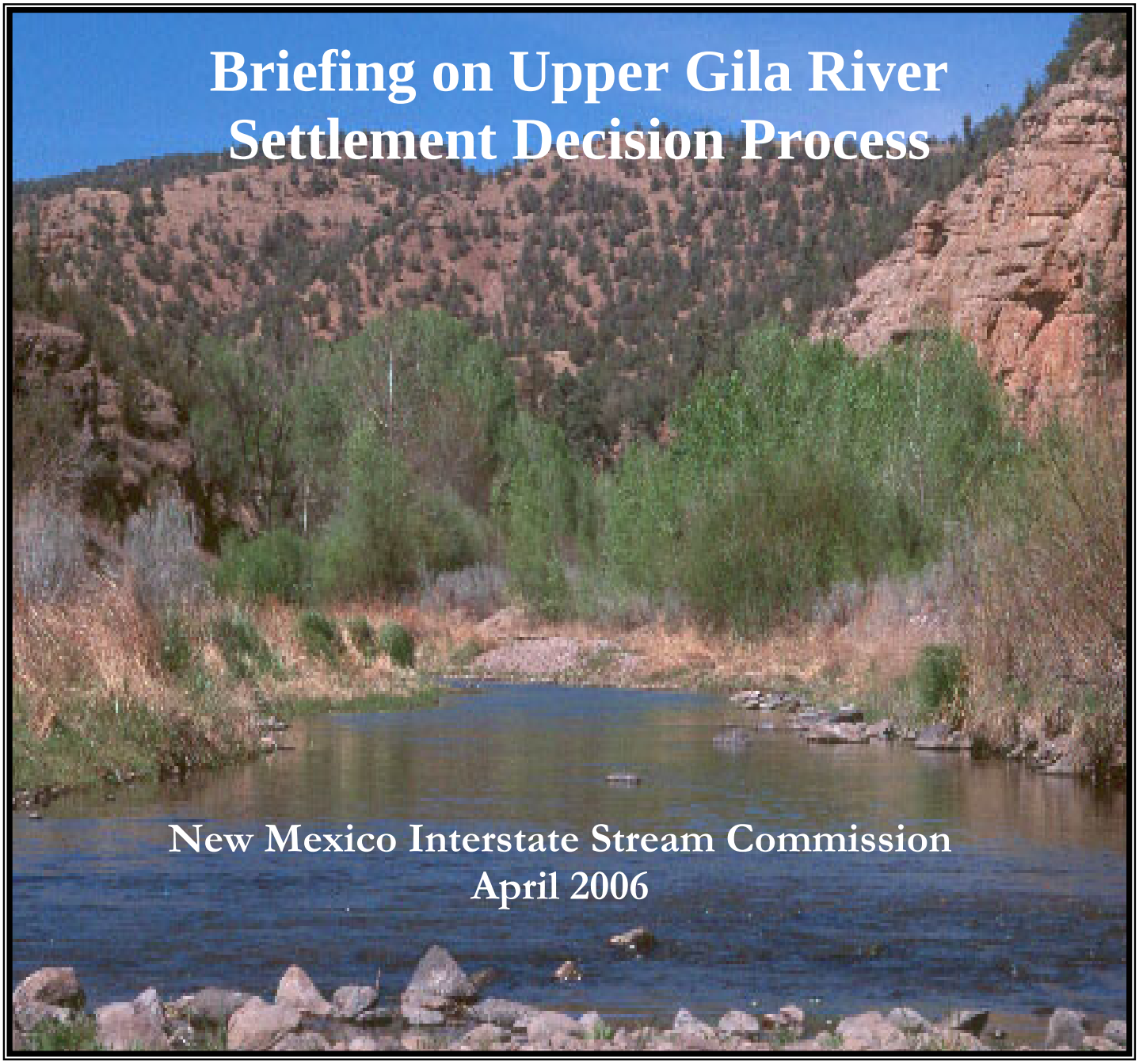

Briefing on Upper Gila River Settlement Decision Process

New Mexico Interstate Stream Commission

April 2006

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SUMMARY

The 2004 Arizona Water Settlements Act provides additional water for New Mexico and $66 Million to $128 Million in non-reimbursable federal funding. Beginning in 2012, $66 Million is received in ten annual deposits into the New Mexico Unit Fund, a fund established and administered by the New Mexico Interstate Stream Commission. Expenditures from the Fund must meet a water supply demand and be approved by the New Mexico Interstate Stream Commission in consultation with the Southwest New Mexico Water Planning Group. Expenditures from the New Mexico Unit Fund may include necessary costs associated with planning, environmental compliance activities, and environmental mitigation and restoration. Any funds above the $66 Million are disbursed on a cost-schedule basis only for a project or activity that would develop additional water for New Mexico in the Gila Basin.

The direction from both the New Mexico Interstate Stream Commission and the Governor of New Mexico is to use the best available science and information, coupled with a full and inclusive public involvement process, to both protect the unique and valuable ecology of the Gila Basin and to provide for present and future water needs. Reconciling these sometimes contradictory demands will be neither easy nor simple. By 2014 New Mexico must give notice to the Secretary of the Interior how, or if, New Mexico wishes to utilize its benefits under the Act. Notice to the Secretary must be based on sound science and reasoning. The goal of this planning and decision process must be to provide the citizens of southwest New Mexico the information and data they need to come to an informed and considered decision and to get them that information in a timely manner.

The Act requires full compliance with all provisions of federal environmental mandates including the National Environmental Policy Act and the Endangered Species Act. The upper Gila River basin has a number of species listed under the Endangered Species Act, including spikedace, loach minnow, Gila chub, Chiricahua leopard frog and southwest willow fly catcher. The impacts on state and federally listed species from any use of the funds or development of the water that New Mexico gained in the 2004 Arizona Water Settlements Act (2004 Act) is a critical consideration in any decision on how to utilize those benefits.

We have a short time to complete the required studies and planning/decision process. The key to a successful planning and decision process is collaborative management by the Gila-San Francisco Coordination Committee (GSFCC). The GSFCC is composed of representatives of the US Fish and Wildlife Service, the Bureau of Reclamation, the Southwest Water Planning Group (representatives of local governments in southwest New Mexico), the New Mexico Interstate Stream Commission, and the New Mexico Office of the Governor. Each of these members has statutory responsibility for implementation of the settlement under either the 2004 Act or other state and federal statutes. It will be the responsibility of the GSFCC to ensure the planning process is efficiently executed and necessary work accomplished in a timely manner.

The GSFCC will be responsible for coordinating this initial study of possible impacts to endangered species. The Technical and Public Involvement Subcommittees, independent science forums, public workshops and meetings, and other necessary studies and work will provide input to the GSFCC. It will be the task of the GSFCC to manage this process, keep it on schedule and focused, and ensure that the different work efforts are mutually supportive and not duplicative.

By the end of 2009, the work done under the GSFCC must be able to support a Fish and Wildlife Coordination Act report that will summarize possible impacts from use of New Mexico's benefits under the 2004 Act, and provide constraints and guidance on possible mitigation activities. The completion of a Coordination Act Report early, rather than near the end of the planning process, is key in that it allows the selection of options to focus on the most likely candidates and because it will permit an efficient, streamlined NEPA process.

A decision on how, or if, to best utilize the benefits New Mexico received in the 2004 Act will be successful only if it is applauded far into the future, not only in the present. The fundamental goal of this planning and decision process is to provide the citizens of southwest New Mexico the information and means to make a considered decision. More than any other element, the success of this process is contingent on the full and collaborative involvement of federal partners, stakeholders, decision-makers, and the public.

