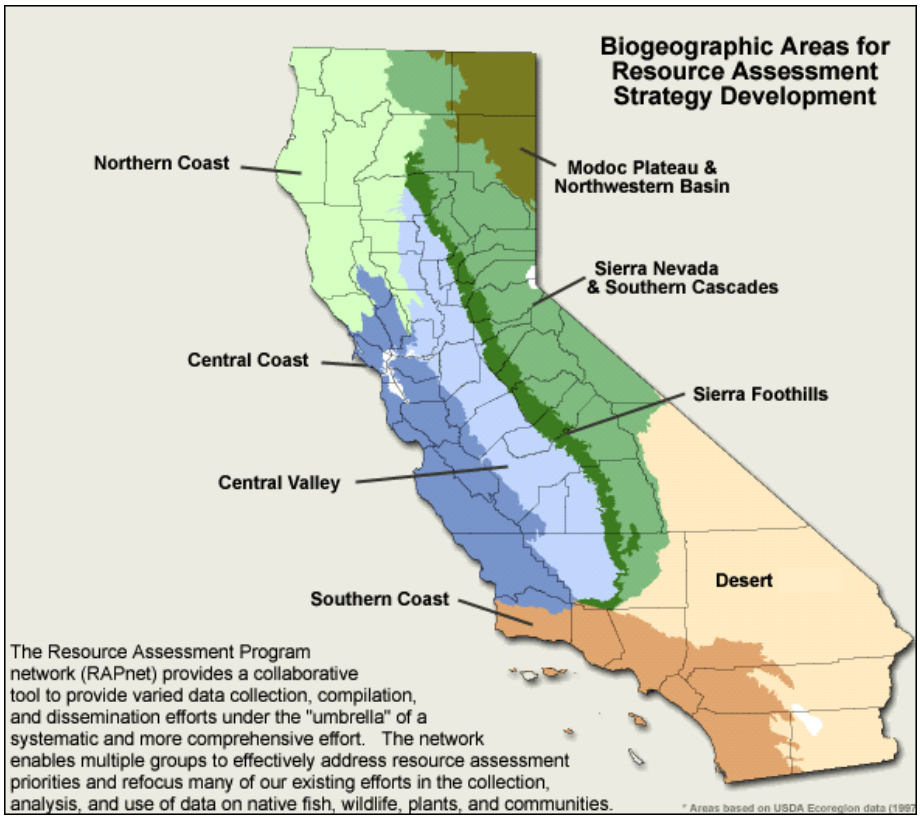
PROJECT STATUS SUMMARIES FOR RESOURCE ASSESSMENT PROGRAM [RAP] SPONSORED ACTIVITIES IN THE DEPARTMENT OF FISH AND GAME [2001-2003]

Attached are 32 project summary statements for work that several units in the Department of Fish and Game have embarked on under a collaborative approach initiated by the Resource Assessment Program. These activities represent some of the Department's/Program's initial high priorities for species and community assessment; and for developing the strategies and infrastructure needed to make fish, wildlife, and native plant data more accessible and available for decision/policy makers, for Department programs, and for the public. Additionally, some of these projects were opportunistically taken on and considered part of the foundation of the new and developing program.

The projects represent efforts by both the major divisions in the Department [Habitat Conservation Division and the Wildlife and Inland Fisheries Division] and by several of its key "fact-finding" units. A simply stated goal of the program is to work to coordinate and facilitate the collection, compilation, and analyses of species, habitat, and community data that is needed by Department programs involved in managing, regulating, and conserving California's wildlife resources. The repository for these data will be the Biogeographic Information and Observation System [BIOS].



We are approaching the development of inventory, monitoring, and applied investigation strategies from a biogeographic perspective, similar to the California Biodiversity Council bioregional structure.

Web link to the Resource Assessment Program is: www.dfg.ca.gov/habitats/rap/default.html

The Program's online collaboration tool "RAPnet" is at: www.rapnet.intranets.com

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Infrastructure and Biological Database/Data Management Activities

Project Status Summary

Title of Project: Burrowing Owl Mitigation Effectiveness Project

Completed **/** ***Ongoing:*** Year 2 of a 3 year study begun in 2002

Biogeographic Location:

The project is located in the Sacramento Valley portion of the Central Coast and Valley Range

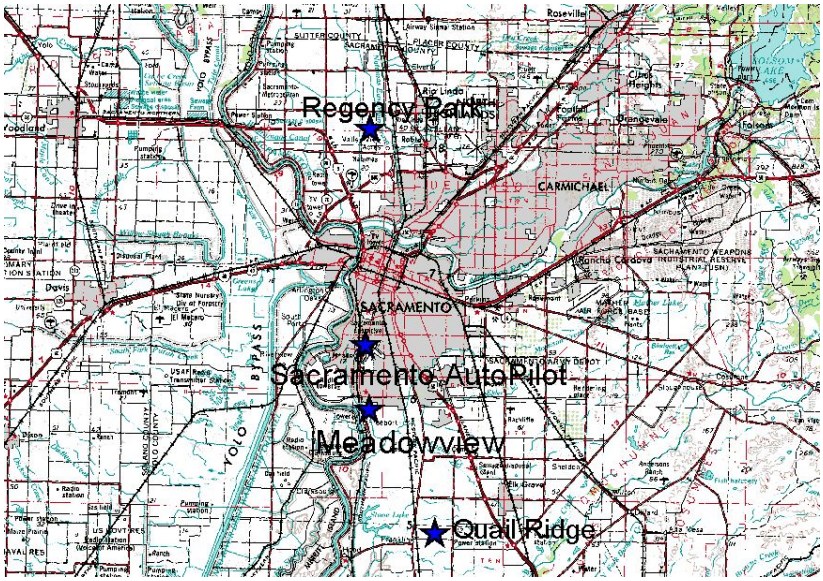
Project Description

The goal of the project is to determine survivorship in a group of burrowing owls (*Athene cunicularia*) subjected to standard mitigation measures contained in DFG's "Staff Report for Mitigating Impacts to the Burrowing Owl". The survival rates of study owls will be compared with those reported in the literature. A secondary objective of the study is the documentation of the pattern of dispersal for fledging young.

Accomplishments

Accomplishments :

- 36 burrowing owls were captured and fitted them with 4.5 gram radio transmitters (24 during 2002 and 12 during 2003) The owls were captured at four different construction sites in Sacramento County (figure 1).
- The owls were radio tracked and/or visually monitored from the time they were captured, through construction, passive relocation, and dispersal (July-December 2002 & 2003).
- Monitoring provided information about mortality and, to a limited degree, dispersal.



Findings/Observations/Issues

-Six study owls were recorded as "missing" meaning that we could not relocate them and therefore their status could not be determined. All 6 missing owls were juveniles, if these owls are assumed to be dead, then survivorship would drop substantially. However, missing owls may also be alive and have dispersed/ migrated. Therefore, we calculated the range of survivorship possible for those cases. If missing animals are omitted, the survival rate for study owls was 0.47 over the 6 month period July to December (0.38 for juveniles, 0.55 for adults). Rosenberg (2001) observed annual survival rates of 0.62 for females, 0.65 for males (n = 242) in an agricultural area near El Centro in the Imperial Valley of California. Rosier (2001) studying a group of 17 burrowing owls in the grassland habitat of the Carrizo Plain National Monument calculated the survival rate to be 0.61. Johnson (1997) calculated survivorship in a group of 112 burrowing owls living on the UC Davis campus. The "worst case" consisted of survivorship wherein missing owls were not included in the survivorship calculation. Johnson's worst case calculation is similar to our method. Worst case annual survivorship for juveniles was 0.23, and 0.42 for adults.

- We determined cause of death for 5 of the16 owls known to have died during the study. Four deaths were attributed to predation, and one owl was crushed inside a plastic pipe during construction activities.

- Dispersal from the natal burrow began in September of both year. The majority of the owls that we were able to monitor stayed within a relatively short distance of the natal burrow. In instances where suitable habitat was not completely removed from the study site some of the owls remained onsite during the entire observation period. IA the Quail Ridge where the entire project site was converted from annual grassland to residential development we were unable to relocate any of the study owls.

STUDY SITE	ALIVE	DEAD	MISSING	TOTAL	Conf TOTAL	Survival
Quail Ridge	2	5	4	11	7	0.18-.57
Sac. Exec Airport	4	3	0	7	7	0.57
Meadowview	3	3	0	6	6	0.50
Regency Park	5	5	2	12	10	0.41-.58
All total	14	16	6	36	30	0.38-.55

Project Contacts and Collaborators

DFG contacts are Dan Gifford, Jeff Finn. Anne Orlando, a research assistant under contract with the UCD Wildlife Health Center was the principal investigator. The DFG flight hanger supplied telemetry over-flights flights to locate dispersing owls.

Privates developer cooperated by generously allowing access to their development sites. Private developers included Quail Ridge Subdivision, Sacramento AutoPilot, Meadowview Subdivision, Regency Park.

Project Status Summary

Title of Project: Swainson's Hawk Population Monitoring

Completed / Ongoing: Year 3 of a 3 year initial set-up and analysis phase. The survey will be Ongoing - repeated every 3-5 years

Biogeographic Location

The project is located in the Sacramento valley portion of the Central Coast and Valley Range

Project Description

The primary objective is to establish a long term monitoring program to detect change in the number of breeding pairs of Swainson's hawks within our study area. There are a number of Habitat Conservation Plans (San Joaquin Co., Yolo Co., Solano Co., Placer Co., S. Sacramento Co., Sutter Co., and N. Natomas) within the DFG's Sacramento Valley/Central Sierra (SVCS) administrative region. We intend to monitor the effectiveness of the above mentioned NCCP/HCPs by tracking changes in the number of breeding pairs over the term of the "take" permit for each conservation plan. The survey will be periodically (every three to five years) repeated in order to monitor population changes.

Accomplishments

Accomplishments include:
Development of a standard survey protocol and survey methods
Development of a stratified random sample design, featuring repeat sampling.
Development of Raptortrack, an Access software application designed by DFG's Isaac Oshima used in recording and storing the project's Swainson's hawk nesting data.
A pilot survey (2001 Placer).
A baseline survey (2002).
A repeat survey (2003) review and analysis phase
*(all data in BIOS compatible GIS format)

Additional benefits include:

- Updating the set of known (active) Swainson's hawk nests. DFG's "Staff Report on Mitigating Impacts to the Swainson's hawk" identifies records in the CNDDB as the source for active nest site information. However there is currently no system for updating CNDDB nest records. During the course of conducting our survey we have relocated, verified, and updated the status of nest recorded in the CNDDB, as well as discovered and recorded new nests.

- Survey results have been provided to land use planning agencies upon request. The nest location data has formed the basis for mitigation plans (Elk Grove, Elverta, Placer and Sac. County), impact analysis, and General Plan updates.

- Use of survey data helped avoid the potential for take of active Swainson's hawk nests on three separate occasions. If posting the survey results on BIOS becomes feasible and acceptable, DFG could provide real time Swainson's hawk information to land use planners.

Findings/Observations/Issues

Measure/Monitor the breeding population:

To date we have recorded the location of 519 active Swainson's hawk nest sites in the project database (see raptortrack.mdb) . The location of the nests may be viewed on DFG's password protected BIOS website at http://bios.dfg.ca.gov/. In addition to recording the location of active Swainson's hawk nests, the survey also collects demographic information which will be analyzed to assess population structure. The 2002 survey results estimate a breeding population of 592 pairs within the study area. A copy of the 2001 and 2002 preliminary report is being forwarded to you for review. 2003 survey results will be used to further refine the estimate and define the survey's ability to detect changes in breeding population.

Distribution of the breeding the population:

We sampled a large area of potential habitat in order to reduce the likelihood of missing Swainson's hawks in outlining, undocumented, or marginal habitats. The accompanying map shows the extend of the study area. By selecting survey blocks at random we found Swainson's hawk nests in some areas that had been under-surveyed in the past thus refining the breeding range for this species in California. Some of the more notable "finds" include the rolling hills west of Woodland, the area west of I-5 in Colusa and Glenn Counties, and the area south and west of the City of Elk Grove.

Habitat Description:

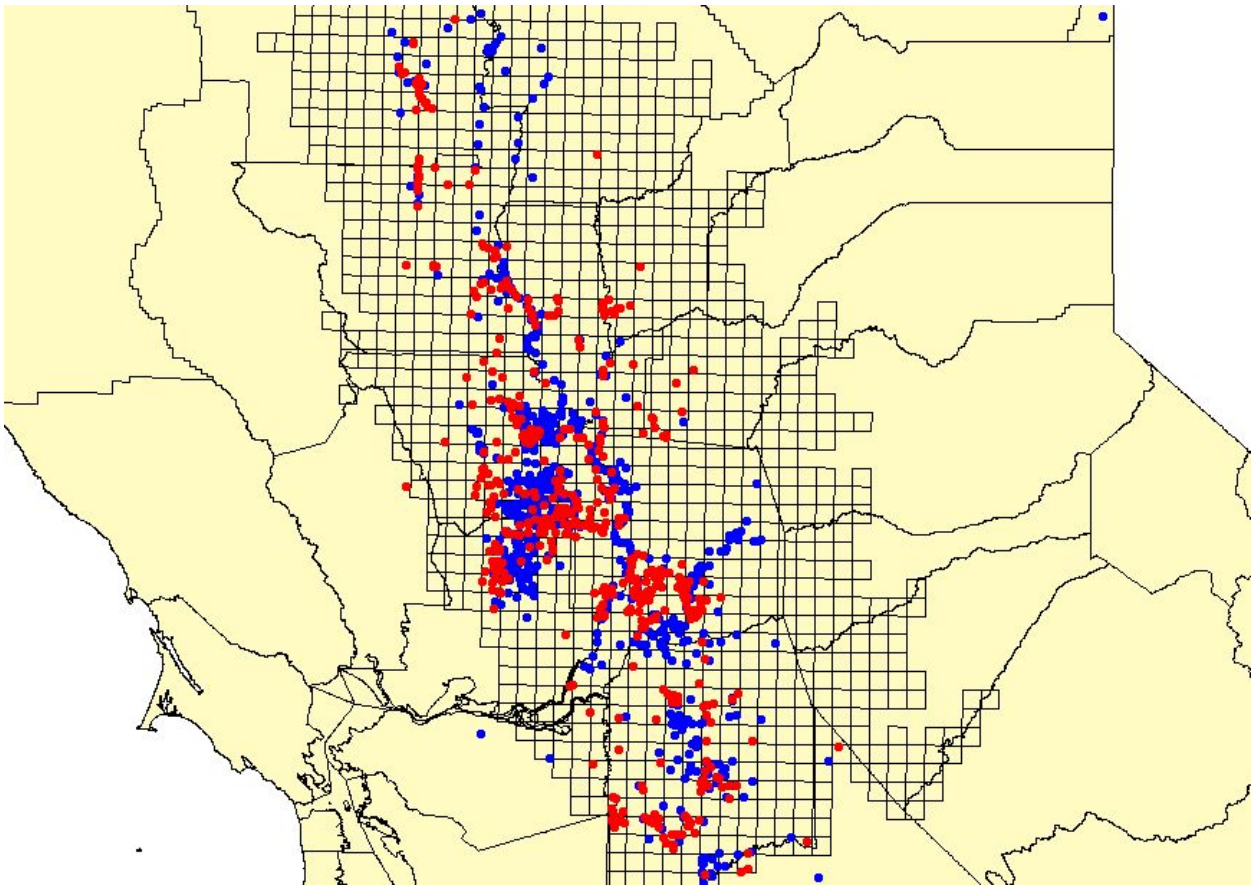
In the course of conducting the survey we collect nest tree and land use information in proximity to each nest. These data in conjunction with existing habitat information (DWR cropland, and Dept. of Conservation Farmland Mapping) will be used to analysis habitat associations. We expect to produce a Swainson's hawk habitat model and map important Swainson's hawk habitat. The habitat map may be used in current Land Use Planning by cities and counties, used in "effects analysis" in Habitat Conservation Plans, and aid in identifying important habitats to be preserved for the benefit of Swainson's hawk.

