State Mapping Advisory Committee (SMAC)
4:30 PM; April 15, 2004
Meeting Notes
NEVADA GEOGRAPHIC INFORMATION SOCIETY (NGIS)
14th Annual Nevada GIS Conference
The Orleans Hotel and Casino Conference Room
Las Vegas, Nevada

For further Information please contact Ron Hess at Nevada Bureau of Mines and Geology (NBMG)
(775)784-6691 Ext. 121 or Email: rhess@unr.edu

Prior to the official SMAC meeting, an open forum was held with presentations on the following topics:
need for prioritization of hydrography data requirements (presented by USGS), review of image file
compression packages available to State agencies (presented by NDOT), overview of HAZUS multi-hazard
modeling software and efforts to start a HAZUS user group in Nevada (presented by NBMG), and need for
transportation data attribute standardization (presented by NDOT).

4:40 PM: **OPENING REMARKS,** introductions, and welcome by Jon Price, Committee Chair

OLD and NEW BUSINESS

Report on USGS National Mapping Discipline projects in Nevada, by Tom Sturm:

Status graphics for digital elevation models (DEM), digital orthophoto quads (DOQ), and National
Hydrography Dataset (NHD) for Nevada are attached. The 10 meter (1/3 arc second) DEM conversion
program for Nevada should be completed by September of this year and available on the National Elevation
Dataset (NED) Web page shortly thereafter. The Department of Interior (DOI) high priority mapping program
paid for the majority of this conversion project. The 1 arc second (30-meter), 2 arc second (approximately 60-
meter), and the 3 arc second (approximately 90-meter) DEM datasets have been available for Nevada for some
time and are all available from the NED Web site (http://edcnts12.cr.usgs.gov/ned/default.asp).

First time DOQ coverage of Nevada was complete last year (with the exception of the Nellis Air Force Range
and the Nevada Test Site). Cooperators with the USGS on this project included the Nevada Department of
Transportation (NDOT), Bureau of Land Management (BLM), and the Southern Nevada Water Authority.
Much of the data is based on National Aerial Photography Program (NAPP) 1999 photography, but some
DOQs are based on older missions from 1994 and 1991. Washoe and Clark Counties have come to an
agreement with the USGS to allow open public use of their most recent coverage DOQ data (2003 and 2004
respectively). NDOT has a similar agreement with the USGS covering the Carson City area.

The NAPP program was designed to capture aerial photography over the country on a 5-7 year cycle. Due to
changing priorities and reduced budgets, the NAPP program has been significantly scaled back and is not
currently scheduled to fly Nevada in the foreseeable future. An alternative to this program is the National
Agricultural Imagery Program (NAIP). The USGS can utilize this program's contracting standards and the
possibility exists to use DOI High Priority Mapping funds to obtain updated DOQ coverage in outlying areas
of Nevada. This program produces a public domain, natural color product. It can be contracted for a 2-meter
rectified digital image product or for a more accurate 1-meter rectified image. Prioritization for this product
should be factored into the next SMAC high priority request. The next meeting of SMAC will be late
September or October of 2004.

Development of a priority list for hydrography mapping in Nevada, by Tom Sturm:

Digital Hydrography data are currently being generated over several project areas in Nevada. The U.S. Forest Service and the U.S. Bureau of Land Management (BLM) have identified several priority areas. It was suggested that prioritization of hydro data should also be factored into the next SMAC high priority request.

The National Map program is partnership based and utilizes a distributed network of Web mapping services accessing OpenGIS Consortium, Inc. (OGC) compliant tools, serving map data to users through a USGS developed viewer. The USGS National Map Program will attempt to serve the best available data whether on their server or with links to other servers that contain map data held by other entities. Best is defined by currency of information, scale, and availability. The primary data themes of concern are:

Orthoimagery (DOQ)
Hydrography (NHD)
Elevation (DEM)
Transportation (roads, trails, rail, airports, seaports, etc.)
Boundaries (political subdivisions, Federal agency management boundaries, State and County lines, etc.)
Structures (buildings)
Land Cover (MRLC)
Geographic Names (GNIS and additional names data from census and other agencies)

The USGS is looking to local agencies to provide boundary, transportation, structures, and land use data layers and updates to the National Map program. Local and State agencies, by nature of their mission and responsibilities, may have better data in these areas than the USGS can access from other sources.

The National Map program is currently moving away from pilot or test projects such as were developed for the Lake Tahoe Region and is moving to identify long-term partnerships with various entities to help provide new data, update existing data, and maintain various data sets as they are worked into the National Map program. The current focus of activity is on urban areas and some state-based data development programs, such as transportation information acquisition.

Report on image file compression software, by Eric Warmath, NDOT:

The purpose of this report is to respond to a concern raised at the previous SMAC meeting about imagery compression software used by different agencies around the state and its impact on interagency data sharing. Nevada DOT, as a user of many CAD and GIS packages as well as a major creator of image data in Nevada, volunteered to look into the matter. This report examines differences between MrSID, ECW, and JPEG2000 software compression effectiveness, ease of use, cost/license limitations, and suggests courses of action.

The majority of the work during this review was performed by Lucy Adams in the NDOT Imagery section working with Eric Warmath in the GIS section. The products evaluated were selected after research as the only options to create a compressed geo-referenced image. These included the ER Mapper free for download utility, MrSID (v 1.5) by Lizardtech, and the jpeg compression engine in ERDAS Imagine (v 8.7), which belonged to the now defunct Mapping Science Corporation. NDOT owned 2 of the 3 products and took the downloadable freeware version from ER Mapper from the Internet. The freeware program was limited to 500 MB so all tests were performed on files smaller than 500MB.