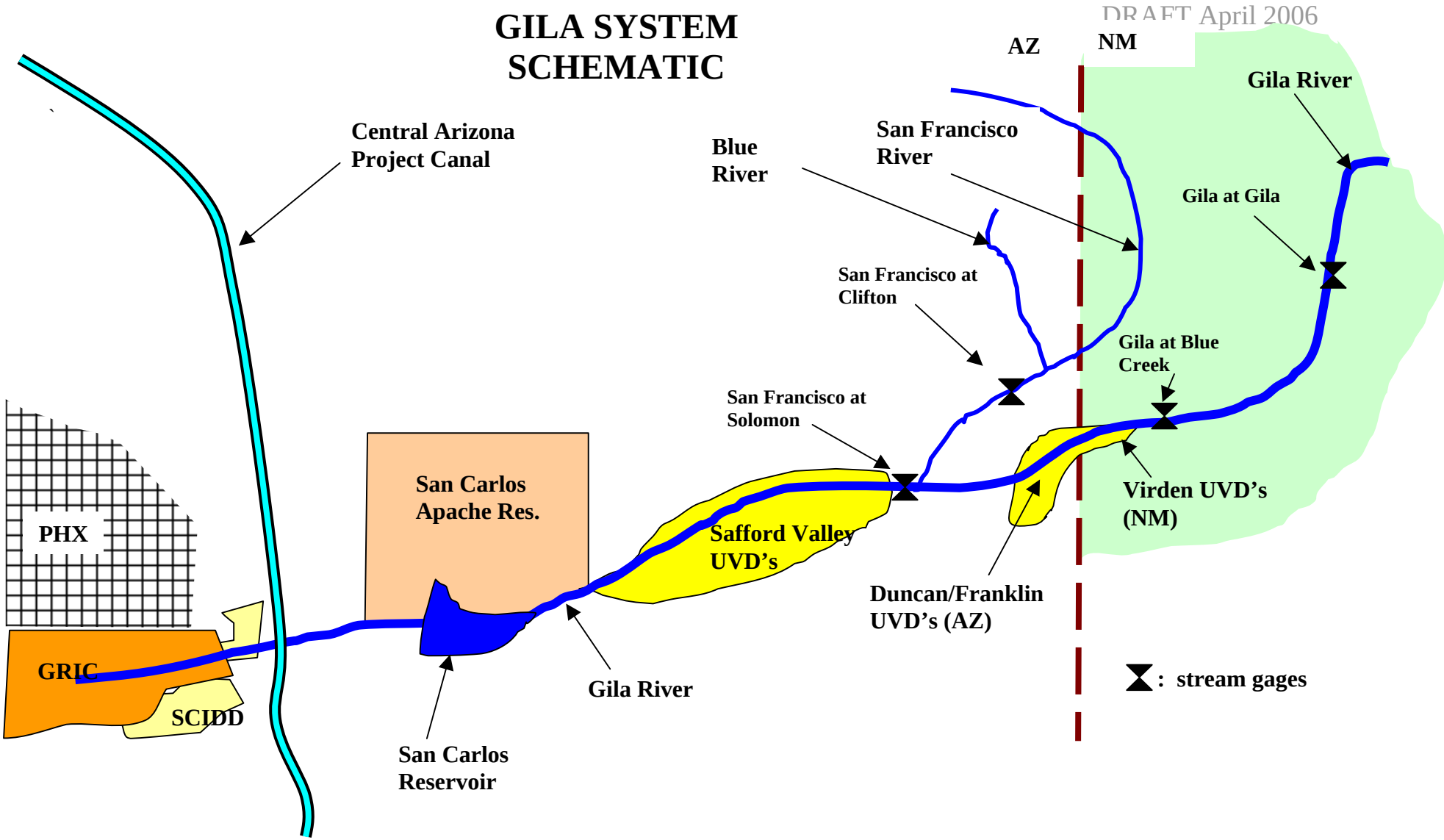

Figure 1. Gila Schematic. New Mexico could divert additional Gila Basin water in New Mexico (light green area) and the Secretary of the Interior would replace that water with Central Arizona Project (CAP) water where the CAP canal intersects the Gila River just upstream of Phoenix.

2004 ARIZONA WATER SETTLEMENTS ACT

On the larger scale, the 2004 Arizona Water Settlements Act settles major Indian water rights issues in Arizona, caps Arizona's re-payment obligations for the Central Arizona Project, and provides for infrastructure improvements in AZ. New Mexico's benefits are a small part of the Act. There are two documents in the Act that are of special importance to New Mexico. The first is Title II of the Act, Gila River Indian Community Water Rights. The second is the Consumptive Use and Forbearance Agreement (CUFA).

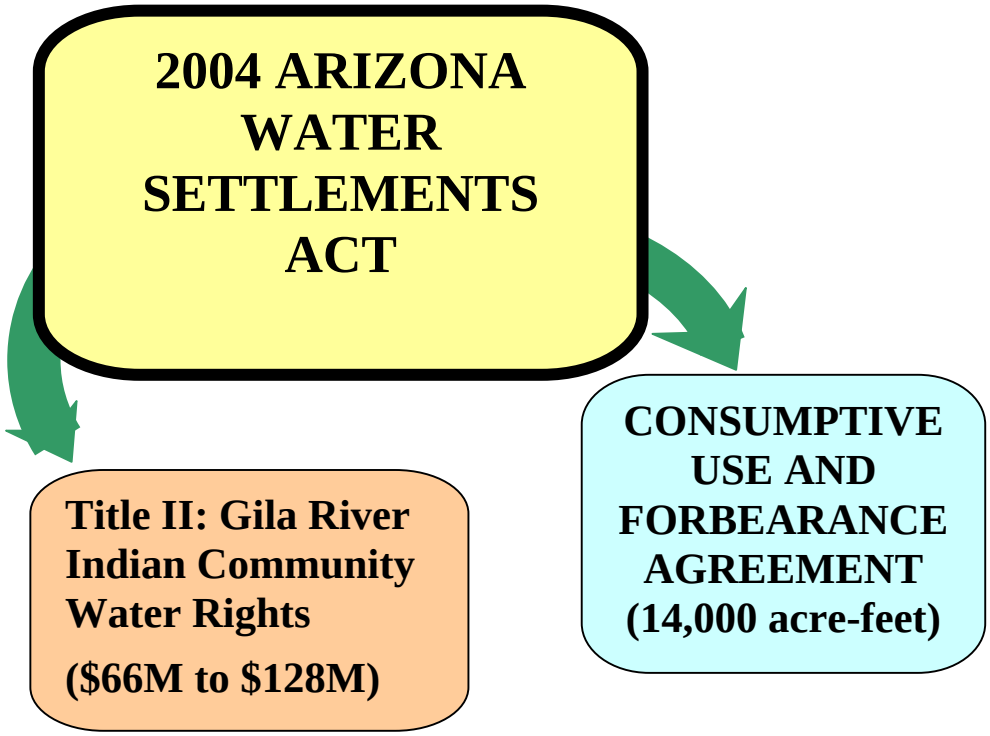

Figure 2. The two sections of the 2004 Arizona Water Settlements Act that are of special importance to New Mexico. In Title II of the Act, Congress granted New Mexico $66 Million to $128 Million in non-reimbursable federal funding. In the Act, Congress also ratified the Consumptive Use and Forbearance Agreement (CUFA), a contract between New Mexico and Arizona water users that permits development of up to 14,000 acre-feet of additional Gila Basin water without objection by senior Arizona rights.

Title II, 2004 Arizona Water Settlements Act

Sections 107 and 212 of Title II provide for ten annual deposits, beginning in 2012 and totaling $66M (adjusted for cost increases), into the New Mexico Unit Fund, a fund established and administered by the New Mexico Interstate Stream Commission. Any expenditure from the Fund must meet a water supply demand and be approved by the New Mexico Interstate Stream Commission in consultation with the Southwest New Mexico Water Planning Group, representing local governments. Expenditures from the

New Mexico Unit Fund may include necessary costs associated with planning and environmental compliance activities and environmental mitigation and restoration.

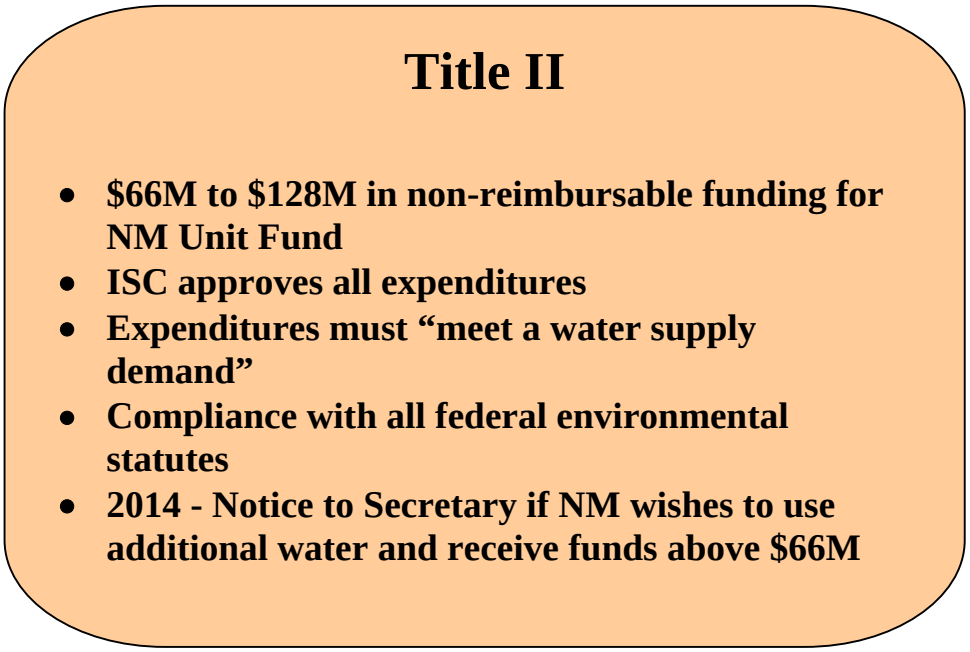

Figure 3. Main provisions of Title II, 2004 Arizona Water Settlements Act. The planning process must ensure that adequate information is developed early enough in the process to provide for an informed and considered decision on how to use the money and water New Mexico received in the 2004 Act.

