U.S. - MEXICO BORDER
FIELD COORDINATING COMMITTEE

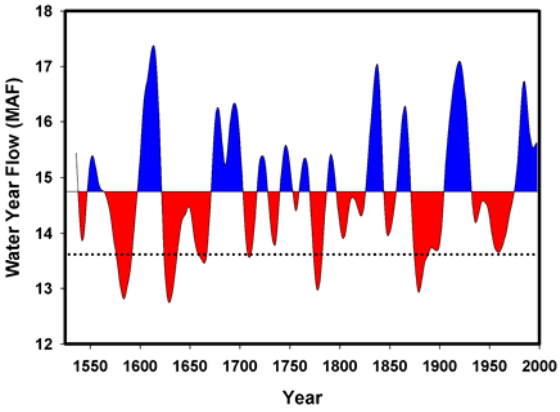
Welcome to the third issue of the Department of the Interior (DOI) U.S.-Mexico Border Field Coordinating Committee (FCC) newsletter. The purpose of our newsletter is to communicate relevant developments and other information that may be useful as we manage, protect, inventory, and monitor natural and cultural resources along our international border with Mexico.

Updated Tree-ring Reconstructions of Upper Colorado River Flow

Without a doubt, streamflow gage records provide one of the most important data resources for the management and scientific study of large rivers like the Colorado. Such instrumental observations also have their limitations. Mainly, gage records are too short to capture the full range of natural streamflow variability in a basin like the Upper Colorado, particularly at the multi-year to decadal timescales critical for the management of large reservoirs.

In the mid-1970s Chuck Stockton and Gordon Jacoby, two researchers from the University of Arizona's Laboratory of Tree Ring Research, found a clever solution to the problem: they used the growth of drought-sensitive trees to estimate past flows on the Upper Colorado. Stockton and Jacoby were able to explain 78% of the variance in observed flows based on tree-ring records, and this allowed them to extend the gage record back to A.D. 1520.

The Stockton and Jacoby reconstruction contained several noteworthy features. First, the highest sustained flows over the entire period 1520 to 1961 occurred in the early decades of the 20th century. As luck would have it, annual streamflow measurements from this unusually wet period formed the basis for negotiating the 1922 Colorado River Compact and allocating river water to participating states. From the vantage point of Stockton and Jacoby, an overly optimistic assessment became the “Law of the River.” Added cause for concern was evidence for a “megadrought” in the late 16th century that far exceeded any low-flow events in the gage record.



In this figure, twenty-year moving averages of reconstructed streamflows are presented for Lees Ferry. High (blue shading) and low-flow periods (red shading) are plotted vs. the long-term mean. The dashed line represents the lowest 20-yr flows of the gage era.

Recently, severe drought, coupled with changing demands for water resources,

has reinvigorated interest in long-duration reconstructions of Upper Colorado River flow. Published in 1976, Stockton's and Jacoby's analysis was in need of a major update. Using 30 additional years of calibration data, new and updated tree-ring collections, and improved methodologies, Connie Woodhouse (NOAA), Steve Gray (USGS) and Dave Meko (U. Arizona) have developed a new and more statistically robust reconstruction of Upper Colorado River streamflow.

As detailed in a presentation by Steve Gray during the May 2005 FCC meeting, analysis of the updated reconstruction shows that the recent drought (1999-2004) was a remarkably dry event. In the context of long-term variability, however, recent low flows are not without precedent. In fact, the tree-ring record suggests that over the period from 1536 to 1998 there were eight to ten 5-yr periods that were equally dry or worse. Moreover, the new reconstruction confirms that several decadal-scale periods prior to the 1900s (e.g. 1580s, 1640s, 1890s) were drier than any low-flow regimes during in the gage era (see figure). In addition to the high flows of the early 1900s century, the new reconstruction shows that the much of the late 20th century (post-1961) was also unusually wet. Just as high flows during the years prior to the Compact led to an over-allocation of water from the Upper Basin, wetness during recent decades may have led to many stakeholders having an overly optimistic view of future water availability. Findings from this research are reported in a paper recently submitted to the journal *Water Resources Research*. NOAA offers a website explaining tree-ring based reconstructions of streamflow at http://www.ncdc.noaa.gov/paleo/streamflow and the authors will provide the Lees Ferry reconstruction and reconstructions for other key streamflow gages online in early 2006. For additional information, please contact Steve Gray (stgray@usgs.gov) at the USGS Desert Laboratory in Tucson.

