

## 2001 WMRS ANNUAL REPORT

The 2001 annual report for the White Mountain Research Station (WMRS) MRU covers fiscal year 2000/2001. However as in previous reports, data related to station use is reported for the 2001 calendar year, which correlates more closely with the main research season from June through September at the station. The report is organized according to the January 8, 1998 General Campus ORU Policies and Procedures. According to the 1982 UC Policy on ORU and MRU reports, this is submitted by the Chair of the Advisory Committee to (1) the President, *via* the Provost and Senior Vice-President for Academic Affairs, and (2) the Vice Chancellor for Research with copies to the Chancellor on the Director's home campus.

### 1. SUMMARY OF MAJOR ACTIVITIES IN

**a. Research and educational "use"** of a field station is one of the most valuable measures of its success. WMRS tracks the total number of users, the total number of "user nights" (requiring room and or board) and "user days" (*e.g.* classroom use for teaching or a conference), and the institutions and disciplines represented by the users for the *calendar year*. The calendar year corresponds more closely to the research season, which peaks between April and October and straddles the fiscal year. The notable features of these data for last year are:

<b>Summary of Usage for Calendar Year</b>	<b>2000</b>	<b>2001</b>
<b>Number of user nights, all sites</b>	<b>7,544</b>	<b>9,560</b>
<b>Number of individual users</b>	<b>4,007</b>	<b>3,497</b>
<b>Number of institutions represented</b>	<b>87</b>	<b>91</b>
<b>Research user nights</b>	<b>2,824 (37%)</b>	<b>4,811 (50%)</b>
<b>Education user nights</b>	<b>3,421 (45%)</b>	<b>3,265 (34%)</b>
<b>Other user nights</b>	<b>1,299 (17%)</b>	<b>1,484 (16%)</b>
<b>UC User Nights</b>	<b>4,238 (56%)</b>	<b>5,199 (54%)</b>
<b>Non UC User Nights</b>	<b>3,306 (44%)</b>	<b>4,361 (46%)</b>
<b>Owens Valley Laboratory user nights</b>	<b>5,584 (74%)</b>	<b>6,262 (66%)</b>
<b>Crooked Creek user nights</b>	<b>1,327 (18%)</b>	<b>1,894 (20%)</b>
<b>Barcroft user nights</b>	<b>633 (8%)</b>	<b>1,404 (15%)</b>
<b>Campus most represented:</b>	<b>UCD (1,337)</b>	<b>WMRS (1,610)</b>
<b>Discipline most represented:</b>	<b>Bio. (3,205)</b>	<b>Earth (3,982)</b>

### **Notes about usage in 2001:**

- Increased absolute number of user nights (26% above 2000) and the highest number ever served.
- Increased lengths of stay as evidenced by the increased user nights with a 13% decrease in the number of individual users compared to 2000.
- Increased absolute numbers of both UC and non-UC users; a similar number of institution, compared to 2000.
- Increased absolute number of research users compared to 2000.
- Increased user nights at all three facilities compared to 2000 but it was distributed more evenly, so OVL did not carry the entire burden with increased use.
- WMRS sponsored programs represent the largest fraction of users in 2001 and earth sciences was the most represented scientific discipline.

**b. WMRS Research Programs.** WMRS scientists submitted 13 proposals in 2001 and 8 or 62% awarded and received external funding. Proposals currently being funded through the period of 1/1/2001-12/31/2002:

1. **Comparative Demography of Selected Mountain Sheep Populations in High Mountains and the Mojave Desert of California** (California Department of Fish and Game (\$583,041 1/00-12/02), J.Wehausen, PI and R. Ramey, Co-PI). Wehausen is in the third decade of research on comparative demography of mountain sheep populations in the Sierra Nevada, White Mountains, and eastern Mojave Desert of California. This work focuses on demography at three levels: (1) actual patterns of dynamics of population sizes; (2) the relative importance of variation in adult survivorship vs. recruitment in these dynamics; and (3) the factors underlying variation in adult survivorship and recruitment, including predation, diseases, weather, age structure, pregnancy rates, and population density. This research uses molecular genetics and fieldwork to test basic theoretical models of ungulate population dynamics that serve as the foundation for wildlife conservation approaches.
2. **Context-Dependent Constraints of Sagebrush-Herb Dynamics** (NSF grant, \$145,370 4/99-12/01, Eric Berlow, PI). Like many other areas of the western United States, large montane meadows in the eastern Sierra Nevada of California have changed dramatically in their vegetative cover since the introduction of livestock grazing earlier this century. The most obvious changes include large-scale expansion of sagebrush, reduction in cover of herbaceous species, and an apparent aridification of these habitats. Currently there is great interest in restoring these meadows to a condition where herbaceous species are dominant, yet little is known about the processes governing the interaction of sagebrush and herbaceous species in these sites, or about the role of temporal and spatial heterogeneity in influencing species interactions and vegetation change. The large montane meadows of the Golden Trout Wilderness in the southern Sierra Nevada are an ideal system to explore what regulates context-dependency in the dynamics of sagebrush-herb interactions. Using a combination of experimental and observational studies, this research addresses the following questions: (1) Within the mesic terraces, where patches of shrubs and herbs vary across constant water table depth, what factors control vegetation patterns and dynamics? (2) If restoration efforts

increase water availability in xeric terraces, will other processes characteristic of mesic terraces inhibit the recovery of herbaceous species? (3) How do the patterns of meadow terracing vary within and among meadows and over time? This project addresses the more general problem of tailoring general ecological theory to site-specific management issues.