By the US Supreme Court Decree in AZ v. CA (1964), New Mexico is currently limited to approximately 30,000 acre-feet of depletions in the Gila Basin on an annual average. Title II allows an additional average of 14,000 acre-feet depletions per year, or an almost 50% increase in available water supplies. In addition, should New Mexico choose to develop Gila Basin water as provided in the CUFA, the Act provides for increased payments up to $128M, on a construction cost schedule basis.

Other key provisions in the Act are:

- Congress ratified the Consumptive Use and Forbearance Agreement (CUFA), the agreement that permits the development in New Mexico of an additional average of 14,000 acre-feet of Gila Basin water without objection by Arizona parties to the settlement.
- Provides for a New Mexico Unit Agreement between New Mexico water users and the Secretary of the Interior. The New Mexico Unit Agreement is that contract between the Secretary and water users for the additional 14,000 acre-feet of Gila Basin water. The Agreement must be executed within one year of New Mexico's

request for such agreement and must be approved by the New Mexico Interstate stream Commission.

- All funds disbursed to New Mexico from the Lower Basin Development Fund shall be non-reimbursable.
- New Mexico water users (the NM CAP Entity) are responsible for their proportional share of OM&R charges but are not responsible for any capital costs attendant to the Central Arizona Project.
- The Secretary is authorized to plan, design, and build facilities (the New Mexico Unit) to utilize the additional Gila Basin water, but upon request by New Mexico, the Secretary shall transfer to New Mexico the responsibility to design, build, or operate and maintain the New Mexico Unit.
- The NM CAP Entity shall own and hold title to all features constructed to divert water in New Mexico.
- Upon execution of the New Mexico Consumptive Use and Forbearance Agreement, the Secretary is directed to carry out all necessary environmental compliance required by Federal law.
- Bureau of Reclamation is the federal lead agency for environmental compliance. Upon request by New Mexico, New Mexico shall be designated joint lead agency.

If New Mexico does not choose to develop additional Gila Basin water, the additional funding between $66 Million and $128 Million will be allocated for uses in Arizona. Accordingly, Title II of the Act also provides certain deadlines for action by New Mexico:

- The State of New Mexico must provide notice to the Secretary in writing not later than December 31, 2014, that the State of New Mexico intends to have constructed or developed the New Mexico Unit. In practical terms, this means New Mexico must know before 2014 what it wishes to do in terms of developing or not developing the water apportioned received in the Act, be able to demonstrate that any chosen option for use of the water is viable, and deliver an informed and considered notice.
- To develop the additional 14,000 acre-feet or any portion thereof, the Secretary must have issued in the Federal Register not later than December 31, 2019, a Record of Decision approving the New Mexico project or other water utilization option.

The Consumptive Use And Forbearance Agreement

The Consumptive Use and Forbearance Agreement (CUFA) is one of almost sixty agreements between parties in the various settlements. Congress specifically ratified the CUFA in the Arizona Water Settlements Act. In the CUFA, New Mexico has the contractual right, without objection by downstream parties in Arizona, to develop and consumptively use on average up to 14,000 acre-feet of water per year from the Gila

Basin, in addition to the approximately 30,000 acre-feet previously adjudicated to New Mexico in the 1964 US Supreme Court Decree in AZ v. CA, representing an increase of almost fifty percent in available water.

The parties to the CUFA are the Gila River Indian Community, San Carlos Irrigation and Drainage District, the United States, Franklin Irrigation District, Gila Valley Irrigation District, Phelps Dodge Corporation, the Secretary of the Interior, and other non-Indian parties such as irrigation canal companies and ditch associations. The State of New Mexico is not a party to the CUFA, but the CUFA and any amendments are subject to approval by the ISC. The San Carlos Apache Tribe is not a party to the Gila settlement or any of the other settlement agreements.

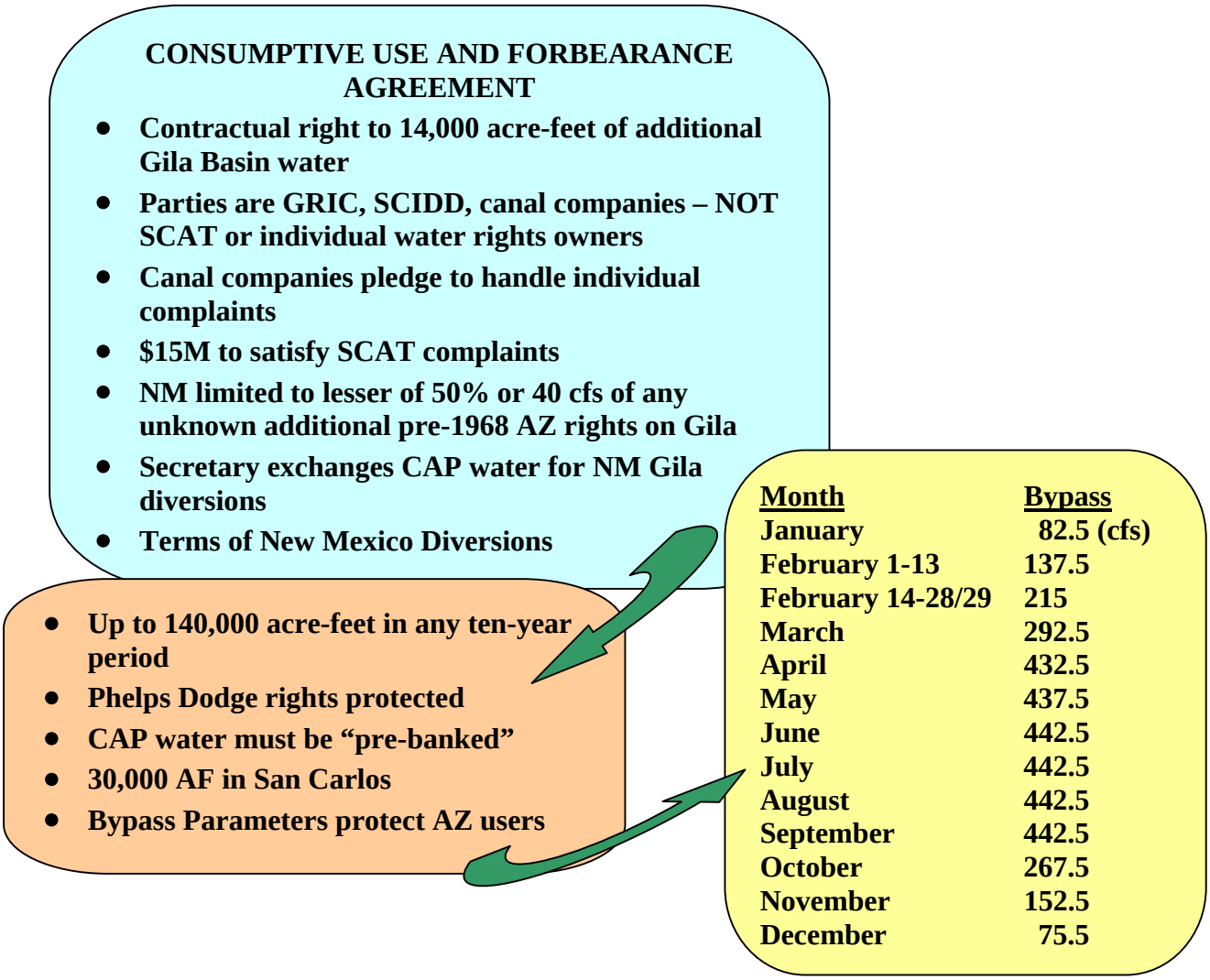

Figure 4. The Consumptive Use and Forbearance Agreement (CUFA), ratified by Congress in the 2004 Arizona Water settlements Act, provides bypass of minimum flows by month and other provisions that protect Arizona water users and make possible New Mexico's diversion of additional Gila Basin water without objection by senior downstream users.

