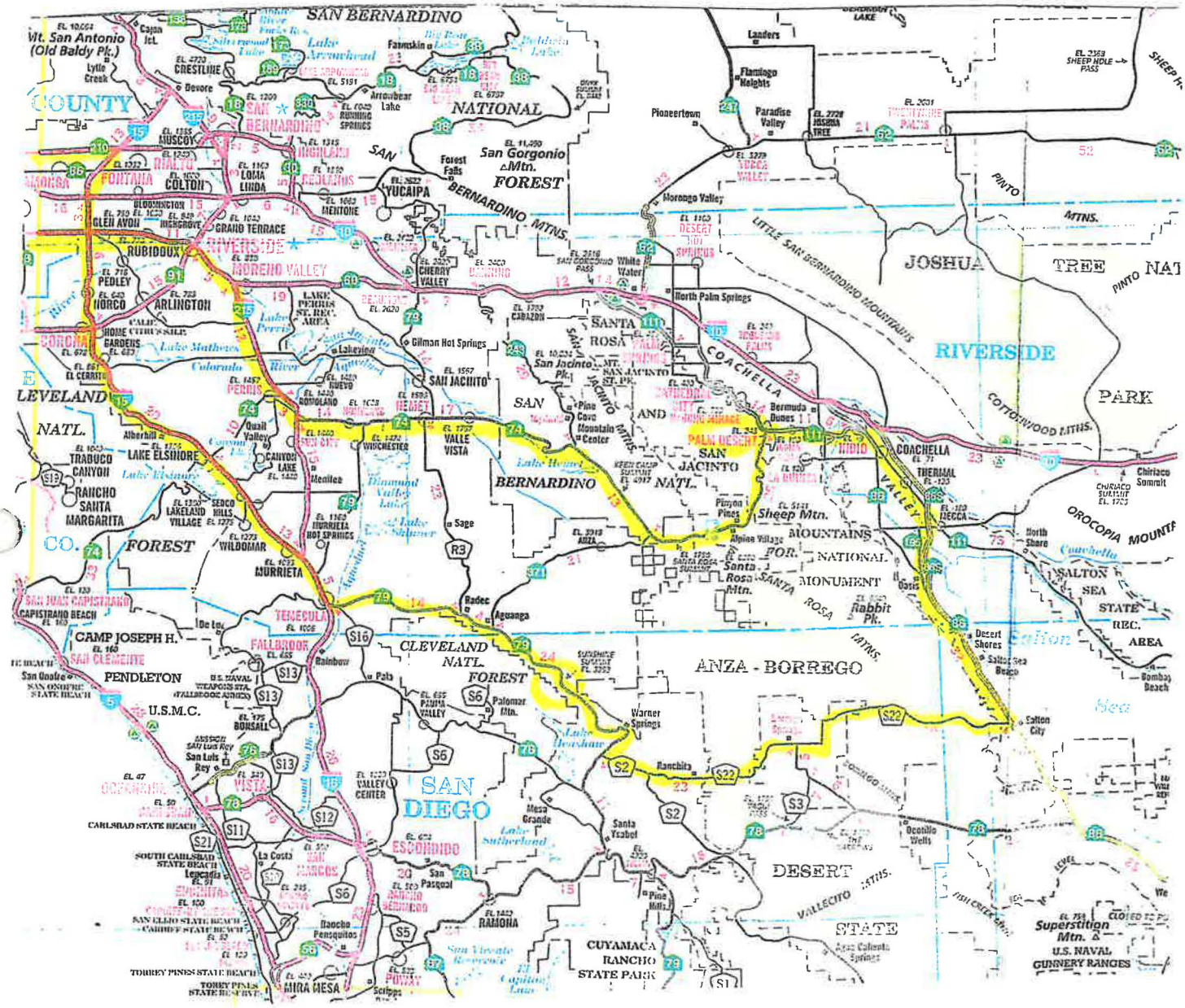
Mono Lake featuring Great Basin sage

Owens Lake

Coyote in Tioga Pass

Photographs by Sherry Schmidt

Palms to Pines, Oak Grove, and Deep Canyon



"Palms to Pines" Field Trip
From flat farmland to yellow pine forest to Colorado Desert

"Bejada" – alluvium deposition flanked by farmland

A helicopter sprays pesticides.

Coastal sage scrub

Coyotes mark their presence.

Chaparral chamise

Coyotes are here, too.

Riparian habitat with oaks, alder and sycamores

Pinion juniper woodland

Professor Schmidt catches a lizard at Vista Point amidst Mesozoic rock.

Cahuilla Indians lived in Painted Canyon.

Ghost flower produces nectar to attract pollinators.

It's mimic, blazing star, does not – but gets pollinated anyway.

Baby chuckwalla

Mom is nearby.

A student caught a scorpion (and released it).

Coyotes and/or foxes live here, too.

The "badlands" seem desolate …

… but some things thrive, such as invasive tamarisk.

People travel far to view
the wildflowers of
Anza-Borrego State Park.

One theory about palm oases is
that coyotes disperse the seeds.

Rocks are 3,000,000 to
80,000,000 years old.

Ocotillo

Entrance to Palm Canyon

Visitors read history and safety warnings.

Coyotes blending in to the habitat

Metates and *manos* for grinding

Oak woodland on Highway 79

Newport Back Bay

Newport Back Bay Marsh Wetland

The wetland is a protected area.

An egret

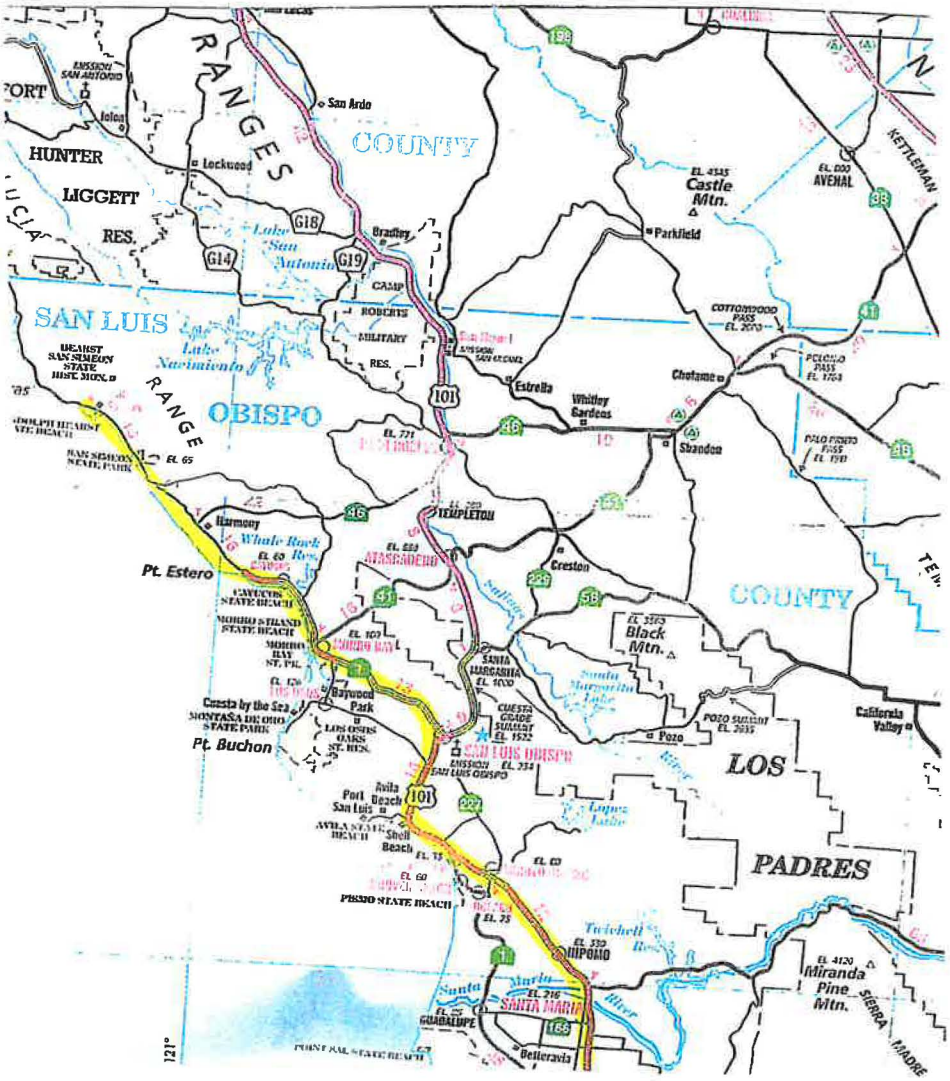
Various waterfowl

The perennial coyote scat

Caterpillar

Houses encroaching on the marsh

San Simeon – Hearst Castle



San Simeon State Park

Gulls over the Pacific Ocean

The campground overlooks coastal forest.

State Parks biologist Callie Hurd

Coastal lupin bush

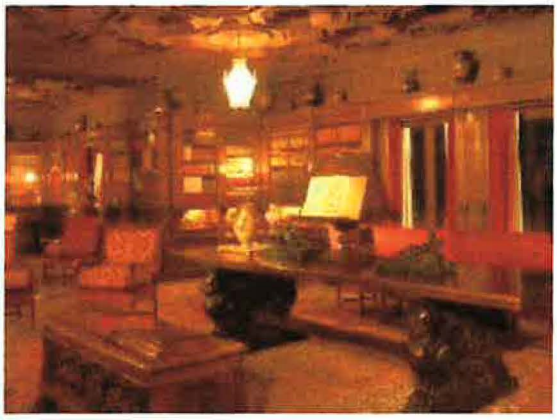
The protected snowy plover nests in the delicate growth on the beach.