Several factors were evaluated: image quality, compressed size and speed of compression on the technical side and cost, compatibility with multiple products, and other relevant issues potentially affecting the user community.

IMAGE QUALITY:
This was a viewer's choice. Prints were made of each image output type at different compressions and were viewed by the persons present at the SMAC meeting in Las Vegas. The winner as indicated by comment was MrSID.

COMPRESSED SIZE:
This was evaluated by output file size. The results are as follows for a compression request of 10:1 as set by the operator:

	Color	B&W
Original size (in MB's)	26.1	78.4
Lossless Compression	13.4	40.97
ER Mapper .ecw	1.6	3.3
Imagine/ Mapping Science .jp2	2.63	7.89
MrSID .sdw	2.32	7.91

Note: Both MrSID and Mapping Science were very close to a 10% target. ER Mapper exceeded 10% in this instance and was the least successful at actually meeting user input percentages. The closest to target size was Mapping Science in Imagine.

SPEED OF COMPRESSION:
The largest file we could use in our freeware version of ER Mapper limited this evaluation. Nevertheless, the file size was large enough to see a difference in compression speed between the products. All files except Lossless Compression were compressed with a 10:1 compression target. Time is in seconds.

	Color	Time	B&W	Time
Original size (in MB's)	472		489	
Lossless Compression	229.5	210	386.5	320
ER Mapper .ecw	21.8	71	119	123
Imagine/ Mapping Science .jp2	47.5	130	49.2	130
MrSID .sdw	44	320	57	320

The speed winner is ER Mapper, but the compressed files do not very closely approach the 10% user input. Mapping Science was not affected by whether the image was color or black and white, nor was MrSID but MrSID was noticeably slower.

COSTS:
The vendors had various pricing schemes dependent on whether the user was private, business, or government. MrSID is a stand-alone image compression utility and costs about $5000. The Mapping Science engine is part of ERDAS Imagine 8.7 and costs up to $7000, depending on what level of product is purchased. The ER Mapper Utility is available free for 500 MB images or is otherwise incorporated in their GIS product at a cost of about $7000.

Unlimited compression is available with the Imagine/Mapping Science or ER Mapper options. MrSID since version 1.5 requires purchase of a specific quantity of compression as a part of the maintenance of the product. It comes in 100, 500, and 1000GB units. It requires the user to know how much compression they will do in a year. On the positive side, the compression quantity is additive so you do not lose any from year to year.

MrSID does not have a floating license option but you can buy additional licenses at reduced costs. The software goes on one machine. Imagine/Mapping Science can go one many machines but the number of instances in use are limited to the number of licenses. ER Mapper has a floating license but at twice the purchase cost of a fixed seat.

COMPATIBILITY:
Most GIS users in Nevada primarily use ESRI products for work. However, NDOT uses GeoMedia 5.1, ESRI ArcView 3.2, ArcGIS 8.3, Bentley Microstation (V7), and AutoCAD. Any products we output need to meet not only internal requirements but also those of agreement partners. The only product that works in all of NDOT's software is MrSID. MrSID performance is found to be extremely slow in GeoMedia. ER Mapper works in all products but a plug in is required except in GeoMedia. We did not test the files in ArcView 3.x, Arc Info, or AutoCAD, but plugins exist for all of those products. The jp2 and ER Mapper files were found to not work in ESRI's freeware Arc Explorer 2.0.

OTHER ISSUES:
ER Mapper has been for sale for over a year. This raises some question as to corporate health. Because a plug in is required for so many products, it is somewhat of an administrative headache with one more thing you have to do to use the product.

The Mapping Science Corporation lost its lawsuit with MrSID and has now come under control of Lizardtech. ERDAS has no idea at present as to the fate of image compression using that engine within Imagine in future releases of the product. Currently there is no other company distributing a product with Geo-referenced jp2 compression.

MrSID has improved the utilities in its product. It now has a lossless compression also. The main drawback from most perspectives is the 'by the gigabyte' compression sales. This company has had some financial troubles but was recently bought by a Japanese firm, Claratem, which now controls both the MrSID and Mapping Science engines for compression. However, they have lost some legal battles over ownership of jp2 compression. Jpeg (jp2) is considered by many to be an open format. However, no product competitors, other than ER Mapper, currently exist.

CURRENT RECOMMENDATION:
With so much change in this area in the last months, it is recommended to wait and see what happens with all the lawsuits and financial troubles. An update will be presented at the next SMAC meeting. If someone were in the market right now for product, the results would lean toward MrSID because of compatibility and image quality. The user would have to figure out how much compression they are doing in order to decide how much they need to acquire.

END OF REPORT ON IMAGE FILE-COMPRESSION SOFTWARE

After presenting the report, Eric requested the formation of an Imagery Subcommittee to look further into the details surrounding not only image compression but also format, distribution, and various agencies image data requirements. The committee and Chair agreed to the request and the Chair appointed Eric chairman of the Imagery Subcommittee with instructions to present a subcommittee report at the next SMAC meeting.

