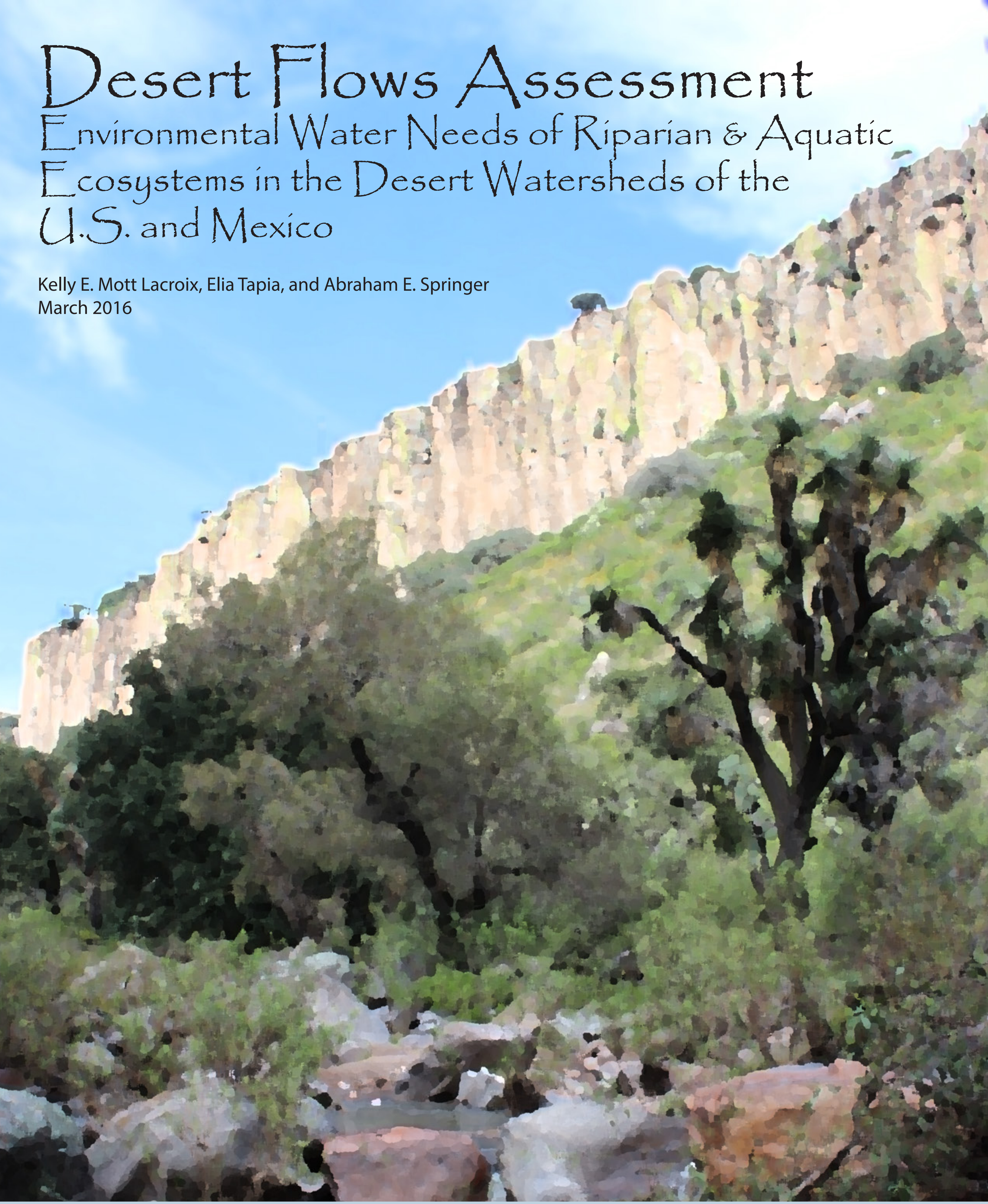
Desert Flows Assessment

Environmental Water Needs of Riparian & Aquatic Ecosystems in the Desert Watersheds of the U.S. and Mexico

Kelly E. Mott Lacroix, Elia Tapia, and Abraham E. Springer

March 2016



DESERT LANDSCAPE CONSERVATION COOPERATIVE
WRRC WATER RESOURCES RESEARCH CENTER
THE UNIVERSITY OF ARIZONA College of Agriculture & Life Sciences Cooperative Extension
Water RAPIDS Water Research and Planning Innovations for Dryland Systems
NORTHERN ARIZONA UNIVERSITY

Desert Flows Assessment

Environmental Water Needs of Riparian and Aquatic Ecosystems the Desert Watersheds of the United States and Mexico

Kelly E. Mott Lacroix, Elia Tapia, and Abraham E. Springer

2016

ACKNOWLEDGEMENTS

This report was made possible by funding from the Desert Landscape Conservation Cooperative (LCC) via the U.S. Bureau of Reclamation. We thank the members of the DLCC Critical Management Question One team for their advice and review of this document and the Desert Flows Database as well as the 47 land and water managers who took a survey in early 2015. Their responses have shaped the format of the database and this report.

CONTENTS

Figures

TABLES

EXECUTIVE SUMMARY

In the past decade there has been increased interest in providing water to meet the needs of riparian and aquatic ecosystems in the western United States and policymakers are using their knowledge of environmental flow needs to advocate for both political and scientific changes. However, there are significant challenges associated with including environmental flows in water management and planning. First, water rights for environmental flows are not universal, and in many cases legal tools used to incorporate the environment into water management and planning only require new users to consider their impact to water in the environment. Second, it can be difficult to include the needs of riparian and aquatic ecosystems in new plans when other existing uses already outstrip supplies.

While the science of environmental flows is ever-growing and expanding, there are few compendiums of efforts to define the quantity of water needed to maintain riparian and aquatic species. This Assessment Report, funded by the Desert Landscape Conservation Cooperative (LCC), synthesizes data from the Desert Flows Database, a geospatial tool that combines data from 408 articles or reports on environmental flows from across the desert watersheds of the United States and Mexico. The goal of this report is to summarize what we know (and do not know) about flow needs and responses and identify critical data gaps in flow need and flow response information.

KEY FINDINGS

- Eighty-three percent of the studies are on rivers and springs in the United States, with the over half of all studies (55%) in Arizona, however, the high percentage of studies in Arizona may be because it is the only U.S. state whose entire geography is in the study area. The highest number of studies in Mexico occurred in the state of Sonora.
- One hundred and forty-four rivers in the watersheds of the Desert LCC have been studied for some aspect of environmental flows. The most frequently studied rivers are the Rio Grande (83 studies), the Colorado River (73 studies), and the San Pedro River (53). Sixty-two percent of the 144 rivers have just one study over the past four and a half decades.
- The majority (67%) of studies used qualitative methods to determine flow needs or responses to changes in flow. The distribution of qualitative versus quantitative studies was similar across the DLCC.
- Sixty-three percent of the studies contain quantified or described information on flow needs or flow responses. The remaining studies discuss environmental flow needs but do not provide specific information that could be translated into the flow need or flow response tables, contain information on relationships between riparian vegetation and terrestrial or aquatic species, or contain information on human values for ecosystems.
- Of the 144 rivers in the study area, 100 rivers have at least one study of flow needs or flow responses.
- The most frequently studied genera for flow needs and flow responses are Cottonwoods (Populus), Mesquite (Prosopis), Tamarisk (Tamarix). Willow (Salix) was frequently studied

for flow needs and Silvery Minnow (*Hybognathus amarus*) was frequently studied for flow responses.

- Engineered structures, non-native species, and altered flows were the most common risks to or stressors on the riparian and aquatic species in the region. Risks and stressors were similar across all watersheds.

Recommendations

Data on environmental flow needs and flow responses for the desert watersheds of the U.S. and Mexico are not equally distributed among species or geographic regions. As a result, the information provided in the database and this report do not paint a complete picture of environmental flows for the region. **Generalized findings, particularly those for well-studied genera like cottonwoods or tamarisk, may be transferrable to less-understood systems. It is problematic, however, to take any data presented here and directly apply it as each system has unique aspects, such as topography and soils, that impact flow needs, flow responses, or relationships among species**. To account for the complexity of river systems, any targets for flows or groundwater levels set using these data should be part of an adaptive management framework where conditions are monitored and standards are re-evaluated based on empirical data.

Although research on flow needs and responses to changes in flow has been conducted across the desert watersheds of the United States and Mexico, there are significant gaps in our knowledge of even the location of perennial and intermittent streams, let alone studies of environmental flow needs. There is a **need for further systematic evaluation of perennial and intermittent streams in the desert watersheds of the United States and Mexico and of flow needs and flow responses in the Sierra Madre in Mexico and the White Mountains in the United States.**

The Desert Flows Database contains flow need, flow response, or vegetation-species relationship information for 312 species and/or genera. While this appears to be an impressive diversity of information, only one-third of the 312 species or genera have been studied more than once and only 15 genera (or 5%) have been studied five or more times. This begs the question, can we manage the entire system using existing data on riparian vegetation and fish species of concern, which are the most frequently studied riparian and aquatic elements? Moving forward, there should be a **focus on working with the people who manage riparian and aquatic systems to determine if data on a handful of species are sufficient, or if a broader array of species need to be examined**.

Perhaps the most important aspect of pulling these data into one repository is the ability to unequivocally say where the gaps exist and uncertainty remains. Two important findings are that the majority of flow studies are qualitative and climate change impacts are infrequently examined. **Further investigation is necessary to determine if qualitative studies provide sufficient information for land and water managers to establish and secure environmental**

flows. Studies that explicitly examine how species will be impacted by altered flow regimes due to changes in climate are needed as well.

Finally, this gap analysis is just a snapshot in time. Research on environmental flow needs and responses continues throughout the DLCC geography. In order for the data within the Desert Flows Database to remain relevant and useful we recommend **the DLCC establish a mechanism and schedule for updates to the content and the functionality of the database**. Doing so directly on the heels of this work will prolong and expand the DLCC's investment in this tool.

I. INTRODUCTION

In the past decade there has been increased interest in providing water to meet the needs of riparian and aquatic ecosystems in the western United States (e.g., Tarlock, 2014; Roach, 2013; Center for the Future of Arizona, 2009) and policymakers are using their knowledge of environmental flow needs to advocate for both political and scientific changes (Le Quesne, Kendy, & Weston, 2010). However, there are significant challenges associated with including environmental flows in water management and planning. First, water rights for environmental flows are not universal (Loehman & Charney, 2011), and in many cases legal tools used to incorporate the environment into water management and planning only require new users to consider their impact on water in the environment (Megdal, Nadeau, & Tom, 2011). Second, it can be difficult to include the needs of riparian and aquatic ecosystems in management when other existing uses already outstrip supplies (Hirji & Davis, 2009)).

In the Western United States, the recent Colorado River Basin Water Supply and Demand Study predicts the gap between supply and demand will grow ever-larger in the coming decades (U.S. Bureau of Reclamation, 2012). At the same time drought and human activities already have significant impacts on streams (Marshall, Robles, Majka, & Haney, 2010; Poff, Koestner, Neary, & Henderson, 2011) and riparian and aquatic ecosystems are among the most vulnerable systems to climate change (Capon et al., 2013). Water deficits mean land and water managers must be proactive in their management of rivers and shallow aquifers if they want to maintain the ecosystems dependent upon them. Ultimately, water-user values will need to determine how riparian and aquatic ecosystems are managed (Pahl-Wostl et al., 2013; Poff et al., 2010). However, certain knowledge is critical to manage them well, such as the best techniques for determining how much water ecosystems need and the timely provision of the best scientific information available to managers and decision makers (Schmidt, Webb, Valdez, Marzolf, & Stevens, 1998; Garrick, Jacobs, & Garfin, 2008).

While the science of environmental flows is continuously growing and expanding, there are few compendiums of efforts to define the quantity of water needed to maintain riparian and aquatic species. This Assessment Report synthesizes data from the Desert Flows Database, a geospatial tool that combines data from 408 articles and reports on environmental flows from across the desert watersheds of the United States and Mexico. The goal of this report is to summarize what we know (and do not know) about flow needs and responses and to identify critical data gaps in flow need and flow response information.