Coyote scat

Barn swallow nests under Highway 1

Hearst Castle in the distance

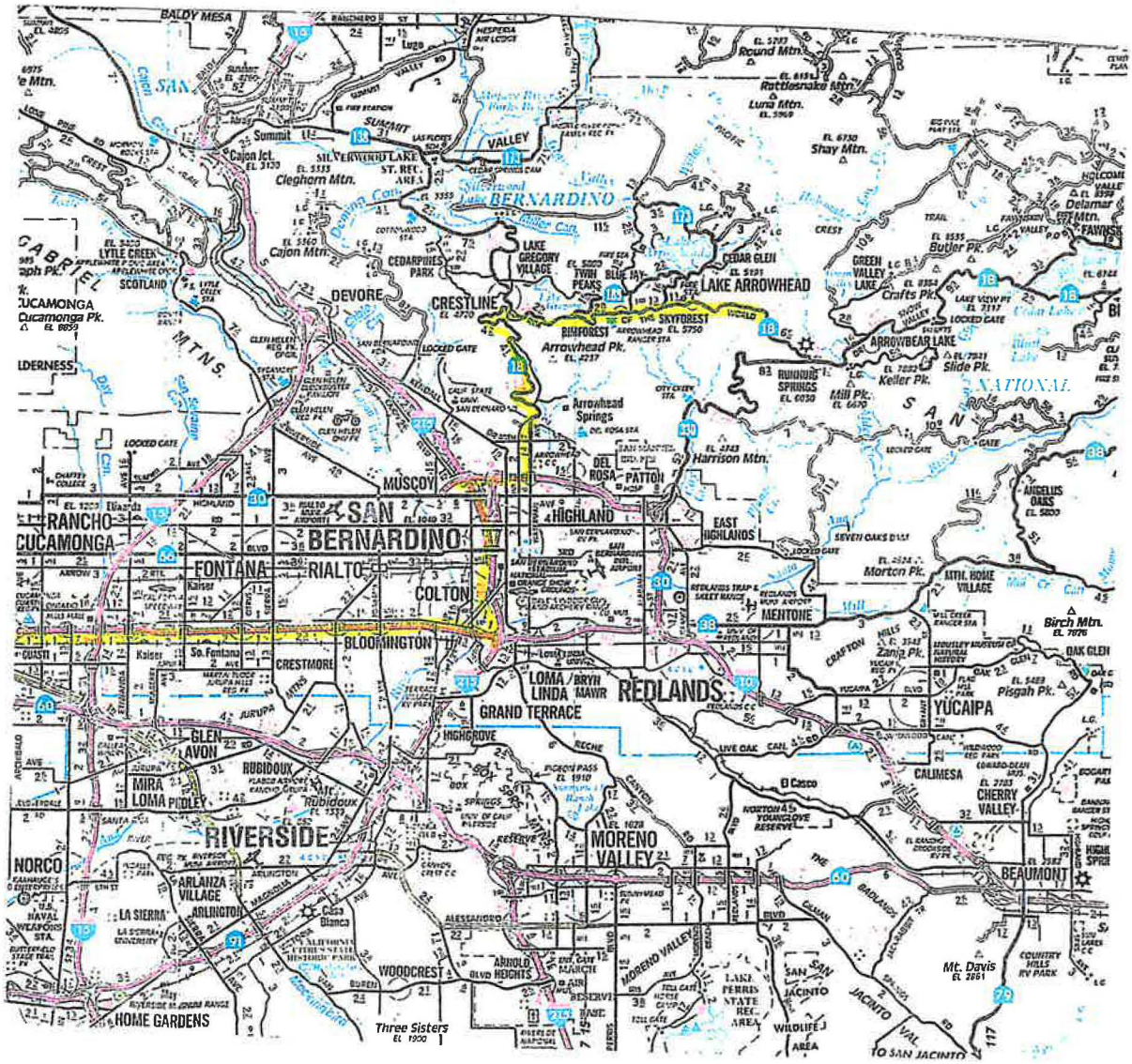
State Parks tour bus



Unbelieveable opulence

Myself swimming in the Neptune Pool – Photograph by Callie Hurd

San Bernardino Mountains



San Bernardino Mountains
6 months after the Grand Prix fire

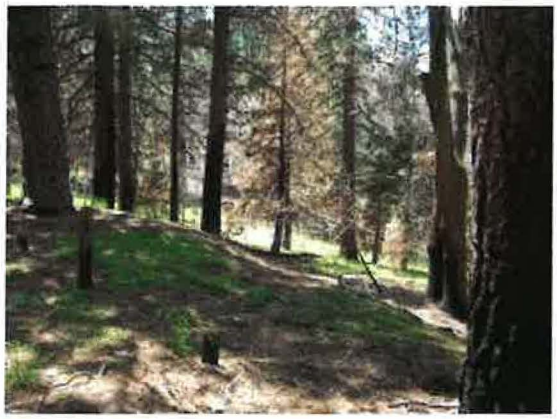
The fire devastated a vast area.

Trails were closed.

Some displays were available to view.

Mosaic burn pattern

Whether burned or infested by bark beetle was hard to tell from a distance.



Grasses were coming back …

… as were small flowering plants.

"If you build it, they will come …"

Lizard

Gray squirrel

Bear scat,
the first I've ever seen

Coyote scat
(that someone apparently stepped in)

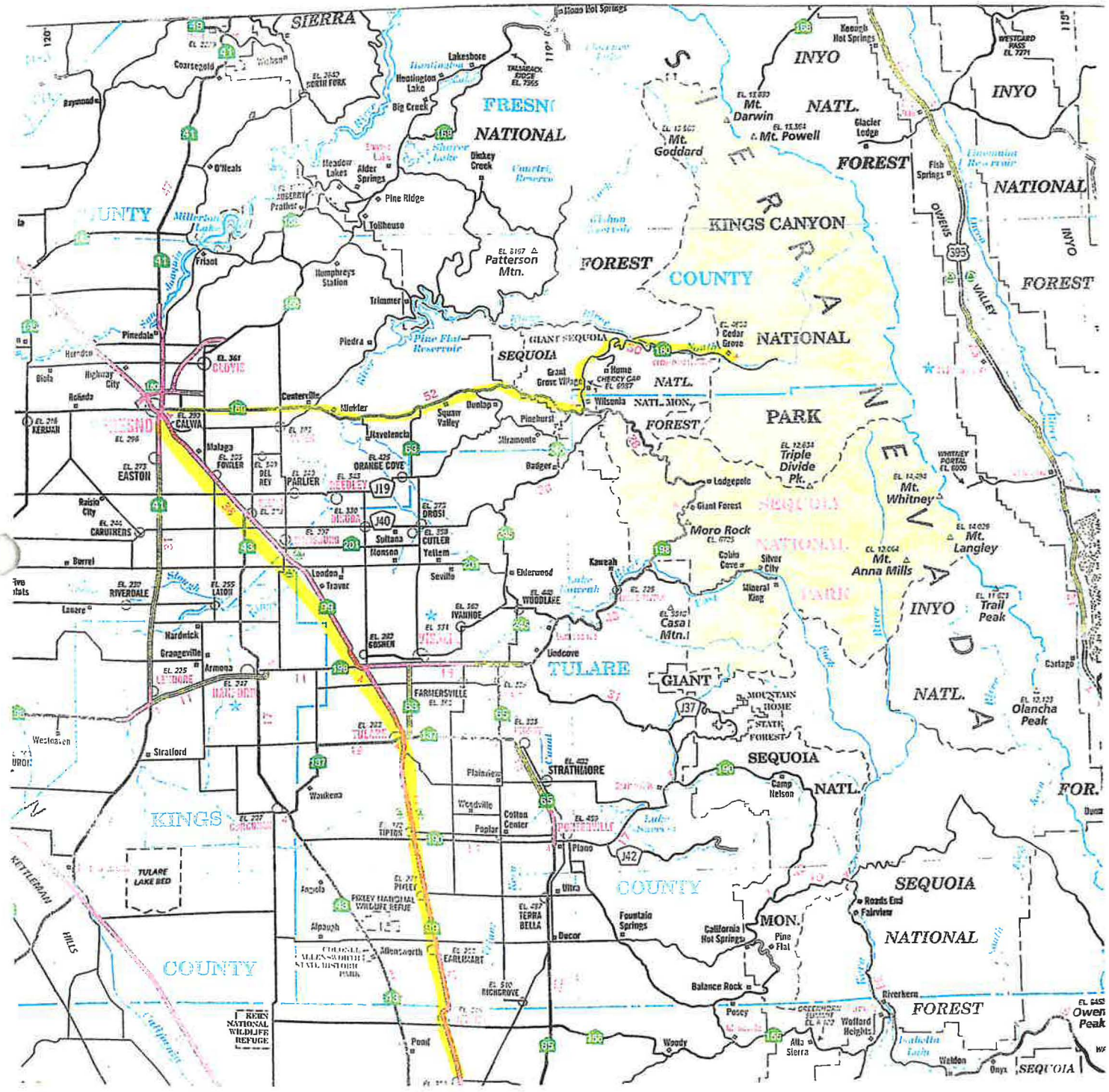
Someone's house burned …

… and someone else's was saved.

Cutting and hauling away dead trees had become one of the biggest local industries, sometimes closing the roads.

Later when I flew to Sacramento, it took 30 minutes of flying before I'd passed out of the burned area.

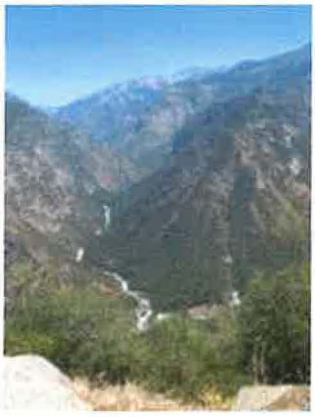
King's Canyon/Sequoia



King's Canyon/Sequoia – Sierra Nevada

Monoculture farming in the central valley

The habitat changes as the elevation increases.



Both forks of the King's river appear far away from atop the canyon …

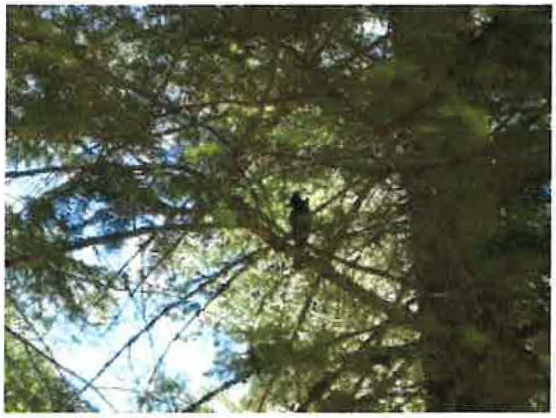
… but keep winding down, and suddenly the river is upon you.

It's so dangerous that water sports are curtailed.

Mountain tributaries, such as Sheep's Creek, feed into it.

Conifers in various stages of life and death

Cones providing the next generations

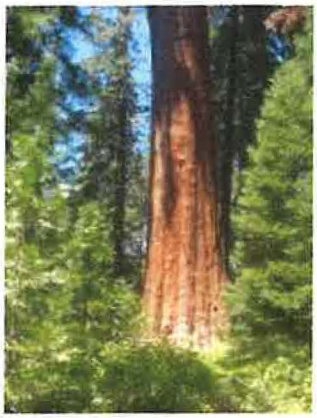


Stellar's jay hoping for a meal
(but feeding wildlife is discouraged)

Resting butterfly

My dog contemplates the meaning
of the bear-proof container …

… and finds a friend to play with.



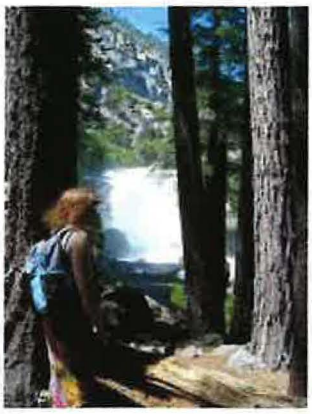
Sequoia, the world's largest tree …

…requires low-level fire to thrive and germinate its seeds.

Oaks and wildflowers

Mountain dogwood

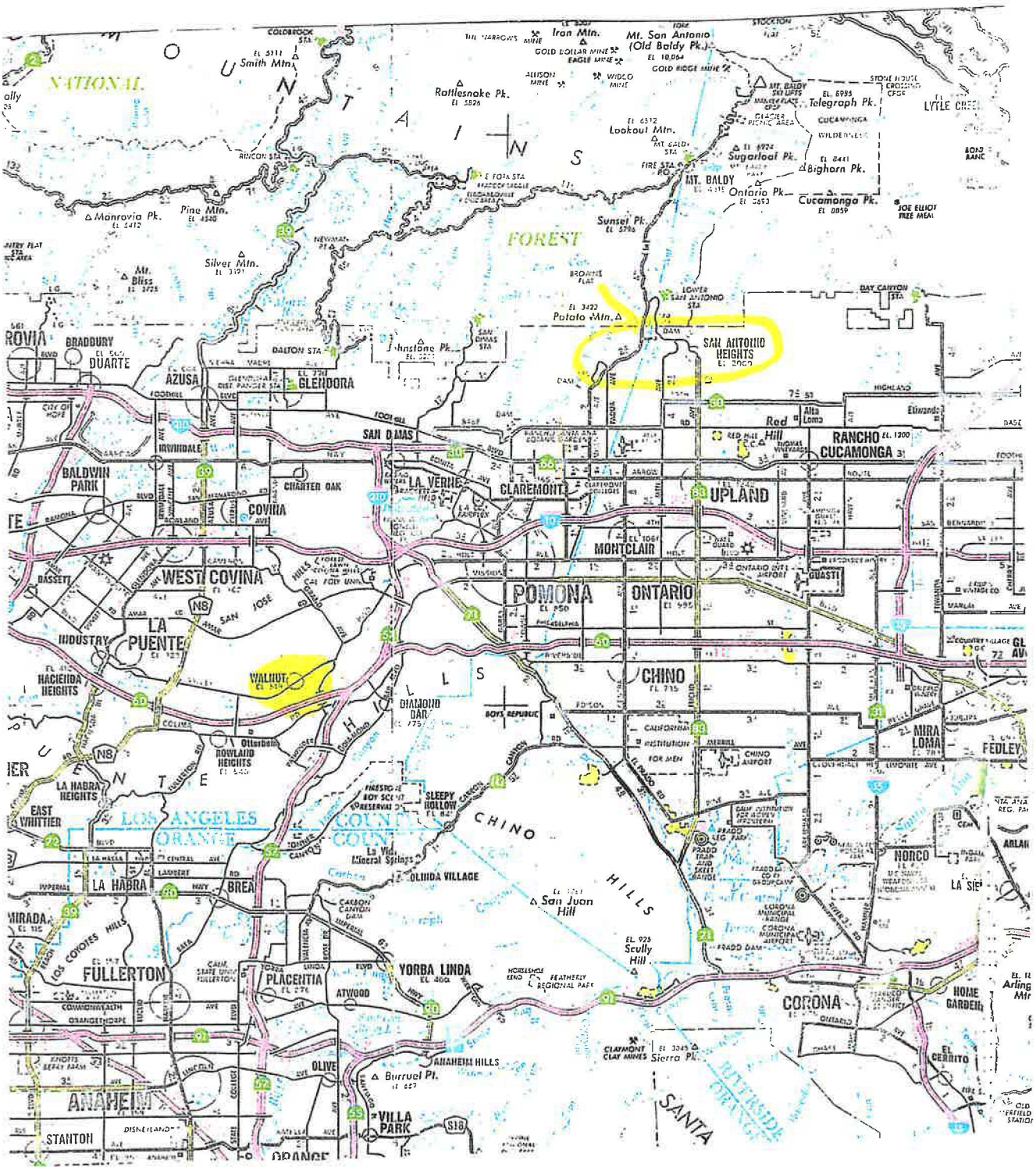
Lichen and ferns



Misty Falls, one of many areas not accessible by automobile

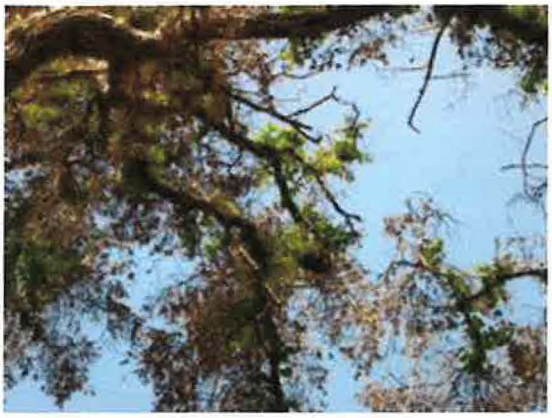
Photograph by Mike Pujals

Evey Canyon and San Antonio Dam



Evey Canyon
From coastal sage scrub to Canadian/Hudsonian habitat
6 months after the Grand Prix fire

The oaks were burned …



… but already show signs of new growth.