3. **Sierra Nevada Willow Flycatcher Demography Study** (USFS contract, \$49,768, 6/1/01-1/31/02, Mike Morrison, PI). Since 1997, Morrison has held a Memorandum of Understanding (MOU) with the California Department of Fish and Game as required under the California Endangered Species Act (C.E.S.A) to allow the monitoring and banding of willow flycatchers and their nests in the central Sierra Nevada. The principal employees for this demography study have banded 283 willow flycatchers since 1997. Determining juvenile recruitment and adult survival is integral to any demographic research. We search for banded willow flycatchers at 15 monitoring sites and search adjacent sites for banded willow flycatchers that may have dispersed. Results of this study will be used to develop management plans for enhancing the population of this species in the Sierra Nevada.
4. **NAS, Lemoore -Fresno Kangaroo Rat Study Plan** (US, Navy, \$40,000 6/1/01-5/31/02, Mike Morrison, PI) The goal of this study is to assist the US Navy in developing a plan that will ensure the long-term survival of this endangered species on Naval Air Station, Lemoore. Work includes: monitoring kangaroo rat burrow locations with GPS/GIS technology; assessing vegetation requirements and use; monitoring soil conditions; and determining population abundance. These data are being used to develop restoration plans to expand the use of the area by the animals, thus increasing survivorship possibilities.
5. **The Forest Health Monitoring/Forest Inventory and Analysis Programs** (USFS Coop Agreement, \$105,864, 11/1/2000-10/31/2001, S.M. Szewczak, PI). FHM/FIA is an interagency-university research team charged with assessing the condition and trends of the nation's forest resources. The program is comprehensive in scale, using a nationwide, intensive assessment grid including thousands of plots and covering every forested ecosystem in the country. FHM/FIA currently works in 32 states (including California) and is slated by Congress for expansion into all remaining states over the next three years. The program includes such indicators as lichen communities, foliar damage, ozone, soils, and crown mensuration/transparency, and involves a collaboration of approximately 20 research institutions and several agencies. FIA's current annual budget for these indicators is approximately \$2 million, with matching funds from other agencies and universities for several million in addition. Epiphytic lichen communities have been chosen as a core indicator of the program because they directly address such key assessment questions as air quality trends, effects of air quality on biodiversity, long-term climate change, and sustainability of forest resources. Lichen communities provide not only a measure of air pollution impacts upon lichens, but also on aspects of forest health that are difficult to measure directly (*e.g.* forage for numerous mammals, habitat for arthropods, and nitrogen fixation). For updates see (see <http://www.wmrs.edu/lichen>). 2001 will be the last year ESICE and WMRS will sponsor the western regional FHM project. USFS has reorganized the project and the funding will be dispersed directly to regional USFS research stations.
6. **Cooperative Agreement Data Collection for Ecological Assessment of Wilderness Plan** (USGS, \$23,810, 6/1/00-5/30/01, E. Berlow, PI; S.M. Szewczak, Co-PI). The U.S. Forest Service (USFS) is in the process of developing a new management plan for areas designated as Wilderness in the Inyo National Forest (INF). To date there have been few restrictions on

recreational use within the Wilderness other than trailhead quotas, domestic pet restraint or prohibition, pack animal access and restraint, campfire prohibition, local confinement to trails, and regulation of campsite proximity to water bodies. The current management plan proposes different zoning alternatives with the goal to balance the recreational and aesthetic needs of human visitors with the need to protect the forest's floral and fauna. In 2001 we completed phase I of this project and developed a Web-based interactive map of the proposed Inyo National Forest wilderness zones based on ArcIM software. Next, US Forest Service experts were asked to complete surveys and were interviewed in person to identify the ecological variables of concern to land managers and also to determine which of these variables could be subsequently used to model recreational impacts on wilderness. From this information, we concluded that the condition of high alpine meadows takes high priority with the management agencies. What remains unknown is which variables, specifically, are most important for assessing meadow condition, nor are the primary sources of uncertainty in the current process of meadow condition assessment known. Based on these preliminary results, we received \$100,000 (Susan May Szewczak, PI) for 2002 to synthesize and model recreational impacts to montane meadows. This project integrates ecological, social, and economic concerns and uses adaptive management in the in response to temporal changes in environmental and social conditions. Since this approach is flexible, it can also be easily tailored to management of other systems.

7. **Modeling, Developing, and Assessing Scientific Inquiry Skills Using a Computer-Based Inquiry Support Environment.** (NSF-ROLE subcontract, \$30,000 1/1/01-12/31/03, S.M. Szewczak, PI). This grant was developed in collaboration with the UC, Berkeley research team of Barbara White and Jon Frederiksen. In this project WMRS will be responsible for a) development of a biological conceptual framework for the Thinkertools SCI-WISE inquiry system, b) establishment and maintenance of school involvement at the Bishop, Ca Home Street Middle School, and c) organization of training workshops for local teachers. The results of this proposal should create a version of SCI-WISE that will contain cognitive models of inquiry practices. The research team will also create curricula in which students use the SCI-WISE system to guide them as they engage in scientific investigations across a number of domains in the physical, biological, and social sciences. This will include curricular activities in which students collaborate to assess, modify, and try to improve the advisory system. Our hypothesis is that these instructional tools and methods will enable students to be more effective in capturing, communicating, and refining their inquiry learning practices. Also, we hypothesize that working with and refining the advisors should enable students to better understand the nature, purpose, and utility of inquiry. Thus, bringing the development of inquiry skills into the "open" through conversations and the creation of artifacts will have the added benefit of providing us with information needed to refine our cognitive models of inquiry practices, as well as improving our understanding of how they can be developed and learned.
8. **White Mountain Research Station Documentary** (Informal Science Education supplement to NSF Field Stations and Marine Laboratory Improvements award for Major Laboratory and Telecommunications Improvements for WMRS, \$38,173, 11/1/01-10/30/02, Frank Powell, PI and Rich Wargo, Co-PI). "Living the High Life" is the working title for a one hour television program which will introduce viewers to the wide range of research activities enabled by a modern high-altitude field research station. Specifically, it will explore the value of modern wireless telecommunication systems, modern molecular biological

laboratory facilities, and interdisciplinary research at field stations for understanding the environment, and how living systems respond and adapt to environmental change. The program, which can be described as an informational documentary, will follow research from a selection of projects being conducted at WMRS. This video will be produced by UCSD-TV, a broadcast television station operated by the University of California, and distributed nationally via the university's educational and public service satellite distribution service. The program will give the audience insight into the scientific process and the relevance of research for understanding biocomplexity (including human health) and the environment.