The following people were identified as having an interest in participating on an imagery subcommittee:

Eric Warmath, NDOT, email: ewarmath@dot.state.nv.us
Matthew Dillon, NDWR, email: mdillon@water.nv.gov
Mark Sappington, National Park Service, email: mark.sappington@nps.gov
Don Harper, USGS, email: harper@usgs.gov
Mike Bish, NDOT, 775-888-7580
Mike Turner, NDOT, 775-888-7449
Mark O'Brien, BLM, 775-861-6440
Ron Hess, NBMG, 775-784-6691 Ext. 121, email: rhess@unr.edu

Discussion also included status of image and vector data sets under development at NDOT. A data coverage of highway rest areas is now complete. NDOT is currently developing digital data coverages for State and County maintained roads, mile posts, public airports, PLSS centroid points, Nevada historic markers, and rail lines (current and historic rail routes from 100k, DRG, and DOQ data sets). Later this year the mosaicking and file compression of 7.5 minute and 30 minute blocks of DOQs will be complete. These mosaics will be publicly available for download on the Keck Web Site.

Announcements and open discussion:

The Risk Assessment Subcommittee of the Nevada Hazard Mitigation Planning Committee is looking into the possibility of starting a HAZUS Multi Hazard software users group for Nevada. If you are interested or have questions about the software, please contact Ron Hess via email at rhess@unr.edu .

The following people were identified as having an interest in being members of a HAZUS Users group:

Ron Hess, NBMG, 775-784-6691 Ext. 121, email:rhess@unr.edu
Don Harper, USGS, email: harper@usgs.gov
Bill Cadwallader, Western Nevada Development District, 775-954-4629, email: captcadwallader@wndd.org
Shawn Toushey, SWCA, 702-248-3880?, email: stoushey@swca.com,
Joe Laravie, Consultant, email: jlaravie@frontiernet.net
Gail Prockish, Washoe County Department of Water Resources

An information handout on RE-GAP vegetation mapping program was passed out by Ron Hess for Mark O'Brien. Mark O'Brien was unable to attend this meeting but will present an information report on the GAP program at the next SMAC meeting. In the meantime he has requested that individuals with questions or comments on the GAP analysis program contact him directly at 775-861-6440. A short summary of the GAP analysis program and an overview of the Southwest Regional GAP Analysis Project are attached.

Aster Satellite data of Nevada are now available on the Keck Web Site (http://keck.library.unr.edu/mapserver.htm   ). This is in addition to statewide coverage of USGS 1:24,000, 1:100,000, and 1:250, 000 scale DRGs, various Landsat coverages, DEM, and DOQ coverage. There are also various historic maps, earth science data resources, geologic maps, and indexes available at this Web site.

The National Elevation Dataset (NED) Web site is now distributing both 10- and 30-meter DEMs and Shuttle Radar Topography Mission (SRTM) data (http://edcnts12.cr.usgs.gov/ned/default.asp) .

6:30 PM: ADJOURN

If you have questions please contact Ron Hess, Executive Secretary, Nevada State Mapping Advisory Committee at (775) 784-6691 x 121 or Email rhess@unr.edu .

State Mapping Advisory Committee Web Page
http://www.nbmg.unr.edu/smac/smac.htm

Virtual Clearinghouse of Nevada Geographic Information Web Page
http://www.nbmg.unr.edu/geoinfo/geoinfo.htm

MEETING ATTENDEES

Jon Price	Nevada Bureau of Mines and Geology
Ron Hess	Nevada Bureau of Mines and Geology
Tom Sturm	USGS National Mapping Discipline
Jan Gould	City of Reno
Joe Laravie	Consultant
Mark Sappington	National Park Service
Joe Hutcheson	National Park Service
Art Ehrenberg	Southern Nevada Water Authority
Bob Puterski	Boulder City
Patrick Guiberson	UNR Department of Geography
Lorraine Cadwallader	Mineral County
Bill Cadwallader	Western Nevada Development District
Sally Kleiner	Washoe County Department of Water Resources
Donald Harper	USGS Water Resources Division
Susan Buto	USGS Water Resources Division
Rick Free	Nevada Department of Transportation
Michael Bish	Nevada Department of Transportation
Eric Warmath	Nevada Department of Transportation
Matthew Dillon	Nevada Department of Water Resources
Jerry Dildine	Nevada Department of Water Resources/ITIS Corp.
Kelly Anrig	Nevada Department of Water Resources
Holly Smith	Nevada Division of State Lands
Judy Brandt	Southern Nevada Water Authority
Shawn Toushey	SWCA
Paul Fenkell	Student