Grasses and wildflowers abound.

Professor Shannon views a giant lupin.

Erosion, due to lack of brush, poses a flood risk.

The white fir that marked the start of Canadian/Hudsonian habitat is gone.

Deep Canyon – Colorado Desert

This biologically diverse desert wash lies between several mountain ranges.

One can see why it takes a shocking amount of water to maintain desert golf courses.

Barrel cactus hundreds of years old

Cactus dying from drought

Professor Revell prepares radio telemetry equipment …

… to study the desert iguana.

The iguanas live around creosote bushes.

The equipment allows research into what occurs in their burrows.

The desert seems inhospitable, but signs of life abound:

Bighorn sheep skeleton

Jackrabbit scat

Harvester ant hill

Snake trail

Kangaroo rat burrow

The omnipresent coyote scat

This cat could have died a natural death, or been a coyote's meal …

… the iguana will never tell.

A spotted toad contemplates a meal.

Can you see what lives in the research station office building?

Oak Grove – Cleveland National Forest

Oak Grove was a bustling stage coach stop before the Civil War.

Myself at Oak Grove campground – Photograph by Jennifer Hoggan

Coast live oaks suffer sudden oak death in the north, development in the south.

This chamise was alive in April, dead due to lack of rainfall by July.

Here's the coyote scat …

… and other signs of them as well.

I saw lizards and snakes in the cactus.

This pellet probably came from a raptor, but they usually have bones rather than seeds.

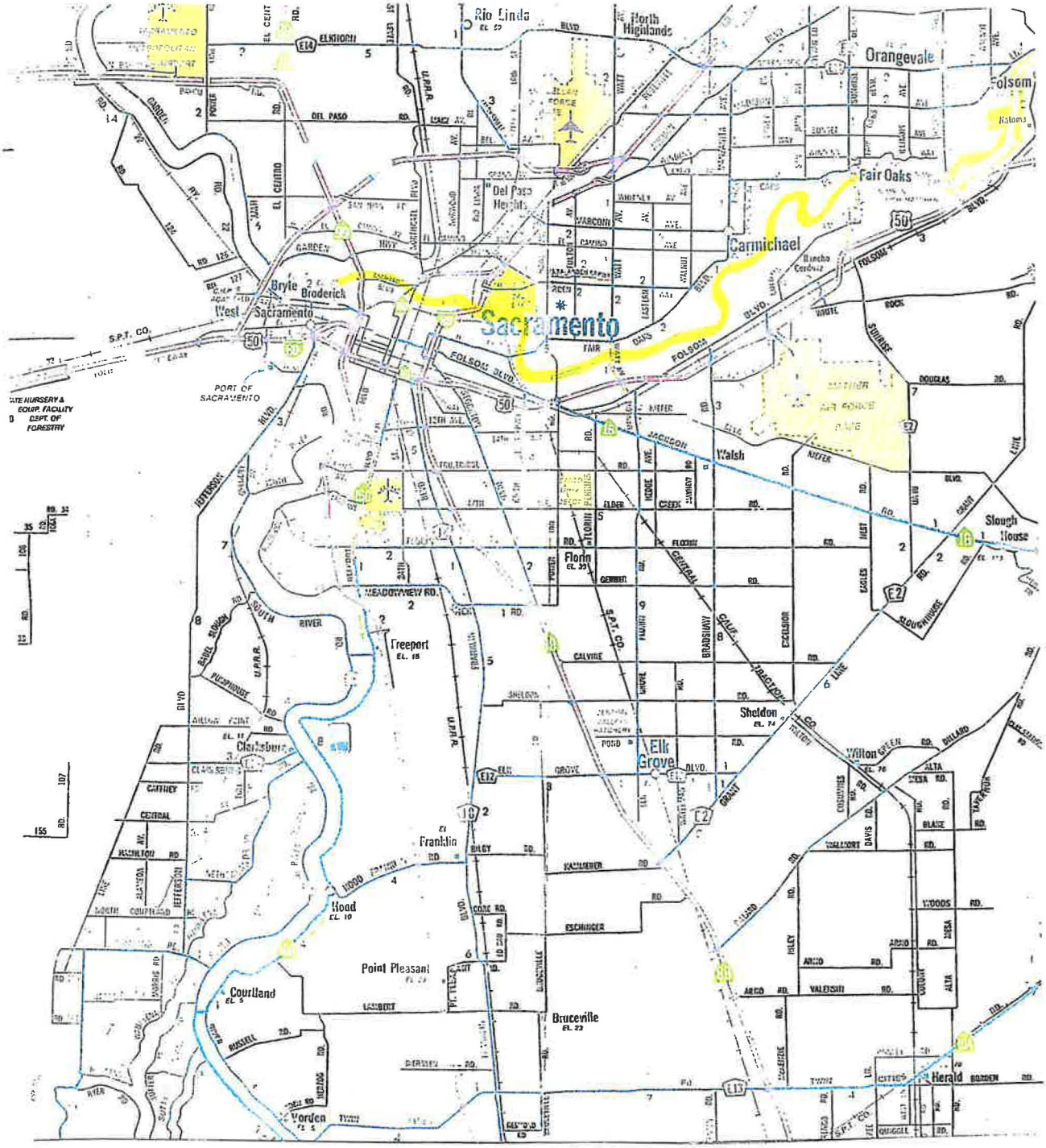
There were thunderstorms in the surrounding mountains ...

... and colorful sunsets.

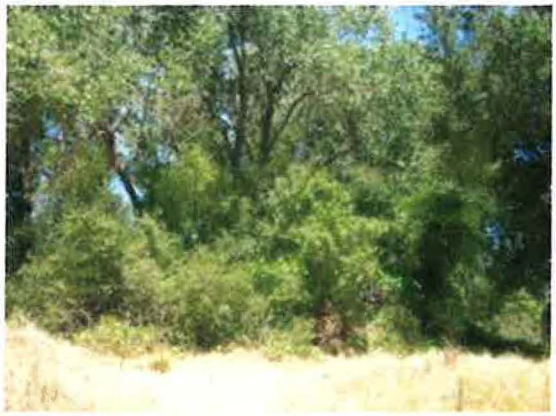
A domestic cat does not camouflage very well.

Humans find many ways to soil nature.

American River – Sacramento



American River – Sacramento



The trail is unmanicured.

Of course, the coyotes use it.

Recreation is low-key …

… no motorized vehicles allowed.

Riparian willow

Valley oak

Wild raspberries

Two red-tail hawks argue loudly.

A mule deer comes to drink and nibble along the shore.

Grand Prix Fire
Coastal Sage Scrub in San Antonio Dam – viewed from my neighbor's home
October 25, 2003

8 a.m. – fire in the distance

10 p.m. – fire cresting the dam

Within 40 minutes - fire everywhere

By 11:30, only smoke and embers …

Photographs by Wayne Stines

.My neighborhood was evacuated.

The sky over much of Southern California looked like this for days.

According to fire personnel, clearance of brush was a factor in why my and many other homes were still standing.

Many small animals had obviously died
from flame or smoke.

Rodent

Bird

Toad

Undoubtedly some large ones died also,
but I didn't see any.

San Antonio Dam – after the Grand Prix Fire

The dam provides flood control at the foot of Mt. Baldy.

After the fire, there was snow on the mountains, burn in the chaparral, and new growth in the coastal sage.

Wild cucumber was first.

Then the grasses started returning.

The wildflowers were prolific.

New monkey flower, burned manzanita

White sage

Jimson weed

Finally some deer weed sprouted.

The yuccas bloomed, but the sycamores remain charred.

In spite of the death of wildlife, scat and tracks indicated that some had survived.

Coyote scat marked by another

Snake trail

Rabbit track

Bobcat

Raccoon

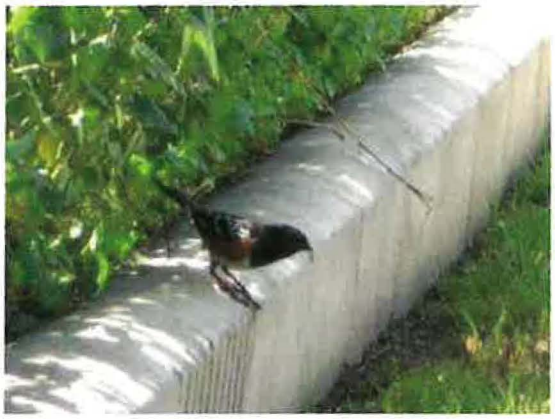
Deer

Predator and prey –
jackrabbit and bobcat

A wide variety

Some wildlife was still immediately visible …

Velvet ant



Spotted towhie

Ground squirrel

Caterpillar

Garden snail

Gamble's quail

Humans often make little effort to blend with nature's aesthetic beauty …

Kids come to skateboard in this famous sluice, and they leave their marks.

Water storage compound

Electric towers

Chemical herbicides

Some wildlife try to coexist with us, like this red-tailed hawk that nested in an electrical tower (until the fire).

But some don't seem to stand much of a chance.

For example …

… do we have to kill a rattlesnake?

Or could we relocate it?

Even our pets can pose a threat.

All human activity affects wildlife.

Building a dam may protect homes and control water distribution,
but it also changes habitat, foliage and speciation.

Coyote camouflaged in the scrub north of the
San Antonio Dam

A few months later, the scrub is completely covered
by the dammed up runoff from winter storms.

But the single biggest threat to wildlife remains
habitat loss due to development.

As Professor Robert Schmidt states, we have a love/hate relationship with our wildlife;
we are at the point of having to make our choice.

Some examples of other predators:

Mountain lion Photograph by Mike Rathbun

Western Diamondback Rattlesnake Photograph by Todd Hoggan

Bald eagle Photograph by Cindy Shannon

Some examples of protected species:

Desert tortoises are seldom seen in the wild.

The Mojave River vole was thought to be extinct, and then a population was found and relocated away from a developing area.

The Southwestern willow flycatcher is being studied by biologists along the Colorado River and its tributaries.

Photographs by Todd Hoggan

Some examples of plant and animal reproductive strategies:

Foxtails stick to animal fur to disperse.

Woodhouse toads mating.

Male California kingsnakes fight for the right to mate with a nearby female.

Photographs by Todd Hoggan

Will coyotes continue to thrive?

This skull shows the predator's dentition.

Many coyotes end up as road kill.

Photograph by Steve Macias

A pair separated during mating season.

There is controversy as to whether studying captive animals is ethical.
But these studies can lead to better non-lethal management techniques in the wild.

A coyote hunts in the coastal sage scrub at dusk.

APPENDIX F – MISCELLANEOUS

Walnut Times Magazine™

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COYOTES IN THE CITY OF WALNUT

Tim Revell, Biology Professor Mt San Antonio College

I moved to the city of Walnut in 1999. One of my favorite activities is to run on the equestrian trails. When I go running in, one animal that I occasionally encounter is the coyote.

Recently, a few Walnut residents have expressed their concern about coyotes in our city. I am writing this article as a concerned resident of Walnut and I hope it will be educational and will help dispel the myths about coyotes.