9. **“A Facility for Cosmological Research at the White Mountain Research Station”** (UC Multicampus Science and Technology Research Fund, jointly awarded to WMRS and INPAC, \$50,000, 7/1/01-6/30/02, Philip Lubin, PI). Facilities at the Barcroft site of WMRS are being renovated to develop a center for astrophysics and cosmology research. Due to its unique location WMRS has the potential to be one of the premier millimeter and sub millimeter wavelength observation sites in the world. We are proposing to utilize some of the high altitude facilities to focus on astrophysics and cosmological measurements. In the near term we will concentrate on developing the facility for use in studying the early universe thru observations of the Cosmic Microwave Background Radiation (CMB) and in the long term on a broad range of millimeter and sub millimeter wavelength astrophysics as well as possible optical and infrared astronomical transient studies. This phased approach will give us time to develop the physical infrastructure needed to develop this site for astrophysical studies as well as take maximum advantage of the existing telescope and instrumentation we already have available for the immediate deployment. By leveraging off existing instruments we are able to field several large telescopes in a matter of months to begin the studies and gain experience with the site which will allow us to work towards longer range development plans.
10. **“Program to Study Adaptation to Hypoxia Using Animal Models at WMRS.** (UC Multicampus Research Incentive Fund, MRIF, \$19,891 July 2000-June 2002, Frank Powell, PI). This program was put on hold and a carry forward was requested while the PI completed the 15-Year Review of WMRS. The program was a follow-up to an NSF sponsored symposium organized by WMRS in 1999 on “Phenotypic and Genotypic Strategies to Chronic Hypoxia” and seeks to integrate different research programs funded by both NSF and NIH to study physiological and genetic mechanisms of adaptation to hypoxia as a model of a stressor and environmental change. A workshop is scheduled for April 29, 2002 to: (1) Define important scientific questions that fit the current research interests of the group of investigators, which can be addressed with animal models using the physical and administrative infrastructure that WMRS offers. (2) Identify funding sources for this research program and plan a strategy for obtaining such funds, i.e. finalize the strategy for seeking external funds and coordinating efforts to collect the necessary pilot data using the investigators’ current funding. Invited participants include Phil Bickler (UCSF), Mark Chappell (UCR), Ted Garland (UCR), Kim Hammond (UCR), Jim Hicks (UCI), Randy Johnson (UCSD), Frank Powell (UCSD & WMRS), Joe Szewczak (WMRS) and Clarke Tankersley (Johns Hopkins). Ray Huey (Univ. Washington) and Albert Bennett (UCI) are acting as consultants and participants from the biotech industry are being sought also.

### c. WMRS Educational Programs:

1. **Integrated Methods in Ecology (IME).** WMRS is designing a new undergraduate program to fulfill the original objectives of the Supercourse in Environmental Biology at WMRS without some of the costs. Specifically, the program is designed to (1) fulfill an important educational need for UC undergraduates and (2) to enhance the academic environment at the Station. The new program will also train non-UC students, allowing it to become financially sustainable through access to external funding sources. The curriculum is redesigned to increase the usefulness for students and increase application numbers and enrollment also. The educational objectives of IME are to train students in ecological and physical processes using modern technology and proven field methods across different scales. Like the Supercourse, students will be in residence at WMRS in Bishop for the entire 10-week spring quarter and earn 16 quarter units. They will take courses on (1) Remote Sensing, (2) Landscape Analysis, and (3) Scientific Inquiry in Ecosystem Analysis, with flexible block scheduling, plus a 199 independent study project (4 units each). Mike Morrison, WMRS Station Manager, will be the on-site course coordinator, Susan Szewczak is the WMRS Academic Coordinator for the program and the courses will be organized by regular UC faculty and faculty from the Desert Research Institute (DRI), University of Nevada-Reno. DRI faculty will participate in teaching, in addition to regular UC faculty and local agency scientists, as in past Supercourses.
2. **UC Summer Symposium in Conservation Biology** for graduate students was held for the third time August 12 to 16, 2001 at the Crooked Creek facilities. In 2001, the focus of the symposium expanded to include a larger world-wide focus to conservation. Over 50 people participated in the symposium, including UC faculty, graduate students from all eight non-medical UC campuses, University of Nevada, Desert Research Institute, government (USDA, CDF&G, NASA Ames) and non-profit agencies (The World Parrot Trust, Sierra Nevada Bighorn Foundation, California Native Plant Society. This symposium completed the funding cycle for the program (**Graduate Course Modules and Research Proposal Workshops at the WMRS Eastern Sierra Institute**; UCOP, \$29,598 per year, 1998-2001, F.L. Powell and C.O. Qualset, Genetics Resource Conservation Program, co-PI's). The activity will be evaluated by the Conservation Biology Workgroup to decide if it should be offered again.
3. **Fluvial Geomorphology: Principles and Applications** was an advanced short course offered by M. Kondolf (UCB) for the second time on 9/30/2001- 10/05/01, 2001 at WMRS. In 2001, the workshop was organized around classroom discussion, current research techniques using data from local monitoring stations, and hands-on field experiences for riverine restoration. The program remains very successful, with 8 more applications than slots in the course, and it will be offered again in October 2002.
4. **Using SonoBat for Non-invasive Bat Monitoring.** In its first year, there were 14 participants for this three day workshop offered by J. Szewczak (WMRS). The workshop combined introductions to sound theory and bioacoustics, how bats use sound to navigate, and how we can interpret that sound to identify species. Participants were also introduced to the management needs for bats and the hardware/software available for non-invasive monitoring. This course will be offered again in June of 2002.
5. **WMRS Undergraduate Internship Program.** The total budget for the 2001 Internship program was \$71,438 with funding provided by the Berger Foundation (\$42,300), BLM

(\$3,600), EPA (\$2,788), Inyo County Water Department (\$8,200), USGS (\$5,950), WMRS-animal care (\$1,400), and USFS (\$7,200). In addition to the article published in the *Journal of Conservation Biology*, another front-page article was published in the local *Inyo Register* paper and received very favorable review in the community. There were 19 undergraduates in the 2001 program. For a second year, we expanded the existing technology in the IRT program with generous funding from the Berger Foundation. This included the interface between satellite orientation with Global Positioning Systems (GPS) and computer-aided mapping with Geographical Information Systems (GIS) and web publishing using Photoshop to manipulate images, and Front Page to build the web sites. As a result, the students each developed web pages that incorporated this new technology in addition to the standard published reports. This process was extremely successful and results in some great web pages. Detailed descriptions of all projects can be seen at <http://www.wmrs.edu/interns-2001/>. With the Berger Funding, ESICE has also purchased a Toyota 4 Runner and a Ford Ranger truck and donated it to WMRS. Plans for next year incorporate full funding, including funding for technology training, for the Internship, and NSF funded Research Experiences for Undergraduate Program that will support 8 new research assistants in the biological fields. Proposals have also been submitted for other advanced interns in collaboration with UC Davis Cooperative Extension, USPS Death Valley, USFS, BLM, CDFG, and USGS.