The preamble provisions specify that the intent of the CUFA is to allow the Secretary to exercise the rights authorized in the 1968 Colorado River Basin Project Act, and to prohibit the Arizona parties from challenging New Mexico water uses that are in compliance with the CUFA. The CUFA is consistent with the 1968 Act in that, to enable additional water uses in New Mexico, the Secretary must provide CAP water to impaired downstream Arizona water users in exchange for diversions from the Gila system in New Mexico. New Mexico will divert water that is at the call of the Gila River Indian Community and the San Carlos Irrigation and Drainage District. The Secretary will replace the Gila water New Mexico diverts with Central Arizona Project Water at the point the Central Arizona Project canal intersects the Gila River (Figure 1).

The exhibit in the CUFA titled the "Terms of the New Mexico Diversions," specifies that on a daily basis, New Mexico must bypass water to meet downstream water rights:

For NM Diversion Days in the month of:	Bypass Amount (CFS)
January	82.5
February 1-13 February 14-28/29	137.5 215
March	292.5
April	432.5
May	437.5
June	442.5
July	442.5
August	442.5
September	442.5
October	267.5
November	152.5
December	75.5

New Mexico water users are obligated only to bypass an additional 50% of any additional water rights that may be in the future adjudicated in Arizona with a priority date earlier than 1968, or 40 cfs, whichever is less.

Other key provisions of the CUFA provide additional requirements on New Mexico's ability to divert additional Gila Basin water:

- New Mexico diversions cannot exceed a total of 140,000 acre-feet of water during any consecutive 10-year period.
- New Mexico may not consumptively use more than 64,000 acre-feet in any one year.

- New Mexico users cannot divert water unless there are at least 30,000 acre-feet in the downstream San Carlos Reservoir.
- New Mexico water users must "pre-bank" (purchase) CAP water before the secretary will make the required exchange of CAP water for Gila Basin water that New Mexico diverts.

The San Carlos Apache Tribe, downstream of New Mexico and upstream of the Central Arizona Project Canal, is not a party to the agreement. To accommodate potential San Carlos objections to diversions by New Mexico, the Act provides $15 Million to ensure the San Carlos Apache Tribe is able to obtain its rightful water:

- A sum of $15 million from the Lower Colorado River Basin Development Fund that can be used to construct a pipeline or other mechanism that could provide water to the San Carlos Apache Tribe guarantees and that Arizona parties will bypass water to accommodate any additional Arizona rights above the 40 cfs cap.
- In the event additional rights are adjudicated to the San Carlos Apache Tribe through a settlement amongst the Arizona parties, New Mexico would not be responsible for bypassing any additional water to Arizona to accommodate those rights.

A technical committee will resolve certain technical issues that may arise under the CUFA in the future, and New Mexico water users are entitled to participate on the technical committee.

THE PLANNING AND DECISION PROCESS

Interstate Stream Commission Policy

Reflecting New Mexico State statutes, Congress directed in the 2004 Arizona Water Settlements Act that the New Mexico Interstate Stream Commission approve any expenditure of monies or contracts for water received by New Mexico in the settlement. Even before the Act was signed into law, the Commission adopted a policy to guide it through the planning and decision process:

> **"The Interstate Stream Commission recognizes the unique and valuable ecology of the Gila Basin. In considering any proposal for water utilization under Section 212 of the Arizona Water Settlements Act, the Commission will apply the best available science to fully assess and mitigate the ecological impacts on Southwest New Mexico, the Gila River, its tributaries and associated riparian corridors, while also considering the historic uses of and future demands for water in the Basin and the traditions, cultures and customs affecting those uses."**

Under State statute, the Governor is also responsible for ensuring the equitable distribution of interstate waters. This policy was adopted by the Commission and approved by the Office of the Governor, with the further directive that the planning and decision process be executed within a fully inclusive and transparent public involvement process.

This process will plan and decide how best to utilize the benefits received in the 2004 Arizona Water Settlements Act. To resolve the potential conflicts between protection of the Gila Basin ecology and present and future demands for water will be neither easy nor simple. The responsibility for the first critical step in this process, providing the citizens of New Mexico the information they need with respect to possible impacts on endangered species, lies with the Gila-San Francisco Coordinating Committee.

The Gila-San Francisco Coordinating Committee

The Gila-San Francisco Coordinating Committee is the body responsible for all management of the planning and decision process. Representatives of the New Mexico Interstate Stream Commission (ISC), the Bureau of Reclamation (BuRec), U.S. Fish and Wildlife Service (FWS), the New Mexico Office of the Governor (NMOG), and the Southwest New Mexico Water Planning Group (SWNMWGP) or its successor form the Gila-San Francisco Coordinating Committee (Figure 5).

All members of the GSFCC have statutory authority and responsibilities under the 2004 Arizona Water settlements Act or other federal or state statutes. The Act designated the

BuRec as lead federal agency for environmental compliance. The ISC and the NMOG have those authorities and responsibilities listed above. The Act provides that the ISC will consult with the SWNMWPG on any expenditure of funds. In addition to authorship of the Coordination Act Report, the US FWS is responsible for consultation with BuRec and issuance of a Biological Opinion that the Secretary of the Interior will consider in any Record of Decision approving or disapproving any use of the federal funds or contract.

To provide for the most efficient process, the member parties of the GSFCC will collaboratively oversee and implement the evaluation of the environmental effects of potential water withdrawals under terms of the Consumptive Use and Forbearance Agreement (CUFA) as approved by Congress in the Act.

Figure 5. The Gila-San Francisco Coordinating Committee is made up of five organizations that have statutory responsibility for implantation of the New Mexico portions of 2004 Arizona Water Settlements Act. It is the responsibility of the GSFCC to manage the scientific, technical, and public involvement processes that will provide for an adequate US Fish and Wildlife Report by 2009.

These entities formed the GSFCC with the understanding that potential effects to Federally listed and proposed species are key components in determining the viability of options for use of New Mexico's benefits under the Act. Using the best available data and science, the members of the GSFCC will first cooperate in evaluating effects on fish,

neotropical migratory birds, and other wildlife resources, from potential flows based on those terms in the CUFA that provide for New Mexico's diversion of additional water from the Gila Basin.

Each entity has one representative and one alternate that sit on the committee. The GSFCC meets monthly and meeting locations change in a quarterly rotational basis. One meeting is in person in Albuquerque, NM. The following month the meeting is by teleconference, and the third meeting in a quarter is in southwest New Mexico immediately following the monthly meeting of the SWNMWPG. Although the public is able to attend any meeting, the quarterly meeting in southwest New Mexico will be well publicized, and the public will be encouraged to attend. All meeting notes and any decisions made by the GSFCC are available on the web, and any information relating to the GSFCC is posted at http://www.ose.state.nm.us/isc_colorado.html and updated monthly. The GSFCC will strive to reach consensus on all issues. However, if the chair feels a decision must be made to ensure timely progress or if the consensus is not attainable, the chair must call for a vote. Each entity has one vote, and the majority vote will rule. The minority opinion will be able to document their concerns in the meeting notes, which are available to the public on the GSFCC web site.