Photo/National Park Service

The coyote is one of the most misunderstood animals in urban areas. Coyotes are about the size and shape of medium sized German Shepard. They weigh between 20-50 lbs and can look practically identical to some dogs and the two can easily be confused. One distinguishing feature is that Coyotes usually run with their tail held down between their back legs, while dogs usually run with their tails held up high. They can run up to 40 mph for short distances. Coyotes are social, vocal animals that communicate with a variety of barks, yelps, and howls. They are very closely related to domestic dogs and often hybridize with them.

The coyote is an extremely versatile animal and will eat almost anything. Coyotes are often a significant predator on economically damaging species such as rats, mice, squirrels and rabbits. In urban areas, they occasionally eat cats and other small domestic animals. These attacks can be greatly reduced, however, if small animals are kept indoors. This is especially important at night. Many of the animals that are supposedly killed by coyotes turn out to be the victims of dogs instead.

Although it is extremely rare, coyotes have attacked humans. But many animals attack people including dogs, cats, deer, goats, bees, rabbits. It is estimated that approximately 10 people are

(continued on page 3)

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☆ Office of Attorney General State of California
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COYOTES *con't. from page 1.*

attacked by coyotes each year in the U.S. Officials with the Department of Fish and Game estimate that roughly one person gets bitten by a coyote per year in California. To put these numbers in perspective, the National Center for Injury Prevention and Control (NCIPC) estimates that about 4 million people are attacked by dogs each year in the U.S. (about 800,00 people seek medical attention for dog bites per year.) Therefore, you are MILLIONS of times more likely to be bitten by a dog than to be attacked by a coyote.

Coyotes occasionally scare humans by displaying teeth and growling. Many animals use aggressive displays when they feel threatened. Of the fifty or so coyotes that I've seen in my life, only one has acted aggressively towards me. I responded by walking towards it, waving my arms, and yelling and the coyote ran away. A friend of mine has encountered coyotes while running on the equestrian trail on Lemon Avenue. He has stated that in every case, the coyotes ran away when he rattled his keys.

Despite overwhelming evidence that coyotes are of little threat to humans, people still fear the coyote. In urban areas, coyotes have been removed by trapping, poisoning and shooting for many years. The United States Department of Agriculture Animal Damage Control/ Wildlife Services program removes approximately 85,000 coyotes per year. Yet there are more coyotes now than in the past. Michael Jaeger, a wildlife biologist at the National Wildlife Research Center and at the University of California, Berkeley states that "overall population reduction is a total waste of money, and certainly isn't the way to go; we've found that relatively few coyotes are doing the killing." Coyote populations are amazingly resilient; a female usually has between 2 to 8 pups. In the meantime, a temporary reduction in the population can lead to a huge population explosion of animals such as rats, mice, squirrels, and gophers.

If you see a coyote, don't panic and don't try to run away! Running from a coyote might actually encourage its aggressive behavior. Remember, coyote attacks on people are extremely rare. Follow these recommendations provided by the California Department of Fish and Game should you encounter a coyote:

1) Make loud noises, throw rocks, or spray them with a garden hose; let the coyote know they are not welcome.

2) NEVER feed a coyote. This is one of the biggest problems leading to Coyotes losing their natural wariness of humans. A coyote that gets accustomed to finding easy food around the residence will most likely come back. Also, you may already be inadvertently feeding a coyote. Make sure that garbage, pet food, and fruit that has fallen from trees is picked up and kept out of reach of coyotes.

3) NEVER leave small children unattended in areas known to be frequented by coyotes (even in your yard). The Inland Valley Humane Society also recommends using odor deterrents such as lion manure, ammonia soaked rags, and dog/cat repellents to prevent coyotes from entering your yard.

In conclusion, let me state that coyotes do more good than bad. Coyotes are known as a keystone species. A keystone species is an organism that is extremely important to the balance of an ecosystem. So even though coyotes occasionally attack people and eat our cats, the fact that they keep populations of rats, mice, and other pests under control cannot be overstated. Historically, rats and mice have been associated with diseases that have injured and killed MILLIONS more people than coyotes. To protect our citizens, we must learn to identify and remove coyotes that are known to be problematic. We must also realize that most coyotes are not problematic. Let's remember that wild animals, including coyotes, are very ecologically important. Instead of fearing the coyote, we must learn to respect the coyote as a normal and important part of the city of Walnut.

If you would like to receive the free brochure "Living With California Coyotes", call Chun Chien Yang, Code Enforcement, City of Walnut, 909/595 7543, ext. 137.

To learn more about Coyotes and other animals in Walnut, visit my website at www.timrevell.com ■

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Landers Earthquake Fault Tour A
Feb. 22

Native American Basket Weaving Skills I
Feb. 22, 23

Ancient Surfaces & Landforms of the Mojave
Mar. 1, 2

Coyote 101
Mar. 8

Map & Compass Basic Skills A
Mar. 14, 15

Landers Earthquake Fault Tour B
Mar. 15

*Flora of Joshua Tree National Park
Mar. 21-23

Mammal Tracking
Mar. 29, 30

Native American Basket Weaving Skills II
Mar. 29, 30

Wildflower Wanderings: The Beauty of Spring Blooms
Mar. 29

*Ecology of Desert Insects
Apr. 4-6

Photographing the Joshua Tree Landscape
Apr. 11, 12

Edible Plants of the Desert
Apr. 12, 13

*Birds of Joshua Tree National Park
Apr. 25-27

*Reptiles & Amphibians of Joshua Tree National Park
May 2-4

Basic Desert Survival B
May 9, 10

Native American Plant Cordage
May 10

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May 17, 18

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National Wildlife Research Center
Logan Field Station

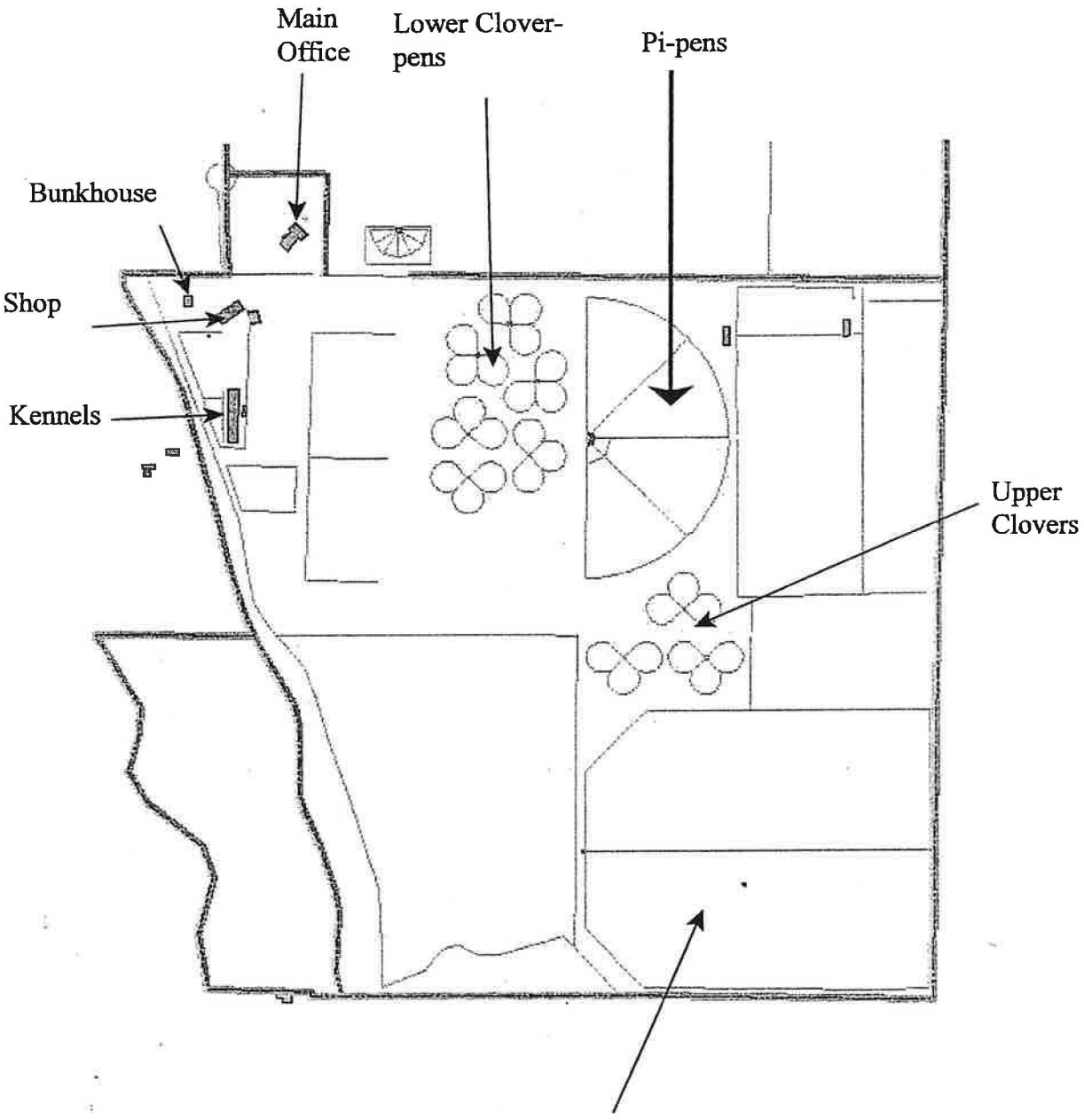
Mission:
The National Wildlife Research Center is a unique institution devoted to testing and developing improved management methods for resolving conflicts between humans and wildlife. Scientists at the Logan Field Station are studying the ecology and behavior of predators to identify non-lethal management techniques and strategies. Specific problems being solved include reducing livestock depredations caused by coyotes and other predators, managing conflicts in urban areas, minimizing effects of wildlife disease, and mitigating impacts of predators on wildlife populations. This research incorporates a variety of techniques that integrate social, ethical and economical concerns, as well as the biology of the predator species.

Facility:
The Logan Field Station has offices and facilities on the Utah State University campus and at the Carnivore Research Facility near Millville, UT. Personnel employed by the Station include 4 research scientists with joint faculty appointments to Utah State, a wildlife biologist, and numerous support personnel. The permanent staff is augmented by graduate students and other staff members from Utah State and other universities and agencies.

The 152-acre Research Facility near Millville is designed for the study of carnivore behavior, ecology, and physiology. The facility includes offices, laboratories, a veterinary clinic, observational buildings, and a variety of holding pens and experimental enclosures. Over 100 coyotes can currently be housed at the facility.

Current Projects:
Two Projects are housed at the Logan Field Station. The first, "Alternative capture systems and aversive stimulus applications for managing predation," is designed to develop new capture methods and management techniques for predators such as coyotes, wolves, and bears. The second project, "Ecology, behavior, and management methods for predators to protect livestock and wildlife resources," focuses on behavior and ecology of coyotes and foxes and the ecological relationships between these species and their ungulate and other prey.

Site Map



"South 40" pens–6.1 and 6.2

2004 Breeding Season Record

DATE	PEN	TIE?	Comments	Your First Name

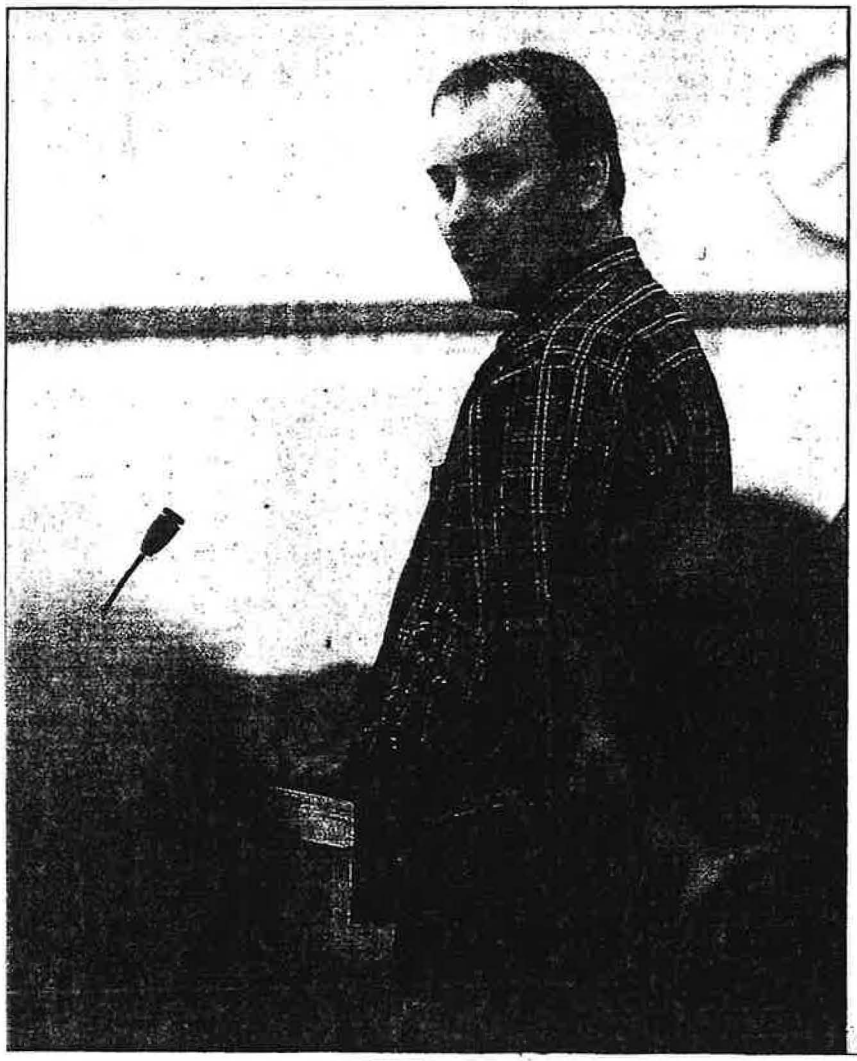
raid Journal

ary 29, 2004 Bridgerland's Daily Newspaper Logan, Utah © 2004 $.50

Prices at USU Bookstore drive students to Internet — A3

Mustangs stampede Grizzlies in showdown — B1

Life without parole



Nielsen jury gives sentence after emotional testimony

By Jason Bergreen
staff writer

Convicted murderer Cody Lynn Nielsen was spared the death penalty Wednesday and sentenced to life in prison without the possibility of parole.

