WORK PLAN FOR STUDY OF DESERT WETLAND AND RIPARIAN AREAS TO IMPROVE MANAGEMENT AND PROTECTION OF WATER AND BIOLOGIC RESOURCES, SOUTHERN CALIFORNIA

September 28, 2000

DESERT
MANAGERS GROUP

PREFACE

This Work Plan was developed by an interagency, interdisciplinary team of biologists, hydrologists and resource managers from the U.S. Geological Survey, Bureau of Land Management, Fish and Wildlife Service, National Park Service and Department of Defense. The authors include:

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The Work Plan was approved by the Desert Managers Group on September 28, 2000. The DMG is currently seeking funds and partners to implement the work plan in Federal fiscal year 2001.

EXECUTIVE SUMMARY

This plan describes work proposed by Federal agencies during fiscal years 2001-2004 that will lead to improved management and protection of water and biologic resources in the desert area of southern California. Federal agencies from the California Desert Managers Group that participated in developing this cooperative work plan include the Bureau of Land Management, the National Park Service, the Fish and Wildlife Service, the Geological Survey, and Department of Defense.

The project includes the inventory of hydrologic and biologic resources at about 200 wetland (springs, seeps, and oases) and riparian sites per year. Hydrologic and biologic data collected by the Federal agencies will follow established protocols, and the data will be stored in computer data bases that will be maintained by the Geological Survey and Department of Defense. Hard copy and digital archives of wetland and riparian photographs also will be maintained. All data and photographs will be available to the public on the California Desert Managers Group web site. Data from the wetland inventory will be analyzed and used by the management agencies to restore and maintain wetlands at their proper functioning conditions.

Several other work products will be prepared during the first four years of this project. Wetlands will be delineated on approximately 250 7 1/2-minute quadrangle maps. A report will be prepared that documents the desert's water resources and the obligate plant communities. A second report will be prepared that analyzes the effects of saltcedar eradication on native plant communities and flow of the Mojave River.

Total funding needed for this project in Federal fiscal year 2001 is $930,000, which includes funding for the following agencies: BLM, $150,000; NPS, $250,000; USGS, $300,000; and FWS, $230,000.

INTRODUCTION

This plan describes work proposed by Federal agencies during fiscal years 2001-2004 that will lead to improved management of water and biologic resources in approximately 26 million acres of desert area in southern California. The work plan for this project is primarily the result of meetings of local staff of the California Desert Managers Group (CDMG) during May-August, 2000. Personnel from local offices of the Bureau of Land Management (BLM), the National Park Service (NPS), and the Department of Defense (DOD) participated in the planning meetings. Personnel from the Fish and Wildlife Service (FWS) and the U.S. Geological Survey (USGS) also participated. This plan supersedes all earlier CDMG documents related to this subject, commonly called the "water study". The work plan for this project will be updated annually.

Out of necessity, a holistic approach that utilizes the financial and personnel resources of all of the local management agencies, and also the FWS and USGS, is proposed. With strong interagency participation and cooperation, the proposed work can be accomplished with the highest level of cost effectiveness and with minimum duplication of effort. Hydrologic and biologic data can be collected uniformly by each of the agencies using established protocols, and the data can be stored in well-maintained quality-assured computer data bases that will be readily accessible to each of the agencies and the public.

Three levels of work are described for this project. Level 1 work extends throughout the life of this plan (2001-2004) and even beyond. Level 1 includes: (a) establishing uniform protocols for collection of hydrologic and biologic data; (b) establishing and maintaining computer data bases; (c) training personnel in collection, storage and retrieval of data; (d) hydrologic and biologic inventories of springs and other wetland areas; and (e) identifying the best management practices for individual springs and wetland areas.

Level 2 work is more interpretive in nature and would be completed during the life of this plan (2001-2004). Level 2 work includes: (a) completion of wetland and riparian maps for all of the CDMG area; (b) a study of the hydraulics and water quality of desert wetland areas and their obligate plant communities; and (c) a study to determine the effects of saltcedar eradication on flow of the Mojave River and native plant communities at Afton Canyon.