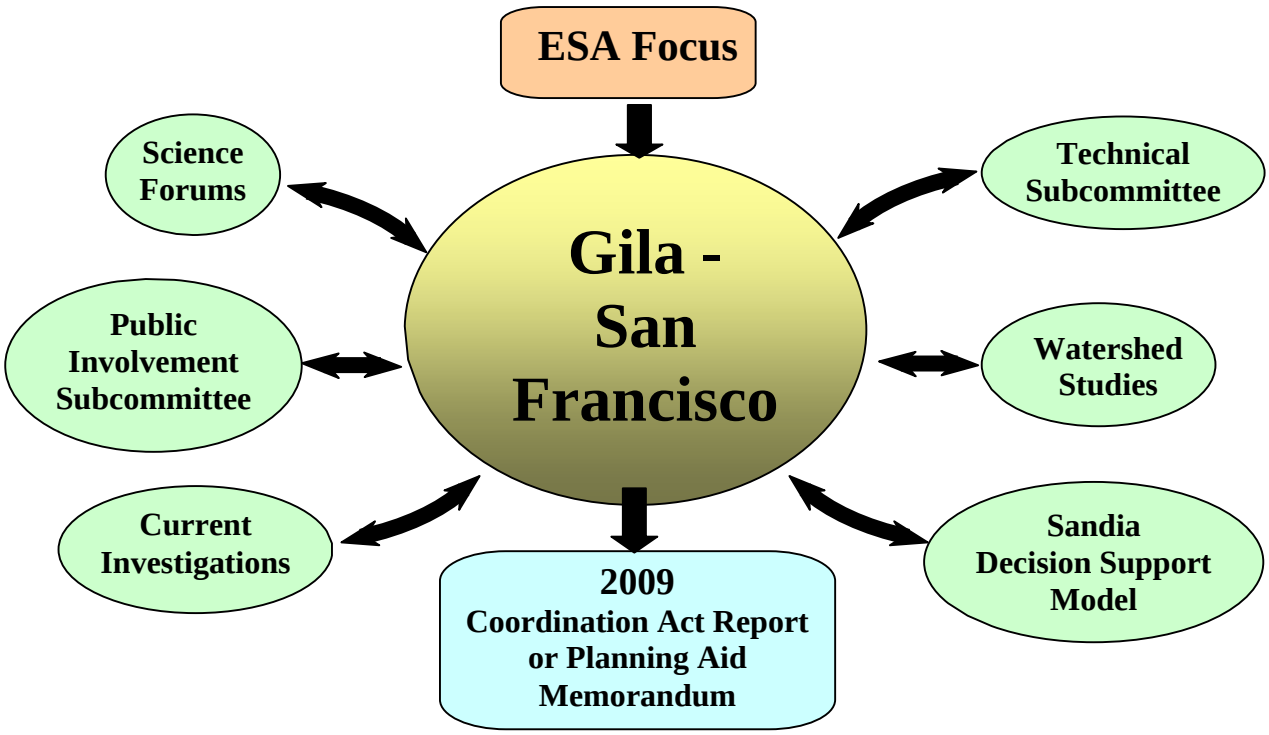

Figure 6. The planning process managed by Gila-San Francisco Coordinating Committee from 2006 to 2009, focusing on endangered species issues and resulting in a US Fish and Wildlife Coordination Act Report or Planning Aid Memorandum.

The GSFCC is a collaborative management body designed to ensure that the necessary studies are completed, and information attained in the efficient manner necessary to produce a comprehensive Coordination Act Report by 2009 (Figure 6). A Coordination

Act Report by 2009 will provide to the citizens of southwest New Mexico, in a timely manner, sound information on the critical endangered species issues. The Coordination Act Report will also lay a sound scientific basis for an efficient NEPA process (Figure 7).

A number of efforts will contribute to the information that will feed into the 2009 report. It is the task of the GSFCC to ensure that scientific studies, public outreach, and data acquisition and analyses progress efficiently and to resolve conflicts or indecisions that prevent completion of the Coordination Act Report by 2009.

There are two very distinct but related phases to the planning and decision process. The first is the work managed by the GSFCC to produce a US FWS Coordination Act Report (or Planning Aid Memorandum) by 2009 (Figure 6). The second phase utilizes the Coordination Act Report as a tool to select prudent options for use of New Mexico's benefits under the Act and permit efficient conclusion of any NEPA process, allowing the Secretary of Interior to issue a Record of Decision by or before 2014 (Figure 7).

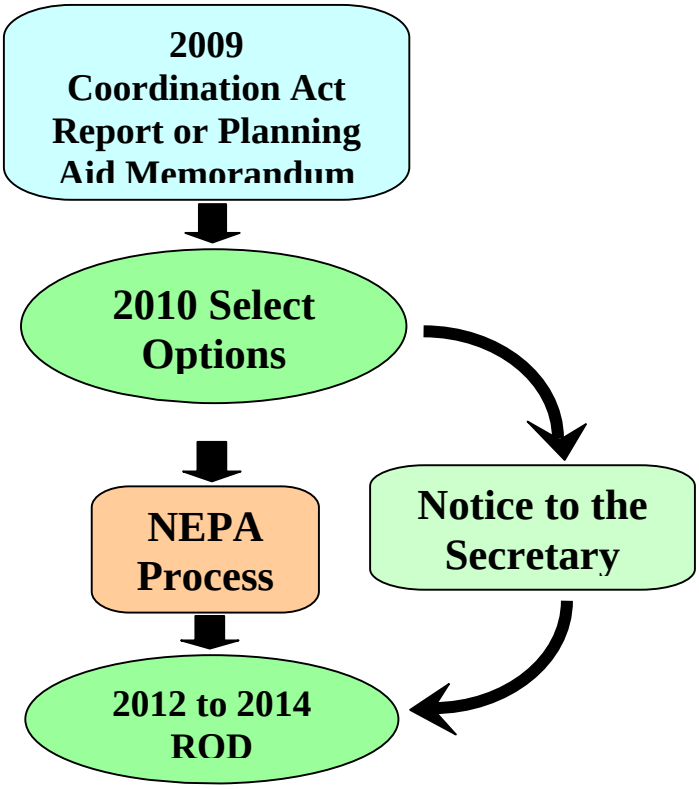

Figure 7. The 2009 Coordination Act Report or Planning Aid Memorandum will allow New Mexico to move efficiently forward with selection of prudent options, give an informed and considered notice to the Secretary, and arrive at a Record of Decision (ROD) by 2014, or earlier.

Technical and Public Involvement Subcommittees

The GSFCC currently directs the work of two subcommittees: the Technical Subcommittee and the Public Involvement Subcommittee. The Technical

Subcommittee is comprised of science and technical experts from a number of participating agencies (federal, state, and local), conservation organizations, and local groups and representing diverse disciplines including hydrology, native fisheries, riparian ecology, watershed management, and others (Figure 8). This Subcommittee will focus on technical and scientific issues related to the possible impacts from diversions permitted under of the Consumptive Use and Forbearance Agreement (CUFA). They will make recommendations to the GSFCC on studies to be scoped, etc. The GSFCC will make the final decisions on what work is funded and what studies are undertaken.

Figure 8. Representation on the Technical Subcommittee. Representation includes experts from diverse disciplines including hydrology, native fisheries, riparian ecology, watershed management, and others.

The Public Involvement Subcommittee is comprised of stakeholders including local governments, agricultural interests, and environmental and conservation organizations. This group is tasked with communicating any actions and decisions made by the GSFCC to the public and local governments, and with tracking and documenting input and comment received from these groups. Any public meetings, presentations or other action of the GSFCC will be publicized and memorialized by the Public Involvement Subcommittee. Figure 9 presents the complex but necessary multitude of paths of a full and inclusive public involvement process.

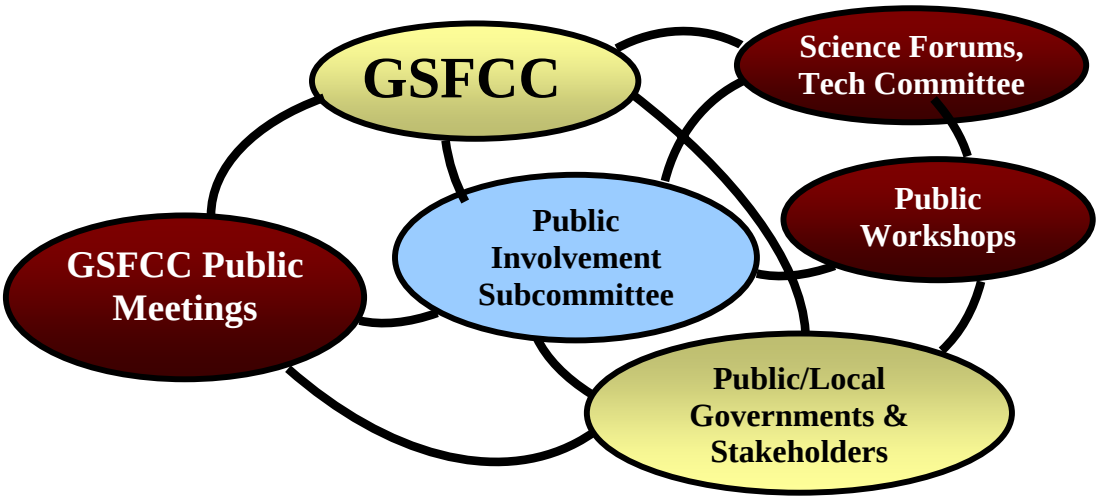

Figure 9. The planning process is structured to allow as many paths as possible for information to pass between the GSFCC and the public, local governments, and stakeholders. The Public Involvement Subcommittee will oversee public outreach.

Science Forums

In addition to formal subcommittees, the GSFCC will sponsor a number of science forums over the next three years.