II. *THE DESERT LANDSCAPE CONSERVATION COOPERATIVE (DLCC) GEOGRAPHY*

The scope of this report is a 2,173,000 km^2 geography that contains some of the most imperiled and iconic rivers and springs in the U.S. and Mexico. The Desert LCC area includes the Mojave, Sonoran, and Chihuahuan deserts, grasslands and valley bottoms, and isolated mountain ranges, with elevations ranging from near sea level to more than 3,050 meters. The Desert LCC also contains several large river systems: the Rio Grande and the Lower Colorado, Gila, San Pedro, Sonora, Yaqui, and Conchos rivers. The ecological richness of this geographic area supports a great diversity of native plants, fish, and wildlife and their habitats. It also includes many species and ecosystems that are vulnerable to landscape scale stressors, including climate change impacts.

FIGURE 1. DLCC GEOGRAPHY

At the heart of these ecosystems are riparian areas, sometimes called "ribbons of life" because they are among the most productive habitats in North America (Johnson et al., 1977; Chaney et al., 1990). Wildlife depends on these riparian areas, especially in arid regions, for foraging, nesting or cover during part of or for an entire life cycle (Zaimes, 2007). Domestic livestock often rely on these areas for their high forage abundance and water supplies. Riparian areas also provide recreational opportunities for humans and can even raise property values when located near urban areas (Bark, Osgood, Colby, Katz, & Stromberg, 2009).

The watersheds of the DLCC contain three types of streams: ephemeral, intermittent, and perennial. Ephemeral streams are the most common and are those that only have surface flow after a precipitation event. Perennial and intermittent streams can be defined in space or in time. In other words, a perennial stream can be defined as one that has surface flow throughout the year or as a stream with surface flow for its entire length. An intermittent stream can be seen as one that only contains surface water during a portion of the year, or a stream that does not always have flow year round for its entire length. For the purposes of this assessment, we use the terms perennial and intermittent to define the amount of time surface flows occur in a stream.

Though many streams in the DLCC geography are dry some or all of the year, perennial flows occur in much of the area (Figure 2). One of the challenges of this study was finding the data necessary to delineate perennial streams and springs. Data shown on the map for perennial streams are a compilation of information from the National Hydrography Dataset, Instituto Nacional de Estadística y Geografía (INEGI), and local covers from Arizona Game and Fish, The Nature Conservancy (New Mexico), and Texas Parks and Wildlife. For springs, data are from the Springs Stewardship Institute, however, at the time of this report we were unable to find datasets for spring locations in Mexico.

The DLCC geography is comprised of 41 river basins: 18 in the Chihuahuan Desert, 19 in the Sonoran Desert, 8 in the Madrean Archipelago, 8 in the Mojave Desert, 12 in the Arizona/New Mexico Mountains and Plateau, and 10 to the Sierra Madre Occidental ecoregions (Table 1). The river basin boundaries are based on the HUC-6 (Hydrologic Unit Code) system (Figure 3).

TABLE 1. DLCC WATERSHEDS

DLCC Ecoregion	No. of Basins	Watershed Names
Chihuahuan Desert	18	Devils, El Salado, Lerma-Santiago, Lower Pecos, Lower Rio Grande, Mapimí, Mimbres-Casas Grandes, Nazas-Aguanaval, Pánuco, Río Conchos-Río Grande, Río Grande-Caballo, Río Grande-Elephant Butte, Río Grande-Falcon, Río Grande-Fort Quitman, Rio Grande Closed Basins, San Fernando-Soto La Marina, Upper Gila, Upper Pecos.
Sonoran Desert	19	Sonora Sur, Río de la Concepción, Río Sonoyta, San Pedro-Willcox, Lower Colorado, Baja California Noreste (Laguna Salada), Salton Sea, Santa Cruz, Middle Gila, Lower Gila, Upper Gila, Salt, Lower Gila-Agua Fria, Salton Sea, Bill Williams, Southern Mojave, Verde, Lower Colorado, Sonora Norte
Madrean Archipelago	8	Middle Gila, Mimbres-Casas Grandes, Río de la Concepción, Río Sonoyta, San Pedro-Willcox, Santa Cruz, Sonora Sur, Upper Gila
Mojave Basin and Range	8	Bill Williams, Central Nevada Desert Basins, Lower Colorado, Lower Colorado-Lake Mead, Mono-Owen Lakes, Northern Mojave, Salton Sea, Southern Mojave
AZ/NM Mts. and Plateau	12	Bill Williams, Little Colorado, Bajo Río Colorado, Lower Colorado-Lake Mead, Lower Gila-Agua Fría, Middle Gila, Mimbres-Casas Grandes, Río Bravo-Presa Caballo, Río Grande-Elephant Butte, Salt, Upper Gila, Verde
Sierra Madre Occidental	10	El Salado, Lerma-Santiago, Mapimí, Mimbre-Casas Grandes, Nazas-Aguanaval, Presidio-San Pedro, Río Conchos-Río Bravo, Río Grande-Caballo, Sinaloa, Sonora Sur

FIGURE 2. LOCATION OF PERENNIAL STREAMS IN THE DLCC GEOGRAPHY

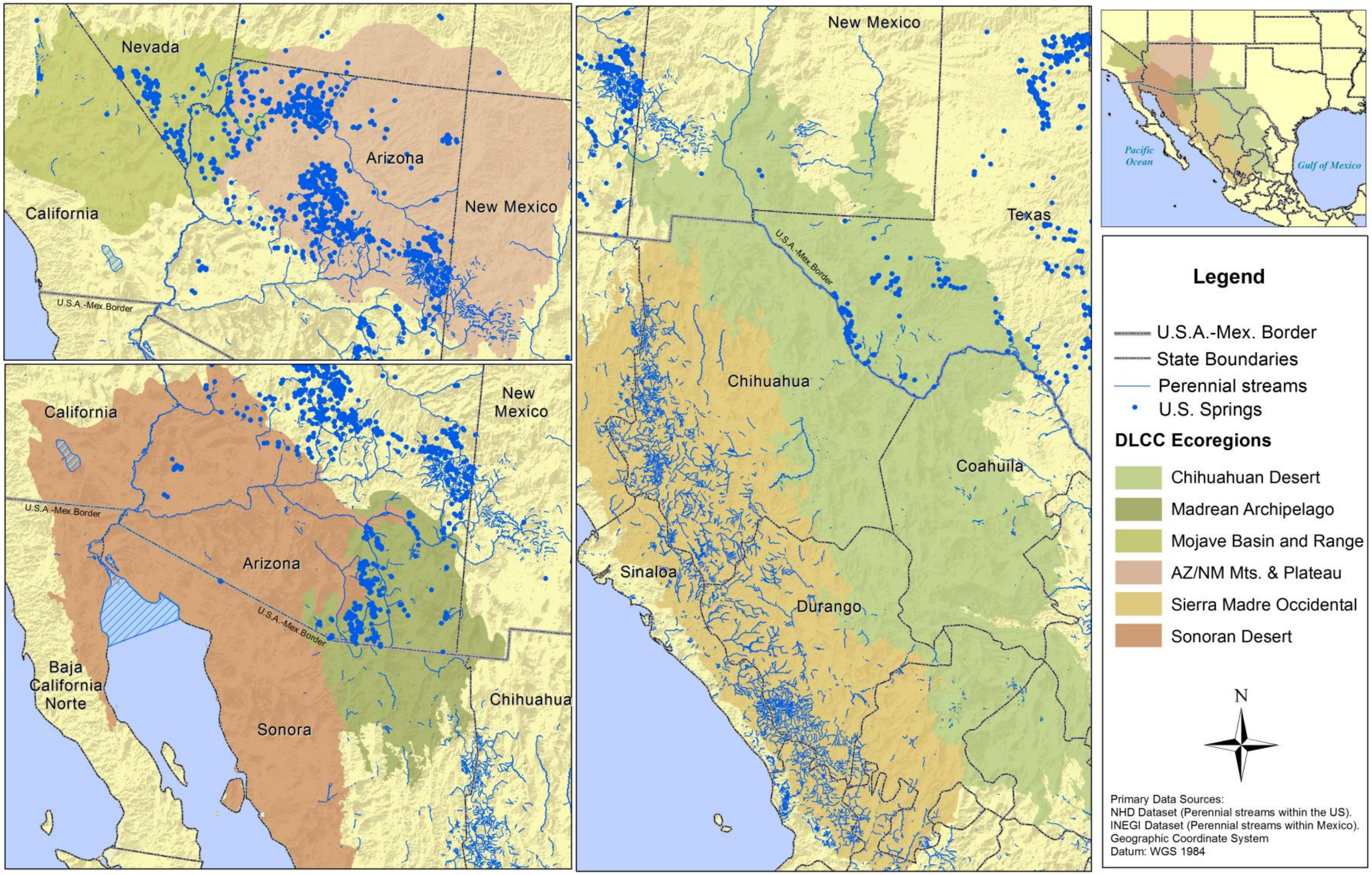
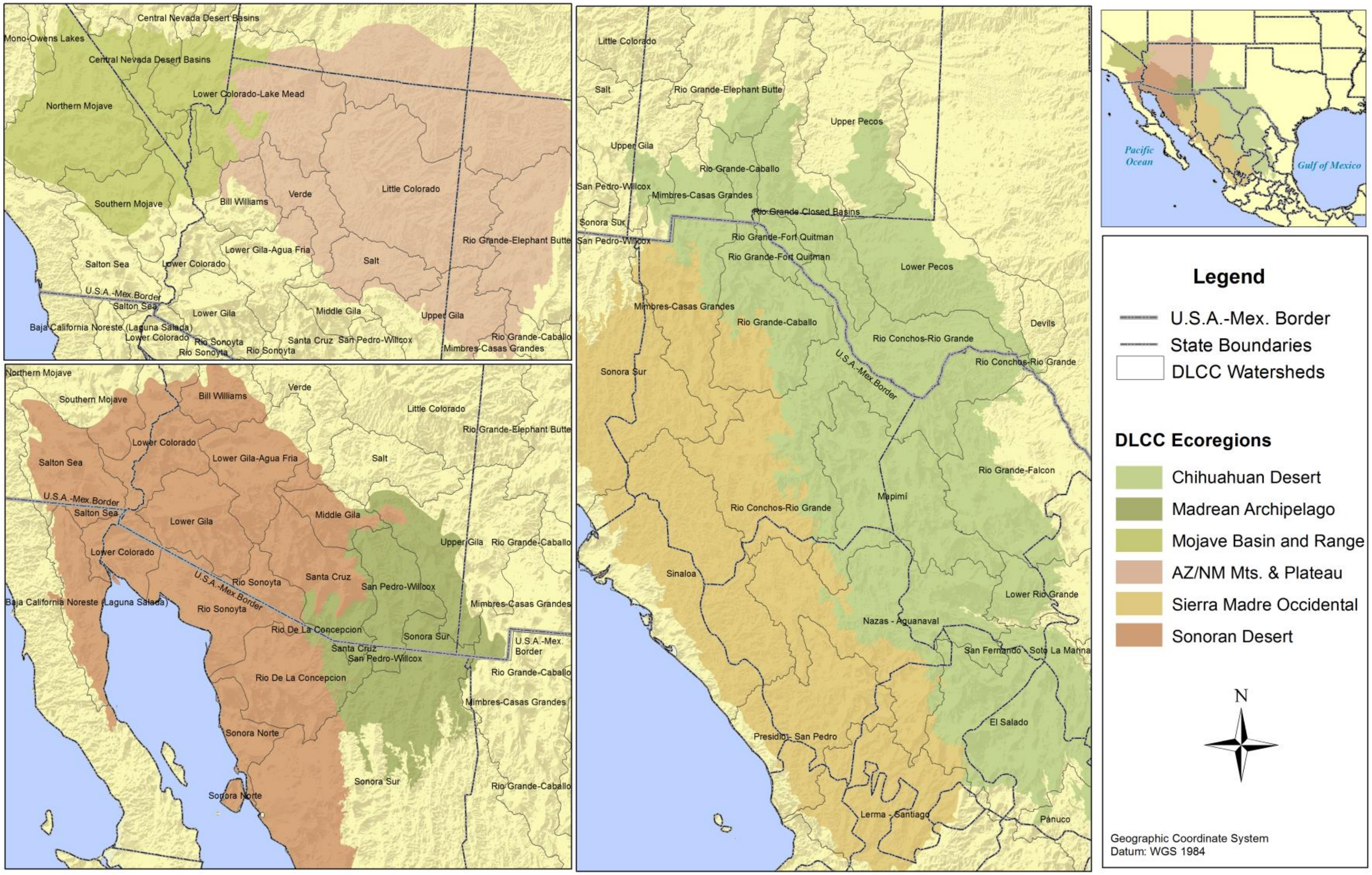


FIGURE 3. DESERT LCC WATERSHEDS



III. *Desert Flows Database Methodology*

The database was created in three phases: review/modification of the Arizona environmental flows database; literature review; and database construction and data entry.