Level 3 work includes the planning of data collection and/or studies not specifically identified at this time and not included in this current work plan. One possible example of Level 3 work would be the planning for a study of ground-water and surface-water relations along the Amargosa River, including changes that would occur with saltcedar eradication and possible upstream water diversions. Level 3 work could also include planning for more site-specific short-term data collection and/or studies. Planning for future training, perhaps in Federal water rights, also is included under Level 3 work.

PROBLEMS

Several documents have been prepared during the life of CDMG describing water issues and problems in the desert area of southern California, and this work plan will not attempt to address them all again in detail. It is worth reiterating, however, that springs, seeps, playa lakes, marshes, oases, and other wetland areas are of limited areal extent in desert areas, but they are rich in biodiversity. The water often supports endangered, threatened, and sensitive plant and animal communities. Some desert plant and animal species are so rare that they are often compared to those that evolved on isolated islands, such as the Galapagos; when in fact, their numbers may be even smaller. For example, recent studies in Death Valley have identified five new invertebrate species that have evolved at individual isolated springs. Federal management agencies do not the know the locations of all water sources, the short- and long-term variability of the quantity of water, nor the plant and animal species that are dependent on the water. A basic hydrologic and biologic inventory is needed for all springs and other wetland areas in the desert area.

In the desert, water is also commonly used for irrigation, by livestock, and sometimes for human consumption. The competition for water often goes unchecked or unmanaged mainly out of a lack of understanding of the quantity of the water available for all users, its source, its variability from season to season, and the needs of native plant and animal communities. With increasing urban water demands in southern California, desert water is increasingly being targeted for removal and importation to heavily populated areas. Federal management agencies often do not have the hydrologic or biologic information to make informed water-management decisions and to protect Federal water rights. Basic information, such as the source of water from a particular spring, often is unknown. Does a spring discharge water that has been recharged within the past few months or years in a small localized basin, or does the spring discharge water from a large regional aquifer that may have received much of its recharge hundreds or even thousands of years ago? Not withstanding anthropogenic effects, how susceptible are a particular spring or wetland area and its obligate plant and animal communities to short-term drought and to long-term climate change? Information to answer these questions is not usually available.

The issues and problems associated with desert water are almost endless. They even include uncertainty in commonly accepted water-management practices. For example, how will the eradication of a stand of saltcedar affect the flow of water in a nearby stream and what will be the effects on native riparian plant communities? Will water quality in the stream change? Or, how will abandonment of a mine change mine seepage, and what will be the effects on native plant and animal communities? Hydrologic and biologic data currently are not available to answer such questions.

OBJECTIVES

Work proposed in this project has several objectives that are all directed at improving management of hydrologic and biologic resources by Federal agencies in the southern California desert. Specifically, objectives are

1. to adopt standardized technically-sound data-collection techniques (protocols) to be used by all Federal agencies collecting hydrologic and biologic data in the CDMG area;

2. to develop, if necessary, and maintain hydrologic and biologic quality-assured computer data bases that can be readily used by all agencies and the public;

3. to complete a hydrologic and biologic inventory of most springs and other wetland areas in the CDMG area, including wetland and riparian maps, in order to define the location and current condition of hydrologic and biologic resources ;

4. to determine the ground-water hydraulics and water quality at selected representative springs and wetland areas in order to better understand the obligate associations with plant and animal species, many of which may be unique, threatened, endangered or sensitive; and

5. to develop a greater understanding of the desert's hydrologic and biologic resources to allow Federal management agencies to better predict, monitor and manage changes that result from both natural and anthropogenic factors, including water developments and diversions and commonly accepted restoration practices such as eradication of saltcedar.

APPROACH

Level 1 Work

<u>Protocols for hydrologic and biologic data collection</u>
In order to assure that all hydrologic and biologic data for this project are of the highest quality, all data collection will follow established protocols and standards. Training of personnel will be a high priority and will be begin shortly after approval and funding of this project. Additional training will be conducted, as required, throughout the life of the project.