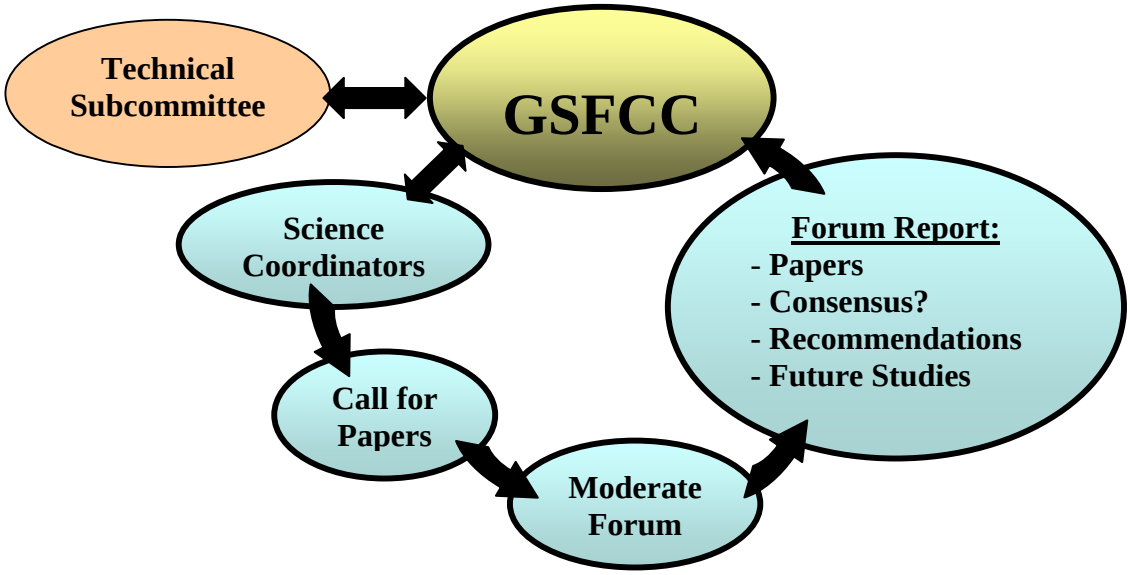

Figure 10. Science is necessarily a never-ending process. It will be the responsibility of the GSFCC, with input from the technical committee and independent science coordinators of the forums, to focus and direct the science forums. The product of these forums will be communicated to the public, stakeholders, and decision-makers via the Public Involvement Subcommittee and public workshops.

These forums will promote the use of the best available science (Figure 10). For example, the first science forum will discuss and assess existing data on the endangered species in

the Gila Basin. A series of presentations by science experts will discuss what kind of data has already been collected and analyzed, how reliable that data is and if it can be used in future decisions. Hopefully, this forum will help the GSFCC decide what data and information gaps exist and what additional studies would lend the greatest value to the planning and decision process. Future forums will be directed by questions garnered in the first forum and subsequent discussions and investigations. The public is welcome to attend any science forum. Local government and political participation in this process is welcome.

A number of on-going current investigations and studies have already begun and will be discussed in the next section. By 2010, we will have information and data to guide an informed and considered notice to the Secretary and lead us into an efficient NEPA process. In 2010, the ISC, in consultation with the Southwest New Mexico Water Planning Group and with input from other stakeholders and the general public, will present general constraints for selection of realistic options that will promote an efficient and timely NEPA process (Figure 7). Again, the process will complete much of the necessary required studies and discussions prior to beginning the NEPA process.

Combining the "best science available" with a fully inclusive public outreach process is neither simple nor easy. It will take hard but cooperative effort from all groups and citizens. However, to provide the citizens of southwest New Mexico the best available science coupled with the best information and data upon which to base an informed and considered decision, and to fully optimize the benefits New Mexico received in the 2004 Arizona Water Settlements Act, there is no alternative path.

CURRENT INVESTIGATIONS

Sandia National Labs Decision Support Model

Sandia National Labs is assisting the New Mexico Interstate Stream Commission in developing decision tools to support implementation of the articles pertaining to the New Mexico Unit of the 2004 Arizona Water Settlements Act. The model focuses on water arising in the Gila and San Francisco Basins in Arizona and New Mexico, and is being developed collaboratively with input from stakeholders in southwest New Mexico. The product from this effort will be an interactive water supply model that the stakeholders and the public can use as one of a number of tools to develop a feasible plan to utilize the water and funding available through the 2004 Act.

The CUFA provisions of the 2004 Act have been modeled, and look at whether the New Mexico Unit can use water based on the necessary legal conditional tests. River routing has been built into the model to route historic water flow data between gages to ensure that water moves through the model in a way that mimics timing in the actual river system. Currently, the modeling team is estimating the evapotranspiration and irrigation components of the model. Future steps include watershed rainfall-runoff modeling, which will help determine tributary inflow into the main river reaches. A groundwater model will be developed and linked to the surface water model, and an ecological model will look at the relationship between the rivers and associated riparian and aquatic communities.

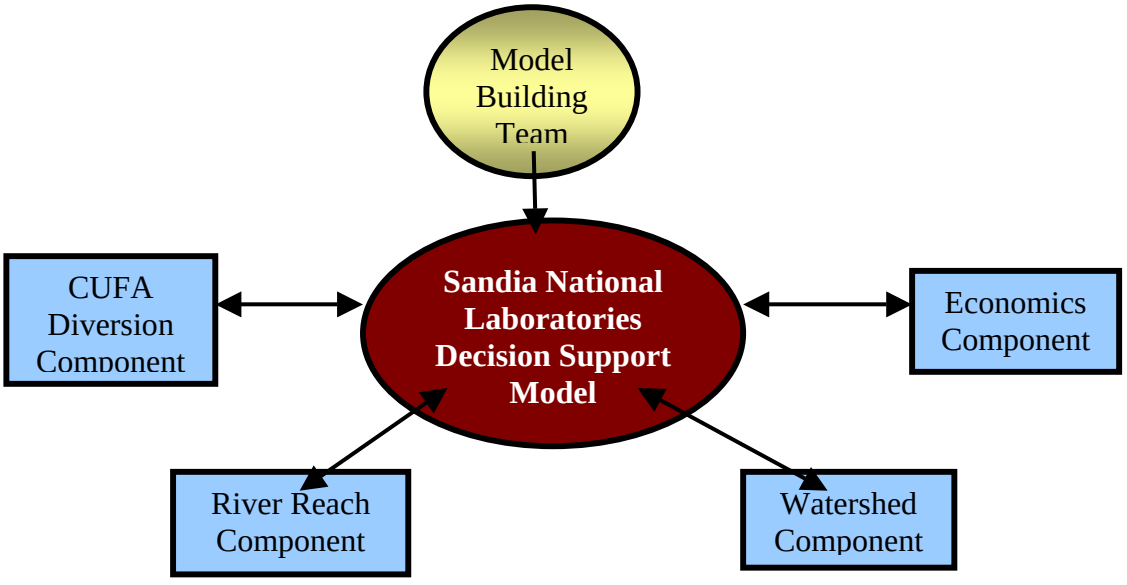

Figure 11. Basic components of the Sandia National Laboratories Decision Support System model. Decision-makers and stakeholders can use the model to investigate trends resulting from differing options for use of New Mexico's benefits under the 2004 Arizona Water settlements Act.

The diverse membership of the model team represents the stakeholders within the Upper Gila River Watershed. Their participation ensures that social, economic, environmental and political concerns are represented and addressed. This membership also serves to incorporate both public outreach and science topics into an informative package that provides stakeholders with the means to assess various options for use of the benefits in the 2004 Act and to educate decision-makers and stakeholders.

After the model is completed it will be placed on the Sandia National Laboratories website to serve as a tool for stakeholders to interact with and assess different scenarios within the constraints of the Act and the CUFA.

The model building team meets twice a month to develop the model and address concerns of team members. Modeling sessions are conducted by teleconference and interactive modeling sessions on the Sandia National Laboratories website. Participation by team members has been excellent and the team has incorporated local information, data, and needs into the modeling effort.