LIST OF ACRONYMS

|	
BLM	Bureau of Land Management (http://www.blm.gov/nhp/index.htm)
DEM	Digital Elevation Model
DLG	Digital Line Graph (can be vector transportation, hydrography, or boundary data, etc.)
DOI	Department of Interior (http://www.doi.gov/index.html)
DOQ	Digital Orthophoto Quadrangle
DOQQ	Digital Orthophoto Quarter Quadrangle
DRG	Digital Raster Graphic (generally georeferenced scanned topographic maps)
GNIS	Geographic Names Information System (http://geonames.usgs.gov/index.html)
MRLC	Multiple Resolution Land Cover Mapping Program (http://www.epa.gov/mrlc/)
NAIP	National Agricultural Imagery Program(http://www.apfo.usda.gov/whitepapers/NAIP03.pdf)
NAPP	National Aerial Photography Program (generally 1:40,000 scale aerial photography)
NBMG	Nevada Bureau of Mines and Geology (http://www.nbmg.unr.edu/)
NDWR	Nevada Division of Water Resources (http://water.nv.gov/)
NED	National Elevation Dataset (http://gisdata.usgs.gov/NED/)
NGIS	Nevada Geographic Information Society (http://www.ngis.org/)
NHD	National Hydrography Dataset (http://nhd.usgs.gov/)
NDOT	Nevada Department of Transportation (http://www.nevadadot.com/)
OGC	OpenGIS Consortium, Inc. (http://www.opengis.org/)
PLSS	Public Land Survey System
SMAC	State Mapping Advisory Committee (http://www.nbmg.unr.edu/smac/smac.htm)
SRTM	Shuttle Radar Topography Mission (http://srtm.usgs.gov/)
USGS	United States Geologic Survey (http://www.usgs.gov/)
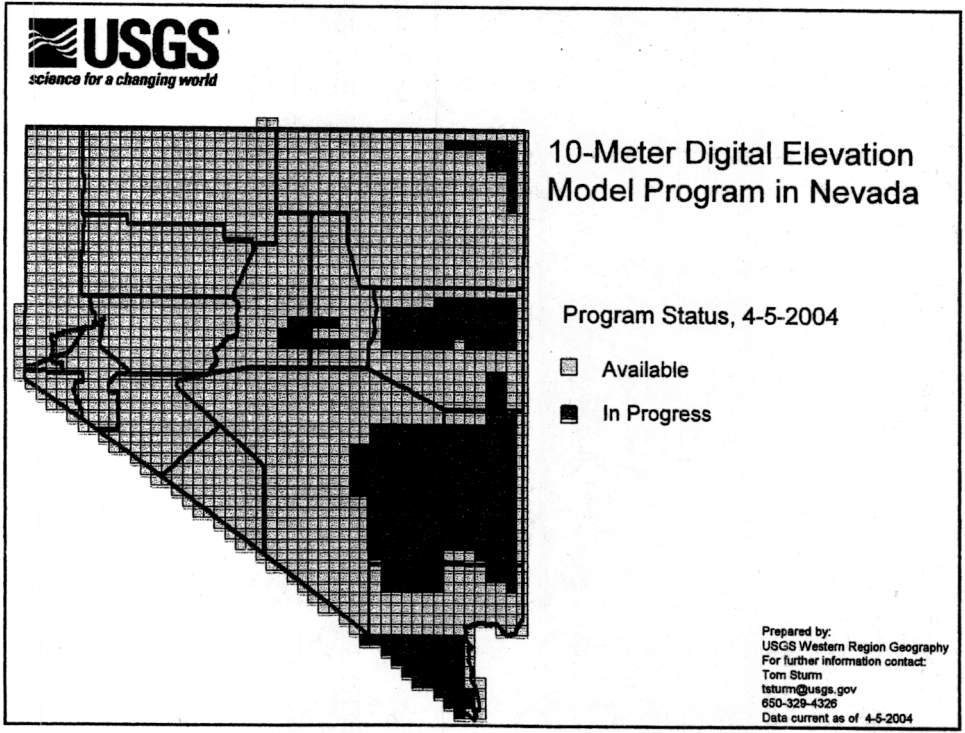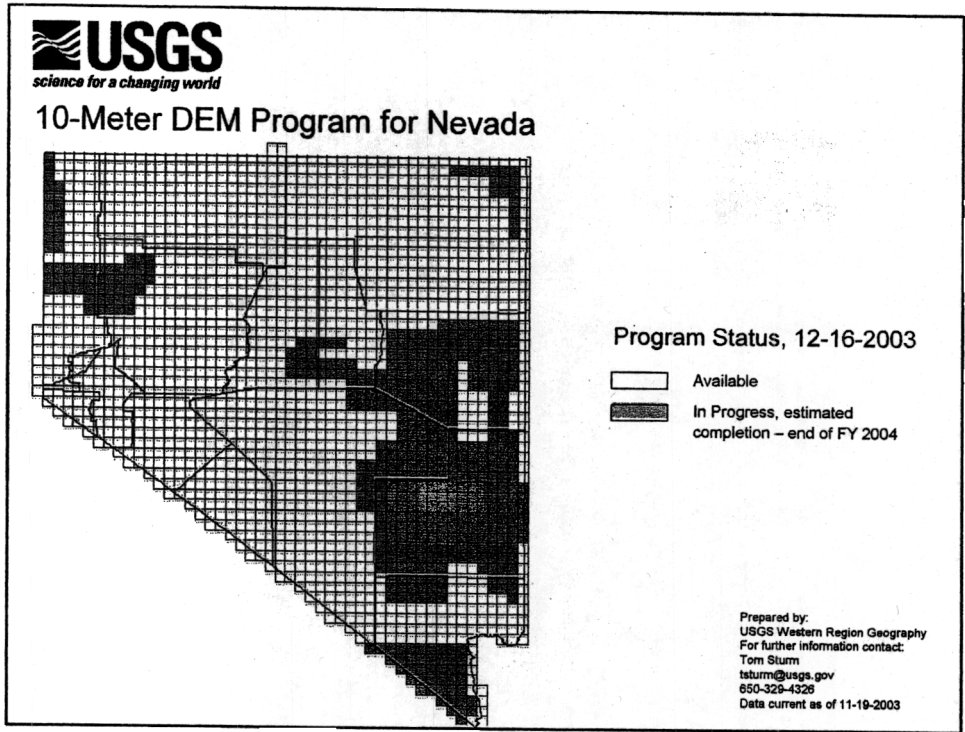
DOQ Program for Nevada
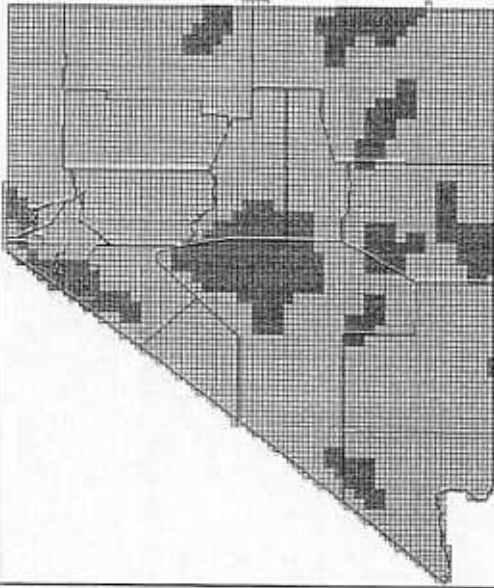
Program Status