Project Contacts and Collaborators

DFG contacts are Dan Gifford, Jeff Finn, and Lora Konde. The survey was developed in DFG's SVCS region with funding provided by the RAP program.

Project collaborators include Isaac Oshima (ITB) who developed Raptortrack the database application. The Swainson's Hawk Technical Advisory Committee (Estep, Bradbury, Holt) a private organization of Swainson's hawk researchers who reviewed and provided assistance on the survey methods and protocol. Gordon Gould (WHDAB), responsible to putting survey data on the BIOS website. Statistical consultation and analysis was provided by John Giebel, Phillip Law, Gary Hee, Mesha Key (DFG Biometrics), and Calvin Chun (RAP)

Project surveyors included SVCS Wildlife and Fisheries Program, wildlife units managers (Hofmann, Holley, Holm, Weist, Lomelli), DFG seasonal aides (C. Dorough) and graduate assistants hired through UC Davis's Wildlife Health Center (Orlando, Anne) .



Red points are SWHA nest sites found during project. Blue are CNDDB accounts of nest sites.

Project Status Summary

Title of Project:
Vernal Pool Classification ***Status:*** complete

Biogeographic Location: Southern California Coast, Central Coast and Valley

Project Description
The objective of this project is to complete a comprehensive survey of vernal pool vegetation throughout California in order to create a classification key to all vernal pool associations. Support from the Resource Assessment Program will allow the completion of a third season of field sampling and associated data entry, data quality control and data analysis. During the third field season, approximately 500 plots in 200 pools will be sampled in Southern California, along the central coast between Santa Barbara and Monterey, and the southernmost part of the San Joaquin Valley. This data will be combined with data gathered during previous survey efforts (1500 plots within 400 vernal pools), in order to develop vernal pool classification descriptions and keys. The vernal pool classification will be directed for use by agency personnel and consultants who deal with management and evaluation considerations on a daily basis.

Accomplishments
All field sampling has been completed. During three field seasons 2000+ plots were sampled within 400+ pools, in 70 vernal pool complexes throughout 25 counties in California. An additional 267 plots of upland vegetation were also sampled. Complete censuses of plant species, pool dimensions, hydrology, soil chemistry, depth to impervious layer, soil series, and geologic parent material were conducted. Using the statistical program Megatab to detect patterns in species presence and abundance, survey information from 728 relevés parsed the pools into 16 distinct community types.

Findings/Observations/Issues
The results of this study showed that most vernal pools are comprised of two to three distinct community types, each occupying a different micro-environmental niche within the pool. Most listed taxa were tightly affiliated with only a few associations, and the distribution of these could be predicted with high probability based on the community type and vernal pool region. Previous vernal pool sampling methods treated each pool as a single unit. However, this study underscores the importance of “deconstructing” pools into smaller community type units to determine conservation value. Two journal publications have resulted from this research thus far: 1) Barbour, M., et al. 2003. Vernal pool vegetation of California: variation within pools. *Madroño* 50:129-146, and 2) Barbour M., et al. 2004. Vernal pool vegetation of California: order *Lasthenietalia glaberrimae*. *Phytocoenologia* (in-press).

Understanding the hydrology of the vernal pools is critical to successful conservation. Results of the hydrological analyses revealed distinct differences in the processes of pool filling and water loss between pools in different regions. Pools in one region filled through direct precipitation and overland flow and lost water primarily through evaporation; while pools in another region filled through direct precipitation, overland flow, and subsurface/lateral seepage and lost water through lateral seepage and deep drainage through channels in the duripan. These results have also been submitted for publication.

Project Contacts and Collaborators

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MaryAnn Showers, HCPB; Dr. Eric Loft, RAP

Project Status Summary

Title of Project: ***Ongoing:*** ***Year*** *1 of 3*

Linking California's desert mountain ranges: metapopulations of bighorn sheep

Project Description **Biogeographic Location:** Desert

Southeastern California deserts can be broadly characterized by numerous mountain "islands" separated by vast open areas of alluvial fans and vast, dry expanses of relatively flat terrain. Bighorn sheep (*Ovis canadensis nelsoni*) are the only large mammal that historically was found in most of the mountainous areas across the region. Their populations fit a metapopulation model in that extirpation and re-colonization events are known to define the distribution of this species. Given the large habitats required for this species and their dependence upon movement corridors to provide for re-colonization, seasonal movements, and genetic viability, they serve as an excellent model for identifying important habitat linkages. Because mountain sheep are a large vagile animal they may in fact be a good "flagship" or "keystone species" for desert habitat conservation efforts. Identifying and preserving their habitat elements, especially "habitat corridors" may provide umbrella protection and enhancement for other desert species that require connectivity between their naturally disjunct habitats.

Goals

To delineate historic, current, and potentially important large blocks of habitat and the movement pathways between them, needed to provide for the persistence of large mammals. The desert region proposed comprises approximately 20% of the state. Bighorn sheep will be the focal species for this model, due to their widespread but insular distribution, and abundance of inventory and monitoring data. This information is critically needed to support regional ecosystem planning efforts being prepared by the Bureau of Land Management and the National Park Service.

Objectives

1) refine the mountain boundaries that define historic and current bighorn sheep populations.

2) using input from biologists and available data, further refine the areas known to be used by desert bighorn sheep

3) develop a model to identify known and potential movement pathways that connect the different mountain ranges (i.e. friction surface model).

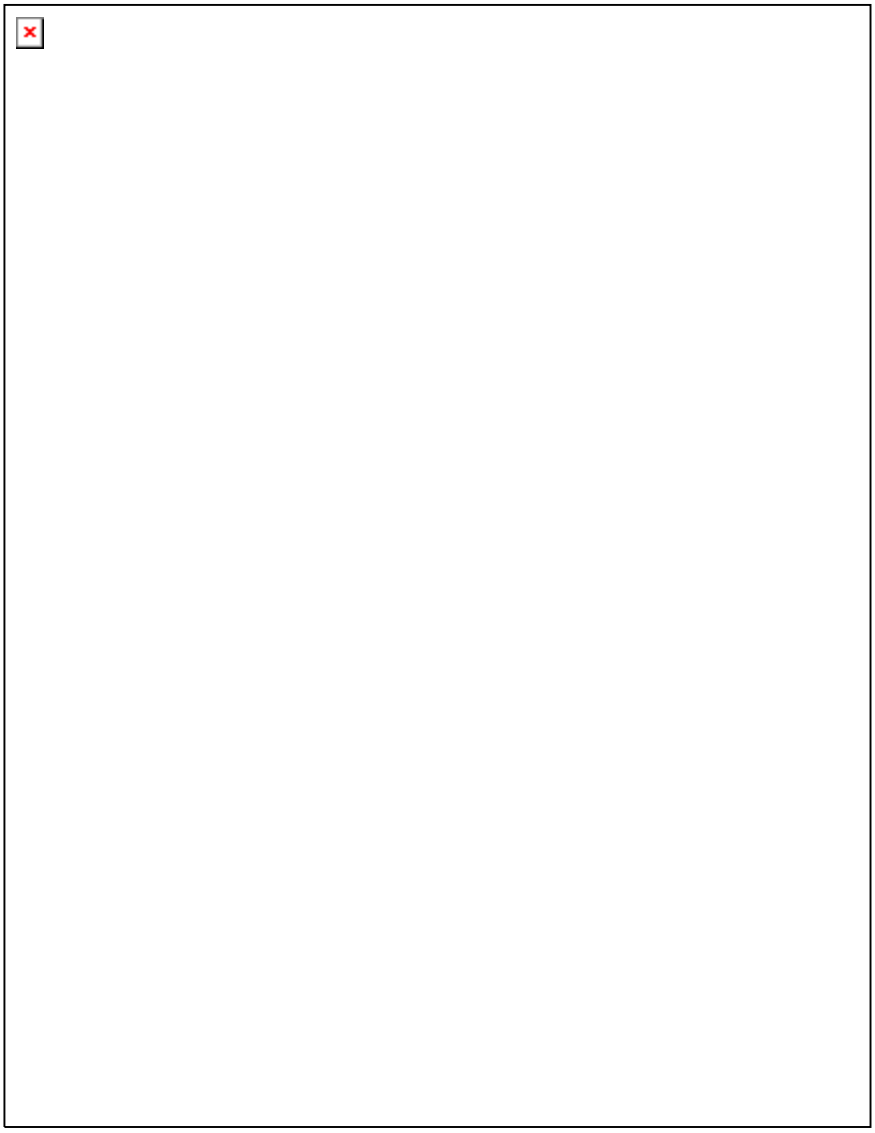
4) develop a general habitat suitability model using topographic features and distribution of mountains

Accomplishments

Bighorn sheep distribution polygons are being updated on GIS.

Current research on habitat suitability and movement pathways is ongoing and being conducted by Clint Epps as part of his dissertation project at UC Berkeley (College of Natural Resources, ESPM, Division of Ecosystem Sciences), with GIS support from Eric Kaufmann

Findings/Observations/Issues



Project Contacts and Collaborators

Clint Epps, UC Berkeley [RAP]; Steve Torres CDFG-RAP, Eric Kaufmann CDFG RAP-WHDAB; Lora Konde, CDFG-ITB; Nancy Andrew, CDFG-RAP Region 6; Dr. Vern Bleich, CDFG, Region 6

Project Status Summary

Title of Project: ***Ongoing:*** ***Year 1 of 2***

Sonoran desert mountain sheep meta-population plan

Project Description **Biogeographic Location** Desert

The conservation and management of California mountain resources has long been a concern of the Department of Fish and Game. They have received special emphasis at different points in time. The first comprehensive inventory efforts were completed between 1968-1972. In1983, the State completed its state wide management plan that contained a number of actions and objectives for the management and restoration of mountain sheep.

The Department, as well as other State and Federal agencies, developed management plans for mountain sheep based on the geographic location of populations, usually including a single mountain range. (although plans have been write for less than 25% of the existing herds). In retrospect, these plans do not provide for, nor protect the geographic and demographic conditions needed for the continued long term viability of each herd of sheep.

Bleich et. al (1996) presented a cogent argument that mountain sheep of California, because of their 1) naturally fragmented distribution; 2) documented inter-mountain movement of both genders; 3) population sub-structuring in which population units can demographically respond differently and independently of each other; 4) documented extirpation and colonization events, fit the definition of a metapopulation. Their conclusions, that what were heretofore identified as mountain sheep populations may be more clearly viewed as demes of a metapopulation. These assertions are further supported by extensive genetic work (Schwartz et al. 1986, Ramey 1993) but also by complex landscape level geographic analyzes (Bleich et. al 1996). (See Bleich et. al 1996 for a complete discussion of their work). Indeed “the typical view of a mountain sheep population as a group of individuals occupying a particular mountain range is an oversimplification of their demography and genetics” (Bleich et al. 1996). This resulted in the State’s Bighorn Sheep program adopting this metapopulation approach and decided to rewrite management plans for the mountain sheep of California using this paradigm. The most southern metapopulation is the Sonoran Desert.

Objectives

1. Develop a mountain sheep metapopulation plan for the Sonoran desert region of California that would serve to provide specific management focus and direction for the long term conservation and enhancement of sheep during the next 10-20 years. The document would also serve as an operations manual for Unit biologists that would identify the goal, objectives, work tasks, reporting responsibilities, etc. for them.
2. Organize, analyze and archive all the information that is known about the sheep in this geographical area. Currently there is no central organization system or location for information regarding these sheep. Much of it exists in hardcopy format and can not be easily accessed by Department employees.
3. Create a document that is a “how to manual” for Unit biologists.

4. This plan would form the template for the writing of subsequent plans, the next being the Southern Mojave Metapopulation Plan.

Accomplishments

The project was started January 2003. The project is seventy-five percent complete, and a draft report has been completed. It will require another tear of focused collaborative work and review before it will be published as a peer reviewed publication.

Findings/Observations/Issues

Much of the data needed to write this plan exists in analog form. Virtually, none is available electronically. Historical data on locations, sex ratios, mortality, diseases, etc. and other types of natural history information is languishing in files boxes. Even more recent scientific undertakings which have involved the capturing and radio-tracking of sheep are in paper form. All of these data need to be entered into a uniform database (desert sheep data system) so that the data may be analyzed, queried as to inform our management decision making process. This is a very labor intensive process.

Project Contacts and Collaborators

Nancy Andrew, CDFG RAP, Region 6
Vern Bleich, CDFG RAP, Region 6
Lora Konde, CDFG ITB, Sacramento
Steve Torres, CDFG RAP, Sacramento

Project Status Summary

Project:

Inventory and Assessment in Montane Meadow, and Quaking Aspen Communities of the Sierra Nevada (Wildlife)

Biogeographic Location: Sierra Nevada **Ongoing Year 2 of Several**

Description:

The purpose of this inventory and assessment project is to gather baseline information on species, habitats, and communities, for the development of a long-term monitoring strategy for montane meadow and quaking aspen systems in the Sierra Nevada. Currently, a comprehensive inventory of aquatic and terrestrial wildlife in these communities does not exist for the Sierra Nevada. There has been, and are, a multitude of wildlife survey efforts in these communities by State and Federal agencies, academics, and non-government organizations. Even though these efforts are continuously expanding our knowledge of these complex communities, a comprehensive inventory is lacking. Additionally, development of a baseline inventory of animal species will serve as the basis for long-term monitoring in response to management need. A secondary objective of this project is to compile and organize all existing relevant information on these communities (i.e. mapping efforts, habitat information, and survey data); the purpose for data mining is not only to compile and organize the existing data into a common useable inventory, but also to identify where further survey work is warranted.

The wildlife survey is one part of a comprehensive inventory effort, and is closely integrated with the vegetation assessment and community mapping work. Additionally, we began testing and implementing handheld computer data collection technology for eventual support of additional DFG projects.

Accomplishments:

The 2003 field season was the first year of an extensive effort to survey priority wildlife species within montane meadows. Much of the effort was directed toward surveying for Willow Flycatchers in locations where no previous survey data exists, but through habitat assessments and analysis of remotely sensed data, determined to be suitable. In addition, we began developing, modifying, and testing, survey protocols for Great Gray Owls and Blue Grouse. Survey protocols for these species will be complete by the 2004 field season.

Specific results include:

2001 Field Season – With a small field crew (2 Research Assistants) we conducted vegetation assessments in selected meadow systems, worked on developing the vegetation survey protocol, and surveyed for willow flycatchers in 9 meadow complexes in the Eldorado National Forest. We performed 50 vegetation assessments in approximately 15 meadow complexes. Of the nine meadows surveyed for willow flycatchers we induced responses from a total of 17 birds in 3 meadows.

2003 Field Season – With a field crew of 8 Research Assistants we conducted wildlife surveys, over a 3 month period, beginning in June. One-hundred and seventy-three meadow complexes were surveyed to protocol (Bombay et al. 2002) for willow flycatchers. Of these, 51 birds were detected, in 12 meadows. Eleven meadows were surveyed to a modified USFS protocol (under development) for Great Gray Owls, resulting in a detection of 3 birds, in 3 meadow complexes (surveys were done as part of an ongoing Region 4 project). Twenty-three meadows were surveyed to protocol (in development) for Blue Grouse, resulting in 13 detections, in 7 meadows.

Project Contacts: Chris Stermer, RAP and Dr. Eric Loft, RAP

Collaborators: UC Davis, Wildlife Health Center Dr. Mike Morrison, White Mountain Research Station

Project Status Summary

Title of Project: Modoc Aspen Community Assessment

Completed or Ongoing- *Nearing Completion*

Field work has been completed. Analysis of data is nearing completion and several papers are currently being prepared for publication.

