

Protocol for Hydrologic Data To Be Collected at Desert Wetland Sites by BLM and NPS Personnel in Support of the California DMG Water Study

The Minimum Data Requirements

Location.—Locate the spring while in the field on a USGS topographic map. This location will be the basis for assigning the official State number (township, range, and quarter/quarter section) and the official site number (latitude and longitude) in the USGS Nationwide data base. If a GPS unit is available, it can be used to check the latitude and longitude. In some areas you will have the FWS wetland maps (USGS topos) to work with.

Altitude.—The altitude of the spring can be estimated from the topographic contours. In general, the accuracy of this estimate is usually plus or minus one-half of the contour interval. So if you are using a topographic map with a 20-foot contour interval, it is misleading to record the altitude to the nearest foot (i.e. 4365 ft). A better estimate would be 4360 +/- 10 ft. Actually, from my personal experience, the uncertainty may be greater than one-half of the contour interval, particularly in areas with significant relief where contour interval may be 40 feet or more. On rare occasions you may be able to improve on the estimate if an altitude is shown on the map for some recognizable nearby feature. It has been my experience that the altitudes indicated by hand held GPS units (no base station) are less accurate than can be estimated from topographic maps.

Topographic setting.—Note the topographic position of the spring or wetland. In most cases they will be located in lowland areas, along stream channels, or on hillsides near valley bottoms. Some springs will be located on hillside several feet above valley bottoms (indicative of perched aquifers).

Size and type of wetland.—Note the size of the wetland area and the area of influence of the wetting (obligate and/or facultative plants). In some cases you may be dealing with a small seep that has wetted only a few square feet of ground. In some cases, the water discharge may support a marsh area or pond of an acre or more. Note whether the water forms a flowing channel, pond, simply wetted soil, or all of these conditions and describe in your note and document with photographs (described below).

Water discharge.—A good discharge measurement may be the most difficult piece of data to collect. Unless the discharge of a spring is concentrated into a few (hopefully, one) channel or pipe, it is often impossible to measure. When the flow is concentrated, discharges can often be measured using a calibrated container and stopwatch, a flume, or current meter—all equipment that you should have to make discharge measurements. In most cases in the desert, you will be dealing with springs with relatively small discharges and you may have to estimate the discharge because of diffuse flow. You can improve

your estimates of spring discharge by practicing at home with your calibrated container and stopwatch and measuring varying discharges from a garden hose. After a while you will be able to estimate fairly accurately discharges from the garden hose varying from less than one gallon per minute to perhaps as much as 20 gallons per minute.

Water temperature.---Use a certified thermometer. Record the water temperature to the nearest one-half degree Celsius (for example, 20.0, 19.5). Water temperature should be measured, preferably in the shade, at the point where the spring issues from the ground. Because of breakage and contamination problems, USGS no longer uses mercury thermometers. Good certified alcohol thermometers can be purchased from commercial vendors.

Specific conductance.---Whatever brand of meter you use, IT MUST BE CLEAN AND CALIBRATED, prior to making you MEASUREMENT IN THE FIELD. You will encounter a wide range of water salinity in the desert, so a wide range of standards will be needed to calibrate the meter. You can make an initial measurement of conductance to determine the correct standard to be used to calibrate your meter—once calibrated, then make your final measurement. Remember that specific conductance is temperature dependent and is reported in microsiemens at 20 degrees Celsius. There are many good meters on the market that are temperature compensated. Also remember to measure the temperature of your water sample at the time of your conductance measurement—it will be different than the original temperature of the spring water that you made. Like temperature, your specific conductance measurement should be made on water collected where the water issues from the ground (the source). There may be a need to measure the conductance in other areas of the wetland if there are factors affecting the water quality between the source and point(s) of water use.

Water use.---Water from all springs and wetlands in the desert is used by some living organism, and the current water use(s) should be recorded. The only apparent use may be plants, but the water may also be used by invertebrates and vertebrates (cattle, wildlife, and man). Additional information on obligate plants and animals will be derived from the bio-assays.