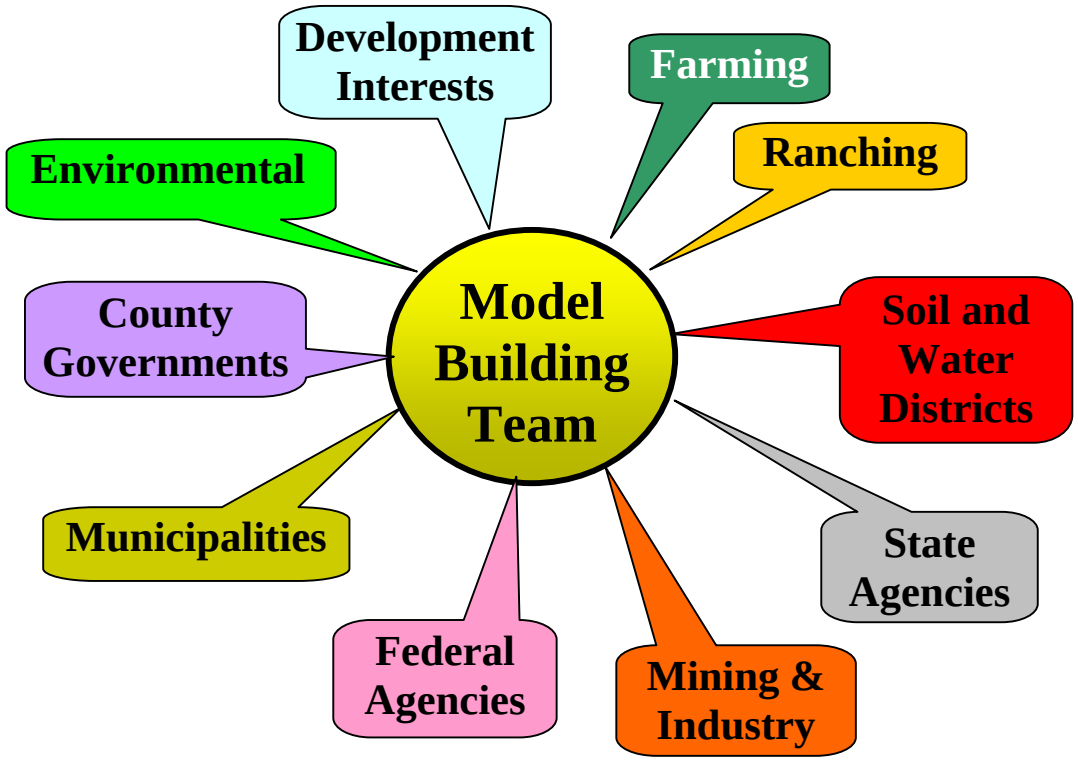

Figure 12. Representation on the Sandia National Laboratories Decision Support System Modeling Team.

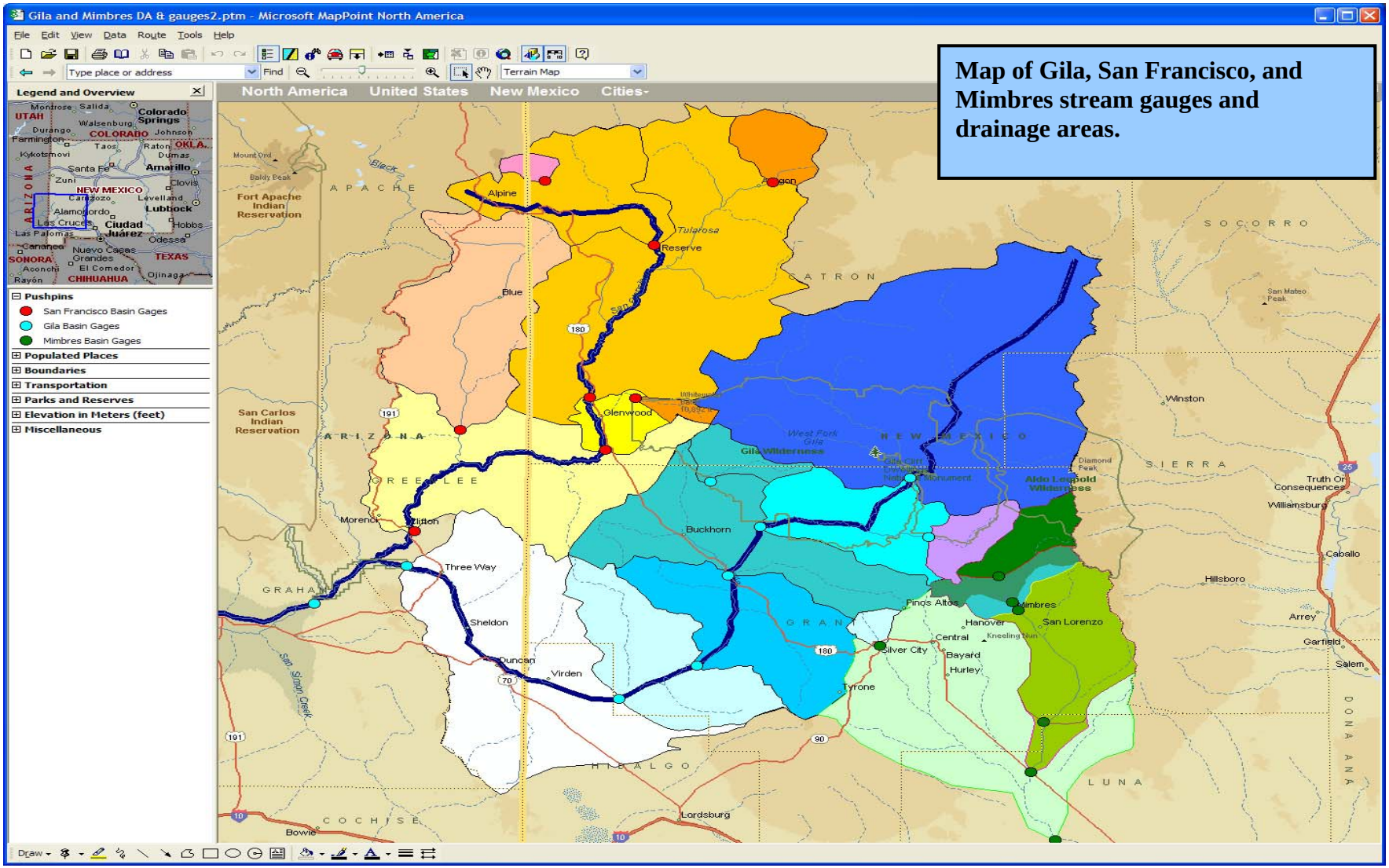

Figure 13. Screen capture of the Sandia model of the Gila Basin in New Mexico by stream reach and drainage, showing existing stream gages.

Baseline Monitoring of Upper Gila River Watershed

The ISC has recently begun baseline investigations in the Watershed. These investigations are not project or activity specific but will support any assessment of impacts from potential diversions under the terms of the CUFA. The investigations will address conditions of the river channel function and habitat under current and historic hydrologic patterns and help predict impacts of potential withdrawal scenarios within the study area. Specific concerns will be directed toward understanding the threshold flow required to maintain the river channel dynamics, maintain fish habitat and support riparian ecology.

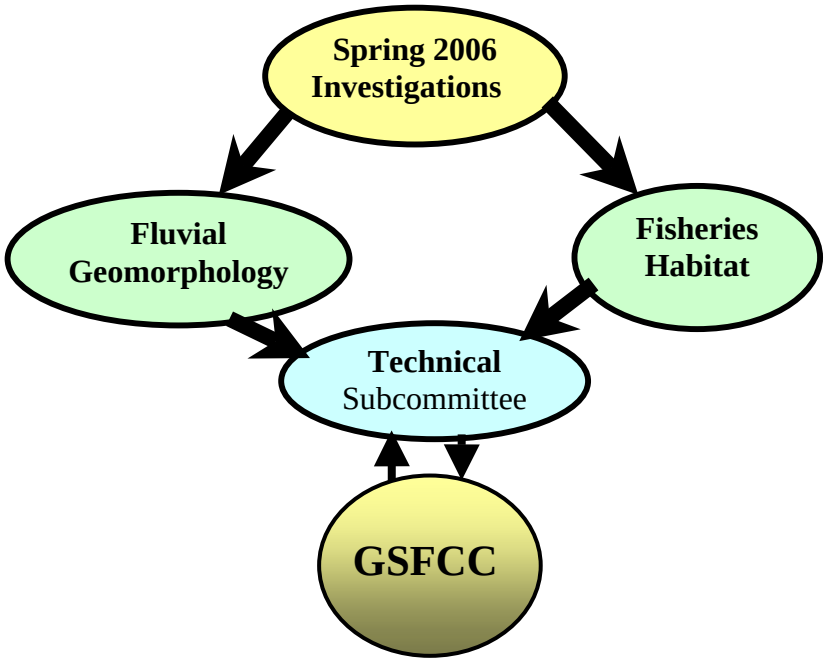

Figure 14. There are ongoing studies currently funded by the New Mexico Interstate Stream Commission to provide baseline information. Results will flow from the Technical Subcommittee to the Gila-San Francisco Coordinating Committee that will utilize the results in development of a Coordination Act Report or Planning Aid Memo. The studies are described in more detail below.

Fluvial Geomorphology

The Gila River has repetitive discharges and channel behavior patterns that must be identified and thoroughly understood. Geomorphology investigations will support the basic understanding of the river channel dynamics and will provide a foundation for further studies. The first phase of these investigations will be to develop the Gila River Hydrological and Geomorphic Model. Additionally, a literature review of existing hydrologic and geomorphic data and reports of the Gila River and similar river systems in the Southwest (e.g. Verde and Virgin) will provide a detailed bibliography. Specifically, documentation of how these systems work in their current state and the flows that are

most important in determining channel form and the availability of fish and riparian habitat.