#### **d. WMRS Outreach Programs**

1. **2001 WMRS Public Lecture Series.** The WMRS Lecture Series for 2001 was a quarter-long series of public lectures at the Owens Valley Facility that was started in 1982. Since that time, the annual series has attracted thousands of attendees, who come to hear about the scientific work by researchers in the region. In addition to an evening lecture, the speakers generally stay at the Station to interact with WMRS students, faculty, and local agency scientists. The "Friends of WMRS" organization hosted many of the talks. They also invited some local citizens to dinner with speakers at the station before the lectures. In 2002 the series is changing to a once-per-month format throughout the year.
  - February 15: The Role of Extreme Climatic Events in Shaping Human Affairs. Henry Diaz, National Oceanic and Atmospheric Administration, Boulder, CO
  - March 1: The Prehistoric Archaeology of the Owens Valley: Investigating the Past. Kirk Halford, Bureau of Land Management, Bishop, CA
  - March 15: Can climate affect volcanoes? Did the bottom drop off the Sierra Nevada batholith? Lessons from late Cenozoic volcanism in eastern California. Allen Glazner, University of North Carolina
  - March 29: Botany on the Edge: Lifestyles of the Curly Leaved Rabbitbrush, Arguably North America's Highest Growing Shrub. Catherine Kleier, University of California at Los Angeles
  - April 12: Biocontrol of Salt Cedar in the Owens Valley. Tom Dudley, University of California at Berkeley
  - April 26: What happens when we learn our "good" data isn't so "good"? How new satellite data is changing urban and environmental planning at Lake Tahoe. Mary Cablk, Desert Research Institute, University of Nevada at Reno

- May 10: The Wonderful World Of Woodsmoke. John Sagebiel, Desert Research Institute, University of Nevada at Reno
  - May 24: The effects of differing substrates on nutrient and water traits in the Coyote Ridge alpine plant community. Elizabeth Wenk, University of California at Berkeley
  - May 31: Bedrock Geology, Vegetation, and Remote Sensing in the Central White-Inyo Range. Gary Ernst, Stanford University
  - June 7: Rocks from Space: The Story of Meteors and Meteorites. Ron Oriti, Former Director, Santa Rosa Community College Planetarium
  - June 21: Geology of Sedimentary Rocks in the Eastern Sierra Nevada. Cal Stevens, California State University at San Jose
  - June 28: Exploring the Highest Sierra. James Moore, Emeritus Scientist, United States Geological Survey
  - October 24. An Advance in The Timing of Spring in Western North America. Daniel R. Cayan, Climate Research Division, UC San Diego.
  - October 19: The Past 2000 Years of Volcanism and Climate Change in the Eastern Sierra. Scott Stine, California State University, Hayward.
2. **The Eastern Sierra Education Forum.** The Education Forum, through the WMRS Academic Coordinator, Susan May Szewczak, provides a link between the academic and research community of WMRS and the local K-12 educational community. The original mission statement adopted in 1994 states that "The Education Forum, facilitated by University of California, White Mountain Research Station, brings together teachers, post-secondary faculty, administrators, parents, governmental agency personnel and other interested individual in an effort to pool and share resources, facilities and expertise. By fostering communication and support, the Education Forum seeks to build consortiums which empower all potential participants, in order to develop creative and cost-effective ways to meet the wide variety of needs of the students in the rural communities of the Eastern Sierra." In 2001, the Education Forum supported the development of grant to the California Post Secondary Education Program- Eisenhower Foundation Rural Systemic Change Initiative. This program will support teacher professional development and outdoor science education by building the capacity of existing local educational organizations to meet the needs of the teachers, students, and community members. Participating organizations in the Education Forum are Bishop Elementary, Bishop High School, Big Pine, Independence, and Round Valley School Districts, Inyo County Office of Education, UC WMRS, Cal Tech Owens Valley Radio Observatory, Cerro Coso Community College, Bishop Paiute Tribe, Inyo-Mono Senior Association, Inyo County Library, Inyo County Head Start Program, US Forest Service, Bureau and Land Management, California Department of Fish and Game, Friends of White Mountain Research Station.
  3. **Friends of White Mountain Research Station.** The Friends of White Mountain is officially recognized as a Campus Support Group at UCSD. The purposes of this organization are (1) to help the station enhance its community outreach activities and (2) provide support to WMRS rural community education needs programs. The mission includes hosting an annual open house, lecture series, adult-education workshops, teacher training, K-12 activities, and

other interpretive activities for general public. Significant activities in 2001 included hosting over 400 visitors at the annual WMRS Open House over Labor Day weekend. The open house involved organizing presentations by WMRS scientists and other users, assisting with logistics, answering guest questions, and providing general staffing for the event. Friends also hosted the annual lecture series, which involved identifying potential speakers, assisting with meeting room facilities and refreshments, and related activities. Friends also assisted with maintaining the WMRS library and updating the research bibliography.

**e. WMRS Laboratory Activity:**

1. **Laboratory Modernization.** During 2001 OVL embarked on a major upgrade of laboratory facilities supported by a grant from the NSF Field Station and Marine Lab program. Two laboratory trailers were purchased and renovations were started in late 2001 to develop a second Molecular Biology laboratory, to segregate some more sensitive long-term projects from the general laboratory work done in the front part of the Manis Laboratory by classes and short-term researchers. Completion is scheduled for May 2002. Equipment upgrades include a water purification system, digital image capture system, new microwave for gel preparation and a class 100 clean hood. PCR equipment was purchased with Dr. John Wehausen's contract with California Department of Fish and Game to study the genetics of the Sierra Bighorn Sheep and his project has also secured the donation of two DNA sequencers from biotech industries in San Diego. New equipment has been critical for research by Profs. Elizabeth Dalhoff (Santa Clara College) and Nathan Rank (CSU Sonoma). Their current studies build on data collected on predator-prey interactions between willow beetles and host plants with chemical defenses by Dr. John Smiley (UCSC) at WMRS in the 1980s. The data are showing molecular mechanisms of evolution to drought in the late 1980s and subsequent recovery that isolated different populations of the willow beetles in the eastern Sierra Nevada's.
2. **Animal Facilities.** The OVL animal facility was remodeled so there is independent access to separate animal rooms allowing complete separation of species. Equipment previously in the animal rooms was moved into the laboratory facilities described above. New guinea pig cages were obtained from UCSD and animal husbandry support was improved to meet the USDA requirements for keeping guinea pigs and wild mice at WMRS. The same improvements were made for guinea pigs at the Barcroft animal facilities. Finally, the garage and chicken house at Barcroft was remodeled to accommodate dogs for biomedical research on acclimatization to altitude. This included installing dog runs (obtained from UCSD), constructing an outdoor dog run for daily exercise and "enrichment" and installing a new lighting and HVAC system to maintain living conditions within the USDA specified standards. Storage for sheep food used at Barcroft is being improved at the OVL site to meet USDA and UCSD standards by 2002. Other procedural improvements for animal care and use at WMRS are described in the minutes of the regular meetings of the WMRS Institutional Animal Care and Use Committee (IACUC), which is still chaired by Dr. John Wehausen, and now receiving administrative support from the new Station Manager Michael Morrison. The IACUC reports to Director Powell as the "Institutional Official" for WMRS, who in turn reports to the Vice Chancellor for Research Richard Attiyeh at UCSD.