Project Description

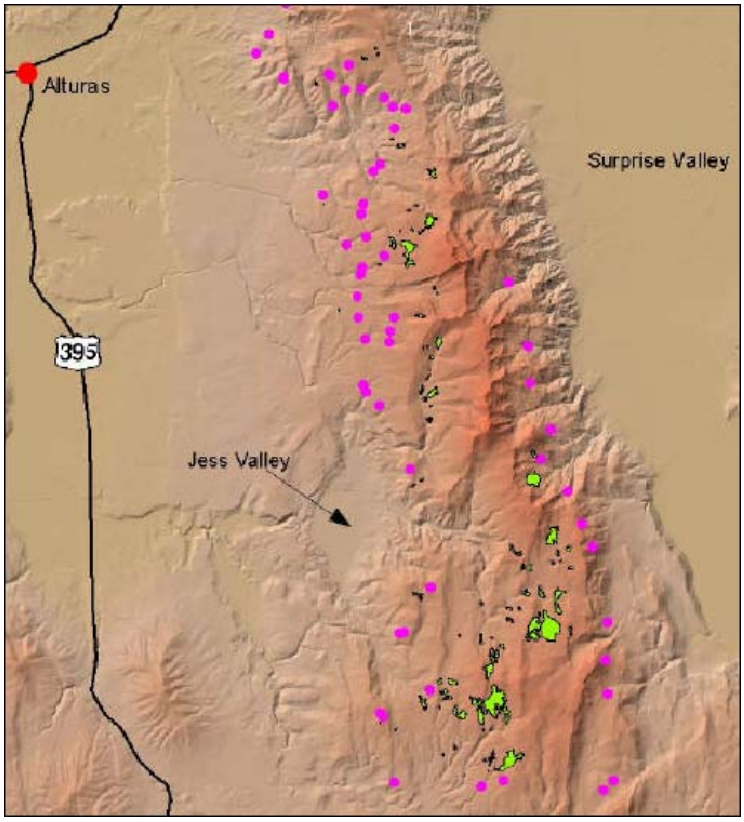
Change detection study focusing on size and quality of aspen stands in the Warner Mountains.

Objectives:

- Map existing aspen stands in the Warner Mountains
- Assess quality of existing stands
- Compare to historical aerial photos to detect change in aspen stand size and distribution

Biogeographic Location

Modoc Plateau and Northwestern Basin Range



Accomplishments

- Aspen Mapping Complete
- Change detection complete
- Poster presented at Meetings of the Western Section of The Wildlife Society
- Assessment of quality of existing aspen stands complete

Findings/Observations/Issues

- Area occupied by aspen in Warner Mountains has decreased by 24% from 1946 to present

Project Contacts and Collaborators

Programs involved:

- DFG-RAP – Steve Burton, Aaron DiOrio [UCD- Wildlife Health Center]
- DFG-Region – Rich Callas, Bob Schaefer

Project Status Summary

Title of Project: Sierra Nevada amphibian/fish surveys

Year 2 of 3 (This summary is for year two – 2002)

Biogeographic Location: Sierra Nevada

***Project Description*:**

Determine the distribution of sensitive amphibians and stocked trout in the high mountain lakes of the Sierra Nevada, quantify the relationship between occurrence of stocked trout and the distribution and relative abundance of those amphibians, and collect current fishery management data.

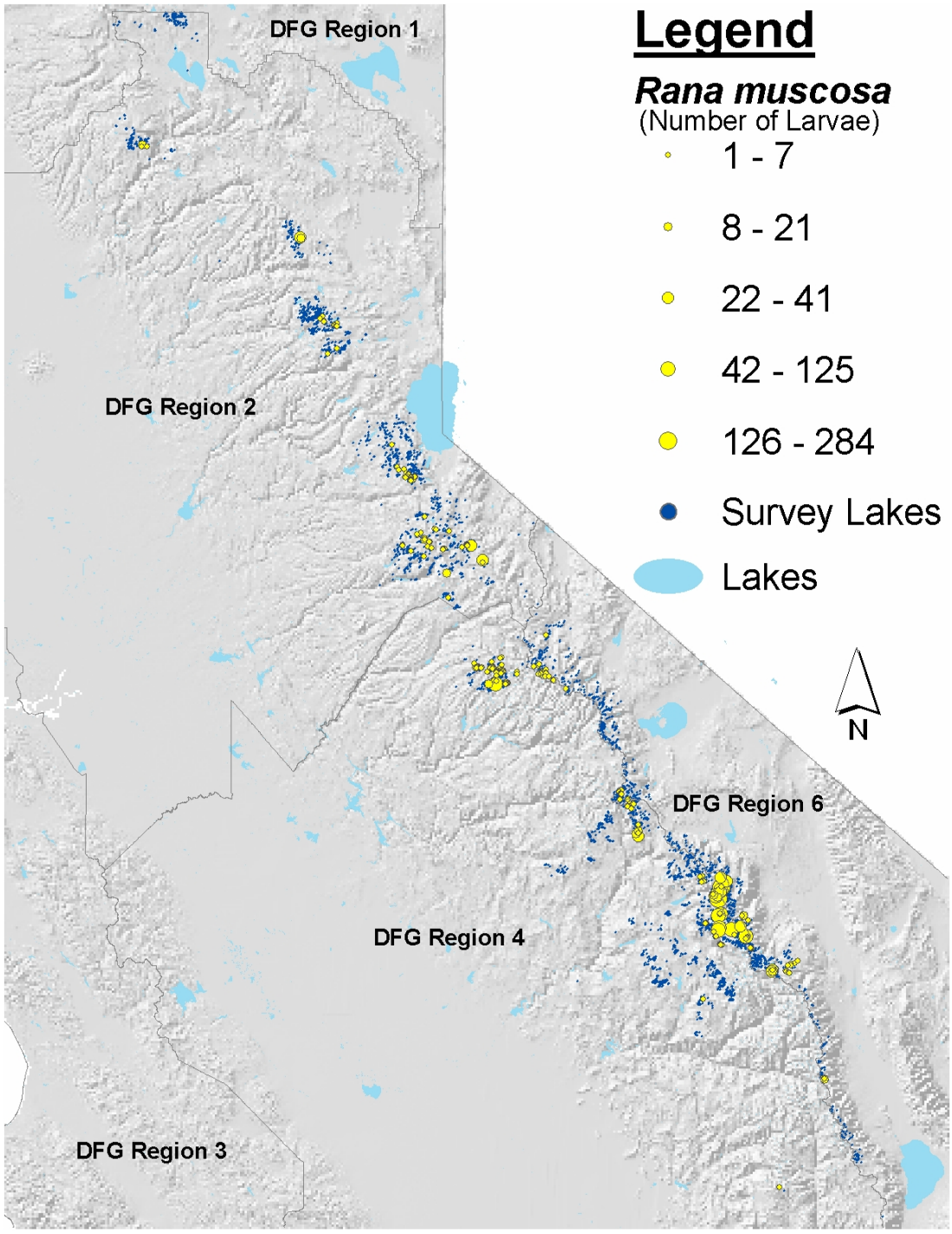
Accomplishments:

In the summer of 2002, CDFG crews surveyed a total of 1,984 waters in the Sierra Nevada. Of these, 223 waters contained trout and 989 contained amphibians. Mountain yellow-legged frogs (*Rana muscosa*) (MYLF) were found in 195 waters and Yosemite toad (*Bufo canorus*) in 32. Six sites contained both MYLF and trout. Other amphibians detected include Pacific tree frog (*Hyla regilla*), long-toed salamander (*Ambystoma macrodactylum*), western toad (*Bufo boreas*), and bullfrog (*Rana catesbeiana*). Fish species sampled included rainbow trout (*Oncorhynchus mykiss*), golden trout (*Oncorhynchus mykiss* subspp.) brook trout (*Salvelinus fontinalis*), brown trout (*Salmo trutta*), Lahontan cutthroat trout (*Onchorhynchus clarki henshawi*), golden shiner (*Notemigonus crysoleucas*), hitch (*Lavinia exilicauda*)and bullhead (*Ameiurus* sp.). At the end of the 2003 field season, over 6,000 waters had been surveyed by Department crews over the time period 2001-2003. The 2003 data are still undergoing clean-up and consolidation with the earlier datasets and are residing with DFG's Information Technology Branch.

***Findings/Observations/Issues*:**

Findings for the survey period 2001-2003 will be analyzed and summarized in a Department report to be completed during 2004 through the Habitat Conservation Planning Branch. Upon completion of the survey of stocked waters, the RAP objective is to capitalize on this effort and expand it to an aquatic systems survey throughout the Sierra Nevada as the precursor to implementing a long-term monitoring strategy.

The attached map graphic demonstrates 2001-2003 data on surveyed water bodies and occurrence of mountain yellow-legged frog presence.



***Project Contacts and Collaborators*:**

DFG: Betsy Bolster (HCPB), Ed Pert and Jim Hopelain (FPB), Curtis Milliron (Region 6), John Hansen and Stafford Lehr (Region 2), John Kleinfelter (Region 4), Isaac Oshima (ITB), Eric Loft, Phil De'ak, and Steve Torres (RAP); UC Davis- Wildlife Health Center; Funding SFRA, RAP, USFWS- Sec. 6.

Project Status Summary

Title of Project: Amphibian and Fish Surveys of High Mountain Lakes in Klamath/Siskiyou Bioregions

Completed Final Report still to be completed and submitted; surveys completed 2002

Project Description

The project involved amphibian and fish surveys conducted by department personnel in consultation with USFS Redwood Sciences Laboratory in wilderness areas of Northern California. Fishery data was collected with timed gill net sets; amphibian surveys were visual and aural

Objectives:

- Amphibian distribution and fish population data for high elevation lakes in Siskiyou and Trinity Counties
- Habitat characterization
- Provide data to HQ for analysis

Biogeographic Location

North Coast /Southern Cascade Range

Accomplishments

- Surveys Complete
- Amphibian distribution
- Trout population data

Findings/Observations/Issues

The amphibian distribution and fishery data were and are being used to guide fish stocking decisions. Trout stocking allotments for lakes where fish populations were deemed to be self-sustaining or with core populations of sensitive amphibian were suspended pending re-survey after a three to five year interval to determine long-term results of management practices on native amphibians and fish populations. The allotments for lakes where sensitive amphibians were not at issue were amended to improve the fishery based upon condition factor and percentage of fish over seven inches in the sample.

Project Contacts and Collaborators

DFG Programs involved

- RAP – Steve Burton
- Fisheries – Bob McAllister, Bernie Aguilar
- Information Services – Eric Haney

USDA Forest Service, Redwood Sciences Lab –

- Hartwell H. Welsh, Jr., Karen L. Pope, Danny Boiano

Project Status Summary

Title of Project: Herpetofauna and Fish Surveys At High Mountain Lakes in Klamath/Siskiyou Bioregions

Completed Final Report still to be completed and submitted.

Project Description

The project involved USFS Redwood Sciences Laboratory, in conjunction with California Department of Fish and Game, Region 1, to sample lentic habitats in wilderness areas of Northern California and examine the relationships between native amphibian distributions and introduced salmonids and determine the impacts on those species.

Objectives:

- Survey high elevation lakes in Siskiyou, Trinity and Lassen and Shasta counties.
- Provide data to HQ for analysis

Biogeographic Location

North Coast Range/Southern Cascade Range/Modoc Plateau and Northwestern Basin Range

Accomplishments

- Surveys Complete
- Data transmitted to HQ

Findings/Observations/Issues

RSL studies show a strong negative correlation between introduced fish and three species of native amphibians. The results of the studies led to changes of fish stocking management practices in those lakes where sensitive amphibians are known to occur. An important issue is to re-survey those lakes where changes were made in subsequent years to determine long-term results of management practices on native amphibians and fish populations.

Project Contacts and Collaborators

DFG Programs involved

- RAP – Steve Burton
- Fisheries – Bob McAllister, Bernie Aguilar
- Information Services – Eric Haney

Redwood Sciences Lab –

- Hartwell H. Welsh, Jr.
- Karen L. Pope
- Danny Boiano

Project Status Summary

Title of Project:

Aquatic Resource Assessment, Southern Sierra Nevada

Ongoing: ***Year 3 of __***

Biogeographic Location

The first 2 years of the project focused on Sierra Nevada foothill habitats, but included high mountain lakes and meadows, valley floor vernal pools, and valley floor rivers.

Project Description

Objectives of the project:

- Sample for aquatic species in various habitats.
- Map distributions of species within watersheds.
- Collect minimal habitat data at areas sampled for aquatic species.
- Focus on areas that have not been intensively sampled in the past.

Accomplishments

Several populations of native fish, amphibian, and invertebrate species have been documented or confirmed in the Sierra Nevada foothills, high elevation meadows, and valley floor habitats. Distributions of several non-native, invasive species have been refined and updated. The data have been used to assist environmental scientists in determining impacts of various land use activities.

Findings/Observations/Issues

Annual Reports for 2001 and 2002 are available on RAPnet. Filenames are:

RAP Annual Report 2001_Tibstra.pdf
RAP Annual Report 2002_Tibstra.pdf

Project Contacts and Collaborators

DFG Contact: Robb Tibstra, R4 RAP rtibstra@dfg.ca.gov, (559) 243-4017 x255

Project Status Summary

Title of Project: ***Completed / Ongoing: Year 2 of 2***

Deer GPS Collars to Evaluate Potential Development Impacts

Project Description **Biogeographic Location** Owens Valley, East Slope Sierra Nevada

A major subdivision is proposed for the middle of the Round Valley Winter Range. The placement of GPS collars on a sample of deer using that area will be used to demonstrate and quantify the importance of the area proposed for development to mule deer, and to development potential mitigation features, if the development ultimately occurs. Additionally, locations have been provided to personnel involved in evaluating the development proposal for the Department, and were used in preparing an acquisition proposal for the property.

Accomplishments

Twelve GPS collars were placed on deer to evaluate use by those deer of an area proposed for housing development. Collars were removed a year later, data were dumped and the collars refurbished, and we then placed them on 12 additional deer. Those collars are due to be removed in March 2004, and the additional data retrieved at that time.

Findings/Observations/Issues

A preliminary look at the data from year 1 indicates extensive use of the proposed development site. Data were provided to Los Angeles Department of Water and Power to help justify acquisition of a 40 acre parcel in the vicinity of the proposed development, which has since been completed. No formal analysis of the data have yet been completed, but will commence when collars are retrieved in Spring 2004.

Project Contacts and Collaborators

Dr. Vern Bleich, CDFG, Region 6

Project Status Summary

Biogeographic Location: Sierra Nevada
Status: Complete

Title of Project:
Patterns of Species and Habitat Richness and Diversity in Grazed Meadows in the Golden Trout Wilderness Area, Eastern Sierra Nevada

Project Description

The Resource Assessment Program provided support for Kathren Murrell-Stevenson's graduate research on species and habitat richness in meadow systems. This project addressed the following questions, which have potential implications for management of mountain meadows: 1) In meadows, is area or habitat diversity a better predictor of species richness?; 2) How are meadow species distributed along the hydrologic gradient in mountain meadows?; 3) Where are species concentrated among a) specific habitat types and b) specific types of meadows?

The study was divided into two major parts:

Golden Trout Wilderness 1
The first part of Golden Trout Wilderness study examined how impacts on physical characteristics of meadows affect biodiversity. This project tested the hypothesis that meadow species richness is related to range of habitats represented, and, in more detail, that richness within specific affinity groups is related to representation of the habitat in that meadow.

Golden Trout Wilderness 2
The second part of Golden Trout Wilderness study evaluated the significance of the field sampling technique using non-channel data from the first study. This technique involved developing a model using surface soil moisture classes to track species change across an environmental gradient. This was important, because although there is evidence for the importance of the hydrologic gradient in meadows, to date a field measurement technique that is simple yet sensitive to the subtle changes to which plants are responding has been unavailable.

Results from both of the above studies will be used by U.S. Forest Service (USFS) personnel to modify management and monitoring practices in the Golden Trout Wilderness.

Accomplishments
Golden Trout Wilderness 1
The field sampling has been completed. Plant surveys were conducted using randomly selected transects running along or perpendicular to the main meadow channels. One hundred points per transect were sampled, with all additional species recorded in a 1x50 m belt. Habitat and/or moisture class was recorded for each species occurrence within each transect. Habitats were determined by surface soil moisture category on non-channel transects and by

topographic position on channel transects. In addition, species found in the willow understory were indicated separately.