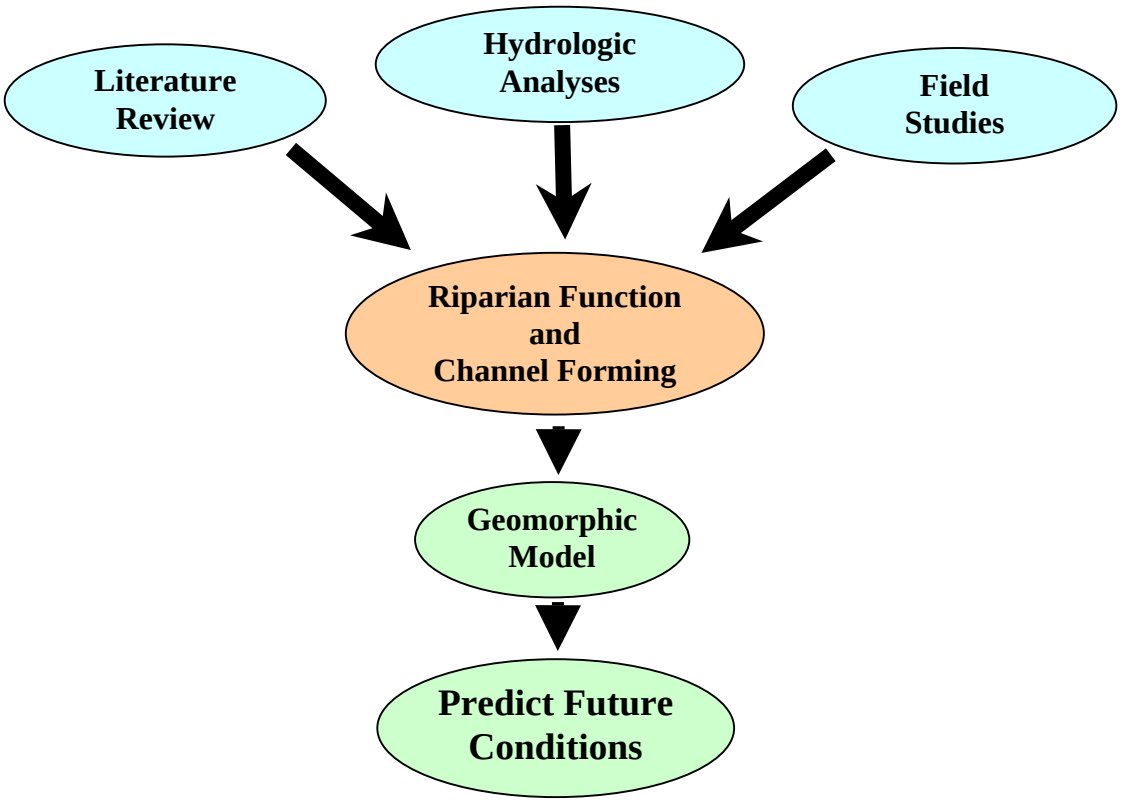

Figure 15. Fluvial geomorphology studies. This set of studies will investigate hydrology, geomorphology, and existing information to result in an understanding of riparian function and channel forming flows that may them be incorporated into a predictive geomorphology model.

Using available data sources, and perhaps additional field studies, geomorphic analyses at representative or important river reaches in New Mexico and Arizona will incorporate the following tasks and analyses:

- Using available USGS gage data, conduct pre and post hydrologic analyses based upon bypass parameters in the CUFA, and construct flow duration, flood frequency curves and other relevant data for important stream reach nodes in New Mexico and Arizona.
- Identify data gaps and develop field surveys to collect appropriate baseline geomorphology of Gila River. To assess potential geomorphic changes since previous surveys were completed, a subset of the sites should be those previously surveyed by the US Bureau of Reclamation (BOR) or US Fish and Wildlife Service (USFWS).
- Develop a one-dimensional geomorphic model for reaches of interest.
- Use the geomorphology model to evaluate the relationship between river geomorphology and baseline (pre-project) hydrology at all USGS gage sites.

- Model future changes to channel planform, longitudinal profile and dimensions without implementation of the withdrawals (i.e. predict baseline into the future). Identify magnitude and recurrence interval of channel forming flows. Assess relationship between hydrology and the availability of fish and riparian habitat.
- Predict future changes to channel dimensions, planform and profile after implementation of the by pass parameters in the CUFA, and evaluate the geomorphic response to potential changes in channel forming flows and it potential affect on riparian and fish habitat.
- Predict geomorphology under CUFA constraints at critical stream reaches.

Fisheries Habitat Surveys

A comprehensive investigation of fish habitats will be conducted to develop an understanding of habitat availability within the study area. The identification of these physical habitats, subdivided into mesohabitats units, will establish a baseline condition. The quantification of mesohabitat units is conducted to expand the understanding of habitats used by fish species listed under ESA. This information will be assembled into an aquatic mesohabitat map and instream flow and habitat model (PHABSIM).

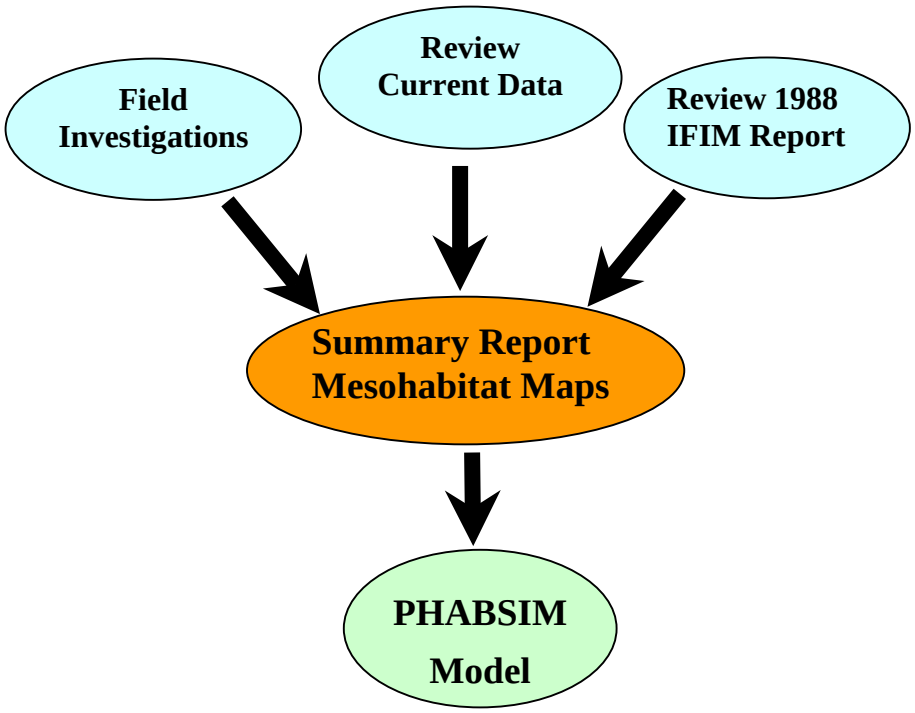

Figure 16. Fisheries habitat studies will result in an understanding of the relationship between endangered fish, stream flows, and fish habitats. The information can be incorporated into a model (PHABSIM) that can predict impacts from various stream depletion or other activities, such as watershed restoration.

Mesohabitat maps of the study area (approximately 73 miles of the Gila River from the Gila Wilderness to Redrock, New Mexico,) will be developed by physically observing the Gila River channel, identifying mesohabitat units by location and size, and collecting

data on average width, braiding pattern, substrate type, maximum depth, and determining what units can be modeled.

The studies will also review existing instream flow study data and reports (including habitat suitability criteria data and analysis), identify strengths and weaknesses, and make recommendations on work needed to update or expand the study to adequately define the relationship between discharge and the PHABSIM relative habitat suitability index (weighted usable area).

In addition to these ongoing studies and work, completion of a Coordination Act Report or Planning Aid Memo may require additional work:

- Collate accessible, existing ecological data on ESA and State of New Mexico species of concern, the native and non-native fish community, and other relevant ecological issues on Gila River in New Mexico and Arizona. Types of information that will be gathered should include: species distribution and abundance in the main-stem Gila River and tributaries, fish community and habitat data, water quality, riparian community and habitat, and general ecology.

- Synthesize available data into a Biological Evaluation (BE) report. This will include confirmation of up to date species distribution and status, identification of significant information gaps, and potential impacts and threats assessment. Evaluation of hydrologic impacts to biological resources will be included.