The Box Elder County jury, that last week convicted Nielsen of capital aggravated murder in the 2000 death of 15-year-old Trisha Ann Autry, announced the unanimous decision around 7:30 p.m. Wednesday after deliberating two and a half hours.

"We're really, really pleased with the jury's decision," special prosecutor for the Cache County Attorney's Office Scott Wyatt said outside the 1st District Courthouse. "He'll never be able to get out of prison for the rest of his life."

Nielsen appeared calm after the verdict was read. He sat silently for a moment before being escorted from the courtroom by bailiffs.

After the court was cleared of spectators, Cache County Sheriff's deputies accompanied Cody Nielsen's mother, Bonnie, from the courthouse to her car via a side door. She declined to comment on the verdict.

JoAnn Autry, Trisha's mother, appeared relieved as she spoke to journalists outside the courthouse about the verdict. She said keeping Nielsen off the streets so he couldn't hurt people anymore was more important than the death penalty.

"The winners today are the children," she said. "The teenagers in Hyrum and other small towns who can now walk unafraid because this

See NIELSEN on A10

Nielsen

Continued from A1

predator is off the streets."

JoAnn Autry said she wanted people to remember Trisha as "a brave young woman" and "an advocate for women." Just before her disappearance, Trisha had presented a school paper on punishment of sex offenders.

JoAnn Autry said the support of family and friends and her faith helped her survive the struggles of the past three and a half years leading up to Wednesday's verdict.

"Death has no victory over us," she announced.

Nielsen's attorney, Shannon Demler, told reporters his client was confused after hearing the verdict and had mixed feelings. Demler did not elaborate but described his own feelings on the verdict as a "hollow happiness."

"In a way I'm pleased but it's not a happy day for anybody," he said. "He is going to jail for the rest of his life and Trisha's not coming back."

Prior to the verdict being announced Wednesday, a tearful Nielsen apologized during a closing statement to Trisha Autry's family for causing her death. However, he refrained from begging for his life of the six women and six men who presided over his fate.

Head bowed, Nielsen stood at the [illegible] and addressed the jury and 30 minutes. He asked forgiveness from the Autrys, told his parents, sisters, children and former wives that he loved them and told the jury his life was in their hands.

"I ask that if you find there is good in me and you believe I can get the counseling that I need, I hope I can return to society and be a part of it like I once was," Nielsen said. "I ask that if you find there is no good that I be sentenced to death. I believe in the death penalty."

Nielsen pondered outloud whether his family would be better off if he were given the death penalty.

"I don't know what's easier for my kids or dad anymore," he said. "For me to be here or for me to not be here."

Many audience members, including JoAnn Autry and Nielsen family members, cried along with him as he asked questions of himself in an effort to explain the unexplainable.

"I ask myself, is there something wrong with me? Something that can be changed? Something that can be rehabilitated? I don't know," he said.

In addition to being found guilty of capital aggravated murder last week, the 31-year-old Nielsen was also convicted of first-degree felony aggravated kidnapping, second-degree felony kidnapping and two counts of third-degree felony desecration of a dead human body.

The jury convicted Nielsen after being convinced by strong circumstantial evidence that he beat Trisha Autry to death then dismembered

photos by Eli Lucero/Herald Jour

Left, Nicole Lowe, Cody Nielsen's first wife, pleads for his life during the sentencing portion of his murder trial Wednesday Logan. Lowe said that she wants their children to have the opportunity to question their father about mistakes he has ma in his life. Right, Nielsen's mother Bonnie testifies during the sentencing portion of the trial Wednesday.

at the Millville Predator Research Laboratory in the summer of 2000. According to Demler, his client has maintained Autry's death was caused by a fall from a 13-foot-tall lookout tower at the research lab and was an accident.

Nielsen was warned Wednesday by Demler and co-counselor A.W. Lauritzen not to make comments regarding Autry's death that would allow prosecutors to impeach his statements.

"As I've been told, I can't go into the facts of what happened. I wish I could," Nielsen said. "At least for Mrs. Autry. She wants the truth."

Nielsen complained to the jury that he wasn't allowed to tell his side of the story during the trial, but his failed decision between Nielsen and his attorneys. Nielsen had been scheduled to take the stand in his own defense last week, but at the last moment his lawyers announced they would not call him and he made no objection.

"Do I think I did some of the things they say I did? No I do not," Nielsen said. "But the evidence points to it."

He later said, "I've never in my life intentionally caused the death of another, nor would I. But no matter how you look at it, there's a young lady dead."

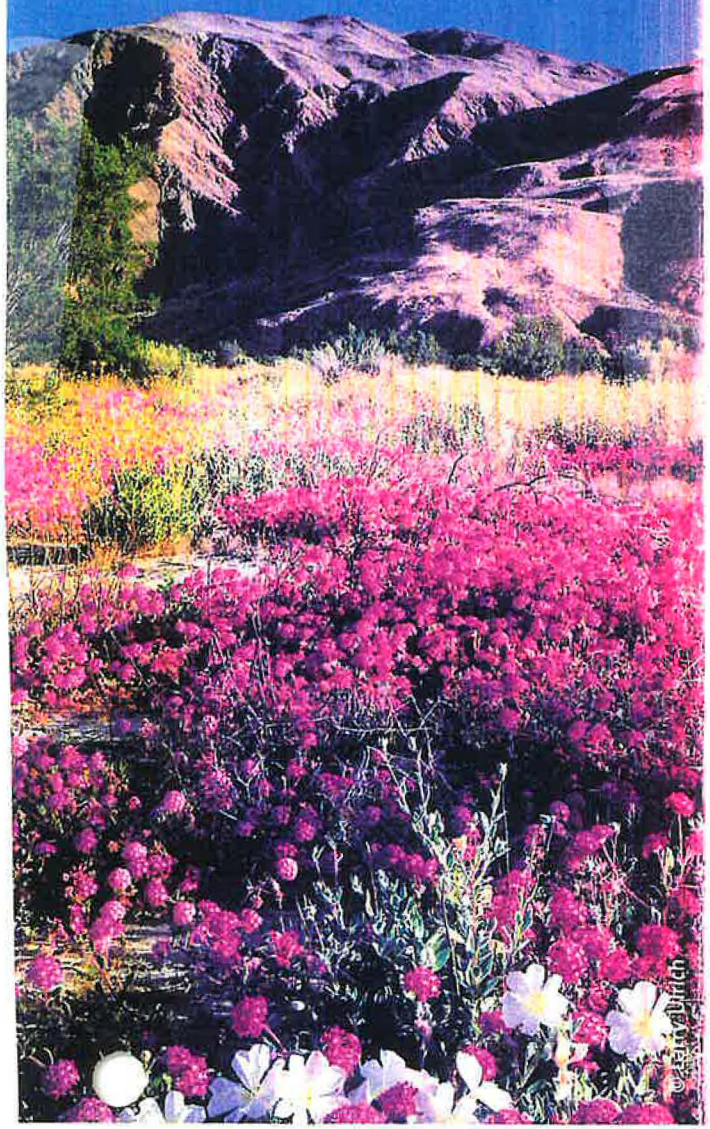
Also Wednesday, Bonnie Nielsen, plus one of Cody Nielsen's sisters and two former wives, testified that good brother, as well as a good father to his four young children.

"I'm not saying Cody is a saint b any means," his first wife Nicole Lowe said. "He's done wrong thing But by giving him the death penalt you only hurt his kids and his moth and his father ... Please think of those little boys and these little girl if nothing else."

Nielsen's father Lynn, who suffered chest pains Tuesday and was taken from the courtroom to Logan Regional Hospital, is reportedly doing "better," Bonnie Nielsen saic

Nielsen will be back in court Feb 9 for a final sentencing hearing before being sent to the Utah State Prison. The hearing is scheduled fo

Wildflowers of Anza-Borrego Desert State Park



A B C D E F G H I J K L M N O P Q R S T U V W X

Anza-Borrego Desert State Park

Desert Gardens
Henderson Canyon Rd.
Borrego Palm Canyon
VISITOR CENTER
Springs Rd.
Di Giorgio Rd.
Borrego Valley Rd.
Peg Leg Road
Palm Canyon Dr.
Dump Road
Borrego Springs
Font's Point
Palo Verde Wash
Arroyo Salado
To Salto
Hellhole Canyon
To San Diego
S22
Culp Valley
S3
Texas Dip
San Felipe Wash
Buttes Pass
Yaqui Pass
Cactus Loop Trail
Bill Kenyon Trail
78
Ocotillo Wells
S2
Yaqui Well
Tamarisk Grove
Grapevine Canyon
Plum Canyon
Mine Canyon
Narrows Earth Trail
Split Mountain Rd.
To Highwa and El Cen
To Julian and San Diego
78
Scissors Crossing
Elephant Trees Nature Trail
Split Mounta
Little Blair Valley
Blair Valley
Box Canyon
Mason Valley
S2
Vallecito
June Wash
Agua Caliente
S1
Indian Gorge
Mountain Palm Springs
Bow Willow
To Interstate 8
zo Badlands Overlook
To Highway 8

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The mission of the California Department of Parks and Recreation is to provide for the health, inspiration and education of the people of California by helping to preserve the state's extraordinary biological diversity, protecting its most valued natural and cultural resources, and creating opportunities for high-quality outdoor recreation.

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Governor

MARY D. NICHOLS
Secretary for Resources

RUTH COLEMAN
Acting Director, California State Parks

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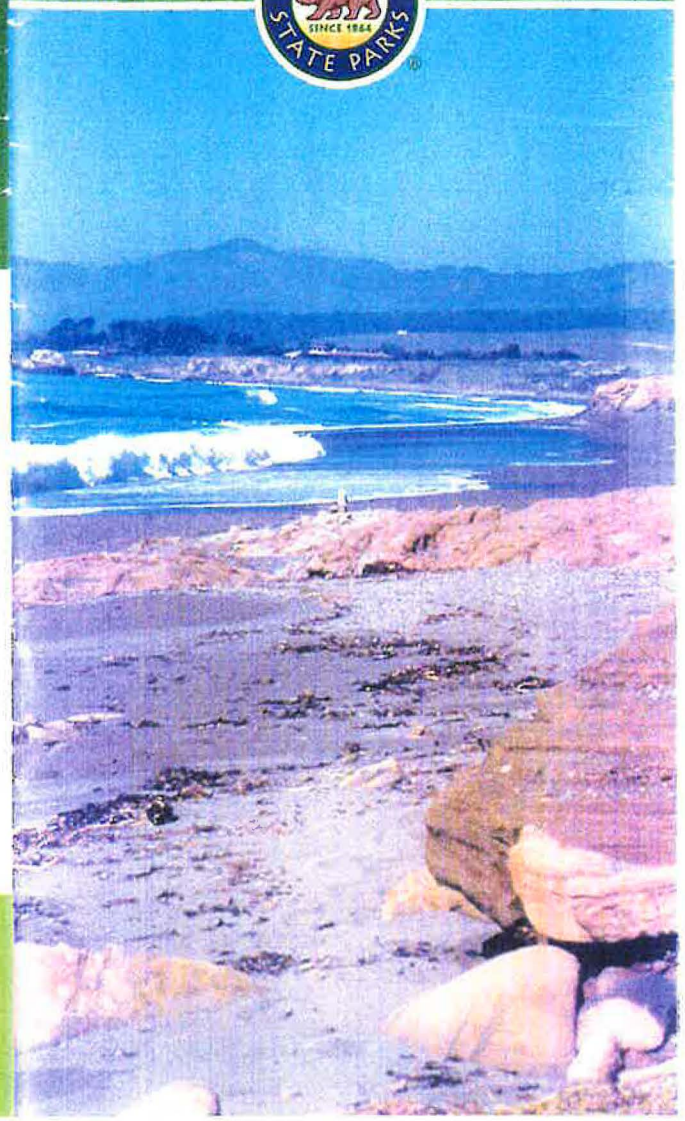

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SEQUOIA NATIONAL FOREST/GIANT SEQUOIA NATIONAL MONUMENT

SPRING 2004 GUIDE

WHERE CAN I...