☐ Available

▨ Forest Service, completed in '02 and '03

Prepared by:
USGS Western Region Geography
For further information contact:
Tom Sturm
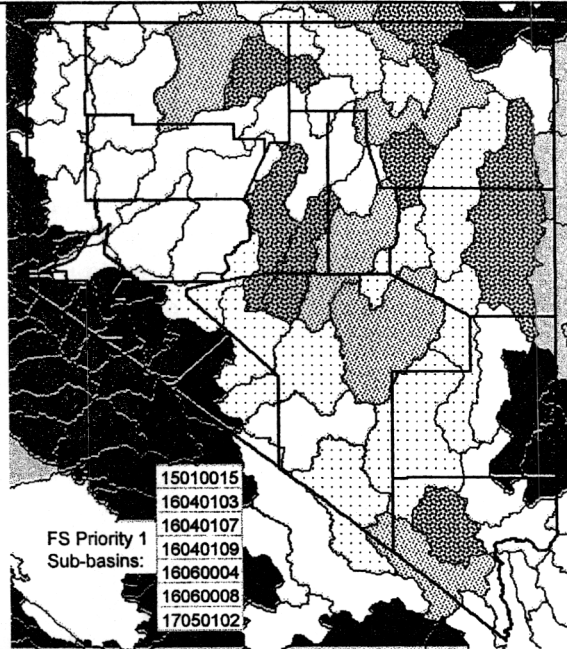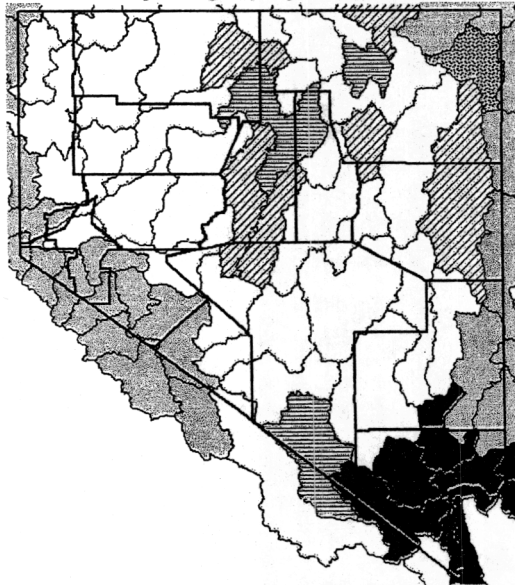tsturm@usgs.gov
650-329-4326
Data current as of 11-19-2003

Urban Area Activities in Nevada
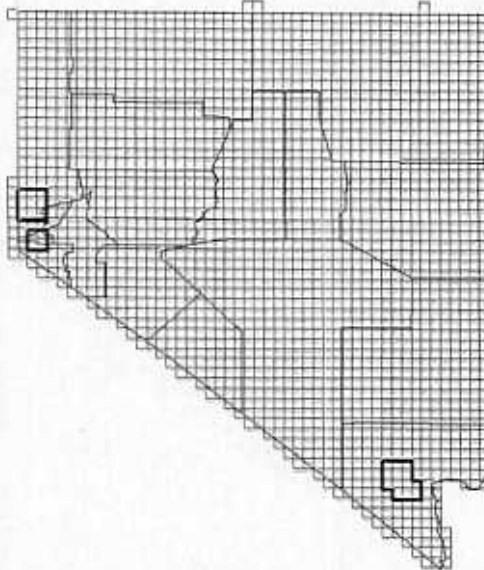
High Res. Orthophotography

Carson City: Partnership with NDOT, completed March 2003

Las Vegas: Partnership with Clark County, in progress
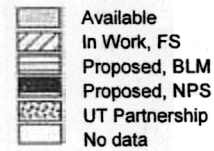
Reno: Partnership with Washoe County, completed Fall 2003

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Data current as of 11-19-2003

USGS
science for a changing world

Gap Analysis Program History and Overview

"Gap analysis" is a scientific method for identifying the degree to which native animal species and natural plant communities are represented in our present-day network of conservation lands …

KEEPING COMMON SPECIES COMMON

The concept for the Gap Analysis Program (GAP) was born in 1987 in response to the need to complement species-by-species management in dealing with broad-spectrum habitat loss. The need for clear, geographically explicit information on the distribution of native vertebrate species, their habitat preferences, and their management status was evident.

Following two years of methods development, the program was launched in 1989 as a research project exploring how to develop predictive information that can be used to manage the nation's biological diversity ("biodiversity") so that ordinary plant and animal species will not become threatened with extinction. Over the past fourteen years, important new and successful methods needed to manage the country's diversity of life forms have emerged, overcoming barriers to mapping elements of biological diversity across large areas – something that had never been done before.