Golden Trout Wilderness 2

A model was developed using surface soil moisture classes at the end of August, when the water table is generally at its seasonal minimum, to track species change across an environmental gradient. The significance of the soil moisture class field measurement was tested.

The resulting data has been analyzed using a variety of statistical methods. Draft manuscripts for publication are in progress, and will be available by June 1, 2004.

Findings/Observations/Issues

Golden Trout Wilderness 1

Findings from fifteen meadows suggest that the diversity of habitats (environmental heterogeneity) is more important than meadow size in predicting species richness. The hydrologic gradient is the most significant, but there also an effect of location. Niche overlap increases in the wetter portions of the gradient. Species richness is greatest in stringers, under willows, in non-channelized habitats and bank tops. Finally, while species richness increases with dryness, the percent of meadow-dependent species decreases, so that wetter habitats become important in maintaining the diversity of meadow-dependent species in the landscape.

Golden Trout Wilderness 2

If the soil moisture class field measurement proved to be significant, it could be used to map the abundance of habitats along this gradient within a given meadow as well as track the distribution of infrequent species with narrow niche breadth. Results from Twinspan analysis, ANOVA, and ordination showed that this gradient was the most important at the scale which was sampled. Therefore, this method has merit for use in meadows throughout the Sierra Nevada as an approximation of niche space with respect to the primary hydrologic gradient.

Management implications:

- The maintenance of habitats containing high-constancy meadow-dependent species is an important conservation objective to maintain biodiversity at the landscape scale;
- Restoration of the water table would increase habitat for meadow-dependent species;
- Stringers and willow habitat appear to be important refugia for species that occur less frequently in more heavily grazed environments; and
- To the extent that cattle grazing may alter the abundance of the above habitat types, continued monitoring of those habitats is important.

Project Contacts and Collaborators

Kathren Murrell Stevenson
(530) 219-6055 kemurrell@ucdavis.edu

Dr. Michael Barbour
Department of Environmental Horticulture
University of California
1 Shields Avenue
Davis, California 95616 (530) 752-2956 mgbarbour@ucdavis.edu

Project Status Summary

Title of Project:

Genetic Status of California Golden Trout in the South Fork Kern River and Transplanted Populations

Completed

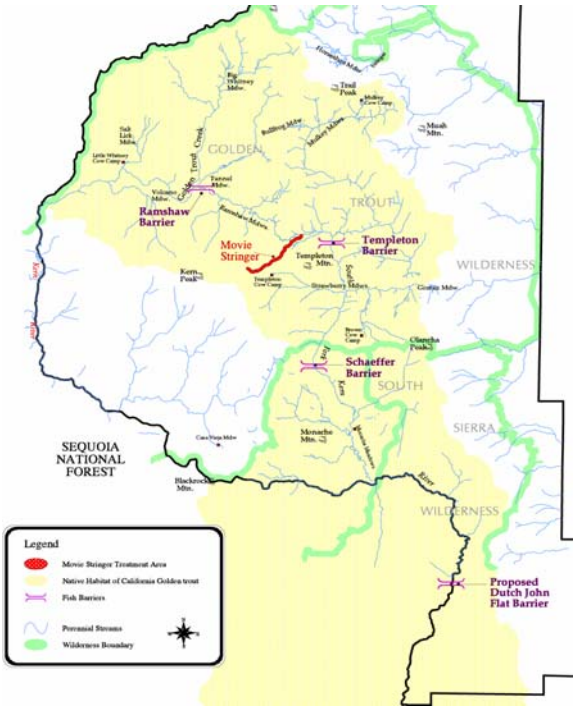
Report completed December 2003

Project Description

RAP funds were combined with other funds to support the research needed to determine the genetic integrity of California golden trout (GT-C) in the South Fork Kern River, Tulare County. California golden trout, the State fish, are native only to the South Fork Kern River and near-by Golden Trout Creek. GT-C is currently petitioned for listing under the ESA as Endangered and is currently undergoing a one year review. The concern is that they may have hybridized with non-native rainbow trout stocked lower in the drainage. Populations of GT-C transferred out of Golden Trout Creek in the early 1900's were also analyzed to determine if they showed evidence of rainbow trout introgression.

The primary goal of this study was to identify GT-C populations in the South Fork Kern River. Out-of-basin trout populations established from GT-C from Golden Trout Creek were also analyzed to determine if they might be useful in restoration efforts.

Biogeographic Location



The South Fork Kern River is located in southeastern Tulare County. Historically it drained into Tulare Lake during historically wetter times. It now empties into Lake Isabella in Kern County.

Accomplishments

Fin tissue was collected from selected trout populations (40 trout per sample) by DFG biologist and delivered to the UCD Genomic Variation Laboratory for analysis. Geneticist used single copy nuclear (scn) DNA and microsatellite markers to identify GT-C populations where rainbow trout introgression has occurred. They also examined out-of-basin waters where records documents transplanting of GT-C from Golden Trout Creek.

Information from forty trout populations, including hatchery references, was included in this analysis. In addition to determining if populations were introgressed with non-native rainbow trout, the study also determine the levels of genetic diversity and provided estimates of levels of introgression.

Findings/Observations/Issues

All GT-C trout populations tested contained some level of non-native rainbow trout genetic introgression. Only one population has been located to date that is not introgressed, but appears to be genetically bottlenecked. The level of introgression increased from the headwaters of the South Fork Kern River downstream to Kennedy Meadows (lower end of sampling). The highest levels of introgression (48% to 88%) occurred at these downstream locations. However, headwater trout populations showed a relatively low level (4%) of introgression. Trout populations on the South Fork Kern River are now separated by a series of three man-made barriers. However, the initial hybridization appears to have occurred prior to the construction of the first barrier in 1970.

It appears that although the South Fork Kern River and Golden Trout have been hydrologically connected in the past, the GT-C populations in these two basins are genetically different and will be managed as such. What the low levels of introgressed mean is that out a sample of forty trout, one or two trout are introgressed. It is unclear (depends on selective forces) if the level of introgression will increase, remain level or decline.

Researchers need to develop better species-diagnostic markers for GT-C and rainbow trout to better delineate levels of hybridization. We need to evaluate a few additional trout populations in isolated tributary streams as well as monitor changes in the level of introgression in key populations (isolated upstream of barriers). It is important to keep all the pieces. When more and better information become available, management decisions will be made on how best to preserve what we have or restore GT-C if possible. This could include keeping the best (lowest levels of introgressed trout) and establish refuges of pure GT-C outside the basin (i.e. in near-by Sequoia National Park).

We are working to eliminate sources of additional non-native rainbow trout genetic material. A GT-C Conservation Assessment and Strategy has been drafted and is currently being reviewed by the U.S. Fish and Wildlife Service.

The full report is available by contacting Stan Stephens at the DFG Fresno office.

Project Contacts and Collaborators

This work was done under contract with the University of California, Davis, Genomic Variation Laboratory. The primary contacts are Dr. Bernie May (bpmay@ucdavis.edu) or Molly Stephens (mrstephens@ucdavis.edu). The primary contact for the Department is Stan Stephens (sstephens@dfg.ca.gov).

Project Status Summary

Title of Project: Wildlife and Habitat Inventory/Monitoring in the Southern Cascades

Ongoing: Year 3

Project Description:
The study design is currently being implemented in the 6.4 million acre Southern Cascade, and 3.6 million acre Modoc Plateau Ecological Provinces. Resource assessment methodology and data management include:

- Habitat data collected from randomly located sample sites consisting of a four-plot grid
- Small mammal traps set in sixteen, 4-trap grids at random locations within the sample plot grid
- Breeding birds monitored in each grid with recording devices
- Baited, remotely triggered cameras set at each survey site to detect mesocarnivores
- Data to be stored in NCNCR Information Services Branch office and at Wildlife and Habitat Data Analysis Branch

Objectives:

- Describe the current abundance, distribution and condition of habitat types and stages
- Determine the current abundance and distribution of CWHR habitat elements
- Determine the trends in abundance, distribution and condition of habitats, elements and wildlife species.

Biogeographic Location
Southern Cascade Range and Modoc Plateau (added in 2003).

Accomplishments

- Completed 2 years sampling
- GIS based maps with sampling grid and locations (coordinates) of each plot sampled have been developed
    - 123 plots sampled for habitat descriptive data which includes:
        - Eight digital photos at each plot grid
        - Ground cover description at 100 random points
        - Diameter and breast height of 100 trees (in tree types)
        - Tree canopy closure (hit or miss) data from site tube at 100 points
        - Tree species identification for 100 trees per plot grid
        - Crown decadence and form class of shrubs and herbaceous plants
        - Presence or absence of twenty-one CWHR habitat elements
        - Density estimates for twelve classes of snags and logs on plots
        - Description of CWHR habitat type, size and cover class for each survey plot
    - 60 plots re-sampled in 2003 for monitoring/trend analysis
    - 154 plots sampled for breeding bird data
        - Bird recordings were interpreted to identify birds and other animal sounds and create a list for each 5-minute survey period at each site per date. Results were entered into the database.
    - 123 plots sampled for small mammal data

    - 123 plots sampled for mesocarnivore data
- Links to project documentation, photos, and data are available by clicking the "Monitoring Project" link at http://ncncr-isb.dfg.ca.gov
- Archived information for each plot includes:
    - Digital photos for each sample grid
    - Habitat variables for each plot and each grid
    - Small mammal trapping results
    - Baited camera results with scanned photographs of species observed
    - Results from Breeding Bird Survey recordings
- ArcIMS, web accessible database created for data input, storage and retrieval was recognized by GIS software company ESRI and awarded DFG the 2003 first-place award for the Best Internet Mapping Application at it's 2003 International Conference (see http://www.dfg.ca.gov/news/news03/03072.html).

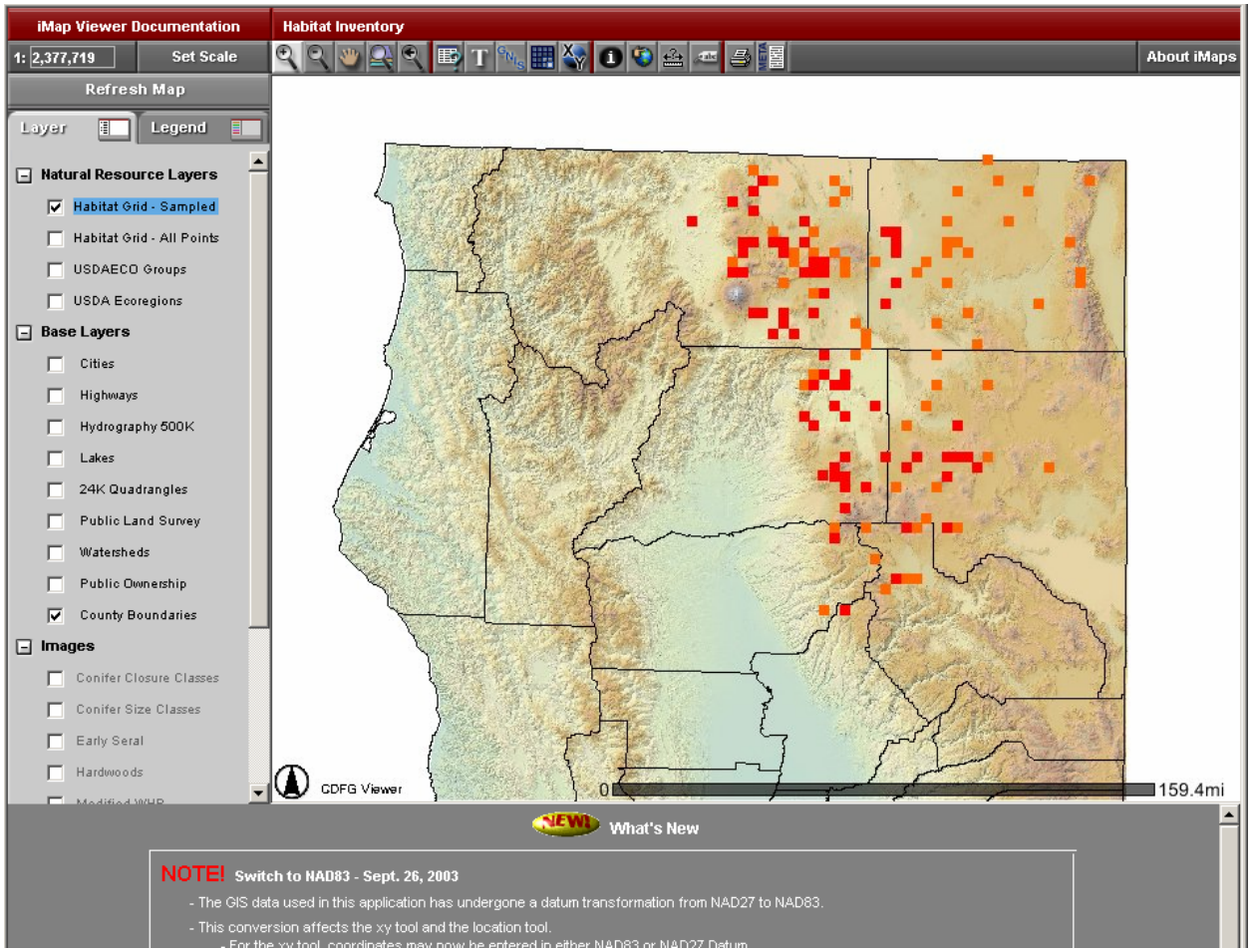
Findings/Observations/Issues

- Inventory work proceeding as planned, at current rate of data collection it will be several years before meaningful trend data are available

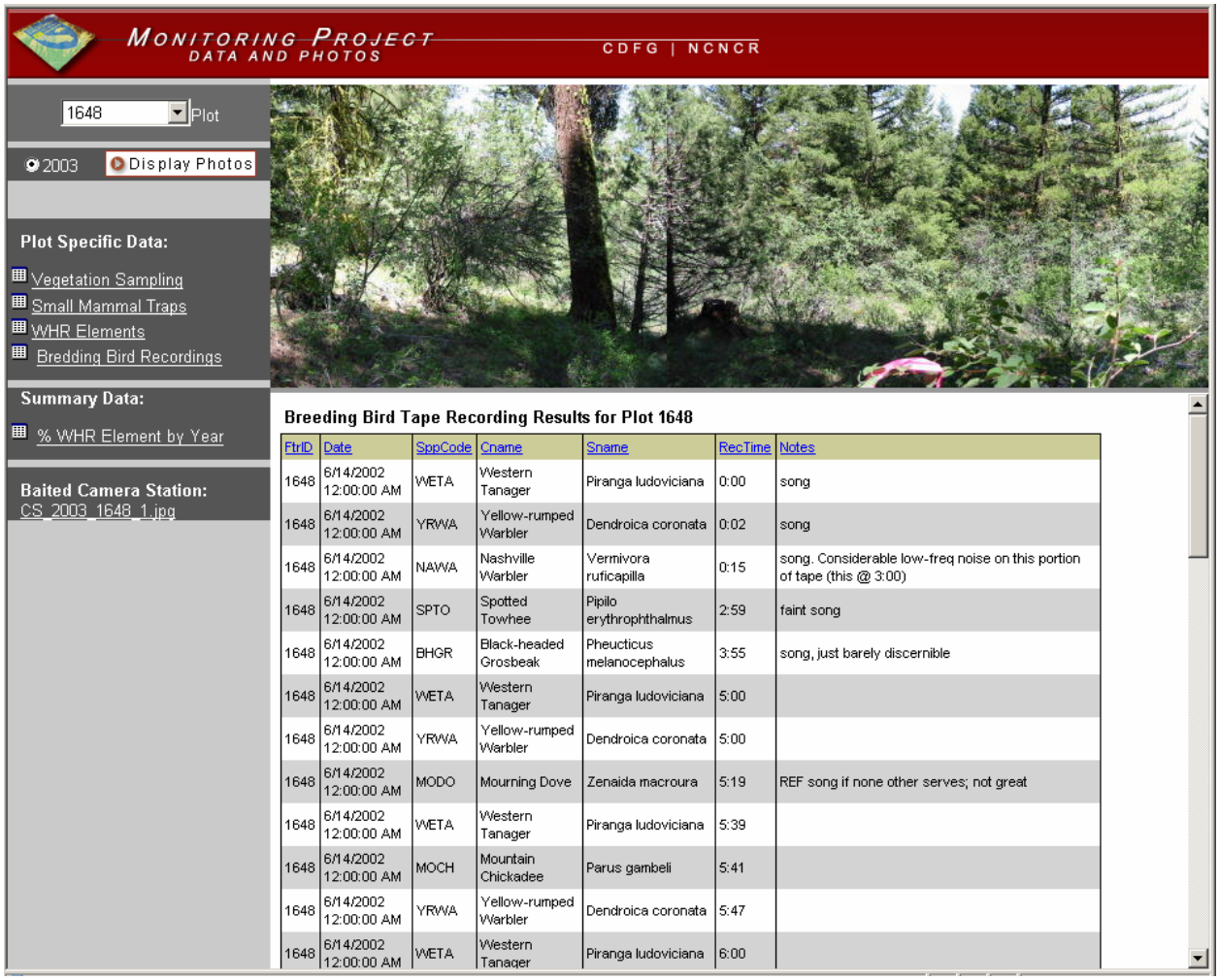
Project Contacts and Collaborators

DFG Programs involved

- RAP – Steve Burton
- Wildlife – Rich Callas
- Information Services – Eric Haney, Clint Kellar



Screen shot of HabPlot, the web-based mapping application developed for the Wildlife and Habitat Monitoring project. This application displays sample points and associated layers, and provides a link to the associated field data.