You are visiting two different types of areas - a National Park and a National Forest. Some activities may be illegal in the Park but legal in the surrounding Forest. See page 2 to learn why this is so, and use a map to know where you are!

- **WALK A PET** *In Parks: Not on trails but it's ok in developed areas (campgrounds, picnic areas, roads).* In National Forest: Pets can go on trails. *In both areas: Pets must be on a leash less than 6 feet (1.8m) long. Don't leave them in hot cars.*
- **RIDE A BICYCLE** *In Parks: Keep bikes on roads only, not on any trail.* In National Forest: Ask a ranger which trails permit bicycles. *In both areas: Be careful & courteous near pedestrians & horses. People under 18 must wear a helmet.*
- **GO CAMPING** *In Parks: Only in numbered sites in designated campgrounds.* In National Forest: In campgrounds or, unless posted otherwise, near roadsides. Pull safely off the road & no further.
- **CUT WOOD** *Not in the Parks.* In National Forest: Call Hume Lake Ranger District for permit & guidelines: 559-338-2251.
- **GO FISHING** *In both areas: Permitted during the season; a California fishing license is required for ages 16 & up. Get copies of park-specific regulations at any visitor center.*
- **FEED WILDLIFE** *In both areas: Don't do it! Animals become unnaturally dependent. Some can be dangerous; some can carry disease. Roadside beggars get hit by cars.*
- **HAVE A FIRE** *In Parks: Only in fire grills in campgrounds & some picnic areas.* In National Forest: Fire permits are required outside picnic area grills & campgrounds. Get one at Grant Grove Visitor Center, Big Stump Entrance Station, or the USFS office in Dunlap on Hwy 180.
- **DRIVE OFF-ROAD** *Not in either area. Stay on roads.*
- **COLLECT THINGS** *Not in the Parks: Leave everything to play its natural role in the ecosystem.* In National Forest: Gathering a few cones or rocks for personal use is permitted. *In both areas: Archeological sites & artifacts are protected by law.*
- **GO PICNICKING** See picnic symbols on map (back-page). *Never leave food unattended!* Most sites have tables, restrooms & fire grills, except: No fire grills at Foothills & Sandy Cove. No fires permitted at Lodgepole & Crescent Meadow. No water at Grizzly Falls, Halstead, and Powdercan.
- **RIDE SNOWMOBILES** *Not in the Parks.* In National Forest: Only on designated snowmobile routes. Snowmobile trailheads are at Big Meadows, Quail Flat & Cherry Gap.
- **RIDE HORSEBACK**

Opening dates are weather-dependent. Rides by-the-hour & backcountry trips.

Cedar Grove - open by 5/28
559-565-3464 summer
559-337-2314 off season

Grant Grove - possibly by late May; 559-335-9292 summer
559-337-2314 off season

Mineral King
Call the park for information:
559-565-3106

Horse Corral (in National Forest/Monument) - open 5/22. Please call for reservations.
559-565-3404 summer
559-564-6429 off season
559-679-3573 cell

Warning: Active Bear Area!

This area has a high level of bear activity and it is your responsibility to know the law regarding food storage.

All of the following items must be stored in your food storage locker,

NOT IN YOUR VEHICLE OR TRUNK.

- **All coolers**
- **All food and drinks, even when sealed, canned or bottled. This includes all pet food.**
- **All toiletries: i.e. cosmetics, toothpaste, lotion, sunscreen, insect repellent, chapstick, soap, hairspray, etc.**
- **1st aid kits, laundry detergent, dish soap, window cleaner, chewing gum, car air fresheners, etc.**
- **Any type of food or odorous trash, including food or gum wrappers, empty bottles or cans, coffee cups, fast food bags, etc.**

Always dispose of food trash into bear proof trash cans or dumpsters.

DO NOT put food trash in bathroom trash cans.

Remove baby and child seats from your vehicle and store them outside. Empty coolers may be stored OPENED, outside of your vehicle.

NEVER leave food or odorous items unattended.

Thank you for following these rules and properly storing your food.

Failure to do so can result in a $150 citation for improper food storage.

NRS NATURAL RESERVE SYSTEM

UNIVERSITY OF CALIFORNIA

Boyd Deep Canyon Desert Research Center

SITE SPECS

ADMINISTERING CAMPUS
UC Riverside

ESTABLISHED
1965 as an NRS reserve; 1958 as a UCR campus reserve.

LOCATION
Riverside County, 8 km (5 mi) south of city of Palm Desert; 2-hour drive from the Riverside campus.

SIZE
6,597 ha (16,301 acres)

ELEVATION
9 to 2,657 m (30 to 8,716 ft) within Deep Canyon Transect.

AVERAGE PRECIPITATION
Annual means range from 15 cm (6 in) at Boyd Center to 40 cm (16 in) along the upper plateau.

AVERAGE TEMPERATURES
January: 10°C (51°F), July: 39°C (102°F)

FACILITIES
Two laboratories w/ basic equipment (balances, etc.), herbarium, small library, housing facilities for 14 researchers, and reserve office at Boyd Center; small four-bunk facility w/ workspace at Agave Hill (no water on site); teaching area and campground for classes.

DATABASES
Complete herbarium and other synoptic collections; data from six weather stations and ongoing plant/animal monitoring; maps of various scales; reference library w/ extensive bibliography of on-site research.

PERSONNEL
Director in residence, staff biologist, and maintenance person.

NRS PUBLICATIONS
Reserve brochure published 1991.

CONTACT INFORMATION
Allan Muth
Boyd Deep Canyon Desert Research Ctr
Box 1738, Palm Desert, CA 92261
Phone: 760-341-3655
E-mail: deepcanyon@ucr.campuscw.net

NRS WEBSITE
<http://nrs.ucop.edu>

2/99 ser

One of the largest NRS reserves, the Boyd Deep Canyon Desert Research Center encompasses a major drainage system descending from the high peaks of the Santa Rosa Mountains down to Colorado Desert. Deep Canyon's tributaries begin in montane forests, flow across a rolling plateau covered with piñon-juniper woodland and chaparral, join at the head of a precipitous gorge, and plunge 360 meters (1,180 feet) into the canyon. From there, the mouth of the canyon opens out into a broad alluvial fan with sandy washes on the southern edge of the Coachella Valley. Except for a few permanent pools, the streambed in Deep Canyon's lower reaches is dry. However, winter storms can trigger dramatic flooding. The vertebrate fauna is exceptionally rich, with forty-six reptile species, 228 birds, and forty-seven mammals. The reserve is part of the U.S. Mojave and Colorado Desert Biosphere Reserve. Desert research is also possible at two other NRS sites: the Burns Piñon Ridge Reserve and the Jack and Marilyn Sweeney Granite Mountains Desert Research Center.

SELECTED RESEARCH

Population biology of the Coachella Valley fringe-toed lizard (*Uma inornata*), a state-endangered and federally threatened species.

Health and demography of the peninsular bighorn sheep (*Ovis canadensis cremnobates*), a state-threatened and federally proposed-endangered species.

Mountain lion ecology.

Rattlesnake ecology.

Pollinator tracking of plant migrations induced by global warming.

Physiology of succulents.

Social behavior of the desert iguana.

SPECIAL PROGRAMS

Fire-recovery monitoring: The long-term recovery of piñon-juniper woodland is monitored using permanent transects established in burned and unburned areas after the 1994 fire.

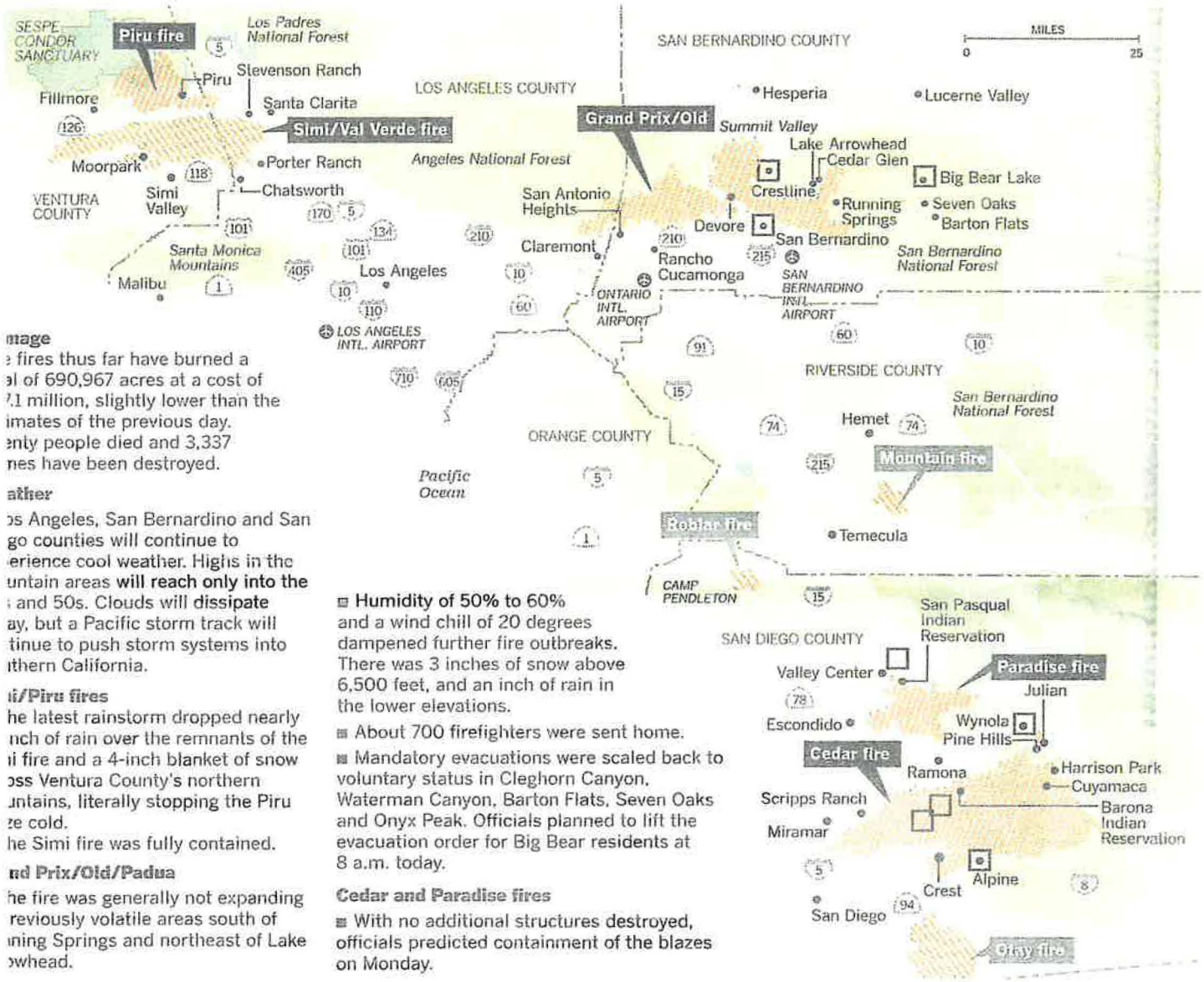
Exotic species removal: A tamarisk and fountain grass management program was initiated in 1996.

Field courses: Site visits by university courses in ornithology, ecology, botany, plant physiological ecology, biology of ants, conservation biology, cactus and succulents, and others.