Guidelines and procedures for the collection of hydrologic data are well documented by the USGS, Water Resources Division, and will be followed by all Federal personnel

collecting data in the CDMG area. Guidelines and procedures for the collection of biologic data are less formally defined, and one of the first tasks of this project will be to establish protocols for the collection of biologic data associated with the regional inventory of springs and other wetland areas. All Federal agencies collecting biologic data in the CDMG area will have input into the establishment of these protocols, which may require revision from time to time.

The USGS has established guidelines and procedures for the collection of a wide range of hydrologic data, including collection and preservation of water samples, field water-quality measurements, and discharge measurements. The data-collection protocols, for the most part, are described in the USGS report series called "Techniques of Water-Resources Investigations", which are supplemented and updated with "Technical Memorandums". The USGS for many years has used field forms for the inventory of wells and springs. The forms are designed to be completed in the field at the time of the inventory and include information such as the location, geologic and topographic setting, water-conveyance structures, discharge, and selected water-quality parameters. All field and laboratory data currently are stored in a USGS nationwide computer data base, which is described below. The USGS also maintains it own water-quality analytical laboratories. All chemical analyses from USGS laboratories also are stored in the USGS computer data base after receiving quality review. All Federal personnel collecting hydrologic data for this project will comply with USGS data-collection techniques and all water-quality analytical work will be conducted at the USGS laboratory or at other laboratories complying with USGS standards. Training of other Federal agency field personnel will be provided by USGS as necessary, and all personnel collecting water-quality data will be subject to annual USGS review for selected field parameters. Although not encouraged, if other Federal agencies choose to use a private laboratory for chemical analyses, the laboratory must have prior USGS approval which can be obtained by demonstrating certain established laboratories procedures and quality-assurance measures. USGS approval of private laboratories is a basic requirement for storage of water-quality data in USGS computer data bases.

Protocols for the monitoring of biologic data at desert wetlands and in riparian areas are not well established. The needed biologic protocols will be established by the Federal agencies participating in this project shortly after approval and funding.

Computer data bases for hydrologic and biologic data

As part of USGS efforts to disseminate water data to the public and for its own use for scientific studies, the Water Resources Division maintains a distributed network of computer and fileservers for the storage and retrieval of water data. This computer data base is called the National Water Information System (NWIS) and is composed of four main components: the Ground-Water Site-Inventory System, the Water-Quality System, the Automated Data-Processing System, and the Water-Use System. Data in NWIS will be accessible on the Internet beginning in the fall of 2000.

The Ground-Water Site-Inventory System contains data on wells, test holes, springs, tunnels (mines), and drains. Currently data exists for about 60,000 sites in California.

The Water-Quality System contains results of analyses of water samples, including chemical, physical, biological, and radiochemical components. The Automated Data-Processing System contains time-series data for stream stage, stream discharge, reservoir water levels, ground-water levels, and precipitation. The Water-Use System contains data on water use at selected sites throughout the Nation.

Where possible, all historic hydrologic data for the CDMG area will be entered into NWIS during the first year of this project. USGS alone has data on approximately 720 springs in the CDMG area in hard copy files that will be entered into NWIS as a part of this project. Data for 185 springs in the CDMG currently is in NWIS. Hydrologic data collected by all Federal personnel during life of this project will be stored in NWIS and will be readily available to the management agencies for their use. USGS will provide training in the entry, quality control, and retrieval of data from NWIS to other Federal agency personnel associated with this project.

Biologic computer data bases will be maintained by each of the participating agencies. Each of the data bases will contain, at a minimum, information identified in the biologic protocol. DOD has agreed to provide a graphics interface with the data bases and to assure that the data bases are available on the CDMG web site.