Phase I - Review/Modification of the Arizona Environmental Flows Database

The first phase was to review the methods and format used to create the Arizona Environmental Flows Database. The Arizona Database was created by the WRRC in 2013 and included 127 studies. To determine the utility of the existing database format and obtain input on what elements the Desert Flows Database should include the WRRC and NAU conducted a survey of land and water managers in the United States and Mexico. The survey was administered in Spanish and in English and was completed by 47 individuals. From this survey we learned that more than half of respondents are not using water needs data to manage riparian or aquatic species and ecosystems. Among those that do use this data the most important pieces of information were: depth to groundwater, surface water flows, and legal or regulatory requirements for the species that are being considered. Information that respondents need to make management and planning decisions included the links between groundwater depths and surface water flows and species abundance, age structure, and survivorship. These respondents also indicated that they would like for the database to provide them with an updated, reliable, easy to access, comprehensive and integrated database that includes quantitative and qualitative scientific information on aquatic and riparian systems, and visual graphics of metrics.

Based on the survey responses we determined that the Desert Flows Database would retain the same geodatabase Microsoft Access structure as the Arizona database. Based on general agreement that the structure of the table that summarizes flow need data used in the AZ Flows database is logical, we also decided to use this method for standardizing flow needs data for the DLCC Flows database.[1]

Phase II - Literature Review

To populate the database the WRRC performed an extensive literature review of 19 different search engines including: Google Scholar, Web of Science, ASCE Library, BioOne, BioScience, BLM Electronic Database, ESA Online Journal, JSTOR, NM SALSA Search Engine, ProQuest Dissertations & Theses Full Text, Science Direct, SpringerLink, Taylor and Francis Online, Wiley Online Library, Texas Parks and Wildlife, Texas Water Board,

[1] More than 50% of respondents to the question regarding the format of the data table indicated that the structure of this table makes sense and that the information is useful, while less than 10% indicated the table was confusing because the codes weren't specified or for other reasons. In the DLCC Flows Database we will provide code explanations, additional columns for units of measurement and provide links to raw data where available.

Treesearch - USFS Publications, US Fish and Wildlife Publications, and USGS Publications Website.

For each search engine, the search criteria shown on Figure 4 were used. For example, search terms included environmental flows AND rio conchos, riparian AND new mexico, or flow regime AND mojave desert. Studies prior to 1970 were not considered.

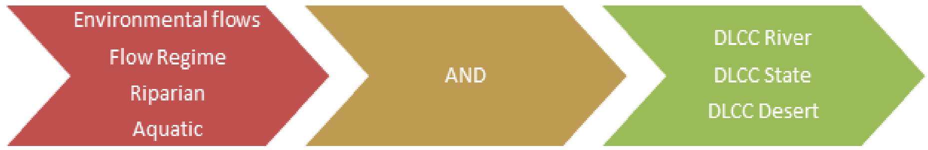


FIGURE 4. LITERATURE QUERY METHOD

This survey of the literature resulted in the assemblage of 981 documents. Each document was then reviewed to determine if it was within the study area (75 river basins discussed in the previous section) and if it discussed some aspect of water needs for species or if it discussed relationships between riparian species and terrestrial species. This review resulted in a total of 398 documents. The most common reasons for a study to be rejected were that it was outside of the study area and that no link between water and species was discussed. The review of studies was completed by two individuals, a random sample of 49 studies were selected for a kappa analysis to test the similarity between the two reviewers. Discrepancies between the two reviewer's choices for whether to include a study led to a reexamination of the approximately 200 studies that were rejected for reasons other than being outside of the study area. The initial number of studies to include in the database was approximately 390. The final number of studies included in the database was 408 after splitting a handful of documents, such as conference proceedings and books, into separate studies or chapters and including studies referenced in articles or reports but not originally encountered in the review.

PHASE III - DATABASE CONSTRUCTION, DATA ENTRY, AND DATA ANALYSIS

Prior to data entry a guide was created to ensure that the two researchers responsible for reading and entering data did so in a uniform fashion. Furthermore, once the database was completed, two studies were selected at random and both entered by the researchers to ensure similarity in data entry. Database tables and fields are outlined in Table 2. More detail on the content for each table and field can be found in Appendix A, Guide for Use of Desert Flows Database. The database is structured with a key table, 1_StudyInfo. All other tables are connected to Table 1 by the Study Index. All tables other than table one have a many-to-one relationship. Because many studies include multiple rivers and many rivers have multiple studies, study data cannot be joined directly to the spatial layer. A many-to-many intermediary table that contains the Study Index and the River ID (used within the shapefile) to connect the data.

TABLE 2. DATABASE TABLES AND FIELDS

Table/*Fields*	Details
1_StudyInfo	
Study_INDEX	Unique index assigned to each study, primary database key
Title_of_Chapter	Article, Chapter, or Study title
Report_Authors	Authors listed in MLA style
Study_Pub_Date	Date published
Publication	Name of journal, book, or report
Study_Period	When data were collected
Flow_Type	Type of flow studied, perennial, intermittent, or perennial
Study_Type	Multi-study synthesis or single study
Summary	Brief description of the study
2_Location	
ID	Unique ID for each entry
Study_INDEX	Unique index assigned to each study, primary database key
River	River name
State	State name
StudyArea_Detail	Details on where the study took place, where available/applicable
EcoRegion	EcoRegion
Spatial_layer	Indicates if the study is included on the spatial layer
3_Methods	
ID	Unique ID for each entry
Study_INDEX	Unique index assigned to each study, primary database key
Quality_Evidence	Assessment of rigor of methods used in the study on a scale of 1 to 5
data_type	If the study includes new field data, existing data or modeled data
Flow_Method	Type of flow method used
4_StudyElements	
ID	Unique ID for each entry
Study_INDEX	Unique index assigned to each study, primary database key
Study_Elem	Elements included in the study, e.g., vegetation surveys, geomorphology, well monitoring
5_SocialAspects	
ID	Unique ID for each entry
Study_INDEX	Unique index assigned to each study, primary database key
Human_Aspcts	Human aspects studied, e.g., economics, values etc.
Notes	Notes on the human aspects studied

TABLE 2. DATABASE TABLES AND FIELDS CONTINUED

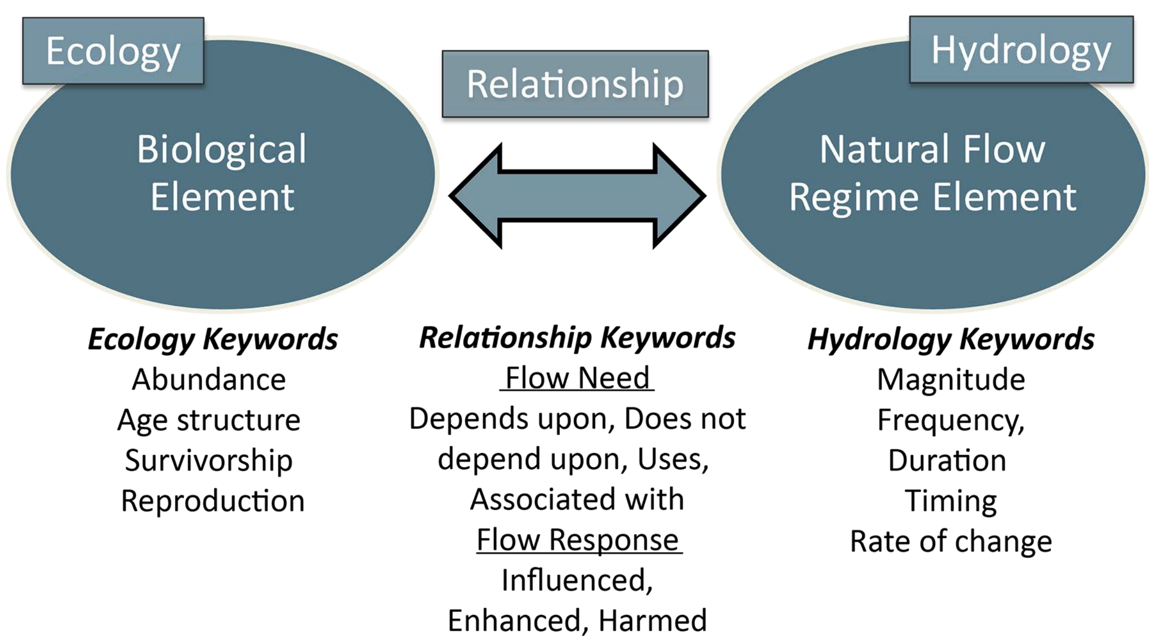
6_RisksStressors	
ID	Unique ID for each entry
Study_INDEX	Unique index assigned to each study, primary database key
Gen_Risk_Stressor	General category for the risk or stressor
Spec_Risk_Stressor	Detailed category for the risk or stressor
Page_No	Page in document where risk or stressor is discussed
7a_Flow Needs and 7b_Flow Responses	
ID	Unique ID for each entry
Study_Index	Unique index assigned to each study, primary database key
Taxa	Taxa studied, e.g., vegetation, invertebrate
Species_group	Species or genus studied
Abundance	Aspects of ecology studied
Age_structure	
Survivorship	
7a_Flow Needs and 7b_Flow Responses	
Reproduction	Aspects of ecology studied
Ecological Need/response linked to hydro element	Link between hydrology and ecology, e.g., depends upon, harmed by, uses
Magnitude	Magnitude of flow or level of groundwater and the unit
Mag_Unit	
Timing	When water needs to be/was available
Frequency	How often type of flow occurs and the unit
Freq_unit	
Duration	Duration of flow (or level of groundwater)
Dura_Unit	
RofC	Rate of change of flow (or level of groundwater)
RofC_Unit	
WQ	Water quality and unit
WQ_Unit	
Flow_component	If the data are for evapotranspiration, groundwater, surface water or soil moisture
page	Page in document where data were found
Figure_Table	If there is an associated figure or table
obs_rec_mod	If the data are observed, recommended, or modeled
Comment	Additional details from the study on the flow need/flow response

TABLE 2. DATABASE TABLES AND FIELDS CONTINUED

7c_Flora_Fauna_rel	
ID	Unique ID for each entry
Study_ID	Unique index assigned to each study, primary database key
Species_Ab	Fauna species or genus studied
Abundance	Aspects of ecology studied
Age_Structure	
Survivorship	
Reproduction	
Relationship	Link between hydrology and ecology, e.g., depends upon, harmed by, uses
Veg_Ab	Flora species or genus studied
Notes	Additional details from the study on the relationship among species

Tables 7a and 7b provide data from each study on flow needs or flow responses. These data are standardized using meta-categories for describing the ecologic impacts of flow and hydrologic element. Meta categories for ecologic impacts include: abundance, age structure, survivorship, and reproduction. Hydrologic meta-categories are the natural flow regime: magnitude, timing, duration, frequency, and rate of change. The natural flow regime elements are used for studies of shallow aquifer systems, surface water, and evapotranspiration. As shown on Figure 5, the ecology and hydrology are then linked using words to describe the relationship between them.