3. **Geographical Information System/ Computer Labs.** Use of the computer/GIS lab increased again in 2001. Activities in 2001 included
  - Partnership with the UC Davis Information Center for the Environment as a sub-regional node of the California Information Node (CAIN) Project and is a demonstration site for Distributed Node geometry and communications.
  - Continued updating of query capabilities to the databases for publications and weather on the WMRS website. Installation of ArcIMS interactive web-based GIS that gives many GIS capabilities to web-clients through their web-browsers. We implemented a prototype project for the Inyo National Forest using maps of its proposed wilderness management plan. Also, developed SW Great Basin website (in collaboration with Connie Millar) and supported development of Forest Health Monitoring website (Peter and Linda Neitlich)
  - Working with UC Davis summer geology class to set up its own local area network and provide Internet access through WMRS' frame relay connection. This effectively doubled the WMRS computing facility and allowed the large group of Davis students to have computer and internet access during the peak summer usage period without impacting other users
  - Acquisition of high-resolution digital orthophoto quads for most of the Eastern Sierra. These images will be of interest to virtually every researcher doing fieldwork in the Whites and Inyo Mountains, Owens Valley, and central Sierra Nevada. This facilitated a Forest Service sponsored project (J. Szewczak, PI) to map potential bat roosts throughout the Eastern Sierra.
  - Researcher Support and data assistance for researchers, faculty and students (including WMRS Interns) from Great Basin Unified Air Pollution Control District, SNARL, Inyo County Water Department, BLM, Inyo National Forest, Mono County Collaborative Planning Team, USGS, National Park Service, CSU Sonoma, UC Berkeley, UC Davis, UC Santa Barbara, Evergreen State, University of North Carolina, Rancho Santa Anna, Brown University, DRI, Arizona Department of Environmental Quality. A project with the Inyo National Forest Service associated vegetation types with proximity to bat roosts.
4. **Deepest Valley Native Plant Propagation Center.** Deepest Valley Native Plant Propagation Center. On-going research included the Eastern Sierra Native Seed Zone Project (S. Szewczak, PI) to determine the amount of ecotypic variation in native perennial bunch grass species and facilitate the development of seed collection zones for on-going and future revegetation projects. Fish Slough milk-vetch (*Astragalus lentiginosus* var. *piscinensis*) a federally threatened species, is being propagated as part of cooperative study between the U.S. Fish and Wildlife Service, the University of Montana, Missoula, MT (P.I.'s. Kevin Murray and Anna Sala), the BLM, Bishop Field Office, California Native Plant Society and WMRS. The study focuses on the ecophysiological effects of flooding on plant survivorship specifically, how soil inundation affects the establishment of mycorrhizal and Rhizobium symbionts on plant physiological performance and is scheduled to finish in 2002. Finally, from 1999 to 2001 the Deepest Valley Cooperative Native Plant Propagation Center has been used to propagate over 50 different species of eastern Sierra native plants grown that have not been grown in a horticultural setting before. Information on germination treatments and cultivation are being recorded in a database to track successes and failures as well as to add

to the broader understanding of Mojave, Sierran and Great Basin native plant propagation. The Bristlecone Chapter of the California Native Plant Society grew approximately 1200 of these plants for their successful native plant sale and Inyo National Forest grew plants for revegetation projects.

## 2. ADVISORY COMMITTEE

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- Robert S. Anderson, Department of Earth Sciences, UC Santa Cruz
- Phillip E. Bickler, Department of Anesthesiology, UC San Francisco, **Committee Chair**
- Diane Campbell, Department of Ecology and Evolutionary Biology, UC Irvine
- Mary Droser, Department of Earth Sciences, UC Riverside
- Gary Ernst, Member-at-large, Department Geological & Environmental. Science, Stanford University
- Joshua Kohn, Department of Biology, UC San Diego
- Mathias Kondolf, Department of Environmental Planning, UC Berkeley
- James McClain, Department of Geology, UC Davis
- Kenneth A. Nagy, Department of Organismic Biology, Ecology and Evolution, UC Los Angeles
- Edwin P. (Phil) Pister, Member-at-large, Calif. Dept. of Fish and Game, Emeritus
- John Smiley, Landells Hill Big Creek Reserve, UC Natural Reserve System
- Steven J. Wickler, Member at large, Department of Animal and Veterinary Science, Cal Poly Pomona.
- *ex officio* Cathy Magowan, Science and Technology Research Coordinator, UCOP
- *ex officio* Carol McClain, Director, Multicampus Research Planning & Programs, UCOP
- *ex officio* Frank L. Powell, Director, WMRS

The vacancy left by the resignation of Professor Reichman (UCSB) needs to be filled by another representative from that campus.

### **3. ACTIVE WMRS FACULTY MEMBERS**

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**a. U.C. Faculty.** In 2000/2001, four faculty from three UC campuses received WMRS support:

1. Mark Thiemens, Professor of Chemistry, UCSD - WMRS Research Scientist.
2. Philip Lubin, Professor of Physics, UCSB - WMRS Research Scientist.
3. Philip W. Rundel and Arthur C. Gibson - Professors of Biology, UCLA, - WMRS Research Scientist.
4. Frank L. Powell, Professor of Medicine, UCSD - WMRS Director.