Hydrologic and biologic inventory of wetland and riparian areas

During the first four years of this project, it is anticipated that about 800 desert springs, seeps, oases, lakes, and other wetland areas supporting obligate plants and animals in the CDMG area will be inventoried by the responsible Federal management agencies. Although the initial inventory will be completed during the first four years, additional monitoring at selected sites will continue well beyond year 2004. Data collection at each of the sites will follow uniform hydrologic and biologic protocols established by the participating agencies. At a minimum, data collection will include a water discharge measurement (if possible); measurements of water temperature, specific conductance, and pH; an estimate of the size of the wetland; an inventory of plant species, including exotics, supported by the water; an assay of macroinvertebrates, birds, amphibians, reptiles, and fish; information on anthropogenic factors affecting the functionality of the site; and photograph(s). Water samples also will be collected from chemical analyses at selected sites, especially at sites supporting threatened, endangered, or sensitive species. Some sites may be revisited periodically to monitor seasonal hydrologic and biologic changes, particularly where management agencies have altered sites to return them to proper functioning conditions or those sites that support endangered species. All data collected during the inventory will be stored in the hydrologic and biologic data bases described above. The data will be available, not only to the Federal agencies participating in this project, but also to the public and others doing research on desert water, plants, and animals.

Many of the sites already have been inventoried by the management agencies, but most will be revisited during the first four years of this project to assure current information is collected following the established protocols. It is anticipated that many previously

unknown sites will be identified with the use of wetland and riparian maps to be completed by FWS for this project (see Level 2 work below).

The initial inventory for this project will be conducted by 3-man teams consisting of a hydrologist (or hydrologic technician) and two biologists (or biologic technicians) with expertise in botany and desert animals. It is anticipated that some seasonal employees will be utilized for team members. NPS and BLM have had success in utilizing seasonal employees, and their use will minimize costs. Use of seasonal employees also will assure that the biologic data can be collected during the critical springtime period of each year with minimal impact on current agency staffs. Depending on animals and plant species and hydrologic conditions identified during the initial visits, other biologists and hydrologists with specialized expertise may be called upon for assistance with additional work at selected sites. It is a goal of this project to utilize, as needed, personnel and expertise of all of the participating Federal agencies. This may include, for example, an NPS biologist with a specialty in invertebrates visiting and collecting data at a BLM site.

Photos will be taken at the time of the wetland inventories. The USGS will maintain a hard-copy archive and DOD will maintain a digital archive of photos. The photos will be available on the CDMG web site. The photos in the archives will be invaluable in detecting future vegetation and other physical changes that may occur at wetland sites.

Identifying best management practices for wetland and riparian areas

Information collected during the wetland and riparian inventory and the interpretive Level 2 studies described below can be used by the Federal management agencies to identify the "Proper Functioning Condition" of each site. The Federal management agencies can use this information to identify management options necessary to return selected sites to proper functionality. Some anthropogenic factors that may be affecting the functionality of sites include livestock grazing, water diversions, vehicle travel, parking, ground-water pumping, mining, invasive plants, and various agricultural practices. The anticipated natural variability of hydrologic conditions, such as seasonal and long-term changes in water discharge, also will need to be considered to determine proper functionality and to mitigate anthropogenic impacts.

Level 2 Work

Wetland and riparian maps

Wetland and riparian maps are the foundation and guide for the hydrologic and biologic inventories described above in Level 1 work. The FWS has completed about 550 wetland maps covering about 70 percent of the CDMG area as part of their National Wetland Inventory (NWI) program. Approximately 250 of these maps are available in digital form, and the remaining 300 are available in hard copy only. About 250 NWI maps, using USGS 7 1/2-minute topographic maps for their base, remain to be completed during the first three years of this project (2001-2003). In addition, riparian habitat

mapping and digitizing remains to be completed for all 800 maps that cover the CDMG area.

Tasks by FWS or its private contractor(s) to complete the remaining NWI maps include: (a) FWS acquiring existing aerial photography; (b) photo interpretation and initial field verification; (c) preparing draft maps; (d) interagency review of draft maps; (e) additional field verification and draft map review; (f) preparing finals maps; and (g) digitizing maps. Because many of the wetland areas will have already have been visited for the hydrologic and biologic inventory, the quality control on the maps will be greatly improved in those areas.

Wetlands are classified using the *Classification of Wetlands and Deepwater Habitats of the United States* (Cowardin et al.), which is the National standard for wetlands mapping. Riparian habitats are classified using *A System for Mapping Riparian Areas in the Western United States* (FWS).