FIGURE 5. METHOD FOR STANDARDIZING ENVIRONMENTAL FLOW NEEDS AND FLOW RESPONSE DATA



Note that when describing their findings, in some studies, the authors did not indicate high degree of certainty in the relationship between the hydrology and ecology. Different relationship keywords are used to capture this uncertainty in tables 7a and 7b. If the relationship between the ecology and hydrology was indicated with words such as "needs", "depends", and "requires", the keyword "depends upon" was used for flow needs. For example, Cottonwood (*P. fremontii*) health depends upon between 0.28 m3/s baseflow in wet and dry years (Hautzinger, Warner, Hickey, & Beauchamp, 2006). If the study results implied a relationship using words such as "occurs", "found" and "associated with" but did not directly indicate it in their findings, "associated with" was used. For example, roundtail chub (*Gila robusta*) abundance and reproduction are associated with 505 m3/s and a temperature of 16-20 degrees C, respectively (Schmidt et al., 1998). Similarly, if the direction of the flow response was clear in the study, "enhanced" or "harmed" were used. If the author was not clear as to the direction of the response, "influenced" is indicated. For example, Cottonwood (*P. fremontii*) health is influenced by groundwater depths between 1.1 and 1.8 meters below land surface (Arizona Department of Water Resources, 2005).

The first step in data entry was to move all studies from the Arizona Environmental Flow Needs database to the Desert Flows Database. These studies were standardized according to the data entry guide. One key element of standardization was abbreviations for all species, methods, and study elements. The Desert Flows Database contains information not included in the Arizona database, therefore, each of the original 127 studies were reviewed for the additional information needed for the Desert Flows Database. Data were entered using google sheets so that both researchers could work concurrently. Once all data were entered the google sheets were imported into a Microsoft Access geodatabase. These data were reviewed for consistency and completeness prior to analysis. SQL queries were used to bring together and summarize data for this gap analysis report. Example queries are included at the end of the database guide in Appendix A.

IV. Summary and Gap Analysis

Extent of inventory of studies

In the study area, 408 studies provide some indication of water requirements for the natural environment. Not surprisingly, all of the studies demonstrate some connection between water availability and ecological health. Multi-chapter reports are counted according to individual chapters when each chapter represents a separate study. For the purpose of this assessment, we only reviewed studies that investigate water needs for riparian (river banks and terraces), aquatic (in-stream), and spring ecosystems. We will use the term "environmental water needs" to refer to both ecological flow requirements and ecological responses to flow alteration. Some studies reviewed for the database focused on the flows involved in moving sediment (or maintaining geomorphologic characteristics) important for river ecosystems. Unless these studies also contained information about environmental water needs for biota, they were not included in the inventory (e.g.,Hornewer & Wiele, 2007; Wiele, Hart, Darling, & Hautzinger, 2009). A list of all of the studies by study index is included in Appendix B and by river in Appendix C. Throughout this report studies are referred to by their study index.

Figure 6 shows the general location of studies across the states, indicated according to the HUC-6 river basin. Specific stream segments are also delineated where sufficient information was available. Maps of study locations represent the data collection sites or focus area of analyses. Experimental studies that were done ex situ (not on site) are characterized according to the study location they are intended to inform. If they are not intended to inform any specific location, they are categorized according to the distribution of the species they are studying and not included on the map.

Among the six ecoregions of this study, 33% of the studies occurred in the Arizona/New Mexico Mountains and Plateau regions. The fewest studies, 5% and 1%, were in the Mojave Desert and Sierra Madre Occidental respectively. The high density of studies in the AZ/NM and Plateau regions is logical given the number of perennial streams in this region. Likewise, a low number of studies in Mojave is likely, in part, due to the small number of perennial streams. Notably, in the Mojave region, most studies are of springs not streams. The Sierra Madre Occidental, however, has what appears to be the highest density of perennial streams and the fewest studies (Figure 6, Table 3).

Examining the number of studies by country, 83% of the studies are on rivers and springs in the United States, with the over half of all studies (55%) in Arizona. The high percentage of studies in Arizona may be because it is the only U.S. state whose entire geography is in the study area. The highest number of studies in Mexico occurred in the state of Sonora (Table 4).

Within the watersheds of the DLCC, 144 rivers have been studied for some aspect of environmental flows. Of these rivers, the most frequently studied are the Rio Grande (83 studies), the Colorado River (73 studies), and the San Pedro River (53). Other rivers with ten or more studies include the Gila River, Bill Williams River, Verde River, Santa Cruz River, and Pecos River. An additional 33% of rivers have between two and nine studies and the remaining 62% of rivers have just one study over the past four and a half decades. Table 5 lists rivers and the number of studies conducted.

Table 3. Number of Studies by Desert

DLCC Ecoregion	No. of Studies	% of Studies
Chihuahuan Desert	66	15
Sonoran Desert	114	27
Madrean Archipelago	67	16
Mojave Desert	25	6
Az-Nm Mtns/Plateau	152	35
Sierra Madre Occidental	6	1
Total Studies	430	100

Table 4. Number of Studies by State

State	No. of Studies	% of Studies
Arizona, US	224	46
California, US	14	3
Colorado, US	1	0
New Mexico, US	106	22
Nevada, US	21	4
Texas, US	39	8
Baja California, MX	15	3
Chihuahua, MX	22	4
Coahuila, MX	14	3
Nuevo León, MX	3	1
Sonora, MX	28	6
Tamaulipas, MX	2	0
Total	489	100

Figure 6. Extent and Number of Studies by River Reach

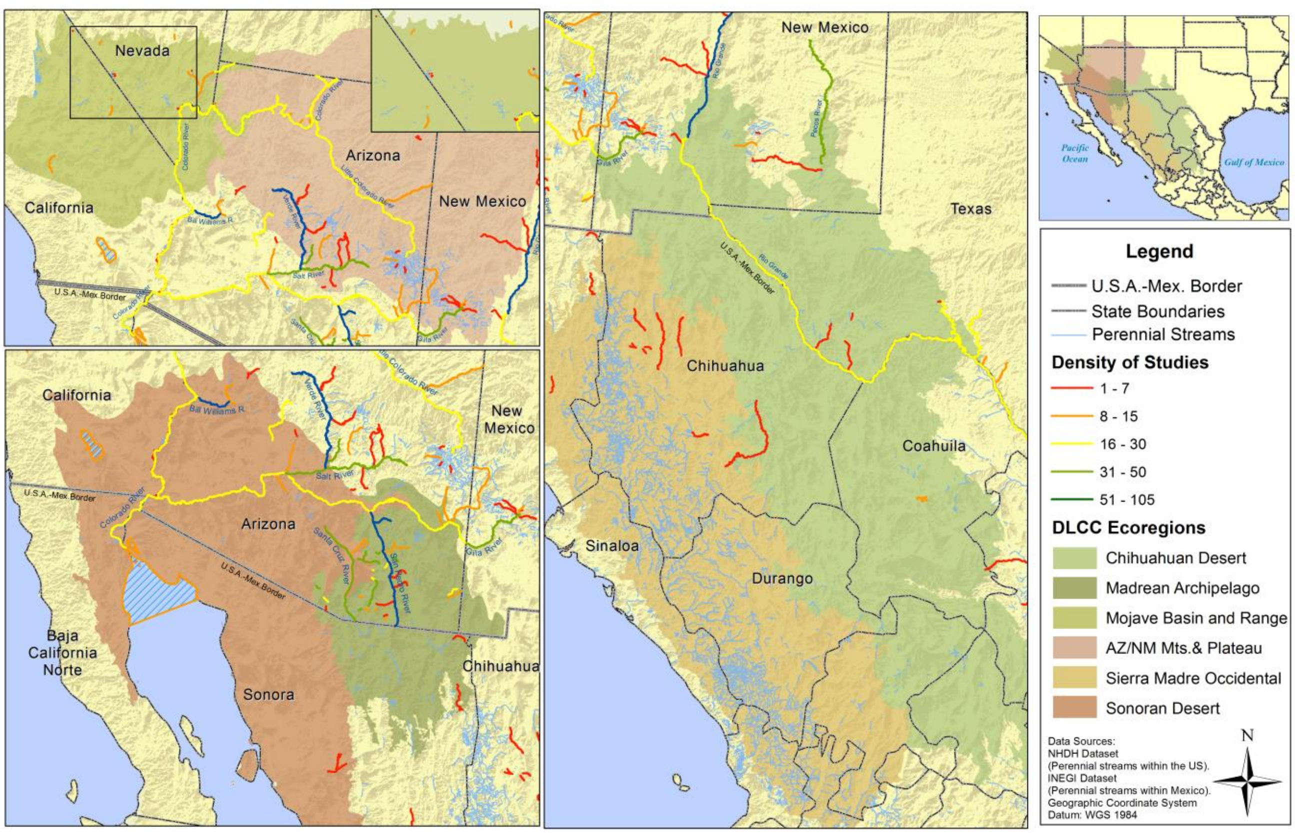


Table 5. Number of Studies by River (N.S. = number of studies)

River	N.S.	River	N.S.	River	N.S.	River	N.S.
Agua Fria River	2	Cherry Creek	2	Jackrabbit Spring	2	Ramsey Canyon	1
Aguja Creek	1	Chihuahueños Creek	1	Jemez River	1	Redfield Canyon	1
Alamito Creek	1	Chinle Wash	1	Kanab Creek	2	Redrock Canyon	1
Amargosa River	1	Chuar Creek	1	Kings Pool Spring	1	Rincon Creek	8
Aravaca Creek	3	Cienega Creek	9	Las Moras Creek	2	Rio Bavispe	1
Aravaipa Creek	8	Ciénega de Santa Clara	5	Little Colorado River	5	Rio Casas Grandes	2
Arroyo la Becerra	1	Colorado River	73	Lyle Creek	1	Rio Chama	1
Ash Creek	1	Cooks Lake	1	Madera Canyon	1	Rio Conchos	5
Ash Meadows Springs	2	Cooks Lake Tributary	1	Matkatamiba Creek	1	Rio de Don Fernando	1
Babocomari River	3	Crystal Spring	1	Meadow Valley Wash	1	Rio de las Vacas	1
Big Casa Blanca	1	Cuatro Ciénegas	2	Middle Fork Gila River	1	Rio del Oso	1
Big Sandy River	1	Dave Creek	1	Moapa (Muddy) River	2	Rio Grande	83
Bill Williams River	25	Devil's Hole	1	Mohawk Creek	1	Rio Grande	1
Bitter Lake	1	Devils River	4	Mojave River	3	Rio Papigochic	1
Black Canyon Creek	1	Diamond Creek	3	Nankoweap Creek	2	Rio Peñasco	1
Boggy Creek	1	Eagle Creek	1	North Fork Cave Creek	1	Rio Pilón	1
Bonita Creek	2	East Fork Gila River	2	Oak Creek	1	Rio Puerco	2
Bright Angel Creek	1	East Turkey Creek	2	O'Donnell Creek	1	Rio Ruidoso	1
Brown Canyon	4	East Verde River	1	Pahranagat River	1	Rio Salado	1
Buehman Canyon	3	Galloway Creek	1	Paige Creek	3	Rio San Carlos	1
Buenos Aires NWR Stock Tanks	1	Garden Canyon	1	Palomas Creek	1	Rio San Miguel	1
Burro Creek	1	Gila River	27	Paria River	3	Rio San Pedro	1
Cajon Bonito River	1	Grapevine Springs	1	Parker Canyon	1	Rio Santa Clara	1
Canada del Oro	1	Hassayampa River	7	Pecos River	10	Rio Santa Maria	2
Canyon Creek	1	Hassayampa River Trib.	1	Pinto Creek	1	Rio Sirupa	1
Canyon del Muerto	1	Havasu Creek	2	Point of Rocks Springs	1	Rio Sonora	1
Cave Creek	2	Hot Springs Canyon	3	Puerco River	1	Rio Yaqui	3
Centerfire Creek	1	Independence Creek	2	Queen Creek	1	Rio Zanjon	1

Table 5 Continued. Number of Studies by River (N.S. = number of studies)

River	N.S.	River	N.S.	River	N.S.	River	N.S.
Sabino Creek	3	San Pedro River	54	Sycamore Creek	7	Vasey's Paradise	1
Salt River	8	Santa Cruz River	11	Tanque Verde Wash	5	Verde River	23
Salton Sea	2	Santa Maria River	2	Tapeats Creek	2	Virgin River	5
San Felipe Creek	1	Shinumo Creek	1	Terlingua Creek	1	Warm Springs	1
San Felipe River	1	Soldier Creek	1	Tonto Creek	1	Waterman Wash	1
San Francisco Hot Springs	1	Sonoita Creek	3	Tularosa River	2	West Fork Gila River	1
San Francisco River	4	South Diamond Creek	1	Tule Creek	1	West Texas Springs	1
San Juan River	1	Spring Canyon	1	Unnamed Poza	1	West Turkey Creek	1

Methods Used to Determine Environmental Flows

There is considerable existing literature evaluating different methods of determining environmental flow needs (e.g., Tharme, 2003). Each of these methods differ in terms of the information used to represent relationships between living things and surface water flow or depth to groundwater. The hydrologic context provides one way to distinguish methods and studies. Researchers may focus on riparian ecosystems, aquatic ecosystems, or both. Through the work of the *Arizona Environmental Water Needs Assessment*, we classified these methods in terms of their context and complexity (Figure 7).