A wide range of tools and procedures are now available, including standards for classifying natural vegetative communities, a consistent set of satellite images from which to render digital databases, and methods to apply GAP information to everyday resource decisions and long-range planning. Today, GAP is operational nationwide and has enjoyed substantial international interest.

GAP's mission is to promote biodiversity conservation by developing and sharing information on where species and natural communities occur and how they are being managed for their long-term survival – making it an important part of the overall National Biological Information Infrastructure (NBII). "Gap analysis" is a scientific method for identifying the degree to which native animal species and natural plant communities are represented in our present-day network of conservation lands. Those species and communities not adequately represented constitute "gaps" in conservation lands and efforts.

Mapping Natural Community and Species Distributions

The ability to successfully map natural communities and species in terrestrial as well as aquatic environments has required breakthroughs in science, technology, and effective partnering. To develop maps of natural plant assemblages, satellite imagery is combined with aerial photography, air video, field data, and expert knowledge to create state- and region-wide maps for use by land managers and planners. GAP partners include state and federal agencies, universities, businesses, and nonprofit organizations. The program develops standards – such as those used to classify natural vegetation communities or to predict the distribution of animal species – that provide a framework for individual states and other organizations to further develop creative techniques and tools.

"Predictive modeling" is used to map species that breed or use habitats in a given state. To predict their distributions, species are associated with mapped habitat characteristics using computerized GIS (geographic information system) tools. The resultant maps are checked for accuracy against verified checklists and published reports of species occurrences and peer-reviewed by experts species by species. GAP began by mapping distributions of amphibian, bird, mammal, and reptile species. Recognizing that biodiversity includes all life forms, the program is currently developing methods to extend its coverage to fish, mussel, crayfish, snail, and other species, and will include additional species as knowledge and resources allow.

Mapping Land Stewardship and Finding Conservation Gaps

GAP characterizes land and water management according to the steward's (resource manager's) intent to maintain biodiversity. Stewardship maps identify categories of land ownership, managing authority, and management intent using standardized criteria applied by the resource manager. The distribution of a species or a natural community is overlaid with a land stewardship map, and the extent of an element's representation in conservation lands can then be determined.

Products

GAP data and reports are distributed through state data distribution centers for the cost of shipping and handling. Data are also made available on CD-ROM and through the GAP Web site <gapanalysis.usgs.gov>. Current products include:

- Land Cover Maps: Produced from 30-meter satellite imagery, in digital GIS format, showing dominant vegetation types (for example, "Eastern Cottonwood Floodplain Forest").
- Species Distribution Maps: Depict the predicted

distribution of each vertebrate species, in digital GIS format.
- Land Stewardship Maps: Indicate categories of ownership, managing authority, and management status for biodiversity conservation, in digital GIS format.
- State Project Reports: Offer analyses of the conservation status for each species and natural community, in digital form with graphic versions of all GIS maps.

Partnership Opportunities

GAP projects could not be conducted without the participation of nearly 500 cooperating state and federal agencies, academic and nonprofit institutions, and businesses. Nationwide cooperators include multiple Department of the Interior bureaus, the Department of Defense, the Environmental Protection Agency, and NatureServe. Partnerships often link entities that may not have previously worked together and provide benefits to all parties.

As part of the overall NBII Program, GAP investigators are helping many organizations apply GAP data to their projects and missions. Numerous GAP

applications have been developed nationwide, ranging from forest management, conservation planning, and scientific research endeavors to business and industry applications. A sample of applications of GAP data can be accessed on the Gap Analysis Program Web site. These Web pages also provide general information on the program, a collection of GAP literature, state contacts, the status of GAP projects, and specific data availability.