SOUTHERN CALIFORNIA FIRES

aturday's developments

Approximate boundary of fire | Contained fire | Where deaths occurred



Fire boundaries as of Saturday.

mage

e fires thus far have burned a al of 690,967 acres at a cost of 7.1 million, slightly lower than the imates of the previous day. ently people died and 3,337 nes have been destroyed.

ather

os Angeles, San Bernardino and San go counties will continue to erience cool weather. Highs in the untain areas **will reach only into the** and 50s. Clouds will **dissipate** ay, but a Pacific storm track will tinue to push storm systems into uthern California.

i/Piru fires

he latest rainstorm dropped nearly nch of rain over the remnants of the i fire and a 4-inch blanket of snow oss Ventura County's northern untains, literally stopping the Piru ze cold.

he Simi fire was fully contained.

nd Prix/Old/Padua

he fire was generally not expanding reviously volatile areas south of ining Springs and northeast of Lake owhead.

- **Humidity of 50% to 60%** and a wind chill of 20 degrees dampened further fire outbreaks. There was 3 inches of snow above 6,500 feet, and an inch of rain in the lower elevations.
- About 700 firefighters were sent home.
- Mandatory evacuations were scaled back to voluntary status in Cleghorn Canyon, Waterman Canyon, Barton Flats, Seven Oaks and Onyx Peak. Officials planned to lift the evacuation order for Big Bear residents at 8 a.m. today.

Cedar and Paradise fires

- With no additional structures destroyed, officials predicted containment of the blazes on Monday.

ive fires at a glance

	Coverage (in acres)	Percent contained	Projected contained	Fatalities	Homes lost	Firefighters present	Engines present	Helicopters present	Cost to fight (in millions)
	63,991	80	Within days	0	1	331	0	3	$6.3
i/Val Verde	116,984	100/100	—	0	37	1,449	32	4	$9.2
nd Prix/Old	161,195	95/65	Today/Nov. 8	4	902	5,755	193	31	$31.3
ntain	10,331	100	—	0	21	0	0	0	$2.2
adise	56,700	60	Monday	2	169	1,608	59	13	$4.36
ar	281,666	90	Monday	14	2,232	4,275	523	27	$9.8

ces: National Interagency Fire Center, U.S. Forest Service, GDT, USGS, University of Maryland, ESRI, Associated Press, Times reports
arched by Times graphics reporter JOEL GREENBERG

COYOTE PLACES THE STARS

(A Wascoe Indian Legend)

1. **Many moons & many moons ago**
   -coyote lived by swift-running river
   -cool night, relaxing with bear in grass
   -"I think I will climb to heavens & discover their secrets!"
   -"how can you do that?"
   -"I can get up there with no trouble at all!"

2. **Coyote was v. skillful with bow & arrow**
   -gathered up lots of arrowweed, made arrows
   -shot them at sky
   -one stuck in moon
   -shot 2nd –it hit the rear notch of the first arrow!
   -shot & shot, every one the same, until a long line of arrows made a
   -ladder!
   -climbed to the moon – took a long time. Rested

3. **Woke up next night, had another idea.**
   -wondered if he could move stars around if he shot them with arrows.
   -shot, star moved, he could place stars wherever he wanted.
   -wagged tail, yelped for joy – he could make pictures in sky for all world to see.

4. **Shot arrow after arrow, moved stars, made a coyote!**
   -then a bear
   -worked all night, made mountain lion, bighorn sheep, fish, owl, eagle
   -with the stars left over, coyote made a big road across the sky.

5. **Climbed down ladder**
   -when moon rose, he saw his handiwork and howled
   -animals, birds woke up, listened to the mysterious sound
   -It called to them.
   -from canyons, mesas, hills, plains, they came, followed the sound.

6. **Coyote appeared high on rock, all animals gathered around**
   -look at sky; I made pictures of animals out of the stars with my arrows.
   -animals gave a great feast for coyote, sang & danced thru night.
   -they all declared that "coyote was the most clever & crafty of them all!!

7. **To this day, if you listen closely in still of night when moon is rising, you may hear the magical howl of coyote. Coyote may be calling you to look up, gaze at the star pictures, and to dream.**

MT. SAN ANTONIO COLLEGE
Salary and Leaves Committee

APPLICATION FOR SABBATICAL LEAVE

Name of Applicant Lynda Hoggan

Address 2521 Electric Ave., Upland, CA 91784

Employed at Mt. San Antonio College beginning 8/96

Dates of last sabbatical leave:

From N/A To _____

Department Biology Division Natural Science

Length of sabbatical leave requested:

One semester _____
Fall _____ Spring _____

Two Semesters *

Purpose of sabbatical leave:

Study _____ Project *

Travel _____ Combination (specify) _____

NOTE: Sabbatical periods are limited to contractual dates of the academic year.

Effective dates for proposed sabbatical leave:

From _____ To _____

and (if taken over a two school year period)

From 8/2003 To 5/2004

Attach a comprehensive, written statement of the proposed sabbatical activity(ies) including a description of the nature of the activity(ies), a timeline of the activity(ies), an itinerary, if applicable, the proposed research design and method(s) of investigation, if applicable.

Attach a statement of the anticipated value and benefit of the proposed sabbatical activity(ies) to the applicant, his/her department or service area, and the College.

Any change or modification of the proposed sabbatical activity(ies) as evaluated and approved by the Salary and Leaves Committee must be submitted to the Committee for reconsideration.

Lynda Hoggan
Signature of Applicant

12/1/02
Date

Applicant's Name Lynda Hoggan

THE ACKNOWLEDGMENT SIGNATURES REFLECT AWARENESS OF THE SABBATICAL PLAN FOR THE PURPOSE OF PERSONNEL REPLACEMENT. COMMENTS REQUESTED ALLOW FOR RECOMMENDATIONS PERTAINING TO THE VALUE OF THE SABBATICAL LEAVE PLAN TO THE COLLEGE.

APPLICANTS MUST OBTAIN THE SIGNATURES OF ACKNOWLEDGMENT PRIOR TO SUBMITTING APPLICATION TO THE SALARY AND LEAVES COMMITTEE.

ACKNOWLEDGMENT BY THE DEPARTMENT/DIVISION

Signature of Department Chairperson [signature] Date 11/27/02
Comments:
See attached letter.

Signature of Division Dean [signature] Date 26 NOV 02
Comments:
See attached letter.

ACKNOWLEDGMENT BY THE OFFICE OF STUDENT LEARNING

Signature of appropriate Vice President [signature] Date 12/5/02
Comments:

NOTE: DEANS ARE REQUESTED TO SUBMIT A STATEMENT OF RECOMMENDATION REGARDING THE VALUE OF THE SABBATICAL PLAN TO THE COLLEGE, DIVISION/DEPARTMENT, AND INDIVIDUAL, IN CONSULTATION WITH THE APPROPRIATE DEPARTMENT CHAIRPERSON.

****

FINAL ACTION BY THE SALARY AND LEAVES COMMITTEE:

_____ Recommend approval to the Board of Trustees
_____ Not recommend approval to the Board of Trustees

_____ _____
Signature - Chairperson, Salary and Leaves Comm. Date

_____ _____
Signature - Authorized Agent of the Board Date

MT. SAN ANTONIO COLLEGE
1100 North Grand Avenue • Walnut, CA 91789-1399
ACCESS TO QUALITY

TO: Wade Frary, Chairperson, Salary and Leaves Committee

FROM: Larry L. Redinger, Dean
Natural Sciences Division

DATE: November 25, 2002

SUBJECT: Support for Lynda Hoggan, Application for Sabbatical Leave

This letter is to indicate my support for Lynda Hoggan, Professor of Biology, in her request for approval of sabbatical leave for the 2002-2003 academic year.

Lynda has been a most innovative instructor and dedicated member of the Biological Sciences Department. As a Public Health educator, she brings a unique perspective to teaching her courses as well as to her collaboration with colleagues. Her considerable community-based experience prior to teaching at Mt. SAC has been of great value to her students and the department. Her enthusiasm for her subject and commitment to her students is evident in all she does.

Also commendable is Lynda's ongoing effort to learn from her colleagues as well as to share her expertise with them. With limited background in Biology, she has initiated the means to learn more about the Biological and Anthropological Sciences and to incorporate multidisciplinary offerings in the curricula. The independent study activities outlined in her sabbatical proposal are typical of her creative and holistic approach. The benefit to the college and the learning opportunities available will be of significant value to Mt. SAC at many levels.

Lynda has the support of the Biology Department. Although her colleagues and students will miss her contributions, her absence for a one-year period can be reasonably accommodated by the department membership.

Please give this proposal your full consideration. I am sure that Lynda Hoggan will carry out her proposed activities with devotion to both professional and personal growth. I encourage the committee to look favorably on her application.

LR:pab

cc: Rita Cavin

MT. SAN ANTONIO
COMMUNITY COLLEGE DISTRICT

November 26, 2002

Sabbatical Leave Committee:

Professor Lynda Hoggan joined the Department of Biological Sciences in 1996 as our primary faculty member responsible for Biology 5: Contemporary Health Issues and Biology 15, Human Sexuality. Her academic preparation suits her particularly well in that capacity, and we are delighted with her efforts to update and build the enrollment in those programs.

She is applying for Sabbatical Leave for 2003-2004 in order to expand and refresh her expertise in several major components of her courses:

1. nutrition and "nutriceuticals" (food as medicine), mental health issues, human sexuality, and
2. coyote ecology and impact on human health.

The Department of Biological Sciences, at its meeting on October 24, 2002, gave its unanimous and enthusiastic support to her proposal. As our only member with this background, Lynda is uniquely able to teach these topics, which, like many others in our discipline, are subject to rapid metamorphosis as research yields new and sometimes altered understandings. Keeping abreast of the discoveries in one's discipline sometimes requires concentrated study, which is essentially what her proposal is all about.

We enthusiastically endorse Professor Hoggan's application for Sabbatical Leave and respectfully request the Sabbatical Leave Committee to honor her request.

For the Department of Biological Sciences:

William L. Waggener

William L. Waggener, Ph. D.
Professor of Biological Sciences and Department Chair
bwaggene@mtsac.edu/Ext. 4554

SABBATICAL LEAVE PROPOSAL REVISION FOR 2003-2004
Professor Lynda Hoggan, Biological Sciences

Nutritional awareness and environmental responsibility, two of the most crucial health issues that Americans face today, are the focus of my year-long sabbatical leave proposal.

Part 1, Fall Semester 2003 – Nutrition, Nutriceuticals and Health: Poor nutrition is linked to several of our leading causes of death and disability, including cardiovascular disease, obesity, diabetes, perinatal conditions, and many cancers. The U.S. Public Health Service has identified nutrition as a key focus in its Healthy People 2000/2010 Goals for the Nation. It is so important to our health and well-being that dietary counseling is now listed first in importance for health care workers to address with their patients - not just in childhood or young adulthood, but throughout the life cycle.

Yet many Americans struggle between the desire for better health and the ease and good taste of already-prepared convenience foods. We often make the wrong choices and then try to reverse them with diets and artificial supplements, some of which are even more dangerous than the unhealthy foods themselves. The medical system is overburdened with trying to treat behavior-related nutritional illnesses. As a result, there is a growing interest, among professionals as well as consumers, in "nutriceuticals," the use of food as palliative and preventive medicine. This includes achieving a proper balance among protein, carbohydrate and fat calories in a way that is satisfying. It involves learning to utilize vitamins, minerals, dietary fiber and phytochemicals (cancer-preventive substances in plant foods) to promote optimum health, including mental health, and prevent disease. And it means planning food choices that are congruent with these goals.

Although I have never taken a formal class on the subject, nutrition is a major unit in Biology 5, Contemporary Health Issues, one of the two courses I teach. And in spite of the stereotype that college-age people don't care about a healthy diet, I find that every semester, students show great interest in the subject; they listen attentively and always have more questions than can be answered in the time allowed. Furthermore, the use of nutriceuticals to enhance mental and emotional functioning is an exciting and relatively new science, and it strongly ties to the study of stress and mental health, which is another important unit in this course.

On the other hand, nutrition is not part of the required curriculum for the other course I teach, Biology 15, Human Sexuality. Yet it has bearing on many areas of sexual health. I find students to be very interested in the subject of how diet can affect fertility, pregnancy, sexual functioning, and the aging process, as well as how disease progression, such as heart disease and diabetes, can affect sexuality. As a result, I have added some of this to the existing units on reproduction, dysfunction and disability. Unfortunately, my own knowledge in all these areas is more limited than I would like it to be. And finally, Professor Tim Revell and I are in the process of creating a website to support making healthy behavior changes. This website includes pages on nutrition and weight management and will benefit from continued expansion and updating in these important areas.