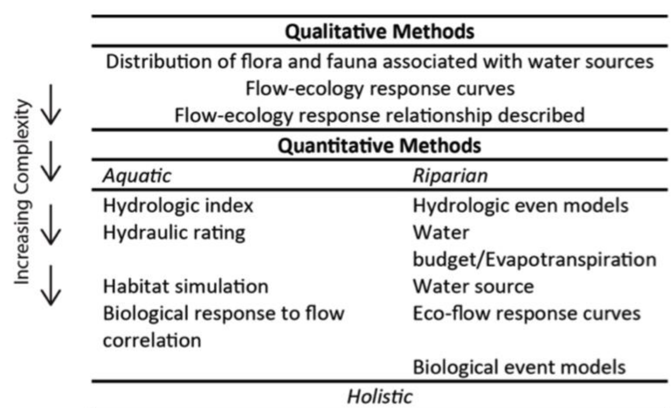


Figure 7. Flow Methods Classification

Ninety-seven percent of the studies in the Desert Flows Database contain some description of the methods used to determine flow needs, flow responses, or relationships between riparian vegetation and species. Thirty-four different methods were registered in the database and are included in Table 9 and Figure 8. Overall, 67% of methods used fall into the qualitative methods category, with 37% of the studies describing distribution of flora and fauna associated with water sources, 24% discussing flow-ecology response relationships or flow-ecology response curves, and 6% of the studies using other descriptive methods. Water Budget/ET methods make up 5% of the studies with all of the other qualitative methods making up the remaining 29%. This breakdown between qualitative and quantitative methods is similar across the ecoregions, with the exception of the Sierra Madre Occidental where of the three studies containing flow need or flow response data, two used quantitative methods (Figure 8).

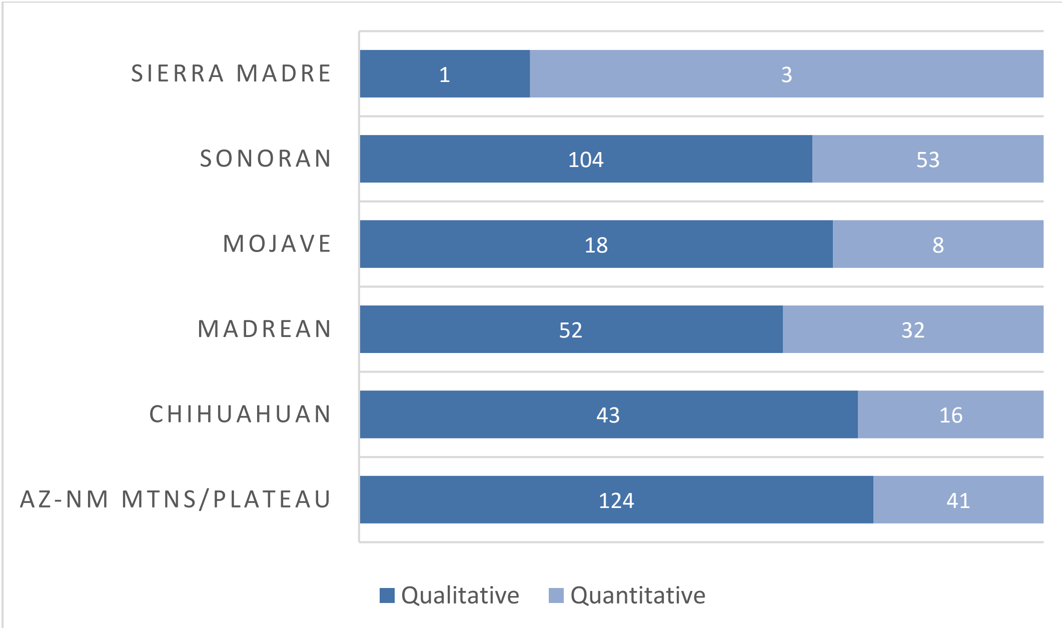


FIGURE 8. METHODS BY ECOREGION

TABLE 6. METHODS USED BY ECOREGION

Method	AZ-NM Mtns/ Plateau	Chihuah-uan	Madrean	Mojave	Sonoran	Sierra Madre
Biological Resp. to Flow Correlation	4		4		2	
Bowen Ratio			3	1	1	
Bowen Variant Method				1		
Building Block		1			2	1
Descriptive	9	5	3	1	11	
Distribution of Flora and Fauna	65	33	24	15	44	1
Ecological Curve	1					
Ecological Response	45	5	21	2	47	
Eddy Covariance	1		3	1	2	
Energy Budget Closure				1		
Existing Data			1	1		
Flow Attenuation	6		1		3	
Great Plains Method	1					
HEC Ecosystem Functions Model					2	
Holistic	1				1	
Hydraulic Method Geo Other	1	2			1	
Hydrologic Engineering Centers River Analysis System	1	1	1		5	
Hydrologic Index		1			1	1
Hydrology-Based Environmental Flow Regime	3				1	
Indicators of Hydrologic Alteration	3	5	2	1	2	
Instream Flow Incremental Method	2	1			1	
Laboratory experiment	2					
Modflow	2	1	3		2	
Narrative Justification					1	
New Field Data					1	
Other method	11	2	2		5	1
Reference Crop ET	1		2			
Remote Sensing	1	1	3		8	
Riparian Habitat-Quality Index		1				
Sap flow			1	1		
Two dim. Flood Routing Model	1					
Two dim. Hydraulic Rating	1				2	
Water Budget ET	2		9	1	11	
Water Source - Isotopic	1		1		2	
Grand Total	**162**	**65**	**84**	**26**	**159**	**4**

Quality of Methods

The quality of evidence assessment of study methods was based on Pullin and Knight's (2003) hierarchy of evidence table taken from Springer et al., 2010. In addition to the six categories indicated by Pullin and Knight, we included a field for calibrated studies (CA) and not calibrated studies (NCA). Of the 435 methods that included new field or existing data, 61% used a comparison of differences between sites with or without controls of a desired species or community (II-2 category) and 21% relied on opinions of respected authorities based on qualitative field evidence, descriptive studies, or reports from expert committees. Of the nine studies that were classified as category I, four were values studies that used random samples for their participants (studies 147-150). The remaining five used random sampling of sites to determine presence/absence of species or were conducted in a laboratory (studies 41, 193, 303, 317, and 367). Of the 71 methods that used modeled data, 85% were from calibrated models. The percent of calibrated versus uncalibrated models and the categories of method quality are similar across the ecoregions (Figure 10).

Table 7. Hierarchy of Evidence Quality (Modified from Pulin and Knight, 2003)

Category	Quality of evidence
I	Strong evidence obtained from at least one properly designed; randomized controlled trial of appropriate size.
II-1	Evidence from well-designed controlled trials without randomization.
II-2	Evidence from a comparison of differences between sites with and without (controls) a desired species or community.
II-3	Evidence obtained from multiple time series or from dramatic results in uncontrolled experiments.
III	Opinions of respected authorities based on qualitative field evidence, descriptive studies or reports of expert committees.
IV	Evidence inadequate owing to problems of methodology (e.g., sample size, length or comprehensiveness of monitoring) or conflicts of evidence.
CA	Calibrated studies
NCA	Not calibrated

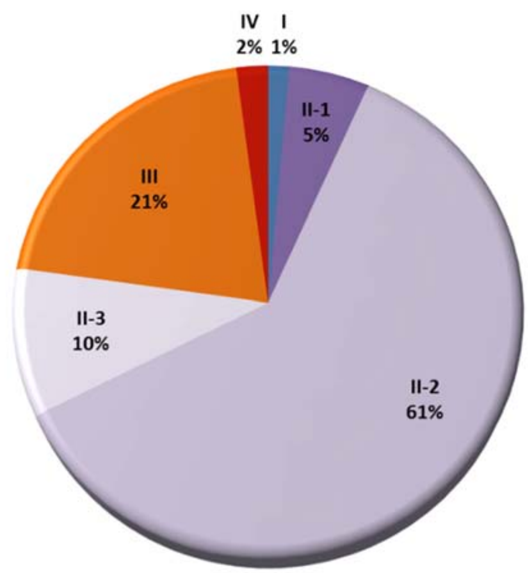


Figure 9: Quality of Methods in Database

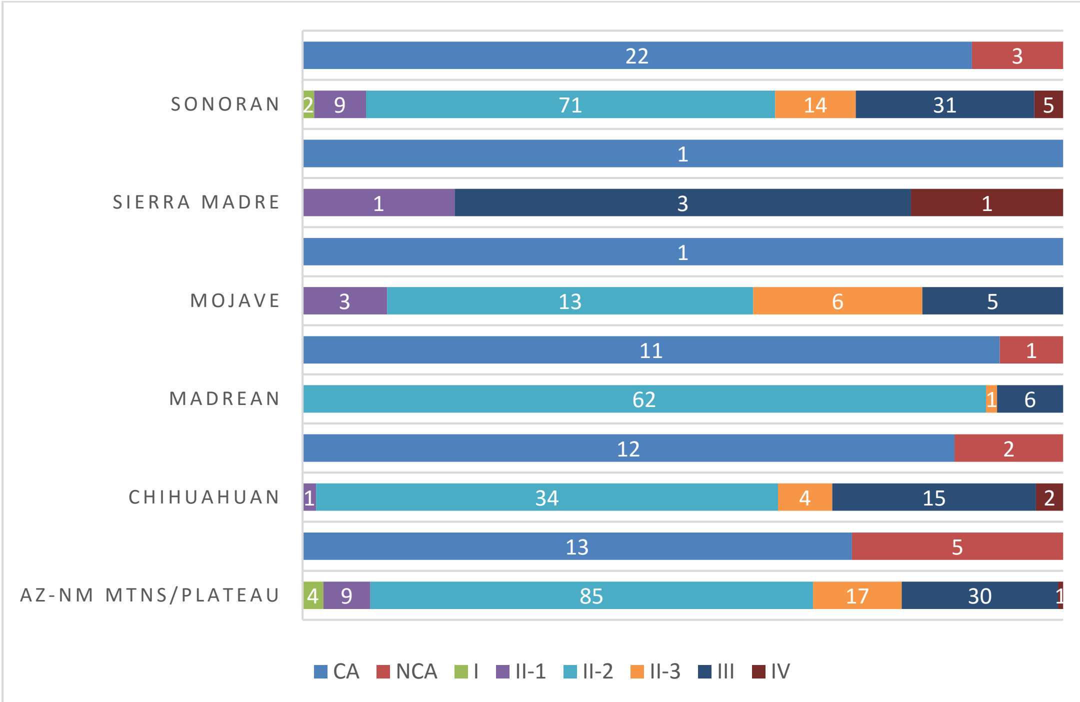


Figure 10. Quality of Methods by Ecoregion

Elements studied (e.g., flora/fauna monitoring)

The studied elements for the DLCC database include climate change impacts, fauna monitoring, geomorphology, remote sensing, soil moisture, soil type, spring permanence, stream permanence, vegetation mapping, survey and water content, in addition to water quality and well monitoring. These elements were highlighted based on the survey results of land and water managers.

Overall, vegetation surveys were the most common study element, with 20% of studies using them. Fauna monitoring and vegetation mapping were conducted in 18% of studies and stream permanence was recorded in 13% of the studies. Given their importance to riparian and aquatic species, it is notable that only 12% of studies examined geomorphology, 9% water quality, and a mere 3% discussed climate change impacts (Figure 11).