Plumbing.---Many sites will have some sort of manmade plumbing, such as collection galleries and pipelines running to water troughs, ponds, or trailers. Describe the plumbing associated with the current water collection and delivery systems. Photographs, described below, also will be useful in documenting the current development of a spring.

Natural or anthropogenic factors suspected of affecting water discharge and/or quality.---Many factors may be affecting the discharge, water quality, and ultimate use of a spring. Some factors, such as cattle wallowing in a spring pond, may be very obvious and they should be recorded. Avoid speculation of impacts unless they are clearly evident.

Photographs.---“A picture is worth a thousand words”. Photographs are the easiest and cheapest way to document current conditions at a spring. Take photographs to document the source point of a spring, the wetted area created by the water, the obligate plant community, and the manmade plumbing. You may be the only person to visit the site for many years, and your photographs along with the hydrologic data will be invaluable to future managers when they struggle with issues of change or mitigation of impacts at a wetland site. Some people will recommend setting monuments so that photographs can be repeated. If you have the time, you can set monuments; but I wouldn't waste the time. But, the important thing is to document current hydrologic and plant conditions, and that may require a half dozen photos or more. At one least panoramic or long-distance photo is helpful. It is recommended that all photographs be maintained in a hard-copy photo archive by the USGS along with your original computer data-base entry forms (described below). Photographs will also be stored in digital form by DOD as part of the Desert Manager Program. Management agencies will also probably want to maintain photographs in hard-copy files—many film-development firms offer two prints for the price of one.

Computer data base.---All hydrologic data should be ENTERED on USGS computer coding forms while AT THE SITE. If, for example, there is a discrepancy between the latitude/longitude determined from your map location and a gps unit, the time to resolve the problem is when you are in the field at the site. The data will be entered in the USGS National Water Information System (NWIS) data base and will be available for your agency's future use. Like the photographs, the computer coding forms will be maintained and archived in a hard-copy file—they are considered original data and thus must be archived for possible future litigation. Classroom instruction on use of the data-entry forms will be provided to management agency personnel by the DMG program.

Additional Hydrologic Information

Geologic setting.---The springs will be located in areas of bedrock (volcanic, metamorphic, or sedimentary) or unconsolidated deposits, and the rock type should be identified (i.e., basalt, limestone, sand and gravel). Most unconsolidated deposits will be flat lying, while sedimentary bedrock often will be dipping some degree from horizontal and the degree and direction of dip should be noted. Geologic maps are available from a number of sources and should be used whenever possible to identify the mapped geologic formation. Geologic maps are also useful to determine if a spring is associated with a mapped fault. If not already available to you, each management agency should begin a library of geologic maps. A rock hammer, brunton compass and, to a lesser degree, a hand lens are necessary equipment.

Type of aquifer.---It will be important to note, if possible, whether a spring is issuing from a large regional aquifer or issuing from an aquifer of fairly limited areal extent. This often will not be readily apparent, but some clues will be available to make an educated guess. For example, a spring issuing from unconsolidated materials on a

hillside more than likely is issuing from a perched aquifer with local recharge. A spring with fairly large discharge that issues from bedrock in a lowland area probably derives its water from a large regional aquifer. Springs that discharge along perennial streams most often are issuing from unconsolidated flood plain deposits with a regional water table, while springs along dry channels most often are issuing from perched aquifers. Analyses of stable isotopes of oxygen and hydrogen probably will be required to verify the residency time of spring water and to conclusively identify whether water issues from a regional aquifer or an aquifer of limited areal extent. See USGS Water-Supply Paper 494, "Outline of Ground-Water Hydrology"—this is a long-out-of-print classic written by Oscar Meinzer in 1923. Beg, borrow, or steal a copy from someone!

Other water-quality field parameters and chemical analyses.---For a number of reasons, additional information on water quality may be collected. For example, if a rare animal or plant species is found at a spring, additional information on dissolved trace metals, dissolved oxygen, pH, or dissolved nutrients may be necessary to adequately determine current conditions supporting the organism. If a spring is being used for human drinking water, additional information will be required to determine if the water meets drinking water standards (selected trace metals, dissolved organic compounds, and bacteria for example). For all water samples collected for chemical analyses, PH of the water should be determined IN THE FIELD using a CLEAN and CALIBRATED METER. Additional equipment will be needed to filter and preserve water samples, and it is beyond the scope of this short summary to describe all of this information in detail.