**b. U.C. Professional Researchers:**

In 2001, seven professional researchers conducted research programs at WMRS:

1. Eric L. Berlow, Ph.D. – WMRS Assistant Research Scientist
2. Michael Morrison, Ph.D. - WMRS Academic Administrator
3. Joseph M. Szewczak, Ph.D. - WMRS Assistant Research Scientist
4. Susan M. Szewczak, Ph.D. - WMRS Academic Coordinator
5. Rob R. Ramey, Ph.D. – WMRS Assistant Project Scientist
6. John D. Wehausen, Ph.D. - WMRS Associate Research Scientist

In addition, appointment papers for two more WMRS researchers were begun pending external funding for their salaries:

1. Jeff Holmquist, Ph.D. Associate Research Scientist, pending 1/1/02
2. Shawn Smallwood, Ph.D. Assistant Project Scientist, pending 7/1/02

**c. Visiting Researchers:**

1. Angela Jayko, Ph.D. (USGS) maintains her field office at WMRS.

### **4. GRADUATE STUDENTS AND POSTDOCTORAL RESEARCHERS**

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**a. Postdoctoral trainees.** Nancy Aguilar, Ph.D. received a 1-year extension (through January 2003, for 3 years total support) on her NSF Postdoctoral Research Fellowship with Professor James Hicks (UCI) and Frank Powell (UCSD) as co-mentors. Her primary appointment is in WMRS to study the effects of hypoxia on gene expression in fishes adapted to different patterns of environmental hypoxia. She is working on physiological studies at UCI and molecular regulatory studies at WMRS.

**b. WMRS graduate student Minigrants.** In 2001, twenty awards were made following review of the proposals (and renewals) by the WMRS Advisory Committee. We awarded \$25,097, with \$8,577 for travel reimbursement and \$16,520 for credit towards room and board, computer and GIS fees at the station. \$17,386 was used for graduate student support as one student dropped a project and the other was delayed in starting and requested a carry-forward to 2002.

The awards in 2001 include:

1. Karrin Alstad, Northern Arizona University, \$630, "Current and historic water use by riparian woody trees relative to altered stream flow regime in Bishop Creek", Dr. Stephen C. Hart-Advisor.
2. Charles R. Ardoin, Central Wash, \$550, "Quaternary slip rates along the Panamint Valley fault zone, California", Dr. Jeffrey Lee.
3. Steve Bacon, Humboldt State University, \$570, "Paleoseismic Investigations on the Owens Valley Fault Zone and Latest Quaternary Stratigraphy in Owens Valley near Lone Pine, eastern California", Dr. Bud Burke.
4. Cheryl Beatty, The University of British Columbia, \$1,415, "The Lactate Paradox-the relationship between exercise metabolite concentrations, aerobic capacity and hormonal regulators of oxygen delivery following acclimatization to high altitude", Dr. Peter Hochachka.
5. David Benner, University of California Davis, \$1,500, "A study of incremental strain geometry based on Quaternary faulting and seismic focal mechanism inversions for the Coso Range, Inyo County, California", Dr. Robert J. Twiss.
6. Shannon Fearnley, Sonoma State University, \$1,000, "Adaptation at phosphoglucose isomerase (PGI) in Montane Leaf Beetle", Dr. Nathan Rank.
7. Ian Gillespie, University of Riverside, \$1,475, "Effects of increased summer precipitation on seedling recruitment in Pinyon-Juniper Woodland", Dr. Edith Allen.
8. Walter Gray, University of North Carolina, \$900, "Chemical and thermal evolution of the Half Dome Granodiorite, Central Sierra Nevada, California", Dr. Allen F. Glazner.
9. Michael Honer, Rancho Santa Ana Botanic Garden, \$1,250, "A Flora of the Glass Mountain Region, Mono County, CA", Dr. J. Mark Porter.
10. Gerald Liberatore, Kimberly Saita, California State Polytechnic University Pomona, \$1922, "Altitude Acclimatization in Horses and Mules", Steven J. Wickler, Ph.D., DVM.
11. Karen Michelsen, Virginia Tech, \$2000, "Emplacement and Internal Structure of the Mount Barcroft Pluton, White Mountains, California", Dr. Richard Law.
12. Gary Nearing, Sonoma State University, \$1,000, "Thermal tolerance of a montane leaf beetle", Dr. Nathan Rank.
13. Randall Perry, University of Washington, \$1,250, "Biology of Desert Varnish", Dr. Peter D. Ward.
14. Jeffrey Schroeder, Central Washington University, \$1,100, "Quaternary Fault Slip History of the White Mountains Fault Zone, California", Dr. Jeff Lee.
15. Abby Sirulnik, University of California Riverside, \$410, "Mycorrhizal Diversity along an Elevation Gradient in the White-Inyo Range", Dr. Edith B. Allen.
16. Heather Swartz, UC Berkeley, \$1,500, "The role of water table and stream dynamics in sagebrush expansion in alpine meadows of the Kern Plateau, Sierra Nevada, CA", Dr. Carla D'Antonio.

17. Tatia Taylor, Miami University, \$2,000, "A Kinematic Study of the Owens Valley Fault Zone Near Big Pine, California, and Tectonic Implications for the Eastern California Shear Zone", Dr. Yildirim Dilek.
18. Christopher Van de Ven, Standford University, \$1,125, "The White-Inyo Mountains, Eastern California: Influence of Bedrock and Topography on Botanical Cover", Dr. W.G. Ernst.
19. Elizabeth Wenk, University of California Berkeley, \$1,500, "The effect of diverse substrates on alpine plant species' physiological ecology in the Sierra Nevada and White Mountains, California", Dr. Todd Dawson.
20. Ji Yong Yang, University of California Santa Barbara, \$2,000, "Assessing Patterns of Hybridization in Aquilegia Hybrid Zones Using Paternity Analysis", Dr. Scott Hodges.

## **5. STUDENT AND FACULTY PARTICIPATION FROM OTHER CAMPUSES OR UNIVERSITIES**

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In 2001, WMRS hosted 9,560 "user nights" at all sites, including 5,199 from the University of California and 4,361 from other institutions. 91 different institutions used WMRS in 2001. The relative usage by UC researchers and classes has stabilized at just over 50% of the total number of users. Growth in total user nights is coming from inside and outside UC over the past several years.

### **User nights by institution**

	<b>1996</b>	<b>1997</b>	<b>1998</b>	<b>1999</b>	<b>2000</b>	<b>2001</b>
<b>UC</b>	25%	47%	52%	40%	56%	54%
<b>non-UC</b>	75%	53%	48%	60%	44%	46%

There were 17 classes, field trips, symposia and workshops for the University of California, from UCB, UCD, UCLA, UCR and WMRS (compared to 16 last year). There were 5 extension classes from UCB, UCR, and UCSC (compared to 6 last year). There were more classes, field trips, symposia and workshops from institutions in 2001 than in 2000 (27 vs. 241).