Figure 12 shows the percentage of the most and least frequently studied elements by ecoregion. The Mojave Desert is characterized by its studies of springs, which is reflected in the relatively high number of studies, although still only five, that examined spring permanence. While not a large number, it is also notable that the region with the highest number of studies that consider climate change impacts is the Arizona-New Mexico and Plateau area.

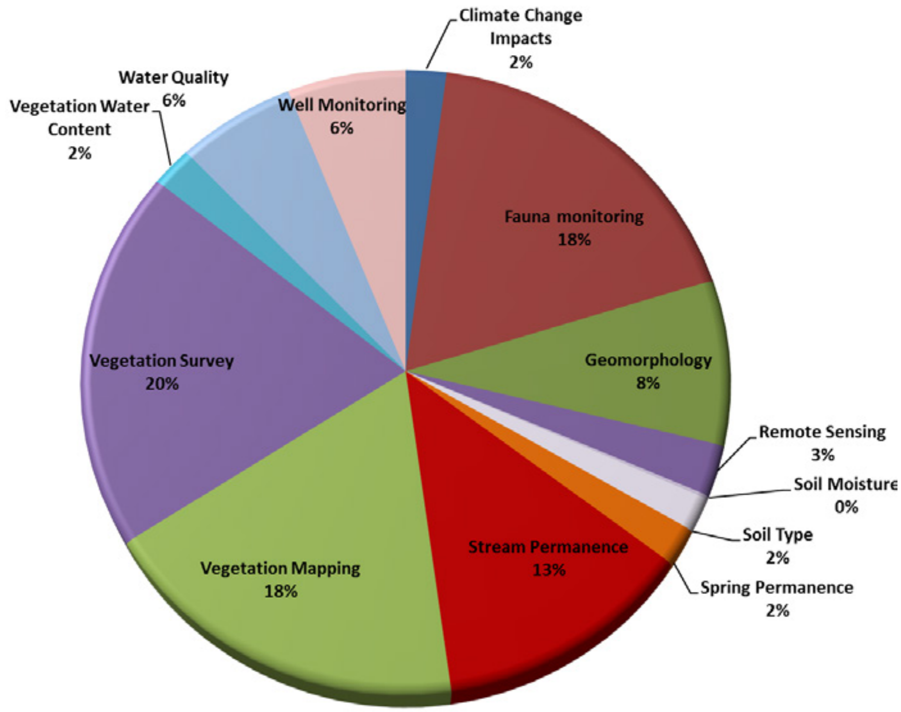


Figure 11. Studied elements in the DLCC Geography

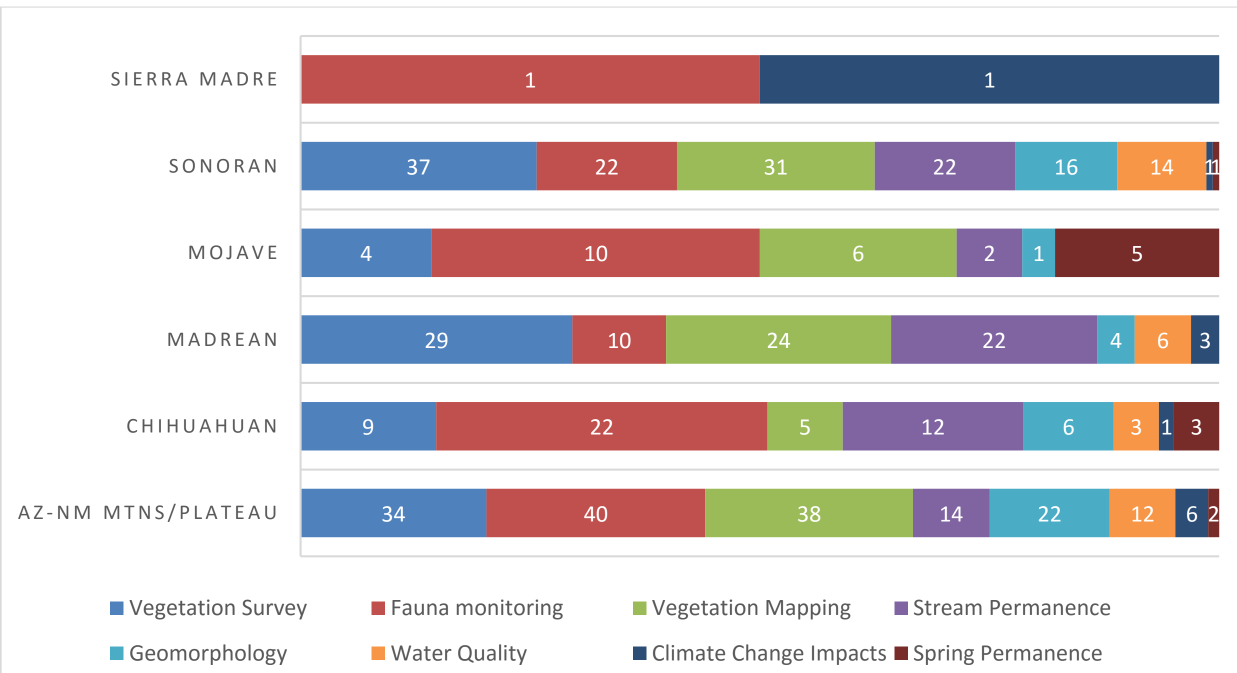


Figure 12. Most and Least Studied Elements by Ecoregion

Extent of Riparian and Water Needs/Responses Studies

Studies with quantified or described flow needs and response data exist in all ecoregions. A flow need is the amount of water flora or fauna require to survive, reproduce, and thrive. Flow responses are how flora and fauna are influenced by changes in flow, e.g., drought or floods. Quantified data are those that have figures associated with the information, e.g., Cottonwood/Willow Forest abundance is associated with ~655 cfs every 10-25 years. Described data do not have figures, e.g., Southwestern Willow Flycatcher reproduction is harmed by low streamflows in the spring. Because a handful of the 408 studies contain information on both flow needs and flow responses, the total number of studies in the database with quantified or described relationships between ecology and hydrology is 257 studies or 63%. The remaining 151 studies were included because they discuss environmental flow needs but did not provide specific information that could be translated into the flow need or flow response tables (53 studies), contained information on relationships between riparian vegetation and terrestrial or aquatic species (48 studies), or because they contained information on human values for ecosystems (50 studies). Summary information on riparian vegetation relationships with species and human aspects of environmental flows are provided in subsequent sections.

The highest density of flow need/flow response studies is in the Sonoran Desert and the Arizona-New Mexico Mountains-Plateau regions (Figure 13). Of the 144 rivers in the study, 100 rivers have at least one study of flow needs or flow responses. Of the rivers that have been studied, however, only nine (Colorado River, San Pedro River, Rio Grande, Gila River, Bill Williams River, Verde River, Pecos River, Cienega Creek, and Aravaipa Creek) have ten or more studies that directly address flow needs and/or flow responses. An additional 43 rivers have 2-9 studies of flow needs and/or flow responses and 48 studies have only one study of flow needs or flow responses. Table 8 shows all rivers with more than one study of flow needs and/or flow responses.

The most commonly studied genera for both flows needs and flow responses are Cottonwoods (Populus), Mesquite (Prosopis), Tamarisk (Tamarix), and Willow (Salix). The locations of flow needs and flow response studies for each of these genera are shown on Figures 14 - 17.

FIGURE 13. EXTENT OF FLOW NEED AND FLOW RESPONSE STUDIES

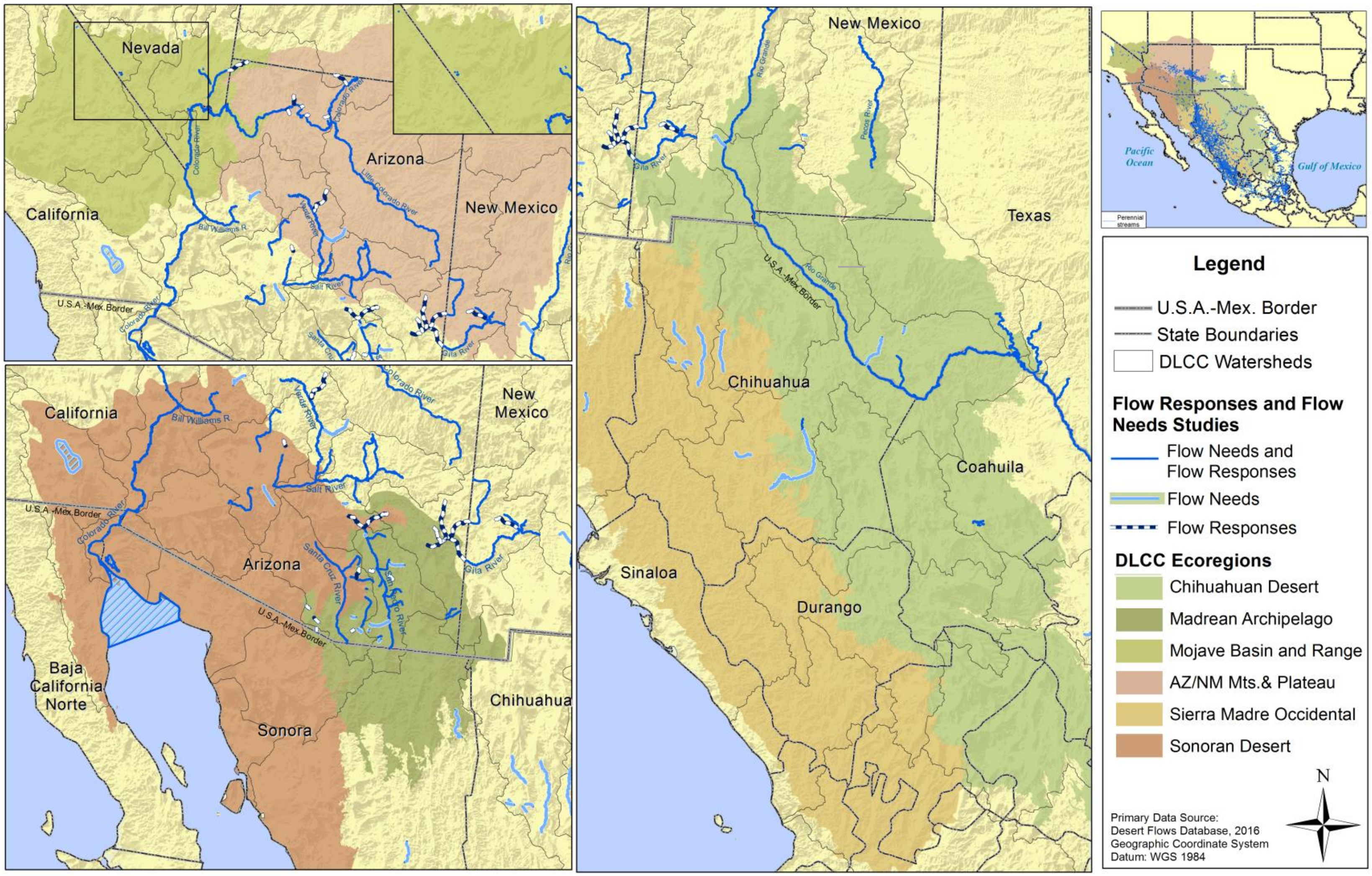


Table 8. Number of Studies of Flow Needs/Responses and Number of Species Studied by River

River Name	*Flow Needs*		*Flow Responses*		River Name	*Flow Needs*		*Flow Responses*	
	No. of Studies	No. of Species/ Genera	No. of Studies	No. of Species/ Genera		No. of Studies	No. of Species/ Genera	No. of Studies	No. of Species/ Genera
Agua Fria River	2	9	1	1	East Fork Gila River	1	1	2	6
Aravaca Creek			2	6	East Turkey Creek	1	6	2	4
Aravaipa Creek	3	14	7	18	East Verde River	1	1		
Bill Williams River	10	20	15	7	Garden Canyon	1	1	1	2
Black Canyon Creek	1	1	1	5	Gila River	15	25	12	10
Bonita Creek			2	12	Hassayampa River	2	1	5	4
Brown Canyon			3	8	Hot Springs Canyon			3	8
Buehman Canyon			3	8	Jackrabbit Spring	1	4	1	1
Cave Creek	1	6	1	1	Kings Pool	1	4	1	1
Cherry Creek	2	13	2	11	Las Moras Creek	2	9	1	1
Cienega Creek	2	2	8	10	Little Colorado River	1	4	4	8
Cienega de Santa Clara	3	7	3	3	Muddy River	2	9	1	1
Colorado River	19	44	39	74	Paige Creek	1	1	2	3
Crystal Spring	1	4	1	1	Palomas Creek	1	6		
Cuatros Cienegas Region	1	8	3	11	Paria River			2	4
Devil's Hole	1	1	2	1	Pecos River	6	28	5	6
Devlis River	4	27	1	1	Pinto Creek	1	1	1	2
Diamond Creek	1	1	1	5	Point of Rocks Springs	1	3	1	1