Formal classroom instruction in the collection and preservation of water samples is available to management agency personnel, on a limited basis, at the USGS National Training Center in Denver. Waiting periods for such training, however, often are one to two years. In the field tag-along training with USGS personnel collecting water-quality samples also can be arranged for management agency personnel and may be the preferred method of obtaining the needed training.

Chemical analyses should be performed by an APPROVED LABORATORY, and the USGS will be working with the management agencies to find one or more labs that you can use.

DMG WETLAND INVENTORY FIELD FORM

EMPLOYEE, AGENCY AND DATE

Name _____ Agency _____

Date (mm/dd/yy) _____

LOCATION OF SPRING

Latitude

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 Longitude

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 Method (map, survey, GPS) _____
Deg Min Sec Deg Min Sec

Landline

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 of section

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 Township

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 Range

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NE, NW, SW or SE N/S E/W

Topographic Map _____

Altitude of spring _____ ft. Method (map, survey, GPS) _____

Spring name if on map _____ Spring symbol on map? Yes No

Topographic setting (hillside, valley bottom, other {explain}) _____

Wetland Code on National Wetlands Inventory Map _____

DISCHARGE, EC AND TEMPERATURE

Discharge _____ gal/min How determined (estimate, flume, meter, other) _____

Water Temperature _____ °C Electrical conductance _____ microS@ 25°C

WATER USE AND PLUMBING

Use of spring (stock watering, human consumption, etc.) _____

Description of plumbing (collection box, pipeline, storage tank, etc.) _____

DESCRIPTION OF WETLAND (width, depth, flowing, ponding, etc.) _____

BIOLOGIC OBSERVATIONS (obligate/ facultative plants and animals) _____

PHOTOGRAPHS (Describe subject of photos)

1. _____
2. _____
3. _____
4. _____

MAN-MADE FACTORS AFFECTING DISCHARGE OR WATER QUALITY if obvious (nearby pumping, septic tanks, cattle wallowing in spring)

GEOLOGIC SETTING (Describe type of bedrock or sediment, formation name at spring, if known)

TYPE OF AQUIFER (large regional aquifer, small localized aquifer, perched aquifer, if known)

ADDITIONAL REMARKS (example: sample collected for chemical analyses)

Highlighted Entries Optional

Wetlands inventory lays the groundwork for effective management of precious desert water resources



Springs, seeps, playa lakes, marshes, oases, and other wetland areas are extremely scarce in California deserts. However, these areas support human settlement, are rich in bio-diversity, and provide habitat for 35 endangered, threatened, and sensitive plants and animals. Human activities and invasive species have seriously impacted natural springs and wetlands in the California deserts over the past century. Rapid population growth in southern California and Nevada, related plans to export the deserts' underground water resources, and increased recreation use will further impact critical desert water and related biological resources. Information on the deserts' water and water-dependant biological resources is essential to effective stewardship of desert water resources to meet both human and environmental needs in the California deserts.

Under the auspices of the Desert Managers Group, NPS, GS, BLM, FWS, and several DOD facilities initiated an interagency study aimed at improving management and protection of water and biological resources. The DMG water study includes mapping the distribution of wetlands throughout the deserts, assessing the hydrological and biological characteristics of priority wetlands and riparian sites, and

implementing actions to restore their Proper Functioning Condition (PFC).

In Fiscal Year 2001, the FWS National Wetlands Inventory Program mapped wetlands on thirteen 7.5-minute USGS quadrangles and digitized the wetlands on 52 quads that were previously mapped. The National Wetlands Inventory maps will be made accessible to management agencies through the DMG website being maintained by DOD's Mojave Desert Ecosystem Program. In addition, under the leadership of the USGS, standard protocols were developed for collecting hydrological and biological data, and an interagency data management system was developed by DOD. In March 2001, approximately 60 staff representing all the land management agencies in the deserts participated in a training session on use of the standardized protocols. In FY 02, BLM, NPS and DOD will begin assessing the hydrological and biological conditions of priority springs and wetlands using the standardized protocols.