For More Information

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E-mail: gergely@uidaho.edu

Tiger Salamander
Ambystoma tigrinum

Primary Habitat

Secondary Habitat
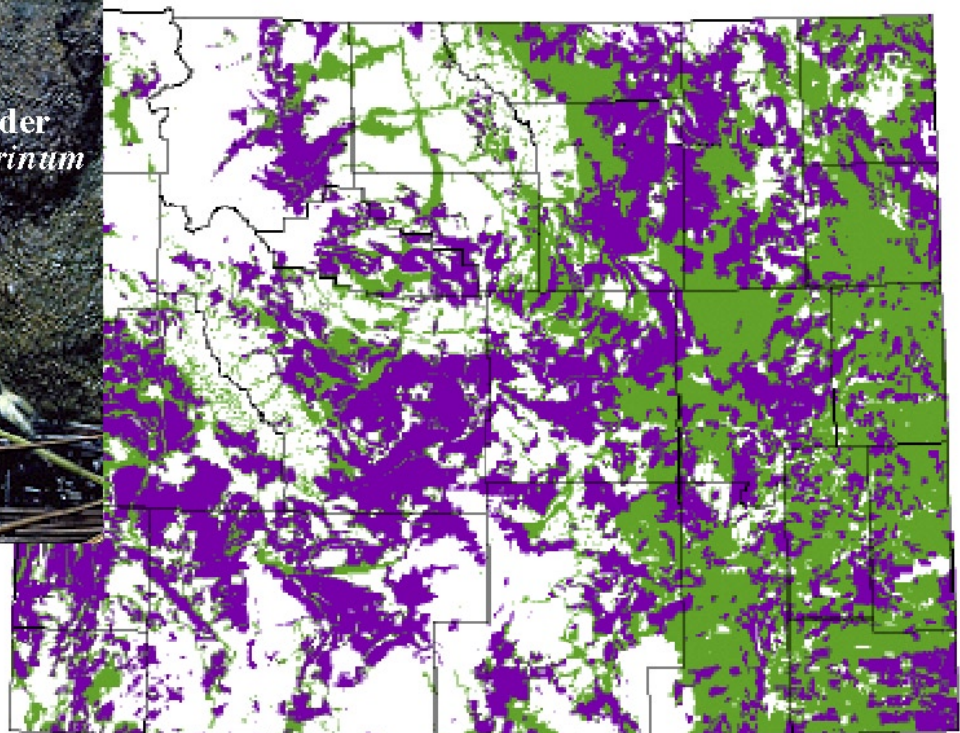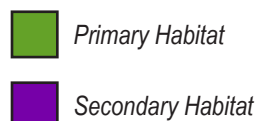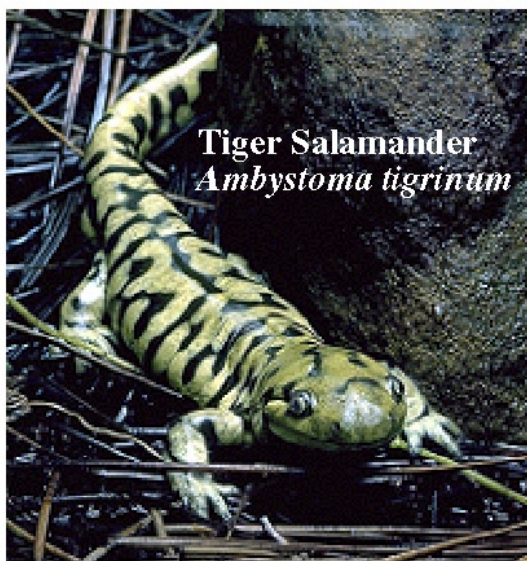
Example of Species Distribution Maps: modeled ranges of birds, mammals, reptiles, and amphibians.

How Partners Can Contribute:

Funding:

- Direct contributions to create mutually needed data
- Related contract work that meets mutual goals

In-kind support:

- Provide existing data
- Create data of mutual need
- Volunteer to assist accuracy assessment
- Expert review of preliminary products

Contacts for SWReGAP:

Regional Coordinator

Julie Prior-Magee, jpmagee@nmsu.edu (505) 646-1084

Arizona

Colorado Plateau Field Station, Flagstaff
Kathryn Thomas, kathryn_a_thomas@usgs.gov (928) 556-7466 ext 235

Colorado

Colorado Division of Wildlife and BLM-NSTC, Denver
Don Schrupp, hqwris@lamar.colostate.edu (303) 291-7277
Dianne Osborne, Dianne_Osborne@blm.gov (303) 236-5664
Lee O'Brien, lee@nrel.colostate.edu (970) 482-1802

Nevada

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William Kepner, kepner.william@.epa.gov (702) 798-2193
David Bradford, bradford.david@.epa.gov (702) 798-2681

Lockheed Martin Environmental Services
Todd Sajwaj, tsajwaj@lmepo.com (702) 897-3283

New Mexico

New Mexico Coop Fish & Wildlife Research Unit, Las Cruces
Ken Boykin, kboykin@nmsu.edu (505) 646-6303

Utah

Utah State University, RS/GIS Labs, Logan
Doug Ramsey, doug@nr.usu.edu (435) 797-3783
John Lowry, jlowry@cnr.usu.edu (435) 797-0653

Natureserve

Keith Schulz, kschulz@natureserve.org (303) 541-0356

SWReGAP Timeline:

1998- First organizational workshops held.
1999- Initial funds distributed. Regional and State Coordinators hired.
2000-2003 Landsat imagery acquired. Land cover mapping and animal modeling underway. Stewardship mapping initiated in 2003.
2004 Land cover mapping and stewardship completed.
2005 Animal modeling and analysis completed; reports written and data published.
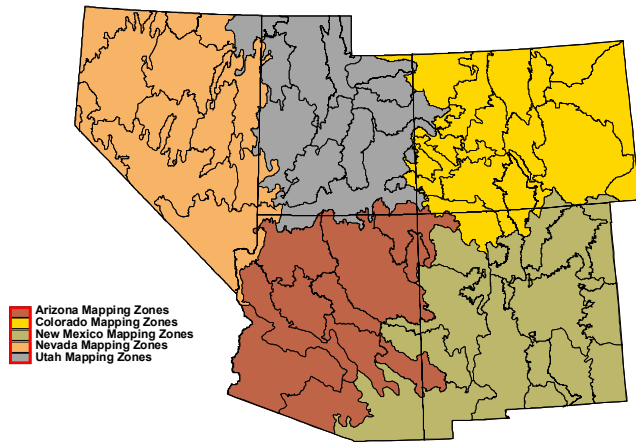
leopold.nmsu.edu/fwscoop/swregap
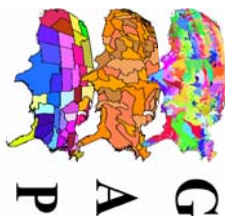
G A P

Southwest Regional Gap Analysis Project

Arizona   Colorado   Nevada   New Mexico   Utah

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Southwest Regional Gap Analysis Project

The Southwest Regional Gap Analysis Project (SWReGAP) is a mapping and assessment of biodiversity for the five-state region encompassing Arizona, Colorado, Nevada, New Mexico, and Utah. It is a multi-institutional cooperative effort coordinated by the U.S. Geological Survey's National Gap Analysis Program (GAP). The primary objective of this project is to use a coordinated mapping approach to create detailed, seamless maps of land cover, habitat for native terrestrial vertebrate species, land stewardship, and management status. This information is analyzed to identify animal species habitats and natural land cover types that are underrepresented on lands managed for their long term conservation. Knowledge of these "gaps" can aid proactive conservation planning in context with other human interests.