Table 8 Continued. Number of Studies of Flow Needs/Responses and Number of Species Studied by River

River Name	*Flow Needs*		*Flow Responses*	
	No. of Studies	No. of Species/ Genera	No. of Studies	No. of Species/ Genera
Rincon Creek	3	18	5	8
Rio Bavispe	1	1		
Rio Casas Grandes	2	4		
Rio Chama	1	6		
Rio Conchos	3	2	2	1
Rio Grande	21	55	24	50
Rio Santa Maria	2	4		
Sabino Creek			3	8
Salt River	2	2	5	8
San Felipe Creek	1	8	1	1
San Francisco River	3	2	2	3
San Pedro River	21	71	30	59
Santa Cruz River	2	2	7	19
Santa Maria River	1	1	3	3
Sonoita Creek			3	8
Sycamore Creek	2	7	4	11
Tanque Verde Wash	1	1	3	3
Tularosa River	1	1	1	1
Verde River	10	31	14	47
Virgin River	2	5	2	2

FIGURE 14: EXTENT OF FLOW NEEDS OR FLOW RESPONSES STUDIES FOR MESQUITE

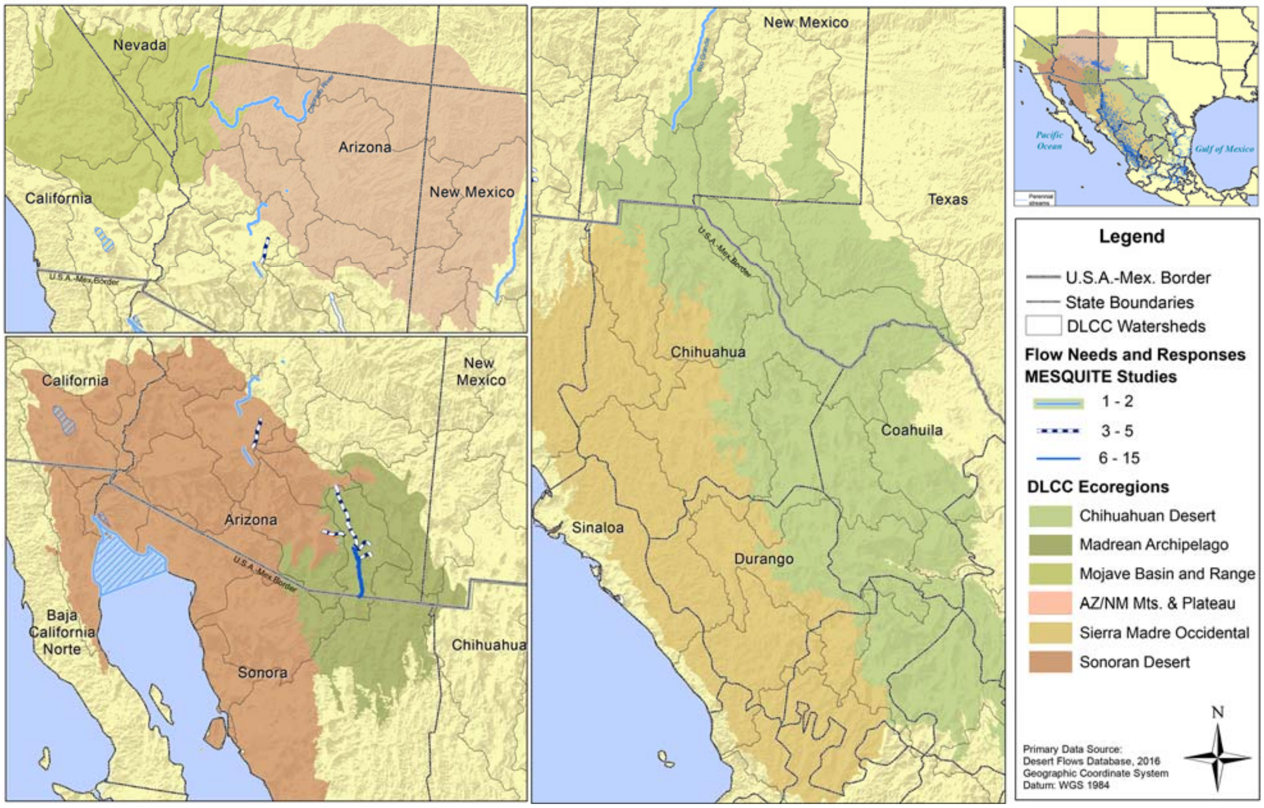


FIGURE 15: EXTENT OF FLOW NEEDS AND FLOW RESPONSES STUDIES FOR POPULUS

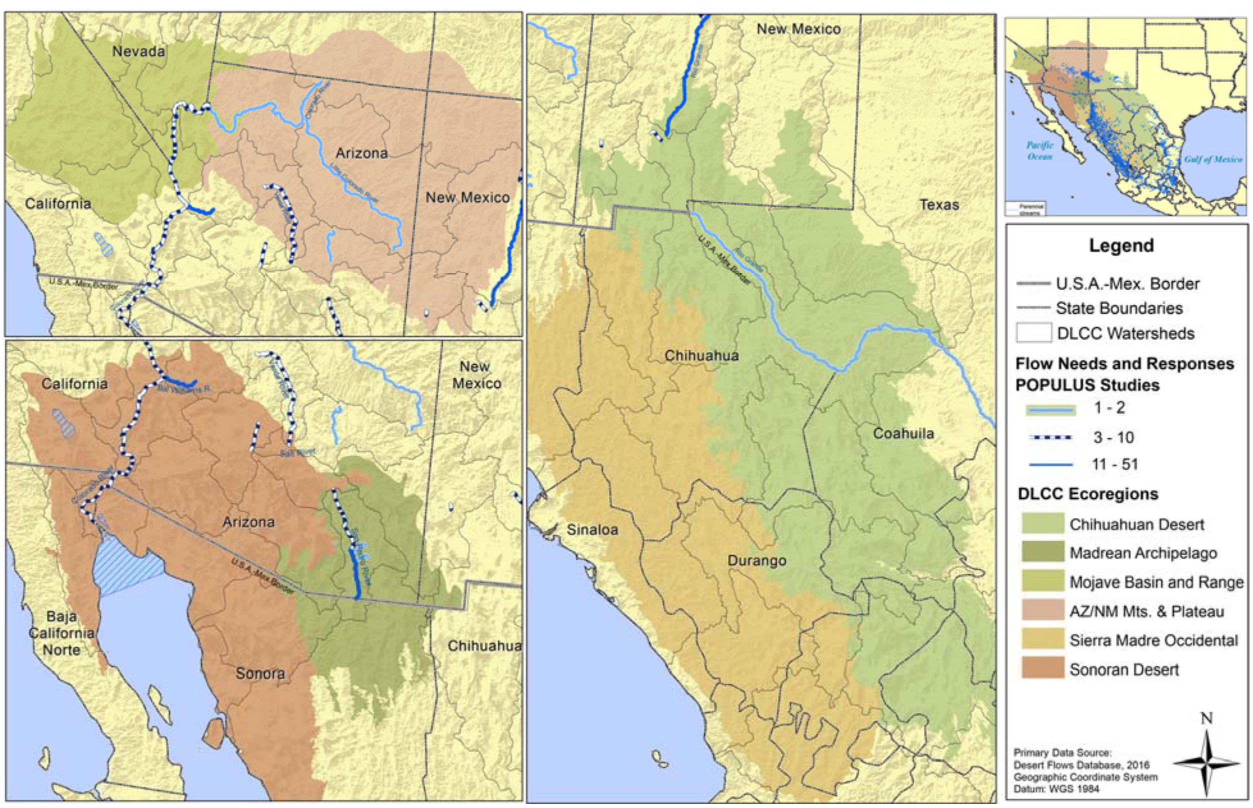


FIGURE 16: FLOW NEEDS AND FLOW RESPONSES STUDIES FOR SALIX

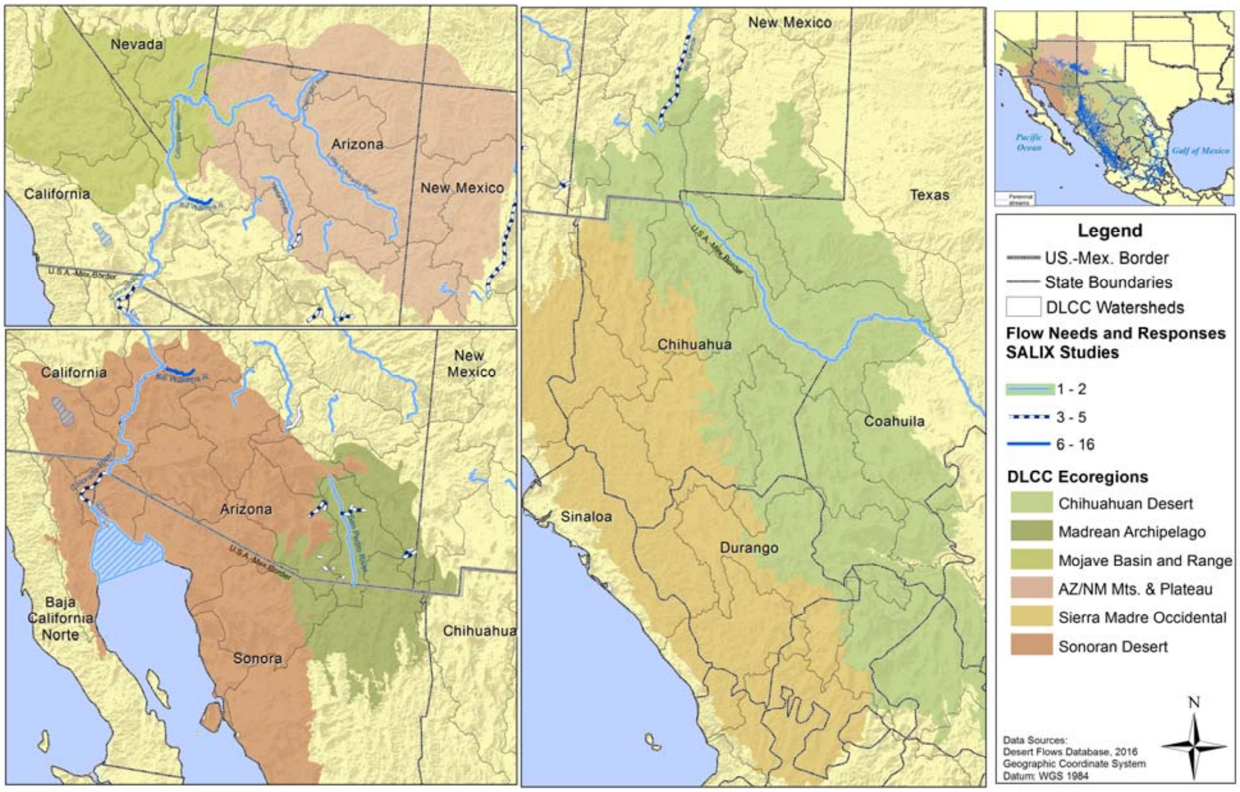
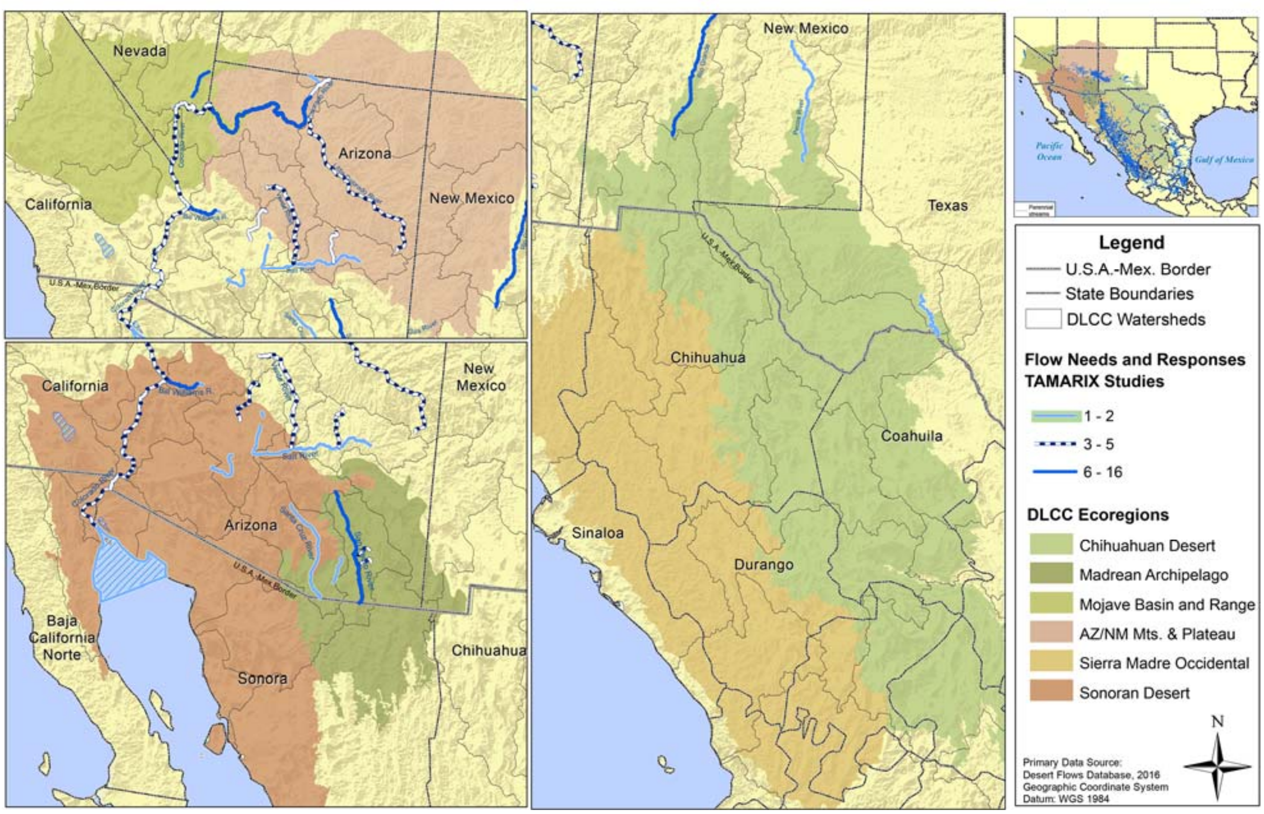