FtrID	Date	SppCode	Cname	Sname	RecTime	Notes
1648	6/14/2002 12:00:00 AM	WETA	Western Tanager	Piranga ludoviciana	0:00	song
1648	6/14/2002 12:00:00 AM	YRWA	Yellow-rumped Warbler	Dendroica coronata	0:02	song
1648	6/14/2002 12:00:00 AM	NAWA	Nashville Warbler	Vermivora ruficapilla	0:15	song. Considerable low-freq noise on this portion of tape (this @ 3:00)
1648	6/14/2002 12:00:00 AM	SPTO	Spotted Towhee	Pipilo erythrophthalmus	2:59	faint song
1648	6/14/2002 12:00:00 AM	BHGR	Black-headed Grosbeak	Pheucticus melanocephalus	3:55	song, just barely discernible
1648	6/14/2002 12:00:00 AM	WETA	Western Tanager	Piranga ludoviciana	5:00	
1648	6/14/2002 12:00:00 AM	YRWA	Yellow-rumped Warbler	Dendroica coronata	5:00	
1648	6/14/2002 12:00:00 AM	MODO	Mourning Dove	Zenaida macroura	5:19	REF song if none other serves; not great
1648	6/14/2002 12:00:00 AM	WETA	Western Tanager	Piranga ludoviciana	5:39	
1648	6/14/2002 12:00:00 AM	MOCH	Mountain Chickadee	Parus gambeli	5:41	
1648	6/14/2002 12:00:00 AM	YRWA	Yellow-rumped Warbler	Dendroica coronata	5:47	
1648	6/14/2002 12:00:00 AM	WETA	Western Tanager	Piranga ludoviciana	6:00	

Screen shot of the data and photo application. This application displays cardinal photos, remotely triggered camera photos, plot specific data, and data summaries.

Project Status Summary

Title of Project: ***Completed / Ongoing: Year 2 of 3***

Wildlife Habitat Changes in Mixed-Conifer Forests from the central Sierra Nevada

Project Description **Biogeographic Location** Sierra Nevada

The majority of forest habitats in the Sierra Nevada are dominated by coniferous trees like ponderosa pine (*Pinus ponderosa*), Douglas-fir *(Pseudotsuga menziesii*), sugar pine (*P. lambertiana*), and white fir (*Abies concolor*). Yet, considerable amounts of forest habitats in the region are either dominated by or contain substantial amounts of hardwoods, particularly California black oak (*Quercus kelloggii*). While habitat values to wildlife are generally significant in coniferous forest habitats, habitat values are equally significant and at times can be greater in forest habitats with substantial amounts of hardwoods. Land management activities conducted in the Sierra's forest habitats variously affect wildlife habitat values. Monitoring these management activities and assessing their effects on wildlife habitat are important tasks that engage public and private organizations. Fire suppression is a land management activity that causes profound changes to forest habitat attributes. For example, forest stands where fire has been excluded undergo wholesale changes in species composition, size, structure, and growth of trees. Because hardwoods typically occupy habitats that represent early seral stages that result from disturbances such as wildfire, hardwood habitats would be expected to show profound changes with fire suppression. These changes will greatly affect attendant wildlife populations and communities. Resource managers must know declines and changes in hardwood-associated wildlife habitats.

To address this problem, the CDFG undertook an investigation in 2002 and 2003 of wildlife habitat change as a result of vegetation change in hardwood-dominated forest habitats in the central Sierra Nevada. We used historical vegetation information to represent baseline or pre-fire suppression conditions, and similar data were collected in 2002 and 2003 to present current or post-fire suppression conditions. Surveys of territorial breeding landbirds were concurrently conducted at the sample points to develop inventories of landbird communities present in these habitats and develop and test habitat relationship models. These models will enable us to validate and improve habitat relationship models used by the California Wildlife Habitat Relationship Program.

In the early 1930's, the U.S. Forest Service (USFS) developed a vegetation map for the forests, woodlands, shrublands, and grasslands of California. The project was known as the vegetation type map (VTM) project, and all VTM data are archived at the University of California, Berkeley. There is also a web site with considerable information about these valuable data: http://nature.berkeley.edu/~kueda/vtm/. More than 18,000 vegetation plots were taken from representative stands of vegetation to support the mapping effort, and these plots were delineated on 1:62,500 scale (30 minute) topographic maps. Detailed information on tree species composition, diameters, and heights and ground cover by vegetation were collected on rectangular 0.2-acre vegetation plots. These plots were collected at the time when active fire suppression was just beginning so these data represent baseline pre-fire suppression habitat conditions where they were collected.

The null hypothesis of this investigation is that there has been no change in a variety of wildlife habitat parameters in these stands in the 70+ years since they were originally sampled.

Examples of alternative hypotheses to investigate are that the occurrence of California black oak has declined on VTM plots where California black oak occurred in the 1930's, and California black oak has not established itself today on VTM plots where it was not recorded in the 1930's.

Accomplishments

Preliminary calculations have been made for data collected from plots surveyed in 2002 (Table 1). Quadratic mean diameters, basal areas, and stem densities of the tree layer for all trees, hardwoods only, and conifers were calculated from the tree data gathered at 29 plots surveyed in 2002. These data were compared to the original VTM data using paired t-tests.

Findings/Observations/Issues

The study stands had statistically significant fewer stems and larger diameter trees in the 1930's than in 2002 (Table 1). Basal areas were greater in the 1930's but not statistically significantly different from 2002. The reasons for these differences are currently unknown but additional samples collected in 2003 will allow us to develop appropriate conclusions regarding habitat changes and retrospectively assess the impacts to wildlife habitats by quantifying these changes. Abundance and distribution data were collected on more than 60 species of breeding landbirds in 2003, and we are analyzing these data in combination with habitat data to develop habitat relationships models. More analysis with these data will be done in 2004.

Table 1. Comparisons between habitat data (n = 13-28) collected in the 1930's and data from the same locations in 2002. Comparisons were made using paired t-tests of averages from single samples collected in the 1930's and grand means from cluster samples collected from the same locations in 2002.

Variable	Mean ± SE (n) 1930's	Mean ± SE (n) 2002	t-test	df	P-value
All stems					
Stems/acre	102.76	167.46	-2.914	28	0.007
Basal area (ft^2/acre)	330.80	159.57	1.462	28	0.155
QMD (inches)	24.41	14.19	5.444	28	0.000
Hardwoods					
Stems/acre	27.81	21.20	2.827	15	0.013
Basal area (ft^2/acre)	49.72	16.24	1.162	13	0.266
QMD (inches)	12.84	13.52	-0.530	13	0.605
Conifers					
Stems/acre	90.54	155.82	-3.282	27	0.003
Basal area (ft^2/acre)	317.0	151.38	1.229	27	0.230
QMD (inches)	25.74	14.49	5.822	27	0.000

Project Contacts and Collaborators

Barry Garrison and Stacy Hall, California Department of Fish and Game
Sacramento Valley – Central Sierra Region
Resource Assessment Program
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bgarrison@dfg.ca.gov 916-358-2945

Project Status Summary

Title of Project: ***Ongoing:*** ***Year 3 of several***

Forestland Resource Assessment in the Southern Sierra Nevada

Project Description **Biogeographic Location** Sierra Nevada

The primary objective of this project is to determine the distribution and status of certain native species of wildlife in the Sierra Nevada throughout the SJVSS Region. To date, teams have surveyed resources in various habitats utilizing several methods to detect the target species. Funding for contract employees and equipment was provided by the Department's Resource Assessment Program.

Accomplishments

Surveys for California spotted owl, northern goshawk, and great gray owl were conducted at various locations on the Stanislaus, Sierra, and Sequoia National Forests. Individuals and reproduction were detected at several sites. In addition, furbearer surveys, utilizing remote triggered camera stations were conducted to detect rare mesocarnivore species such as American marten and Pacific fisher. A small collection of the pictures taken is included in this report. Lastly, funding and field assistance was provided to the ongoing study of spotted owl demography in the Central Sierra Nevada being led by the Forestry Sciences Lab of the Pacific Southwest Research Station of the U.S. Forest Service.

Findings/Observations/Issues

Enclosed with this report are four tables that generally summarize the results of the activities of the Project effort. The data from these surveys is currently being transferred to the Department's BIOS Unit. Detailed information regarding these surveys is also found in the completed Annual Reports for the SJV-SS Region Timberlands Resource Assessment Unit.

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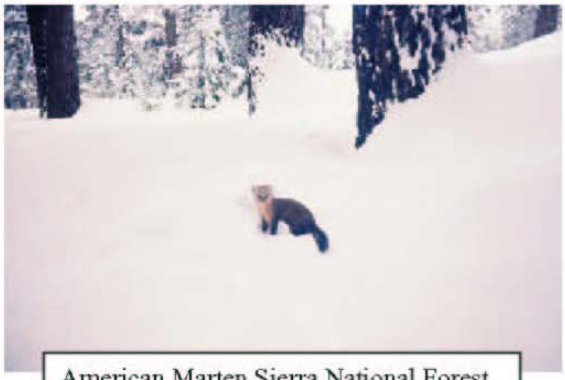


American Marten Sierra National Forest

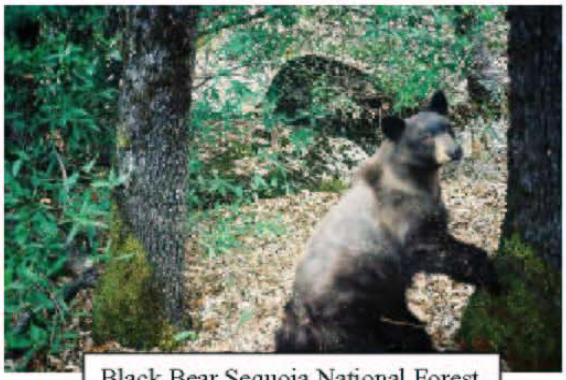
American Marten Sierra National Forest

American Marten Sierra National Forest

Golden Eagle Sierra National Forest

Coyote Sierra National Forest

Coyote Sierra National Forest



Black Bear Sequoia National Forest

Gray Fox Sequoia National Forest

Gray Fox Sequoia National Forest

Black Bear Sequoia National Forest

Pacific Fisher Sequoia National Forest

Pacific Fisher Sequoia National Forest

Mountain Lion Sequoia National Forest

Raccoon Sequoia National Forest

Northern Flying Squirrel Sequoia National Forest

Mule Deer Sequoia National Forest

Spotted Skunk Sequoia National Forest

Bobcat Sequoia National Forest

SJV-SSR TRAU
Summary Report

Table 1

Summary of Furbearer Surveys, 2001 Through 2003

	Number of Stations	Number of Days of Operation *	Total Number of Species Detected	Target Species Detected ?
2001	18	785	16	Pacific Fisher at 3 Stations
2002	33	1,467	13	Pacific Fisher at 5 Stations
2003	15	601	11	Pacific Fisher at 2 and American Marten at 5 Stations
Totals:	**66**	**2,853**	**20**	**10 Fisher/5 Marten**

* Cummulative count of days that cameras were operable and functioning.

Table 2

Summary of Spotted Owl Surveys, 2001 Through 2003

	Number of Sites Surveyed	Number of Visits	Spotted Owls Detected	Nests Located
2001	3	6	2 pairs and 1 young	None
2002	11	25	6 pairs, 2 single males, and 4 young	None
2003	10	13	2 pairs and 4 singles	1
Totals:	**24**	**44**	**10 pairs, 6 singles and 5 young**	**1**

Table 3

Summary of Great Gray Owl Surveys, 2002 Through 2003

	Number of Sites Surveyed	Number of Visits	Great Gray Owls Detected	Nests Located
2002	6	27	2 pairs and 4 young	None
2003	31	78	5 pairs, 2 young and 2 singles	1
Totals:	**37**	**105**	**7 pairs, 6 young and 2 singles**	**1**

Table 4

Summary of Goshawk Surveys, 2001 Through 2003

	Number of Sites Surveyed	Number of Visits	Goshawks Detected	Nests Located
2001	2	3	None	None
2002	5	6	4 pairs and 6 young	3
2003	4	5	1 pair, 1 young and 1 single	2
Totals:	11	14	5 pairs, 7 young and1 single	5

Project Contacts and Collaborators

DFG Contact: Kevin O'Connor, Environmental Scientist, SJV-SS Region.
Collaborators: Sierra National Forest and U.S. Forest Service Pacific Southwest Research Station, Fresno California.

Project Status Summary

Title of Project: Scanning and Ortho-rectifying 1940s Aerial Photos for the Klamath National Forest

Complete

Project Description
Contract with Chico Foundation to scan and ortho-rectify complete set of 1940s aerial photos for the Klamath National Forest.

Objectives:

- Gather complete set of 1940s aerial photographs (hard copy) for the Klamath National Forest
- Scan and ortho-rectify photos
- USFS to use data set for change detection analysis for known Northern Goshawk nesting sites

Biogeographic Location
Southern Cascade Range/North Coast Range

Accomplishments

- Photos scanned and ortho-rectified
- Data set available for DFG use
- Data set provided to USFS
- USFS analysis of Northern Goshawk nesting site change detection initiated

Findings/Observations/Issues

- Entire photo set not scanned and ortho-rectified, select photos done due to budget constraints
- Data set will be useful for future analyses and projects – i.e. change detection analysis for forest openings (currently proposed for RAP funding)

Project Contacts and Collaborators

DFG Programs involved

- RAP – Steve Burton
- Wildlife – Rich Callas, Bob Schaefer
- Information Services – Eric Haney, Clint Kellar

Chico Foundation – Chuck Nelson, Jason Schwenkler

USFS – Bonnie Allison

Project Status Summary

Title of Project:
Data Entry and Analysis of USDA Forest Service VTM Plot Data

Biogeographic Location: Southern California Coast, Sierra Nevada and Southern Cascade
Status: Year 2 of 2 ***Completion Date:*** June 30, 2004

Project Description
The objective of this project is to complete the electronic entry and compilation of the 9000 handwritten forest plot data sheets originally collected in the 1930's over an area of 40 million acres in California. Of the 9000 data sheets, 8000 have already been entered into electronic format. This project will combine the existing Access databases containing plot data into a single database, convert plot data that was entered into Excel into Access and combine it with the larger database, and enter the remaining 1000 data sheets into the database. The project will assist the state in developing a strategic approach to inventory and monitoring by providing a valuable historical perspective on vegetation community attributes, composition, and distribution.