For the first semester of my sabbatical leave, I propose to undertake an independent study project on nutrition. The focus of my study will be on nutriceuticals, with particular emphasis on two areas - how nutriceuticals enhance general health and fitness and interact with neurochemistry to reduce stress and promote mental health; and how nutrition/nutriceuticals can enhance sexual function, pregnancy and fertility. The study goal is to enhance my teaching in both Biology 5 and Biology 15, and to make my research available to my colleagues who teach these or related courses. The study objectives will include the following: 1) To conduct a literature review of current, pertinent research and opinion (selective rather than exhaustive) and to read appropriately from this list. 2) To read at least six primary and peruse at least two secondary selections from a list of 11 relevant books I have already located. 3) To interview at least two expert sources. 4) To write a sabbatical report for the college and otherwise disseminate my research to my colleagues. 5) To appropriately update the behavior change website (see Attachment 1 for more detailed objectives and estimated timeline).

The college will benefit from my project in the following ways. 1) Biology 5 is an elective that fulfills Area E requirements and transfers to many universities, including some which apply it to the health education component of the California teaching credential. This course will offer improved units in three of its most significant areas - nutrition, mental health and reproduction. 2) Biology 15 is an elective that also fulfills Area E requirements, transfers to many universities, and is one of the department's, as well as the college's, most popular courses. This course will have access to information to enhance students' understanding of the nutritional component of many areas of sexual health. 3) Other courses on campus address nutritional issues, for example, Basic Nutrition, Essentials of Nutrition, Fitness for Living, and General Biology. Instructors in these courses may utilize this research for their classes as well. 4) This information can be added to the behavior change website and thereby accessed by students, faculty and staff, as well as the world community that utilizes the internet, for the purpose of improving personal and public health.

My personal development will be enriched by this project in the following ways. 1) I will better understand the information that I am already teaching in order to strengthen the case for students to seek healthy nutrition. 2) I will have the opportunity to read and reflect upon areas of great interest to me. 3) I will return from leave refreshed and energized about the possibilities for helping students to become more interested in and aware of how nutritional choices impact many areas of their lives. 4) I will enjoy sharing my research with colleagues and through the website. 5) And I, too, will have an enhanced diet and better health as a result!

I will make this information available to the college in my written report, through informal seminars with my colleagues, and/or via the website.

Hoggan **Attachment 1**

Objectives and Estimated Timeline

Fall Semester 2003

Week

1 Refine preliminary online search of nutrition and nutriceuticals, 7,850 hits.
Refine preliminary online search of nutriceuticals and mental health, 856 hits.
Locate and read pertinent articles. Notate for report.

2 Refine preliminary online search of nutriceuticals and sexuality, 106 hits.
Refine preliminary online search of nutriceuticals, fertility and/or pregnancy, 2,880 hits.
Locate and read pertinent articles. Notate for report.

3 Read Molecules of Emotion by Candice Pert, PhD (neuroscientist who participated in discovery of the opiate receptor). Summarize.

4 Read The Natural History of the Senses by Diane Ackerman, PhD (renowned poet and naturalist). Summarize.

5 Read The Natural History of Love by Diane Ackerman. Summarize.

6 Read The Botany of Desire by Michael Pollan (science writer; winner of the first Reuters-World Conservation Union Global Award for Excellence in Environmental Journalism). Summarize.

7 Read Food and Love by Gary Smalley, MD (physician specializing in holistic relationships.) Summarize.

8 Read Sexual Nutrition by Morton Walker, MD (physician and controversial medical writer). Summarize.

9 Read Tales of the Shaman's Apprentice by Mark Plotkin, PhD (ethnobotanist, specialist in indigenous peoples' use of nutriceuticals). Summarize.

10 Complete any unfinished reading.
Prepare informed interview questions.

11 Interview Mark Meskin, PhD, Professor of Nutrition at Cal Poly Pomona (pioneer in phytochemical research - *confirmed*).
Review phytochemical sources provided.

12 Interview Karen Magarian, DC, MA (alternative women's health and sexual health specialist - *confirmed*).
Review women's health and sexual health sources provided.

13 Interview Christopher Nyerges (wild plant/herb specialist - *not yet confirmed*).
Review plant/herb sources provided.

14 Review Edible Wild Plants by Elias and Dykeman (North American field guide).
Review Native American Herbal Remedies by Anthony Cichoke, DC, PhD.

15 Review Botanica Erotica by Diana DeLuca (natural foods specialist).
Review Intercourses by Hopkins and Lockridge (sexual nutriceutical cookbook).

16 Review Reader's Digest Foods that Harm, Foods that Heal.
Review and organize notes.

17 Write first half of sabbatical report.

18 Edit first half of sabbatical report.

Note: References, contacts and timeline are based on information available by the Proposal due date. These may change slightly if new references and contacts should become available, or if any listed should become unavailable.

Hoggan

Part 2, Spring Semester 2004 – Environment, Habitat and Human Health:
Majoring in public health in graduate school, I was required to take a class on environmental health. What I remember of this class was that it tended to focus on air and water quality, was generally boring, and seemed unconnected to the family and reproductive health-related subjects that were my main area of study. When I began teaching in the Biological Sciences Department at Mt. SAC, I was astonished to begin learning from my colleagues about our deep and critical connections to the natural world.

In particular, the issue of habitat destruction and its effect on biodiversity has come to interest me, perhaps at least in part because it is so often ignored in a discussion of environmental issues. A study released by the National Wildlife Federation in April 2001 cited "urbanization and sprawl" as the single greatest threat to wildlife in California. This means not only the new housing developments that daily result in the bulldozing of natural habitats (and appear shortly thereafter in the "New Homes" section of the newspaper), but also the roads, schools, markets, strip malls and other businesses that soon follow.

In Biology 5, Contemporary Health Issues, I teach a unit on environmental health, and in spite of my initial ignorance, I now view it as one of the most important subjects in the course. As I query my students, what are the long-range benefits of learning to delay heart disease or prevent accidents or sexually transmitted diseases, if we can't maintain an environment that supports life for our future generations? I believe it is especially important to sensitize them to these issues, because they are the consumers, voters and parents of the future. At the end of the course, many cite this as the most meaningful unit in the class for them. And yet, as a non-biologist teaching in a Biology Department, I often feel daunted by my lack of expertise in this area. I would also like to understand more so that I can be a more informed contributor to my colleagues' decision processes.

The study of biology, ecology, and the environment would be such an overwhelming undertaking that colleagues have advised me to take a more focused approach: By learning the natural history of one animal and its interrelationships with its habitats and other species, I believe that I will begin to understand and appreciate the web of life in a more personal way, and ultimately to more effectively transfer that knowledge to my students. Therefore, the animal that I have selected is the coyote. *Canis latrans* has a fascinating place in ecology. A colorful and mythical character in ancient Native American lore, coyotes now extend across every state of the continental United States. Unlike other predators, which are dwindling, they thrive because of their complex interaction with their environment. Intelligent and adaptable, they are often perceived as an object of fear or contempt by humans and are even routinely killed when their success impinges on our freedoms. Yet they pose very little threat to human lives and are an important part of ecosystems. They are just about the only large mammalian predators that we may still be fortunate enough to view with relative ease in their natural environment. In fact, I think students can more readily appreciate the aesthetic value of coyotes because of their personal experiences both with them and with pet canines.

For the second semester of my sabbatical leave, I propose to undertake an independent study project on coyotes. The focus of my study will be on their natural history (including how they interact with other plant and animal species, humans, human-altered environments, and their natural environment), as well as how these interrelationships ultimately affect human health. The study goal is to enhance my teaching in the area of environmental health as well as to improve my overall contributions to the Biological Sciences Department. The study objectives will include the following. 1) To interview at least three of my colleagues for background information and sources. 2) To conduct a literature search for current, relevant books and articles (selective rather than exhaustive) and read appropriate selections from this list, as well as my brief existing list. 3) To complete a course offered through Joshua Tree National Park Desert Institute entitled "Coyote 101," and/or to visit and photograph one or more research facilities to observe coyote behavior and interview expert sources. 4) To visit and photograph at least four Southern California habitats in order to understand the varied biotic communities the coyote inhabits. 5) To write a sabbatical report for the college and otherwise disseminate my research to my colleagues (see Attachment 2 for more detailed objectives and an estimated timeline.)

The college will benefit from my project in the following ways. 1) Biology 5 is an elective that fulfills Area E requirements and transfers to many universities, including some which apply it to the health education component of the California teaching credential. This course will offer an improved unit on environmental health, particularly the effects of habitat loss on wildlife and ultimately on human life. 2) The Biology Department will function more efficiently from having a more aware and informed department member contributing to discussions, curriculum development and other decisions. 3) Many courses on campus address issues of environmental health, habitat loss and/or the natural history of plant and animal species, for example General Biology, Ecology and Field Biology, Animal Behavior, Zoology, Natural History of California, etc. Instructors in these courses may utilize this research for their classes as well.

My personal development will be enriched by this project in the following ways. 1) I will better understand the information that I am already teaching in order to strengthen the case for students to understand and practice environmental responsibility. 2) I will have the opportunity to systematically learn from a variety of experiences, including those with colleagues, field experts, hands-on visit(s) to the research station(s), and finally independent observations, as well as from reading and reflecting upon areas of interest to me. 3) I will return from leave refreshed and energized about the possibilities for helping students to become more interested in and aware of how environmental interactions impact many areas of our lives. 4) I will enjoy sharing my research with my colleagues. 4) And I, too, will have an enhanced relationship with the natural environment we all depend upon!

I will make this information available to the college in my written report and through informal seminars with my colleagues.

Hoggan **Attachment 2**

Objectives and Estimated Timeline

Spring Semester 2004

Week

1 Read Prodigal Summer by Barbara Kingsolver, MS (award-winning nature writer; educational novel on the role of predators in ecosystems). Summarize.
Interview one colleague on natural history of California, preferably Sherry Schmidt or Damon Day (depending upon availability).
Search for recommended out-of-print book, Skywalker (author unknown).

2 Refine preliminary online search on habitat loss (228,000 hits).
Refine preliminary online search on California habitat loss (67,500 hits).
Obtain and begin reading and notating appropriate articles.
Interview one colleague on ecosystems and human intervention, preferably Cynthia Shannon, Karyn Kakiba-Russell, or Craig Peterson (depending on availability).

3 Refine preliminary online search on *canis latrans* (5920 hits).
Refine preliminary online search on *canis latrans* in California (2500 hits).
Obtain and begin reading and notating appropriate articles.
Interview one colleague on animal/predator behavior, preferably Tim Revell or Mark Cooper (depending on availability).

4 Read preliminary articles provided by Coyote Research Station.
Visit and photograph Coyote Research Station in Logan, Utah; interview John Shivik, PhD (predator specialist - *confirmed*).
(January/February is best time to observe mating behavior.)
Review subsequent sources provided.

5 Read Coyotes: Biology, Behavior and Management, editor Mark Bekoff (expert on animal cognition). Summarize.

6 Interview Carla Wakeman, MS, Fire Ecologist,
National Forest Service, on forest and fire ecology (*confirmed*).
Review subsequent sources provided.
Continue any unfinished reading.
Organize notes from books, articles, research station, interviews.

7 Complete course "Coyote 101" at Joshua Tree National Park Desert Institute.
Explore and photograph Mojave Desert habitat (creosote and Joshua tree woodland).
Review subsequent sources provided.

8 Interview Gerald Braden, MS, Research Scientist,
San Bernardino County Museum of Natural History, on habitat loss and endangered species (*confirmed*).
Review subsequent sources provided.

9 Visit Wildhaven wildlife rescue center in San Bernardino Mountains (*confirmation pending*).
Explore and photograph San Bernardino Mountain habitat (lower warm and upper cold chaparral, oak woodland, alpine forest).
Review subsequent sources provided.

10 Visit National Parks Service Predator Study in Santa Monica Mountains (*confirmation pending*).
(March/April is best time to observe behaviors related to birthing/feeding young.)
Review subsequent sources provided.

11 Interview Glenn Stewart, PhD, mammalologist at Cal Poly Pomona (*confirmation pending*).
Review subsequent resources provided.
Continue unfinished reading.
Organize notes from course, research/rescue stations, interviews.

12 Explore and photograph Colorado Desert habitat, e.g. Anza Borrego
Continue unfinished reading.

13 Explore and photograph coastal sage scrub habitat, e.g. Newport Back Bay.
Continue unfinished reading.

14 Explore and photograph yellow pine and montane forest habitat, e.g. San Jacinto Mountains. Continue unfinished reading.

15 Explore and photograph Great Basin Desert habitat, e.g. Mono Lake.
Continue unfinished reading.

16 Complete any unfinished reading.
Organize notes and outline key findings.

17 Write second half of sabbatical report.

18 Edit second half of sabbatical report and submit.

Note: References, contacts and timeline are based on information available by the Proposal due date. These may change slightly if new references and contacts should become available, or if any listed should become unavailable.