**6. NUMBERS AND FTE OF ACADEMIC RESEARCH PERSONNEL, TECHNICAL STAFF AND ADMINISTRATIVE PERSONNEL<sup>1</sup>**

		<b>FTE</b>
<b>Director</b>		
Powell, Frank	Director	0.50
<b>Asst. Res. Sci. 11-mos<sup>2</sup></b>		
Thiemens, Mark (UCSD)	Res. Scientist	0.33
Rundel, Phil (UCLA)	Res. Scientist	0.33
Lubin, Phil (UCSB)	Res. Scientist	0.33
<b>Academic Subtotal (Sub 00)</b>		<b>1.0</b>
<b>Campus Office Staff</b>		
Fager, Barbara	MSO	1.00
Jamous, Cecilia	Admin. Asst. II	0.53
<b>Campus Subtotal (Sub 01)</b>		<b>1.53</b>
<b>Station Staff</b>		
Anderson, Kathy	Admin. Asst. I	1.00
Hetzler, Scott	Lead Groundskeeper	1.00
Masters, Richard	Automotive Technician	0.75
Patrick, Cecil	Principal Cook	1.00
Shinn, Donna	Admin. Asst. III	1.00
Trydahl, David	Sr. Super. of PPS	1.00
<b>Station Subtotal (Sub 01)</b>		<b>5.75</b>
<b>Total FTE</b>		<b>8.78</b>

<sup>1</sup> Casual employees; office help, seasonal cooks, carpenters, building maintenance workers, laborers are essential for support during heavy research use in the summer season but are not shown here.

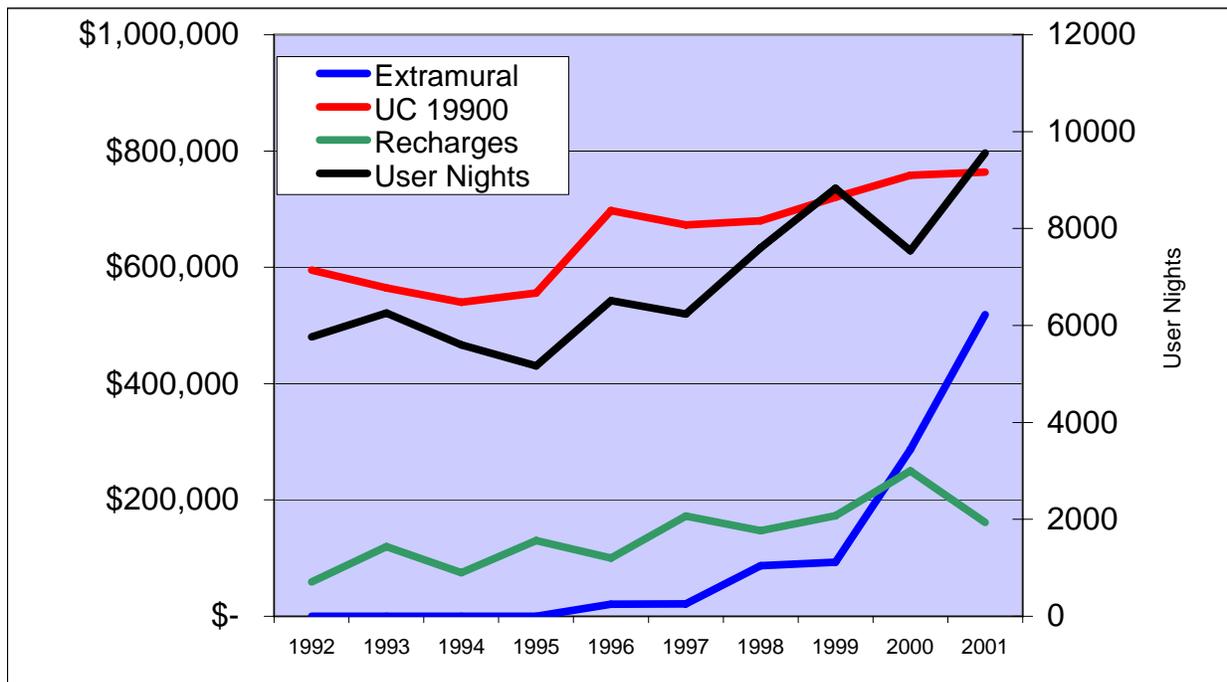
<sup>2</sup> The Assistant Research Scientist (1) FTE is an unfilled position used for rotating support of UC faculty to seed long-term research programs at WMRS.

## 7. PUBLICATIONS

Publications based on research done at a field station are a traditional measure of research productivity. The WMRS bibliography includes 1,338 publications from its inception in 1950 through 1999. This number includes 81 Master or Doctoral theses, 177 papers or chapters from WMRS Symposia and over 850 original research articles or book chapters. 819 publications have been added over the last 15 years with 300 just since 1995. This bibliography is currently being updated as a searchable database that will be ultimately be available in a searchable format on the WMRS web site. New publication information is not being collected from users to update the bibliography until the existing publications are entered in the database. The Friends of WMRS are helping the WMRS Data Manager (Daniel Pritchett) with this job and it is anticipated that this will be finished by the end of 2002.

## 8. INCOME & 9. EXPENDITURES (BUDGET)

The figure below illustrates the long-term trends in funding for WMRS operations and research programs for the past ten years. The trends evident in the 15-Year Review (2000) remain intact. (1) External funding for WMRS research programs continues it's dramatic increase that started with the new direction for the station in 1995 when the new director was appointed. (2) Recharge income is increasing to cover increased numbers of users. (3) The UC appropriation increases slightly, for merits and benefits of career staff, but not for seasonal workers or inflation of operating costs.



The Table below shows the WMRS budget for fiscal year 2000/01. Not included are the federal and state contracts and grants awarded to individual investigators who use WMRS but who do not run their grants through the unit. The 2001 annual total for such WMRS-related awards was \$1,065,502. This includes \$560,049 to UC faculty and \$505,053 to non-UC faculty for research directly involving WMRS (*i.e.* the work would be impossible without the Station).