Buffelgrass Invasion of the Sonoran Desert

In the next decade buffelgrass will come to be seen as the worst plant pest ever to strike the Sonoran Desert, according to Travis Bean, a Senior Research Specialist with the U. of Arizona in Tucson. Buffelgrass out competes native species for moisture and nutrients, dramatically reducing biodiversity. Dense stands of this African, perennial bunchgrass now occur along the majority of southern Arizona's roadways and have invaded urban and suburban areas as well. Because of its abundant biomass and flammability, this introduced grass has quickly become the primary threat to biological conservation efforts in the Sonoran Desert and urban - suburban fire management. Travis warns, "Don't be too surprised if fires become commonplace in southern Arizona winters, when buffelgrass dries out, and Africanized

grassland begins to replace our saguaro-studded landscapes."

Roadsides are the primary vector of spread for buffelgrass. The road surface provides extra moisture from runoff and traps heat to protect the plants from frost. Together with an artificial wind source from passing vehicles, roads allow buffelgrass to disperse and establish great distances from source populations. Once established along a roadside, seed is produced throughout the year, accumulating in adjacent areas. Although most years may be too cool or too dry for buffelgrass to escape from the roadside areas, eventually conditions become permissive for establishment of buffelgrass into the wild lands, where eradication efforts can become much more costly. Thus, the most important action to be taken in controlling buffelgrass and preventing its further spread is to aggressively eradicate it along roadsides.

In April of 2005, the buffelgrass was listed as a noxious weed in Arizona. The major consequence of this listing is the prevention of the sale of more aggressive, "improved" cultivars of buffelgrass from Texas in Arizona. Such cultivars may substantially extend the northern limits of buffelgrass by increasing its frost tolerance by as much as 1° C. Funding opportunities for buffelgrass eradication and research are also expected to increase as a result of the noxious weed listing.

Another important activity is outreach to state, county, and local governments and land management agencies, as well as the general public, about the profound negative consequences of the buffelgrass invasion. Key to this effort are the simple objectives of successful identification and proper eradication and control techniques. The buffelgrass threat is a regional problem that will require cooperation at all levels of government and across agency boundaries. For more information, contact Travis Bean at (520) 629-9455 x104 or by email at bean@email.arizona.edu.

Protection of Cultural Resources

Smuggling of antiquities worldwide has been estimated to be a billion dollar business, ranking only behind the illicit sale of arms, drugs, and money laundering in international crime. Like pages torn out of a history book, once a site is damaged or even destroyed, our ability to learn about a certain chapter in the past has been lost forever. The principal authority for protecting the Nation's cultural

resources is the Archeological Resources Protection Act (ARPA). The Act made it a Federal offense for anyone to collect or excavate artifacts on Federal or Indian lands without a permit or proper authority. Violators can face felony criminal charges, including a maximum fine of $250,000 and five years in prison, plus the forfeiture of all vehicles and equipment used in the commission of the crime. The law also provides for civil penalties and supplemental to any ARPA case on Indian lands, a perpetrator can be prosecuted in Tribal courts under related ordinances.

Example of an illegal looting

ARPA is not just about prosecuting the looter or vandal, but also about preservation. Yet it is not about preserving archeological resources for the exclusive benefit of archeologists. ARPA includes provisions for education, partnership, and collaboration with the interested public, measures which continually prove to be the most effective means of preserving a valuable and finite source of historical and scientific information. Multiple opportunities for ARPA training are available. But, Federal land managers should be immediately aware that ARPA exempts the nature and location of archeological resources from disclosure under the Freedom of Information Act (FOIA). Also, because of safety concerns, non-law enforcement personnel in the field should never approach suspected looters. They should instead report any potential ARPA violation to law enforcement authorities immediately while providing detailed information about the suspected illegal activities. At every opportunity, land managers should advise the public that a $500 reward is allowed for information leading to a conviction. A hotline has been established at 1-800-242-ARPA (-2772) for anybody wishing to provide information about possible ARPA crimes. This summary was prepared by Garry Cantley, Regional Archeologist for BIA's Western Region (602-379-6750).