The NWI maps will be used by the Federal management agencies and the USGS to identify previously unknown wetland areas and will allow for a comprehensive field inventory described above. Wetland and riparian plant communities are identified on the maps, and the information will be invaluable in detecting future changes in the areal extent of those communities. Data from the NWI maps will be digitized and, when used in a GIS, it can be used by the Federal agencies and private sector for a wide range of hydrologic and biologic management and research.

<u>Hydraulics and water quality of desert wetlands and their obligate plant communities</u>
It is anticipated that desert springs and other wetland areas can be classified and grouped into a small number of hydraulic categories based on the source of water. Such a classification will be useful to management agencies in that it will allow for identification of recharge areas and the likely short- and long-term variability of water discharge. It also will allow agencies to assess the vulnerability of particular springs and obligate plants to short-term climatic variations. For example, it is likely that most springs and seeps in upland areas will discharge water from unconsolidated perched aquifers having a water table separated from the regional water table by an unsaturated zone. The recharge area for the perched aquifers will be relatively small and topographically higher than the spring. Water discharge in these areas will be relatively small and will vary markedly from season to season. Water will be held in storage for a relatively short time, perhaps only a few months or years.

Wetlands and springs in lowland areas, such as many of those in Death Valley, probably discharge water from unconsolidated regional aquifers at or near the regional water table. The recharge probably occurs many miles from the discharge area and probably has been in storage for hundred to tens of thousands of years. The discharge of water in lowland areas will probably be less variable than from perched systems and less susceptible to short-term drought. Springs and wetland areas with the largest water discharge probably will fall into this category.

Some springs and wetlands also will discharge water from fractures and other openings in consolidated rock aquifers. These aquifers can be either perched or regional in nature and thus the recharge areas, the residency times, and the variability of discharges can be markedly different. It is anticipated that some of the most highly mineralized water and water with the highest temperatures will be discharged from these aquifers. Springs from consolidated rock aquifers commonly are associated with faulting or volcanism.

It is anticipated that a small number of common plants will be found at a large number of springs and wetlands throughout the desert area. Some plant species, however, may require permanent discharge of water at land surface, and others may be able to survive with only periodic discharge. Water requirements of some of the rarer plant species may be unique and may actually be associated with water chemistry including trace metals. These associations between hydrologic conditions and obligate plant species will be defined, and the information will aid management agencies in determining proper functionality at wetlands. The associations also will allow management agencies to predict future changes in plant communities caused by both natural and anthropogenic impacts.

The bulk of the hydrologic and biologic data to be used for this study will come from the comprehensive inventory of wetland areas and NWI maps described above. Some hydrologic data at springs dates back to the early 1900's and currently is in hard-copy files and published reports. Where possible, this historic information will be entered into computer data bases and also will be available for analysis. In addition, a number of springs will be selected for seasonal measurements of discharge and for collection of water for chemical analyses. It is anticipated that the yearly recession of discharge at a spring will be indicative of the spring's hydraulic classification.

Environmental tracers such as stable isotopes of oxygen and hydrogen (oxygen-18 and deuterium), tritium, helium-3, dissolved nobel gasses, and chlorofluorcarbons (CFC) will be analyzed in the water discharged by several springs in each group in the hydraulic classification. At seeps with no discernible surface flow, water would be extracted from unsaturated soils for analyses of stable hydrogen and oxygen isotopes. These data will be used to determine the source, movement, and age of water discharged by the springs. The data also will help identify springs that discharge water that is relatively young and that are susceptible to short-term climatic variations.

This study will begin in 2001, but it will primarily be conducted during the second, third and fourth year of this project. The final report, to be completed by 2004, is planned for publication in the USGS Professional-Paper series.

Effects of eradication of saltcedar at Afton Canyon

In 1996, BLM began saltcedar eradication along the Mojave River at Afton Canyon. The objectives of the program were to control invasive saltcedar, to restore native plant communities, and to increase flow in the Mojave River. Saltcedar eradication is a commonly accepted management option throughout the arid Southwest, even though its effects on the hydrologic and biologic resources seldom are quantifiable. Data collected by BLM on plant communities and by the USGS at a gaging station in Afton Canyon offers a rare opportunity to quantify the effects of saltcedar eradication on native plants and on flow in the nearby stream. Information at Afton Canyon will have strong transfer value in the CDMG area and throughout the Southwest, including the Amargosa River where the eradication of saltcedar is being contemplated.