## 8. & 9. BUDGET (CONTINUED)

<b>MRU BUDGET REPORT, FY 00/01 (7/1/00-6/30/01)</b>					
<b>White Mountain Research Station</b>					
<b>UC San Diego</b>	<b>UCOP</b>	<b>Rechg. Income</b>	<b>Extramural Funds</b>	<b>Gifts &amp; Endowments</b>	<b>TOTALS</b>
<b>I. Funding in 2000-2001</b>					
A. Carryforward from 1999-2000	\$213,056	\$0	61,379	152,960	\$427,395
B. Current Year Funding	\$763,574	\$0	457,000	\$10,928	\$1,231,502
C. Environmental Biology Supercourse	\$15,000	\$0	\$0	\$0	\$15,000
D. Income/Recharge	\$0	\$161,146	\$0	\$0	\$161,146
<b>Sub Total - Funding</b>	<b>\$991,630</b>	<b>\$161,146</b>	<b>\$518,379</b>	<b>\$163,888</b>	<b>\$1,835,043</b>
<b>II. Expenditures in 2000-2001</b>					
<b>A. Administration (Campus)</b>					
1. Salary	\$109,771	\$0	\$0	\$0	\$109,771
2. Benefits	\$34,739	\$0	\$0	\$0	\$34,739
3. Supplies/Equip./Travel	\$21,249	\$0	\$0	\$0	\$21,249
4. Other Expenses	0	\$0	\$0	\$0	\$0
subtotal	\$165,759	\$0	\$0	\$0	\$165,759
<b>B. Research (Station)</b>					
1. Salary	\$352,452	\$0	198,397	\$0	\$550,849
2. Benefits	\$97,537	\$0	43,861	\$0	\$141,398
3. Supplies/Equip.	\$119,038	\$110,405	130,422	\$0	\$359,865
4. Other Expenses	\$0	\$0	0	\$0	\$0
subtotal	\$569,027	\$110,405	\$372,680	\$0	\$1,052,112
<b>C. Other Functions</b>					
1. Conferences & Travel	\$4,769	\$0	\$0	\$0	\$4,769
2. Advisory Committee	\$0	\$0	\$0	\$512	\$512
3. Publications	\$0	\$0	\$0	\$0	\$0
4. Development	\$0	\$0	\$0	\$0	\$0
5. Director's Discretionary Funds	\$0	\$0	\$0	\$0	\$0
6. Other (specify)					
subtotal	\$4,769	\$0	\$0	\$512	\$5,281
<b>Sub Total - Expenditures</b>	<b>\$739,555</b>	<b>\$110,405</b>	<b>\$372,680</b>	<b>\$512</b>	<b>\$1,223,152</b>
<b>D. Distributions (xfers to other UC)</b>					
Grants awarded - Faculty	\$45,000	\$0	\$0	\$0	\$45,000
Grants awarded -Graduate Students	\$7,254	\$0	\$0	\$0	\$7,254
Grants awarded -Other (specify)	0	\$0	\$0	\$0	\$0
<b>Sub Total - Distributions</b>	<b>\$52,254</b>	<b>\$0</b>	<b>\$0</b>	<b>\$0</b>	<b>\$52,254</b>
<b>Balance = (Income) - (Expenditures + Distributions)</b>	<b>\$199,821</b>	<b>\$50,741</b>	<b>\$145,699</b>	<b>\$163,376</b>	<b>\$559,637</b>

## **8. & 9. BUDGET (CONTINUED)**

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Sixty percent of the funding for WMRS comes from UCOP and the other half comes from user fees (recharge income) and extramural funding. The UCOP funding increased only for regular advancement of career employees with no cost increases for non-career (seasonal) employees, utilities or inflation.

Recharge income, and the interest it earns, is absolutely critical to operate the infrastructure at WMRS and assumes a much more important role than at most MRUs, so we added it as a separate category. The figure plotting long-term trends for station use and recharge income shows how the income lags user nights, for example with a decrease in recharge income in 2001 following the decrease in use in 2000. In part, this is because we report user nights for the calendar year, which fits our main research season of May through October. However, we match this to the fiscal year ending in June of the same calendar year, which only includes billing for the first part of the year. In addition, we are not able to complete the billing until after the research season ends in October, so essentially all of the use in a given calendar year is paid for in the next fiscal year. Hence, user nights in 2001 are paid for in FY 2001-2002 while we are reporting FY 2000-2001.

Gifts and endowments grew primarily by interest.

Extramural funding almost doubled as WMRS continues to develop an in-house research portfolio, which was virtually non-existent in 1994..

Historically, we have divided expenses into those occurring at the campus headquarters and those occurring at the station, which correspond closely to “administration” and “research”, respectively. Using this algorithm, 86% of the total expenses are for “research” while 62% of the UCOP funding goes to research. This algorithm considers all of the costs for basic infrastructure at WMRS as research expenses, which may not be the case on a campus where basics such as electricity, buildings, insurance, etc. are provided. Currently, we are working on a budget model that will use the UCSD financial tools to better segregate administrative, infrastructure and operational expenses at every site, including the individual laboratories at the Station.

The balance being carried forward includes an approximate \$250,000 for operations in the next fiscal year, including the hiring of a new Station Manager (and paying the salary of the current manager for overlap between the individuals and job training), finishing more construction at Crooked Creek and maintaining a \$100,000 contingency fund for emergencies, necessary for continuous and safe operation of facilities in a remote and harsh environment. The rest of the balance being carried forward consists of contract and grant awards for periods of performance that do not match the UC fiscal year and gifts and endowments which are still being “grown”.

## 10. SPACE

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New laboratory space was added to OVL in 2001 as part of the Molecular Laboratory Complex funded by NSF-FSML grant. The lab and all cabins at Crooked Creek are now functional, although some finish work remains in the lab and some bathrooms. One of the cabins is set up to function as a classroom/workroom.

<b>Owens Valley Laboratories</b>	<b>Square Feet</b>
Dining/office	2,475
Sleeping dorms	4,231
Manis lab	716
Molecular lab complex	300
Classroom	864
Library	400
Shop	1,250
Lecture hall	960
Classroom & computer lab	960
Caretaker's housing	900
Bathroom	320
Temporary housing	1,695
Long term housing	1,440
<i>subtotal</i>	<i>16,511</i>
<b>Crooked Creek</b>	
Hall lodge	6,600
4 Cabins	3,200
Quonset/Storage	1260
Bathroom	320
Shop	960
Lab	1,300
<i>subtotal (square feet)</i>	<i>13,640</i>
<b>Barcroft</b>	
Pace lab	9,400
Quonset/Storage huts	300
Animal lab	476
Outer lab	392
Garage/Shop	672
<i>subtotal</i>	<i>11,240</i>
<b>Summit Laboratory</b>	
<i>subtotal</i>	<i>450</i>
<b>TOTAL</b>	<b>41,841</b>