Update: Border Digital Aerial Photography Initiative

Current policy within the USGS is to partner with the Farm Services Administration (FSA) to obtain new imagery through the FSA National Agriculture Imagery Program (NAIP) for all areas in the western portion of the United States. FSA has a robust plan to obtain 2 meter or better resolution imagery every year during the growing season. Since leaf on is not such an issue

in the western US, the USGS is modifying their program to cooperate with FSA.

California – The State of California is partnering with FSA to fly aerial photos and produce digital orthophoto quadrangles (DOQs) for the entire State at 1-meter resolution in natural color. This will began in June 2005 with initial deliveries of DOQs by December. For more information contact Carol Ostergren, USGS at costergren@usgs.gov or (916) 278-9510. The data will be publicly distributed through the California Spatial Clearinghouse Library at http://gis.ca.gov/.

Arizona – The USGS is producing new DOQs for the Arizona portion of the border from 2002 and 2003 color infrared aerial photos. The western portion of the State should be available by August 2005 with the remaining portion completed by November 2005. Due to special projects, the area around Mt. Lemmon in northeast Pima County and border quadrangles for the Santa Cruz County area have been completed. Information on obtaining these data can be obtained from Tom Sturm at tstrum@usgs.gov.

New Mexico – Currently no new aerial photos or DOQs are being produced. The Office of the State Engineer is looking for partnerships to fly the entire state with new 1 meter DOQs.

Texas – FSA has completed their 1-meter DOQs for the entire state from 2004 imagery. All counties have been delivered in compressed format and are undergoing QC/QA review. Along the border of Texas, the International Boundary and Water Commission (IBWC) has received copies of full resolution, natural color DOQs that cross over at least 5 km into Mexico. For the rest of the State, the full resolution DOQs should be released in July 2005. The USGS has completed the 2002 DOQs for the northwestern portion of the State. These data can be obtained from the USGS Earth Explorer at: http://edcsns17.cr.usgs.gov/EarthExplorer/.

Mexican Digital Data Availability

The USGS participated in the third annual National Geography Conference for Mexico, hosted by the Instituto Nacional de Estadística, Geografía e Informática (INEGI). The purpose of the conference is to contribute towards the development of the Spatial Data Infrastructure of Mexico by sharing information on digital data development, discussing standards, developing new partnerships, and planning joint collaborative activities for the future. Invited attendees included Federal, state, and local governmental agencies working in mapping and GIS.

Aerial Photos and Digital Orthophotos - Since 1968, aerial photographs have been flown at a scale of 1:75,000. These photographs were used to create the 1:50,000 paper maps that are INEGI's standard large-scale map product. INEGI recently acquired planes to fly new aerial

photography at 1:40,000. The increase in scale will result in four times the number of photographs. INEGI plans to use this new generation of aerial photography to create 1:20,000 scale digital and paper map products; 1:10,000 scale digital orthophotos; and 5-10 meter contours. Long-term objectives include: digitalizing all aerial photos, transitioning to color photography, and finishing the entire country.

LIDAR - INEGI purchased a LEICA LIDAR system in 2003 and installed it in one of their aerial photography airplanes. Current priorities for data collection are flood-prone areas and volcanoes, but the ultimate goal is to fly the entire country. INEGI has collected and processed LIDAR data at three different ranges: high altitude flights (6,000 meter) for volcano elevation data, including Volcan Colima and Volcan Popo; medium elevation flights (1,000 meter) for regions in Zacatecas; and low elevation flights (less than 1000 meter) for river basins in Salamanca, Guanajuato, and Ricon de Ramos, Aguascalientes. Unfortunately, emphasis has not yet been placed on data collection along the U.S.-Mexico border.