BLM has collected data on native plant reestablishment, densities, and reproduction along the affected river reach. In addition, changes in floodplain and channel geometry have been noted. For an earlier USGS study of ground-water and surface-water relations along the Mojave River, the seasonal depletion of base flow of the river was used to verify estimates of evapotranspiration at Afton Canyon. Using the same method, post-eradication evapotranspiration and base flow can be estimated, and the effects of saltcedar eradication can be quantified.

Little, if any, additional data collection would be needed to complete this study. Existing data could be analyzed and a journal article prepared during the first year of this project (2001). It is anticipated that the article would be published in “Ecology” or possibly the “Journal of Arid Environments” during 2002.

Level 3 Work

As discussed earlier, Level 3 work includes the planning of new monitoring and interpretive studies to be completed by this project. Planning of additional work will take place during the life of this work plan, but the work may actually be completed after 2004. New studies may be fairly long term and comprehensive in nature like the study of hydraulics and water quality of desert wetlands and obligate plant communities described above. Or, new studies may be fairly short term and site specific in nature like the study of effects of eradication of saltcedar at Afton Canyon described above. Planning for future training also is included under Level 3 work. For example, personnel from the management agencies have suggested the need for a training class in understanding, establishing, and protecting Federal water rights.

ANTICIPATED PRODUCTS

In addition to the internal documents produced by each of the Federal management agencies for the management, restoration, and protection of desert wetlands and associated biologic resources, physical end products that will be produced by this project during the life of this work plan include the following:

(a) computer data bases for hydrologic and biologic data that will be used by all of the participating Federal agencies and be available to the public on USGS and CDMG internet home pages;
(b) hard-copy photo archives of wetland areas to be maintained by USGS and digital photo archive available on CDMG internet home pages to be maintained by DOD;
(c) NWI wetland and riparian maps of the complete CDMG area to be completed by 2003 and available in both hard-copy and digital form;
(d) report describing the hydraulics and water quality of desert wetlands and the association with obligate plant communities to be completed by 2004; and
(e) journal article analyzing the effects of saltcedar eradication on native plant communities and the flow of the Mojave River at Afton Canyon to be published in 2002.

AGENCY BUDGETS

Total funding needed for this project in Federal fiscal year 2001 is $930,000. Funding requirements, in thousands of dollars, for each of the agencies to complete tasks in this work plan during Federal fiscal year 2001 are summarized in the table below. Not shown in the table are costs that will be borne by DOD for data management and graphics interface with the CDMG web site. In order to complete work described in this work plan, minimum funding requirements for each of the agencies during fiscal years 2002-2004 will be the same as those for fiscal year 2001, plus annual increases of about 5% for inflation. It is anticipated that the wetland and riparian maps will to be completed by 2003, and there may be no funding requirements for that task in 2004.

The CDMG has requested $1,930,000 for this project for fiscal year 2002, which would include the following annual funding for each of the agencies: BLM, $600,000; NPS, $600,000; USGS, $500,000; and FWS, $230,000. Funding at this level would allow for more comprehensive and timely completion of each of the tasks outlined in this work plan. The increased funding also would allow work to begin on new interpretive level 2 type studies, more comprehensive analyses of threats to water and obligate biologic resources, and greater implementation and monitoring of mitigating measures to restore wetland areas to their proper functioning conditions.

Table 1. FY 01 funding needed to implement the California Desert Water Study. Funding in Thousands of dollars.

TASK	BLM	NPS	USGS	FWS
Level 1:				
Enter historic water data into USGS data base	15	35	50	--
Training	(a)	(a)	5	--
Hydrologic and biologic inventory of wetland and riparian areas	35	105	70	--
Level 2:				
Wetland and riparian maps	100	110	--	230
Wetland hydrologic and biologic study	(a)	--	100	--
Mojave River saltcedar eradication study	(a)	--	70	--
Level 3:				
Planning for new work and annual update of work plan	(a)	(a)	5	(a)
Totals	**150**	**250**	**300**	**230**

(a) funding from existing programs