Accomplishments
Data sheet entry and database compilation and conversion are underway and are expected to be complete by spring, 2004.

Findings/Observations/Issues
The final products will be submitted to the Resource Assessment Program by June 30, 2004, including a Microsoft Access database of all Weislander VTM plots and a final report describing preliminary analyses conducted on the subject data. The Weislander VTM data will provide valuable historical information to be used in the development of further inventory, monitoring, and research efforts.

Project Contacts and Collaborators

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Dr. Ayzik Solomeshch
Russian Academy of Sciences
aizsolomeshch@ucdavis.edu

Dr. Eric Loft
Resource Assessment Program
eloft@dfg.ca.gov

Project Status Summary

Biogeographic Location: Southern California
Status: Year 2 of 2
Estimated Completion Date: May 31, 2004

Title of Project:
Vegetation classification, San Dieguito River Watershed, San Diego County

Project Description
The Resource Assessment program is helping to support a field-based assessment of vegetation and habitat of the San Dieguito River Watershed, San Diego County. Local, regional, and state governments, and private NGO's are currently planning an 80,000 acre conservation corridor within this watershed, to run from central coastal San Diego County to the interior desert of the county. The goal of the field assessment is to map, monitor, and assist with appropriate selection of the 80,000 acre area of conservation lands within the watershed.

Accomplishments
The field sampling portion of this project has been completed as of June 2003. Field samples were allocated using a gradient directed transect (GRADSECT) analysis that partitioned the study region into focused sampling areas. Regional DFG personnel assisted in obtaining access permission to private lands or in identifying alternate accessible survey areas. Field samples were taken at approximately 425 sites using the California Native Plant Society Vegetation Rapid Assessment Protocol and/or the CNPS Releve method (see www.cnps.org for complete methodology).

The sample data has been entered into databases containing all information collected at the field sampling locations, including species, site impacts, abiotic environmental data, and other ecological information. The data have been quality controlled and analyzed using hierarchical classification techniques. Photographs from each field site have been digitally archived.

A vegetation map is being produced in conjunction with the field sampling and classification using aerial photograph interpretation and GIS processing. A formal field accuracy assessment of the map is underway.

In this project, we are implementing proposed standards from the Interagency Vegetation MOU group (http://ceres.ca.gov/biodiversity/vegmou.html) for the first time, including total tree, total shrub and total herbaceous cover. In addition this project is using a detailed system of vegetation quality ranking for each polygon mapped, based on invasive exotic cover, roads and trails, grazing, etc.

Part of this area was burned in the recent Cedar Fire of San Diego County, and plots from this project are available for long-range monitoring of post-fire vegetation recovery in the Julian and Santa Isabel areas.

Findings/Observations/Issues

Final products will be available May 31, 2004, including:

- A digital list of vegetation alliances and cross walks to other vegetation classifications including modified Holland and Wildlife Habitat Relationships
- Keys and description of vegetation types to alliance level
- A database of all field samples collected, and a database of all samples collected
- Final report including: sampling methods, standards used, a final listing of vegetation types classified, accuracy assessment methodology, and an assessment of the success of the overall project
- A final map product in ArcMap format of the entire area at the association level.

Project Contacts and Collaborators

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Project Status Summary

Title of Project: ***Ongoing:*** ***Year*** *1* ***of*** *3*

Population ecology and movement of mountain lions across habitats fragmented by urban development

Project Description **Biogeographic Location** South Coast Range

Habitat fragmentation has been identified as one of the principal threats to biodiversity worldwide (Wilcox & Murphy 1985; Saunders et al. 1991). Besides the direct loss of habitat, fragmentation isolates once continuous populations into smaller subpopulations (Saunders et al. 1991; Gaines et al. 1997). Small, isolated populations fluctuate more widely. Consequently, these populations are particularly vulnerable to localized extinction because they are more susceptible to genetic(Gaines et al. 1997), demographic(Wauters et al. 1994), and environmental stochastic events, thus, jeopardizing population viability (Noss & Cooperrider 1994).

Species that display a high vulnerability to fragmentation include those that are wide-ranging, exhibit low population densities, or are large-patch or interior-dwelling species (Meffe et al. 1997). Large mammals, particularly carnivores, exhibit these characteristics, but their decline in fragmented systems has received little attention (Beier 1995; Noss et al. 1996; Reed et al. 1996). The loss of these top predators from fragmented systems may have community-wide implications (Crooks & Soulé 1999; Terborgh et al. 1999) because they may function as keystone species in regulating community interactions (Mills et al. 1993).

Wildlife corridors have been proposed as a way to ameliorate the negative effects of fragmentation (Noss & Cooperrider 1994; Dobson et al. 1999). Corridors are essential in allowing for movement of animals during their daily activities, such as foraging and breeding, but are also necessary to allow for dispersing sub-adults or range shifts in response to climatic changes or environmental catastrophes (fires, floods, etc.) (Terborgh et al. 1999). In an urban environment opportunities to identify these landscape connections are quickly disappearing because habitat is rapidly becoming developed. Even though specific, fine-scale travel routes remain mostly unidentified, and the probability of animals finding an improperly placed linkage is low (Haas 2000), most often corridors are placed where habitat remains.

Stakeholders continue to use mountain lions to identify landscape linkages across the South Coast Ecoregion, but data is limited on how mountain lions actually use the landscape, and if the identified corridors actually support movement of both adult and dispersing sub-adults. Other population factors that have not been taken into consideration when planning corridors in this area are prey availability, social interactions, ecological elements, and additive mortality. The final oversight and quite possibly, the most important, is public reaction and support for mountain lion conservation via corridors, especially in an urban environment.

Once these factors have been clarified and it has been determined that the western Riverside County MSHCP can, biologically and politically (public support), support a mountain lion population, a cost-effective and biologically sound monitoring program must be implemented to ensure that management decisions do not adversely affect the viability of the mountain lion population

The specific objectives for this study are as follows:

1. Obtain basic demographic information for the mountain lion population within western Riverside County and adjacent areas (i.e. individuals captured within the periphery of western Riverside County are likely to be moving across county lines into Orange, San Bernardino, San Diego, and possibly Los Angeles Counties) via capture efforts, GPS and radio telemetry methods, and road kill information.

2. Obtain fine and coarse movement patterns of mountain lions specifically aimed at determining factors influencing mountain lion movement within a highly fragmented environment: landscape variables (both natural and anthropomorphic), social interactions, and prey abundance and distribution.

3. Determine what diseases are present in the population; evaluate how the social structure in a fragmented environment may affect transmission rate and what the effects may be in the current and projected landscapes via epidemiological extinction probability modeling.

4. Associate GPS radio telemetry activity with activity patterns seen at camera, track, or hair snare stations (i.e. changes in relative abundance and distribution) so a biologically and cost effective monitoring program can be designed for western Riverside County and applied uniformly across the entire South Coast Ecoregion.

Accomplishments

Project field activities have begun. To date, one female mountain lion has been captured and collared at the north end of Santa Anna Mountains. This individual is being monitored with a remotely transmitting GPS collar. Field capture efforts continue and effort will be highest in winter/spring months.

Findings/Observations/Issues

Project Contacts and Collaborators

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Project Status Summary

Biogeographic Location: Southern California
Status: Year 2 of 2
Estimated Completion Date: May 31, 2004

Title of Project:
Vegetation classification, Western Riverside County

Project Description
The Resource Assessment program is funding most of the comprehensive field-based vegetation sampling classification within the Western Riverside County Multi-Species Habitat Conservation Plan (MSHCP). The MSHCP aims to establish 510,000 acres of reserve land within the 1.2 million acre plan area in western Riverside County, California. The goal of the vegetation classification project is to establish a complete vegetation and habitat classification system and field monitoring database for the core 510,000 acres of potential reserve lands. The classification and database will provide a baseline to map and monitor the vegetation and habitat of the area over time, to ensure habitat quality and drive management decisions within the conserved landscape.

Accomplishments
The field sampling portion of this project has been completed. Field samples were allocated using a gradient directed transect (GRADSECT) analysis that partitioned the study region into focused sampling areas. Regional DFG personnel assisted in obtaining access permission to private lands or in identifying alternate accessible survey areas. Field samples were taken at 1,220 sites using the California Native Plant Society Vegetation Rapid Assessment Protocol (see www.cnps.org for complete methodology).

The sample data has been entered into databases containing all information collected at the field sampling locations, including species, site impacts, abiotic environmental data, and other ecological information. The data have been quality controlled and analyzed using hierarchical classification techniques. Photographs from each field site have been digitally archived.

Contractors are currently quantitatively analyzing the field samples as of early January. All samples have been subjected to cluster analysis and ordination of environmental variables is beginning.

A vegetation map is being produced in conjunction with the field sampling and classification using aerial photograph interpretation and GIS processing. Currently, approximately 85% of the area has been delineated by photo interpreters and we are awaiting new fine-scale imagery from USGS from which final attributes will be derived. Accuracy assessment plots have been collected and a formal field accuracy assessment will be completed following final labeling for the vegetation polygons.

A full set of plot data, including photos, has been given to RAP in Region 5 as of early December. These may be used to drive further sampling for vertebrates and for fire monitoring within the Western Riverside study area.

Findings/Observations/Issues

Final products will be available May 31, 2004, including:

- A digital list of vegetation alliances and cross walks to other vegetation classifications including modified Holland and Wildlife Habitat Relationships
- A map
- Keys and description of vegetation types to alliance level
- A database of all field samples collected, and a database of all samples collected
- A final report including: sampling methods, standards used, a final listing of vegetation types classified, accuracy assessment methodology, and an assessment of the success of the overall project
- A digital set of accuracy assessment plots
- A final map product in ArcMap format of the entire area at the alliance and super-association level of the National Vegetation Classification.

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Project Status Summary

Title of Project: *Completed* ***/ Ongoing: Year 3 of 11***

Western Riverside County Multiple Species Habitat Conservation Plan (MSHCP) Biological Monitoring Program

Project Description: **Bio-geographic Location:** South Coast

The Western Riverside County MSHCP is one of several large habitat conservation plans in Southern California, providing for the regional protection of species and habitats within a rapidly urbanizing environment. This is one of the largest plans ever attempted, encompassing approximately 1.26 million acres and conserving 146 plant and animal species and 500,000 acres of habitat ("Conservation Area"). The CDFG Resource Assessment Program (RAP) will be overseeing the implementation of the Biological Monitoring Program for the western Riverside County MSHCP for at least the first 8 years of the permit (to be issued in early 2004). The initial involvement of the RAP will ensure that data is collected in a consistent manner throughout the MSHCP Conservation Area and throughout the State, and that the data collected is stored and accessed through a centralized database (i.e. BIOS).

The RAP began laying the groundwork for implementing the Biological Monitoring Program in 2002 and 2003 by writing the framework monitoring program for the MSHCP, purchasing field supplies, developing and testing protocols, expanding databases, initiating a vegetation mapping project, and contracting with universities and other agencies to assist with implementation. The Biological Monitoring Program will be implemented in two phases. There is an initial phase, carried out during the first 5 years of the permit, of inventorying and assessing species, wildlife communities, and habitats, followed by the long-term monitoring phase with full implementation throughout the Conservation Area. Beginning in 2004, activities will focus on specific monitoring requirements for species covered by the MSHCP, baseline inventory, and on developing a community-based approach. Long-term monitoring of all 146 species is expected to begin in 2009.

Implementation of the Biological Monitoring Program requires the cooperation and support of multiple agencies. Although the first few years of this project have largely been funded by the RAP, starting July 1, 2004, the bulk of the financial support will come from local governments with jurisdictions in the planning area (i.e. Riverside County and Cities). Funding will be used in contracts to hire personnel and purchase supplies for implementing the monitoring program throughout the entire Conservation Area. In addition, federal and State agencies with land conserved in the planning area (i.e. BLM, State Parks & Recreation, USFS, CDFG, USFWS) will provide funding and/or personnel to contribute to management and monitoring on their lands. The RAP has committed to overseeing contracted personnel and coordinating the Biological Monitoring Program through at least 2012.

Accomplishments:

Framework Monitoring Program - In 2002, RAP staff drafted a framework Biological Monitoring Program for the MSHCP in coordination with the local governments and U.S. Fish and Wildlife Service. The framework prescribes an initial inventory phase for the first 5 years of the permit to

assess species and habitat status and distribution, and to develop the sampling design and protocols for long-term monitoring. The Western Riverside County MSHCP Biological Monitoring Program will serve as a testing ground for how monitoring programs will be implemented throughout the State.

Vegetation Mapping - In 2002, the RAP determined that a new vegetation map for the MSHCP planning area was needed to evaluate the status of habitats and to partition areas for sampling. The RAP contracted with Aerial Information Services, Inc. to create a new map using aerial imagery to "heads-up" digitize vegetation polygons. The RAP also contracted with the California Native Plant Society to conduct their Vegetation Rapid Assessment protocol to describe the vegetation characteristics within the polygons. Field work to characterize the vegetation was completed in fall 2003 and the new vegetation map will be completed by June 2004.

Data Mining, Niche Models, Species & Community Surveys: In 2002, the RAP contracted with UC Riverside to assist with determining the status of species and habitats, and to develop protocols for long-term monitoring. In 2002, UCR began collecting historical records on species of interest from museums, herbaria, and universities throughout the nation. Many of these records were revisited in the field in 2003 where possible to determine current status, particularly for plant species, burrowing owl, and several lizard species. In 2004, niche models will be created using the location records and GIS layers of environmental attributes (e.g., soils, elevation); these models will be used to predict new locations where the species may occur. Also in 2004, transects will be located within Coastal Sage Scrub and Riparian habitats and surveyed for multiple species (i.e., birds, insects, plants, lizards).

Amphibian Surveys: In 2002, the RAP hired several scientific aides to assist with species surveys for the MSHCP. Surveys to test protocols and discover new populations of the federally listed endangered mountain yellow-legged-frog and arroyo toad were conducted in 2003 within the MSHCP Conservation Area. No new populations were found by these efforts. Surveys will continue in 2004 and will include 2 additional species (coast range newt, California red-legged frog).

Mountain Lion: The RAP contracted with USGS in 2003 to assist with protocol development and species surveys for the MSHCP. A mountain lion study was initiated in 2003 to assess the movement of mountain lions and the use of corridors. This study will continue in 2004 and will result in the development of standardize methodology for detecting mountain lion usage throughout the State.

Findings/Observations/Issues

The species-specific conservation objectives for the 146 species covered by the Western Riverside County MSHCP require, at a minimum, tracking of each species' distribution within the Conservation Area at least once every 8 years. Additionally, approximately 28 of the 146 species require information in addition to distribution (e.g., reproductive status, density) or must be monitored more frequently, and 16 of the 146 species require additional conservation objectives to be met before they are considered fully conserved. Species-specific objectives present a challenge to developing an efficient, multiple species monitoring program because they require intense, single species survey efforts. At present, there are no tested methods to aggregate the 146 covered species in a manner that increase monitoring efficiency; nor are there sufficient data on the occurrence, much less the abundance, for most of the covered species. One of the goals

of the monitoring program is to monitor the covered species within the context of their relevant species assemblages (i.e. communities) because threats are likely to be similar and management actions will affect all species within the community. During the initial inventory and assessment phase, a multi-species, community-based approach will be developed to the extent possible for use in long-term monitoring. This approach will result in greater monitoring efficiency in that data on several species can be collected simultaneously or at least at the same sampling station. By developing the monitoring program in this manner, the requirements for surveying individual covered species are met, but the actual surveying is done at the community level, which is more efficient and practical.