Seamless Digital Elevation Models - INEGI has mosaicked their 50-meter posting, digital elevation models (DEMs) for the entire country. The source for the data is contours from the 1:50,000-scale maps and 1:25,000-scale urban maps, where available. To edge-match the borders, INEGI used the USGS National Elevation Dataset and the SRTM 90-meter for Guatemala. The data have been re-sampled to a 30-meter grid and are available as "seamless" DEMs at no cost to the user through INEGI's website (http://www.inegi.gob.mx/lib/usuarios/default.asp?s=geo&sistema=mde). After creating a username and password, anyone can download the DEMs. A user-friendly interface is available to browse the 1:50,000 quadrangle grid and enter the grid number manually or to click on the desired quadrangle. DEMs can be downloaded in .bil format by 1:50,000 quadrangle or by specifying an area no larger than two square degrees. Edge-matching among quadrangles is inconsistent in some areas, e.g. the north Gulf Coast. This is perhaps the largest dataset that INEGI has ever offered at no cost to the user.

National Atlas of Mexico - INEGI developed the Atlas Nacional Interactivo de Mexico as a manifestation of IDEMEX (Mexico's spatial data infrastructure). The Atlas is a web mapping service that allows users to discover geospatial data available from many different Mexican Federal agencies. Map services are not hosted by the Atlas, but are pulled from their respective agencies. Some agencies contributing data are: INEGI, SEMARNAT, CENAPRED, INE, CONABIO, INMujeres, and others. The Atlas does not have download capabilities at this time. More information is available at http://www.atlasdemexico.gob.mx.

Soils - INEGI has completed a soil profile database using 10,000 soil profiles that show depth, color, carbonates, texture, organic carbons, acid, and soil nutritive elements. More information is available by going to the Edafologia link at http://www.inegi.gob.mx/geo/default.asp?c=124.

Mexican Geological Survey – This agency has recently changed its name from the Consejo de Recursos Minerales. The Mexican Geological Survey (MGS) is collaborating with INEGI to produce the 1:250K geologic maps in digital format. The majority of the country is available at 1:250K in digital format at www.coremisgm.gob.mx. MGS is beginning to map at 1:50K, with some progress in the area south of Big Bend National Park.

Other Highlights

Water Management Report of Arizona Aquifer Released - On July 5, the report, "Water Management of the Regional Aquifer in the Sierra Vista Sub-watershed, Arizona," requested by Congress in 2004, was delivered to Congress. The report is available at http://water.usgs.gov/Section321.2004_050705.pdf . Mark Anderson and Jim Leenhouts of the USGS in Tucson coordinated the preparation, review, and transmittal of the report with the Upper San Pedro Partnership, a consortium of Federal, State, and local agencies.

Mapping, Modeling, and Analysis of Mercury Data - The USGS and National Institute of Environmental Health Science have chosen mercury as a test contaminant to develop a web-based system for geospatial analysis (http://emmma.usgs.gov/). It provides access to environmental mercury datasets and integrates them with USGS maps, imagery, and other geospatial tools.

Border Region Environmental Health - The USGS is creating a bi-national database for the U.S.-Mexico border region (http://borderhealth.cr.usgs.gov/) that integrates mapping, demographic, water and biological contaminants, public health, and geologic data for both sides of the border. It can be used to analyze possible causal links between the environment and public-health issues. In partnership with the Texas Department of Health, the USGS is investigating spatial analysis methods to analyze health issues and to explore possible links.

World Water Forum - The World Water Forum will be convened in Mexico City during March 16-22, 2006. The USGS in partnership with U.S. Army Corps of Engineers will be participating in the forum. Information about the forum is available at www.worldwaterforum4.org.mx.

If you would like to submit an article for the FCC Newsletter or announce the availability of a publication or future meeting relevant to the U.S.-Mexico border region, please send your contribution to Lloyd Woosley at lwoosley@usgs.gov.