- Arizona Mapping Zones
- Colorado Mapping Zones
- New Mexico Mapping Zones
- Nevada Mapping Zones
- Utah Mapping Zones

Background

GAP provides regional assessments of the conservation status of native vertebrate species and natural land cover types to facilitate the application of this information to land management activities. SWReGAP is an effort by USGS and partners to produce another generation of land cover and vertebrate species data with improved resolution, detail, and accuracy.

The five-state project area includes approximately 1,373,774 sq. km. Federal lands encompass approximately 52% of this area, state lands— 7%, tribal lands — 9%, and other categories of ownership — 32%.

Total cost for project completion is estimated at nearly $5,000,000. With partial funding from USGS, SWReGAP is seeking both cash and in-kind support from cooperators. This support will be crucial to project completion.

Land Cover

The region was segmented into mapping zones, attempting to divide the area into homogeneous landscape units. The zones are based on expert knowledge, elevational gradients, and satellite imagery interpretation. Project labs in each state will map land cover within these zones rather than within state boundaries. The mapping zone approach will: (1) allow each team or lab to focus its efforts and specialize on interpretation of fewer, spectrally similar vegetation types; and (2) achieve a seamless, regional land cover map.

- 1999-2001 Landsat 7 Enhanced Thematic Mapper Plus imagery and sophisticated analytical procedures will be used to classify the vegetation.
- Land cover will be mapped to a 2-5 ha resolution.
- Land cover mapping will adhere to Federal Geographic Data Committee standards and will use the National Vegetation Classification System (NVCS). NVCS is a standardized classification system that provides a hierarchical framework for describing vegetation. Land cover will be mapped using a combination of ecological systems and alliance level classification and will include exotic and semi-natural types.
- High-resolution sensors are being researched to refine vegetation mapping in riparian areas.
- Accuracy assessment will be conducted to provide needed information to end-users.

Landsat 7 Satellite image of Southwestern New Mexico. Imagery similar to this will be used in land cover mapping.

Animal Habitat Modeling

SWReGAP will map predicted suitable habitat for all terrestrial vertebrates that breed or use habitat in the region for an important part of their life history. Habitat modeling uses, but is not constrained by known occurrence. It also uses probable and possible occurrence to define range limits. Outcomes are depicted as habitat maps for approximately 833 animal species.
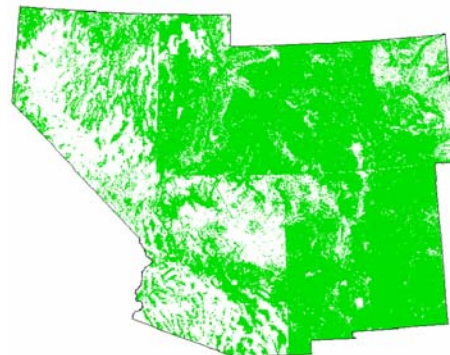

Merged predicted distribution of mule deer *(Odocoileus hemionus)* habitat from the prior GAP modeling efforts within the five SWReGAP states. The current project will eliminate these obvious state boundary effects.

Land Stewardship

SWReGAP will produce a land stewardship map for the five-state southwest region that indicates individual management units of public land and private conservation lands when voluntarily provided. Each tract will be characterized for land ownership, managing institution, and management status to reflect degree of maintenance of biodiversity. GAP currently uses a scale of 1 to 4 to denote relative degree of maintenance of biodiversity for each land tract. A status of "1" denotes the highest, most permanent level of maintenance, and "4" represents the lowest level of biodiversity management.

A comparison of ownership/managing entities to biodiversity management status will be made in order to report the representation of stewardship among the management status categories, and statewide.

Stewardship
- Federal
- Other
- State
- Tribal
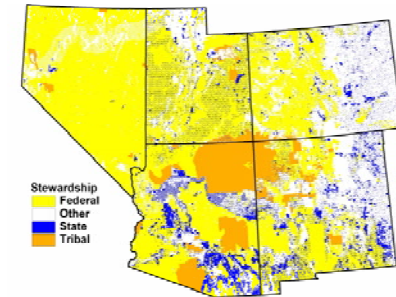
Sample map showing four categories of stewardship for the SWReGAP region. Final stewardship map will show more detailed categories for managing institutions.

Gap Analysis

The objective of gap analysis is to determine the representation of each mapped element (animal habitat and land cover distributions) according to managing entity and management status. The results will be reported in a way useful for land stewards in their development of land use and management plans that conserve or restore those biotic elements or avoid causing further impairment.

Products and Applications

Digital products are anticipated to be available on CD-ROM and the Internet (www.gap.uidaho.edu) in 2005. Products will be available for the entire region, as well as for individual states and include:
1) GIS datasets of land cover, animal habitat distribution, and stewardship/ownership
2) Gap analyses results
3) Areas of species richness
4) Ancillary data used in modeling
5) Report of methods and results

GAP products are provided to the public and those entities charged with land use research, policy, planning, and management. GAP has provided resource data and analyses to federal, state, regional, and local government institutions, as well as private conservation organizations.