Data, Reports, Products

See www.rcip.org for final MSHCP document [see section 5.3 vol. 1 for Monitoring Program]

Contact Yvonne Moore for project information, draft Workplan for 2004-2008, annual reports on amphibian surveys, amphibian data, & UCR summary reports

Contact Tom Lupo for data collected by UCR on burrowing owl, plants, and lizards

Contact Todd Keeler-Wolf for information and data on vegetation mapping project

Contact Steve Torres for information and data on Mountain Lion Project

Project Contacts and Collaborators

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Eric Loft (RAP), Monitoring Program Development
Steve Torres (RAP), Mountain Lion Project Coordinator
Todd Keeler-Wolf (WHDAB), Vegetation Mapping Project Lead
Tom Lupo (WHDAB), Database Project Lead
Eric Kauffman (WHDAB), GIS Support
Chris Stermer (RAP), Database and GIS Support
Calvin Chun (RAP), Statistical Support
William Diez and Ricardo Escobar (RAP), Scientific Aides and Amphibian Survey Crew Leaders
Annie Bustamante and Jeff Wheater (RAP), Scientific Aides

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Veronique Rorive, Database Support
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Karin Cleary-Rose, Riverside Branch Section 10 Coordinator

DUDEK and Associates (Riverside County's Environmental Consultant):
June Collins, MSHCP data and technical support

Other Collaborators:
California State Parks and Recreation
Bureau of Land Management
California Department of Transportation
U.S. Forest Service
Metropolitan Water District
CDFG Lands and Facilities Branch

Project Status Summary

Title of Project: ***Ongoing: Year 2 of 3***

Linking Puma Movement Patterns to Conservation Planning in California: a large mammal model

Project Description

Biogeographic Location:
Sierra Nevada Foothills and Sierra Nevada and S. Cascades Bioregions

The most critical conservation issue facing wide-ranging mammal populations is habitat loss and fragmentation due to development and other land uses that compete with wildlife. Large mammals require large blocks of contiguous habitat that provide sufficient prey (Carbone and Gittleman 2002), and because isolating populations from each other can result in local extirpations. Conservation biologists recognize that ensuring the persistence of large mammals such as puma and deer may also serve to protect many other animals. Additionally, large carnivore populations, such as pumas, are particularly vulnerable to landscape changes (Crooks 2002, Sunquist and Sunquist 2001). Therefore, it is important to understand how populations are distributed at a broad scale to protect these areas and any important movement corridors between them.

Although many studies have used radio-telemetry collars to provide insight into puma distribution, density, and local habitat use, many important questions remain regarding their use of larger geographic areas. These larger-scale questions are necessarily more general, but are very important for understanding the size and locations of areas required for the survival and conservation of predator and prey populations. In addition to studying traditional habitat characteristics such as home range, it is important to detect movement corridors between regional areas of use. Movement corridors are often overlooked and not recognized as “traditional habitat” for a species, yet these areas may be very important for ensuring the long-term survival of large mammals by preventing isolation of populations. It has been well established that the isolation of populations has both genetic and demographic consequences that threaten species persistence (Clarke and Young 2000).

Torres et al. (1996) described the diverse pattern of human and puma activity in California. By examining puma depredation conflicts from 1972 through 1996 (24 years), they showed that pet depredation was highest in counties that had the highest rate of housing development and habitat loss. This increased pet depredation appeared to be a manifestation of habitat fragmentation, and emphasized the need to protect large blocks of habitat and mammal movement corridors (Beier 1993).

Torres and Lupo (2000) developed a puma habitat map that was derived using CWHR and GAP data. This map provided a means to visualize and initiate assessment of important habitat areas and potential movement corridors on a broad scale.

Objectives

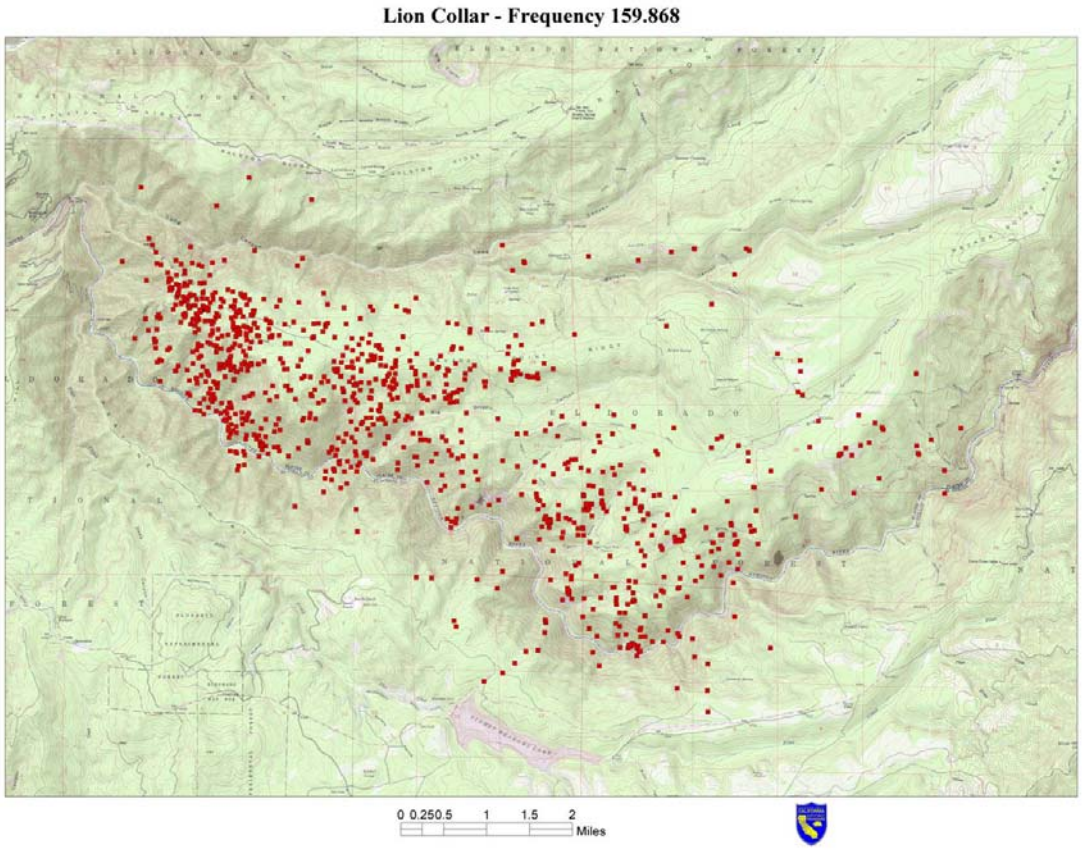
1. Determine the extent of habitat use and movements of puma on the west slope of the Sierra Nevada.
2. Demarcate the scale of large mammal predator and prey systems to establish geographic area requirements.
3. Identify current movement corridors used by pumas, and existing and potential barriers separating large blocks of habitat (e.g. north/south impediments such as Interstate Highway 80).
4. Collect detailed puma location data to develop habitat use and suitability models. Identify key habitat features, and combinations of features, that make an area quality puma habitat.

Test the use of the puma model to rapidly delineate lower bounds of terrestrial ecological systems on the west slope of the Sierra Nevada.

Accomplishments

- Placer and El Dorado counties have been focal areas
- 6 animals collared, each will report over 1000 locations
- Hourly locations over 4 months (over-sample)
- Data collected (4-5 collars): analyze to determine time and location biases, and optimal sampling schedule
- Annual report prepared

Findings/Observations/Issues



Project Contacts and Collaborators

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Cliff Wiley, UC Davis, Wildlife Health Center
Anne Orlando, UC Davis

Project Status Summary

Title of Project: ***[ ] Completed / [X] Ongoing: Year 3 of 3***

Information System Infrastructure Development

Project Description **Biogeographic Location** Statewide

The Resource Assessment Program (RAP) has contributed funds and other assistance to help modernize the department's computer infrastructure with the objective of improving the flow of biological information throughout DFG. Targeted are those systems that support the processing and distribution of data collected by DFG fieldwork. Specific systems include the installation of a centralized biological data management system, distribution of data and information via web-enabled interactive maps, and the decentralization of headquarters "library" data to various DFG offices around the state.

Before this project, data traveled an assortment of paths from the field to the office depending on the project, researcher, and organizational unit. Without consistency data was made available to the public while other data remained locked away. And it wasn't uncommon for projects to handle things differently resulting in incompatibilities in data pertaining to the same species. This led to a situation not just inefficient but potentially wasteful.

Organizationally, RAP and its partners are working to bring consistency through better coordination between department scientists. Even if the organizational issues are resolved there still remain the underlying technical and logistical questions of what systems will be used to manage all the newly generated fieldwork data. These technical issues are the focus of this project. The primary objective is to build the computer infrastructure that directly supports the work of biologists and others who manage biological data collected in the field.[1] Project accomplishments are discussed below.

Accomplishments

Thus far, gains have been made in the distribution of "framework" geographic information system (GIS) data and how processed field data is distributed throughout DFG and its collaborators. "Framework" data consists of roads, waterways, cities, vegetation cover, elevation, climate, geology, aerial photography and more. This is used to help develop sampling designs, map what was found, and analyze results. Efforts in this regard have focused on decentralizing the large storehouse of framework data housed at GIS data library in Sacramento. Until now the large file sizes of this data have made it infeasible for biologists in regional DFG offices to access the GIS library in Sacramento—despite the fact that DFG's wide area network is fairly capable. RAP's approach has been to co-fund the installation of GIS data library "mirrors" at several regional offices thereby reducing the limitations posed by file size and network bandwidth. Below is a list of DFG offices that now have GIS mirrors installed (The locations with an asterisk '*' were RAP sponsored projects):

[1] Related to this project is the Biogeographic Information and Observation System, or "BIOS," which is the subject of another project status summary.

- ✓ Bishop*
- ✓ Fresno*
- ✓ Los Alamitos*
- ✓ Rancho Cordova*
- ✓ Redding*
- ✓ Yountville*
- ✓ Fortuna
- ✓ Monterey

Decentralizing headquarters data is half the equation; the other half is to provide a conduit for field data to flow from the field into headquarters and then be redistributed among department scientists, outside collaborators, and to the public. The GIS technologies to do this are still emerging such as hand-held computers attached to global positioning units, central spatially-enabled databases accessible from remote locations, and web servers capable of delivering geographic data to a variety of computer applications. More specifically, these web services allow information to be simultaneously viewed in a web browser or with a high-end desktop mapping system—the choice depends on the needs of the data consumer.

Here is a list of computer infrastructure components that have been installed to support the distribution of processed field data:

- ✓ Installation of computer server hardware (Funded mostly by the Information Technology Branch [ITB] with contributing RAP funds and other assistance)
  - o Storage Area Network
  - o Includes 8 new computer servers for the “production” system
  - o Two computer servers for the software application “testing” system
  - o One computer server for the software “development” environment
- ✓ Computer server software
  - o ArcIMS: online map data distribution (Funded primarily by ITB GIS Unit)
  - o ArcSDE (Funded primarily by the Wildlife and Habitat Data Analysis Branch)
  - o MS SQL Server (Funded by RAP)

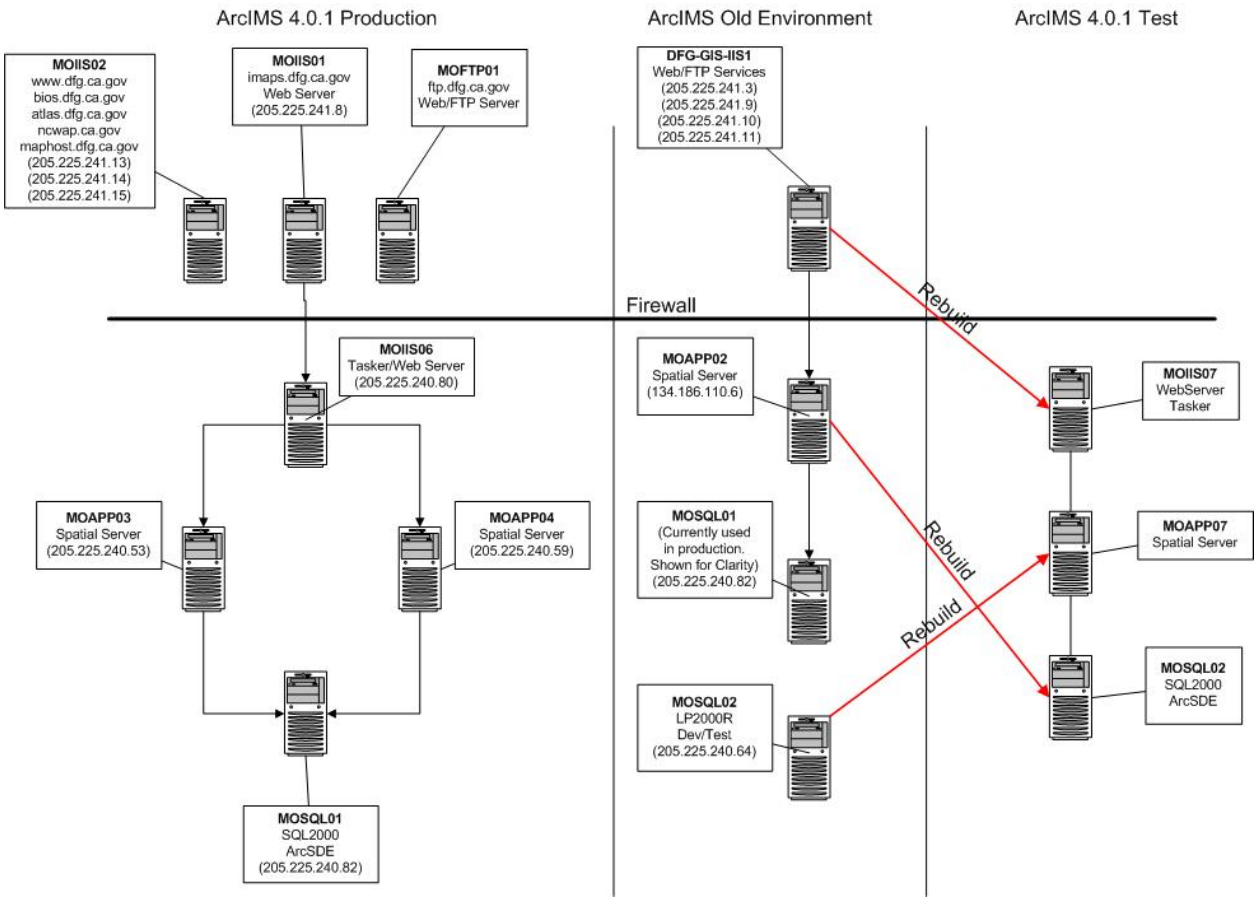
Findings/Observations/Issues

Strategically speaking RAP has focused its efforts on investing in computer projects that make not just technical but institutional progress in the way the DFG handles biological field data. Fundamental to this strategy are these core tactics:

- ✓ Invest in technologies that embed capabilities into the DFG corporate computer system rather than building a separate computer network for biological field data.
- ✓ Whenever possible, RAP resources are pooled with other department resources to minimize duplication and leverage available funds and labor.
- ✓ Work with existing software and hardware standards, and on-going IT planning to ensure corporate acceptance and institutionalization of any new computer functionality.

Fundamental change for any organization needs to be systemic in nature. If RAP built a computer system parallel to the DFG corporate system, there would be high risk in having the "biological" system fall to the wayside since (a) RAP does not have the personnel to support such a system on its own, (b) any "separate" system is more easily abandoned when personnel leave or budget constraints require cut backs, and (c) crucial "buy-off" would not exist among computer support personnel. Through entrenching functionality within corporate computer infrastructure RAP has sought to secure a long-term future for the systems designed to sustain biological field work.

Results are promising as joint projects involving RAP, ITB, ITB GIS Unit, and WHDAB are coming to fruition and are being increasingly used by department biologists. Combining funds and technical resources from many sources has in fact resulted in computer systems with far greater functionality and performance than had we built a separate system for RAP. More importantly, ITB and WHDAB staff are now committed to supporting these data systems since they are intertwined with the rest of the department's infrastructure. As a side benefit, other programs within DFG not directly related to RAP have benefited from the synergy of cooperation since all these systems have multi-use functionality.