For more information on the DMG water study, contact Annie Kearns at 760-255-8815

Scarce water resources support a diversity of plants and animals.

BRIEFING STATEMENT

Date: September 12, 2002

Title: DMG Water Technical Group Update

Issue: Problems and progress towards a standardized inventory of springs and wetland features.

Background:

Springs and wetland features are of concern to the DMG. Goal 12 of the 2002 5-year work plan is to inventory, monitor, and protect these features. The ad hoc water group is tasked with implementing standardized protocols for spring inventories.

Current Status:

A task from the February 2001 workshop was to develop a spring sampling protocol. The result combined the USGS and BLM PFC protocols for springs, and the FWS classification for vegetation. Several difficulties were encountered with this protocol.

- USGS protocol doesn't have a good biologic component.
- BLM PFC protocol questions don't relate well to desert springs and are designed to answer the question, "Is this spring in trouble, and will it fix itself?" While this is an important question, different agencies have other questions to answer, and need to answer them in the most efficient manner possible.
- None of these protocols, nor their combinations, answer the question "How well is this desert spring functioning, and why" which is important to the NPS.

While the hope was to find a core list of parameters to which each agency could supplement with added data collection, the technical committee failed to reach agreement on one set of parameters that meet criteria for all agencies involved in DMG.

The technical group was not able to complete this task prior to beginning NPS field season so Kearns (NPS) used the original combined protocol (from Feb 2001) and supplemented and revised it somewhat to increase the biological representation.

During the spring FY02 field season, Kearns and biotech surveyed 54 springs and other water features in the Mojave NP. Mark Hessing, Ft. Irwin botanist, went along on one of the field trips. Currently, Kearns is collecting water samples for lab analysis.

USGS BRD staff made a presentation at the monitoring workshop on the Pendragon PDA system and its abilities for field data collection. Many members of the group planned to purchase that type of system. Kearns had already ordered and purchased the Trimble GeoExplorer 3 GPS unit before the PDAs were available. The Trimble was, and still is, an accurate and precise GPS device. It's data handling system is cumbersome and frustrating to use, making data collection and much more difficult than with the PDA system.

Proposed Actions:

NPS has contracted with DRI (Don Sada and Karl Pohlmann) to develop "protocols for field and database methods to determine biological and hydrogeological characteristics of springs within the Mojave inventory and monitoring network." This project will

1. Develop a methodology to inventory springs that uses a principal components approach to focus on those parameters that are most critical to characterizing hydrogeologic and biologic viability of spring systems in the Mojave I&M Network.
2. Develop a straightforward and standardized field protocol that can be used to rapidly describe springs using critical parameters.
3. Develop a standardized database to capture this information.

This \$25,000 to \$40,000 project will be implemented in three tiers according to complexity and detail of the survey.

Level 1 Broad environmental characteristics that describe general conditions and indicate the relative resource value of each spring. Will include at least 40 parameters such as location (e.g., township, range, county, state, elevation, etc.) and a number of quickly accumulated data that describes/characterizes each spring.

Level 2 Detailed information that will describe functional characteristics of biotic communities and groundwater flow systems.

Level 3 Detailed hydrogeologic and biological information to determine specific relationships between environmental parameters, macroinvertebrate community structure, and external stress factors (e.g. human and/or environmental). This sampling will provide information that may be used to resolve particular issues that may occur at sites with high resource values and conflicting uses. Level 3 will also include elements appropriate for ongoing, long-term hydrologic and biologic monitoring.

Products will be delivered March 1, 2003. These protocols will be useful to all DMG participants.

NPS has submitted another proposal to implement "Level 1 spring inventory within the Mojave inventory and monitoring network." This project would begin in April 2003 at Death Valley NP and Mojave NP and end in spring of 2005 at Joshua Tree NP.

BLM has submitted a \$25,000 grant application to the "Green Sticker" OHV program to implement the Level-1 spring inventory on BLM land.

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