Project Contacts and Collaborators

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Primary WHDAB Contact: Patrick Gaul

Collaborators:

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Jim Tanner (WHDAB)
Daren Thiel (ITB Server Group)
Joseph Vondracek (WHDAB)

Project Status Summary

Title of Project: Assessment and Data Programming Efforts

Completed

Project Description:

The funding for this project was added to a larger contract DFG had already executed with Pacific States Marine Fisheries Commission (PSMFC). PSMFC hired 1 programmer and 3 field technicians under Contact number P0010022 with RAP funding. The programmer and one field technician was headquartered in Redding, the other two field technicians were headquartered in Rancho Cordova.

The programmer position was dedicated to assisting in the development of the Uniform Field Observation (UFO) system for DFG (see attached reports). UFO is now part of the Biogeographic Information and Observation System (BIOS) (www.bios.dfg ca.gov). Once work on the UFO/BIOS system was completed the programmer was then dedicated to development of an access database that now contains all existing information on the Siskiyou Mountains Salamander (*Plethodon stormi*), a California State Threatened Species.

The Field Technician position in Redding was dedicated to the pilot project that has now become the Wildlife and Habitat Monitoring in the Southern Cascades project. The technician field tested and refined protocols for systematic vegetation surveys, element data collection, small mammal trapping and remote camera use.

Objectives:

- Assist in the development of DFG's UFO/BIOS system
- Develop an Access Database that allows easy access to data
- Develop an efficient and comprehensive protocol for monitoring habitat and wildlife in the Southern Cascades

Biogeographic Location

Sierra Nevada and Southern Cascade Range/North Coast Range

Accomplishments

- Aided in the development of UFO which is now part of the larger BIOS.
- Access Database for all Siskiyou Mountains Salamander data complete
- Siskiyou Mountains Salamander data queried and used to develop species status review that will soon be going out for peer review.
- Protocols for inventory and monitoring of wildlife and habitats in Southern Cascades tested, made more efficient and has now been implemented, 2 years of data collected, currently preparing for third year.
- Greater detail on accomplishments can be found in attached quarterly and final reports from PSMFC

Findings/Observations/Issues

- UFO information helped to develop BIOS database currently in use
- Siskiyou Mountains Salamander data input is ongoing status review indicates species is at far less risk than previously expected.
- Inventory and Monitoring in Southern Cascades is ongoing, see Project Status Summary for Wildlife and Habitat Monitoring in Southern Cascades Project
- Funding for this project was used for Sacramento Valley – Central Sierra Region's Mesocarnivore Study, information available from Armand Gonzales (DFG – Rancho Cordova) at (916) 358-2876.

Project Contacts and Collaborators

DFG Programs involved

- RAP – Steve Burton
- Information Services – Eric Haney
- Wildlife – Rich Callas (NCNCR), Armand Gonzales (SVCSR)

Project Status Summary

Title of Project: ***Project Status***

GIS, Web and Database Application Development — Ongoing support & development

Project Description **Biogeographic Location**

Application development tasks include the following: — Statewide (Headquarters)

1) Creation and management of modular PDA and MS Access database structures and data processing procedures to permit processing of habitat and species data.
2) Development of a web-based mapping system to permit viewing of GIS features, data and photos.
3) Creation of a Resource Assessment Program Internet website to provide public information on the program.
4) Creation of a Resource Assessment Program Intranet website to enhance communication, data sharing and collaboration with non-departmental agencies and organizations.
5) Provide web and database management support for multiple Program projects.

Accomplishments

The major products of this project are:

1) Developed a Windows CE and Palm PDA/Access data processing applications that supports multiple RAP related projects, e.g. - Sierra Meadows Project, Willow Flycatcher Project, Great Gray Owl, Blue Grouse Project, Aspen Stand Management, and the High Mountain Lakes – Fish and Amphibian Projects.

2) Developed the iMaps application portal website that permits viewing of GIS features, data and photos for the Resource Assessment Program. Application received 1st Place 2003 Internet Mapping Award from ESRI. See URL below.

3) Created Internet websites for the Habitat Conservation Division and Resource Assessment to provide public information on the Division and its Programs. See URL's below.

4) Researched and created the Resource Assessment Program Intranet website (RAPnet) to enhance communication, data sharing and collaboration with non-departmental agencies and organizations. Current membership: 98 DFG and 13 Non-DFG Staff. See URL below.

5) Combined 4 legacy datasets and constructed new database to house High Mountain Lakes – Fish and Amphibian data. Ongoing tasks include normalization of data, reports preparation, and develop queries to identify data issues. Provide XML/SVG web application development to display reports to managers.

Findings/Observations/Issues

See the following URL's for additional information:
Habitat Conservation Division website: http://www.dfg.ca.gov/habitats/
Resource Assessment Program Internet website: http://www.dfg.ca.gov/habitats/RAP/default.html
Resource Assessment Program Intranet (RAPnet) website: http://rapnet.intranets.com/
Internet Map Services (iMaps): http://imaps.dfg.ca.gov

Project Contacts and Collaborators

Contractor Services:

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601 Riley St.
Folsom, Ca. 95630
916 985-8421

MRG Global, Inc.
11707 Fair Oaks Blvd, #203
Fair Oaks, CA 95628
916 860-8668

Program Contacts:

Phillip Deak, Eric Loft, and Steve Newton-Reed-- HCD/RAP

Project Status Summary

Ongoing: ***Year 3 of 3***

Title of Project:

Multiple Species Database Maintenance

Project Description

The project maintains databases on individual occurrences of spotted, great gray, elf, and barred owls, bald eagles, tricolored blackbirds, Point Arena mountain beavers, and California red tree voles. This maintenance effort provides information directly Biological Observation and Information System (BIOS), a system used to share spatial, qualitative, and quantitative information of biological observations with Department personnel and eventually with selected external partners. Department collaborators include biologists, planners, and environmental impact evaluators. Outside collaborators include other state, federal, and local agencies and the private sector (particularly private industrial timber companies), most of which are required by regulations and internal policies to use a large portion of the project's information on an ongoing basis.

For the last two years the Resource Assessment Program (RAP) has assisted in funding a temporary employee to gather, analyze, enter, and distribute the observation data compiled by the program. This temporary employee also has supervised other RAP-funded temporaries.

Objectives:

- To track the range, distribution, and abundance of these species.
- To be able to monitor the site occupation of a portion of the statewide population.
- To provide the information needed to evaluate specific project proposals and make the best evaluation to avoid or minimize impacts to these species at the local, site-specific level.
- To provide the information needed to carry out land management and planning at the land-ownership level.
- To provide biologists with location and site history information to facilitate research.
- To identify where and when interspecies competition is occurring and may become a problem.

Biogeographic Location

Individual species observations are mostly multi-regional. However, overall the project tracks animal occurrences statewide.

Accomplishments

- Updated databases for the four species of owls, bald eagle, tricolored blackbird, and are in the process for the California red tree vole.

- Have added an average of 6,800 spotted owl records per year to the Spotted Owl Database during this project. There are now over 83,000 observations records in this database.

- Have created BIOS data sets (seven feature classes or layers) and have made these data available on the BIOS web site for the four owl species.
- Are currently creating data sets for bald eagles and tricolored blackbirds.
- Have responded to about 100 direct requests for location and status information on spotted owls per year during the course of this project.
- Have responded to about 20 direct requests per year for location and status information on other species during the course of this project.
- Have produced annual updates of the spotted owl database for use by the California Department of Forestry and Fire Protection in providing required information needed by Registered Professional Foresters for preparing Timber Harvest Plans.

Findings/Observations/Issues

- BIOS website ArcIMS application displaying spotted, barred, great gray, and elf owl data collected by this project.
  http://moiis06.geo.dfg.ca.gov/Viewer-4.5/bios/app.htm

- Department personnel use the databases to:
  - Track species' distribution and status;
  - Comment on species and land management planning proposed or made by other agencies;
  - Comment on proposed species and land management regulations; and
  - Work with agency planners and land owners and managers to reduce or eliminate impacts on these species.
- Other agency participants and their role:
  - The California Department of Forestry and Fire Protection (CDF) regulates the timber harvest on non-federal lands in California. Board of Forestry regulations require that Registered Professional Foresters use the Spotted Owl Database in preparing timber harvest plans in the range of the northern spotted owl.
  - Both the California Department of Transportation and Department of Parks and Recreation use the database information for project analysis.
  - The US Fish and Wildlife Service (USFWS) uses database information as a regulator in checking consistency on all timber harvesting in the State for compliance with the Federal Endangered Species Act. In this aspect, they also provide owl data from timber harvest plans for inclusion into the Spotted Owl Database. They also use these databases to determine and track spotted owl population status and make species status determinations.
  - The US Forest Service (USFS) and Bureau of Land Management (BLM) use the database information to do land management and planning, often across large areas. They also supply observation records to the Department.
  - The Federal Emergency Management Agency and BLM use database information to assist in doing project evaluations.
  - National Park Service provides observation information to the databases and uses database information to determine the species' status on their lands.

  - The Department also has joint cooperative agreements with CDF, USFS, and USFWS on how spotted owl observation information will be managed, shared and distributed.
  - Some county planning departments use database information to assure that local planning follows State laws and regulations.
- Other outside participants and their role:
  - Timber companies, Registered Professional Foresters, forestry and wildlife consultants are required to use the Spotted Owl Database in preparing timber harvest plans in the range of the northern spotted owl. They also are beginning to use the databases for similar activities in the Sierra Nevada. These same groups are also major providers of observation information.
  - Consultants use the databases to get information for assessing potential project impacts.
  - Timber company, timber industry, university, and USFS researchers use the databases for species and habitat research, land management planning, and habitat conservation plan planning. They also provide observation data.
  - Environment groups use the database information for environmental planning.

Project Contacts and Collaborators

- CDFG project lead: Gordon Gould, Wildlife and Habitat Data Analysis Branch; Carie Sears, RAP- UCD Wildlife Health Center

Project Status Summary

Project: Handheld data application and Resource Assessment Database (RADB) development

Ongoing Year 2 of Several

Biogeographic Location; Statewide

Project Description:

At the onset of the Resource Assessment Program we were given the directive to begin work on alternative methods for collecting data in the field, specifically using handheld computers. The numerous benefits were considered: 1) Personnel savings from having to translate data from paper field forms into a database; 2) reducing data-entry error from re-entering data; 3) a greater assurance project data ends up into a manageable database; 4) less paper bulk for field crew to handle and carry into the field; 5) quicker, and more precise data entry; 6) and, a greater ability to standardize our data collection.

We began work in the fall of 2001 to develop a handheld data entry system and associated project level database that can effectively be used by a wide-range of the Departments field efforts. Since each project will have a different suite of information to collect, we realize modifications to the system will be needed to fit the specific effort. There will be many standard features benefiting virtually all projects, such as: consistent collection and management of spatial information (i.e., GPS data); the management of digital photography taken in the field, and system to link them with location and attribute information; an auto-generated key-ID that reliably links all related information together; standard pick-lists that include all plant and wildlife species encountered in California using either scientific or common names; and, the Level 1 required information to migrate data into the Biological Information and Observation System (BIOS).

Accomplishments:

Two years of using handhelds in the field has taught us many important lessons, and led us to the hardware and software with the functionality and reliability suited for our field research. We have also developed a reliable system to integrate and manage tabular data, spatial data, and digital photography from the field into the office (or field station), where the data is stored in an Access database and GIS layers. Much of the development and testing has occurred as part of the Sierra Nevada Meadow Project, where we have collected two years of field data using multiple professionally reviewed plant and animal survey protocols (see Project Summaries on project for list of protocols). The handheld database was also used in the Western Riverside vegetation collection led by Todd Keeler-Wolf, where we built handheld forms supporting the CNPS/DFG Rapid Assessment Vegetation protocol. In these projects the data was managed by the project lead or a member of the field crew given the added responsibility; the point being that data management can be done by someone with little GIS or database skills. We are calling the complete system, including the handheld data entry application and associated PC database, the Resource Assessment Database (RADB).

2004 Field Season and Beyond:

In preparation for the upcoming field season additional hardware and software has been purchased to support Resource Assessment Program projects. We will continue to use the handheld database on the Sierra Meadow Project. We have also committed to supporting the vegetation sampling in the Sierra Foothills, and other projects using the Rapid Vegetation assessment sampling methods. We are currently in discussion about other projects to support for the 2004 field season. There will be an ongoing effort to improve the system and broaden its use throughout the Department.

Project Contact: Chris Stermer, RAP **Collaborators:** Phillip Déak, RAP; Isaac Oshima, ITB.

Project Status Summary

Title of Project: ***Completed: June 2003***

Biogeographic Information and Observation System (BIOS) Feasibility Study

Project Description **Biogeographic Location: Statewide**

Project Goals

1. Document the data management needs of Department staff engaged in the scientific collection, analysis, and distribution of biological data (terrestrial, aquatic, habitat, and natural communities data).
2. Articulate our biological data management needs in terms of a business problem that is currently unmet with existing support systems and technical infrastructure.
3. Explore and evaluate alternative information technology solutions, develop a blueprint that addresses requirements, and outline an implementation plan.
4. Meet stringent state oversight directives administered by the Department of Information Technology (DOIT) and the Department of Finance - Technology Investment Review Unit (DOF-TIRU). *Note:* This project was initiated before the Department of Information Technology (DOIT) was abolished.
5. Provide a DOIT and DOF approved pathway for potential funding and support and the basis for a budget change proposal.

Project Objectives

1. Develop a comprehensive, Department-wide wildlife and habitat information/data use and management strategy.
2. Develop a plan to introduce standardization to the Department's wildlife and habitat data collection, data formatting, data storage and access methods and processes.
3. Increase the value of existing stand-alone wildlife and habitat databases and other information sources.
4. Implement a pilot solution using existing Department resources.

Outcomes

This project produced three major products:

1. Needs Assessment Report - Documents the current state (baseline) of data collection, storage, and use within DFG, identifies information management deficiencies, and discusses business and functional requirements needed to address the gap.
2. Conceptual System Design - Documents each of the general components of a proposed system pilot solution including hardware, software, tools, and processes.
3. Feasibility Study and Report (FSR) - Definition of business problems/issues, functional requirements and business objectives that must be met, exploration and analysis of alternatives, recommended system solution, costs, implementation plan, and risk assessment. The FSR was developed according to DOIT and DOF-TIRU guidelines and specifications.

Accomplishments

Feasibility Study Report (FSR) presented to Information Technology Branch and Information Technology Advisory Committee for Department approval. FSR approved pending updates to reflect the Department's current technical environment.

Findings/Observations/Issues

Refer to *Needs Assessment, Conceptual Design, and Feasibility Study Report* documents.

Project Contacts and Collaborators

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Project Status Summary

Title of Project **Completed:** **2002**

Level II Model Prototype for California Wildlife Habitat Relationships (CWHR)

Biogeographic Location Statewide

Project Description

The goal of the project was to develop a prototypical spatially-explicit wildlife model (Level II model) to improve the ability of CWHR to predict species presence and habitat suitability. The current Level I matrix model is not scale sensitive and uses structural habitat stage as the primary predictor, when all species do not respond equally to this model assumption. Vegetation and habitat GIS data is also becoming available at increasingly higher resolutions, so an additional goal of the project was to design a spatially-explicit model to take advantage of such data sets.

Accomplishments

The Level II Model relies on a more flexible way of storing and retrieving data than the current database matrix model allows. The US Forest Service Pacific Southwest Research Center (PSW) has been successful in designing the new data structure, preparing models for 35 species, most of which are in forested ecosystems (researching habitat attributes, critical distances and minimum habitat patch sizes, for example), and programming a prototypical software application. The project started as single-year contract beginning in FY 2000/01 and, with a time-only extension, was completed in 2002.

Findings/Observations/Issues

A PowerPoint presentation of the major accomplishments and issues to be addressed has been developed by WHDAB and will be used to help steer further development of the model. Some questions remain to be answered, and these can be placed in two broad categories. The first is how habitat data should best be used with the species models to predict suitability as this can be done several different ways. The second set of questions has to do with the user application – what the user interface should look like and how it can best be designed and programmed to complement other DFG applications. PSW has designed a user interface to show the program functions, but it is understood that it need not stay as it is, especially if DFG will be responsible for maintenance, training, and technical support.

Project Contacts and Collaborators

DFG Contact:

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