FIGURE 17: FLOW NEEDS AND FLOW RESPONSES STUDIES FOR TAMARISK



Of the 408 studies, 147 (36%) contain quantitative or descriptive information on environmental flow needs. Among these 147 studies, 74% provide quantified flow need information. Figures 18 and 19 show where flow needs have been studied and the number of species studied for flow needs. The most frequently studied genera for flow needs are Cottonwoods (Populus), Mesquite (Prosopis), Tamarisk (Tamarix), and Willow (Salix). Data on flow "needs" for each of these genera, sorted by evapotranspiration, groundwater, and surface water, are summarized in Tables 10-13. Complete information for all species with flow needs data is included in the Desert Flows Database. The data on Tables 10-13 were standardized using meta-categories for describing the ecologic impacts of flow and hydrologic element, e.g., abundance for ecology and magnitude for hydrology. The ecology and hydrology are linked using the phrases: depends upon, does not depend upon, or associated with for flow needs and uses for evapotranspiration. Depends upon was only used when authors indicated a high degree of certainty in the relationship between the hydrology and ecology.

FIGURE 18. EXTENT AND NUMBER OF STUDIES OF ENVIRONMENTAL FLOW NEEDS

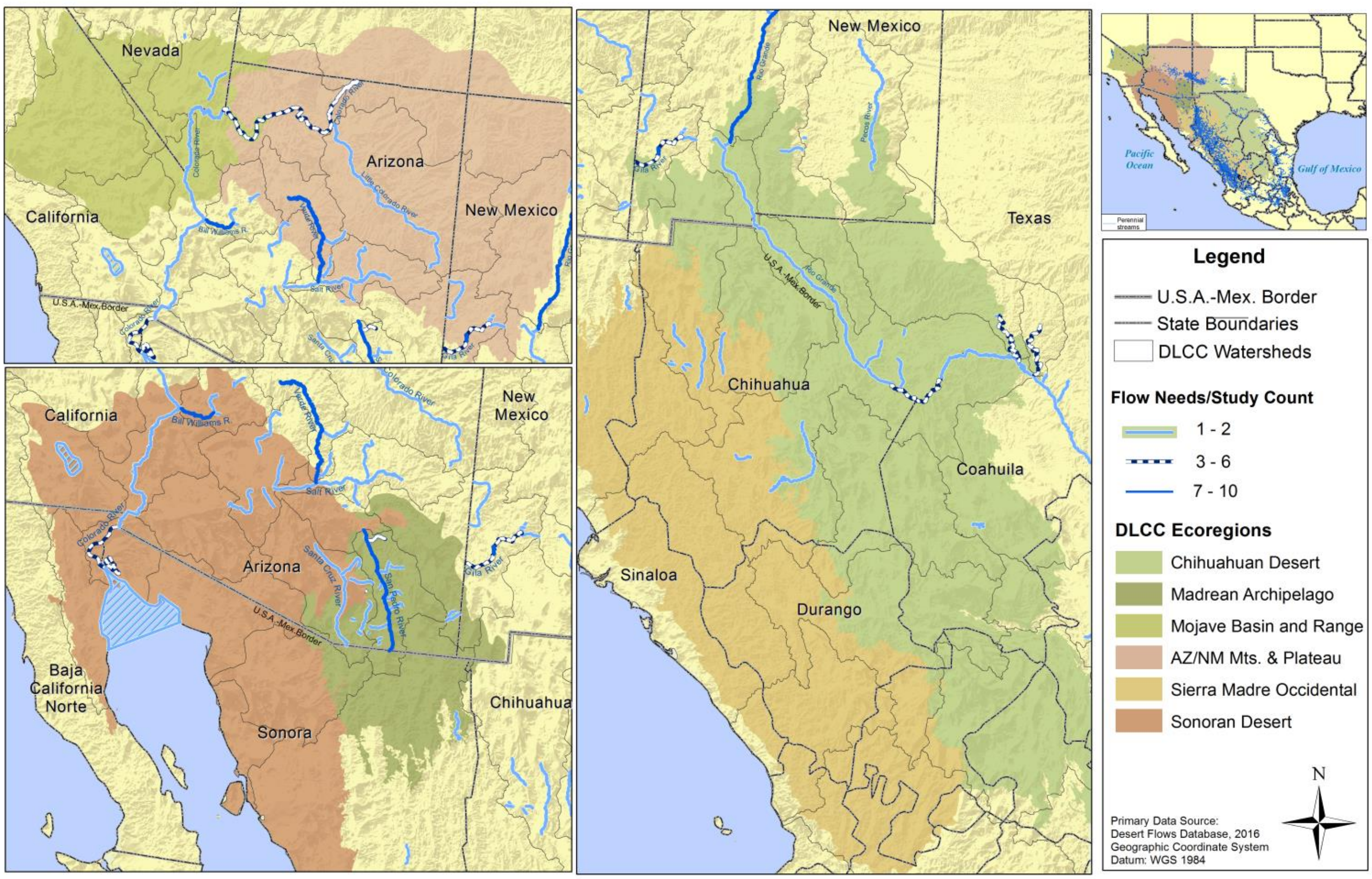


FIGURE 19. EXTENT AND NUMBER OF SPECIES STUDIED FOR FLOW NEEDS

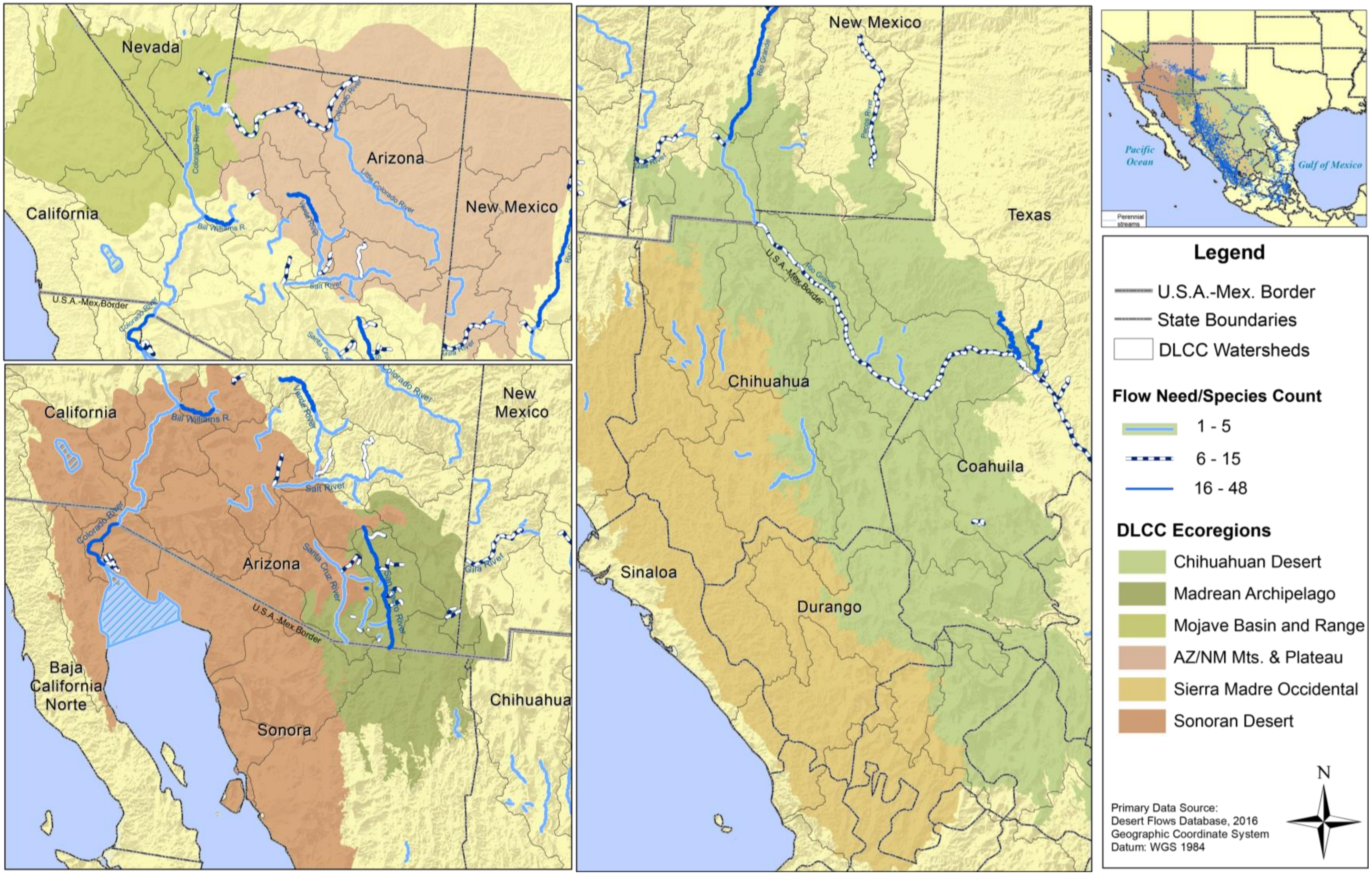


TABLE 9. SUMMARY OF DATA ON FLOW NEEDS FOR COTTONWOODS (POPULUS)

Species	Ecology	Relationship	Magnitude		Timing	Frequency	Duration	Rate of Change	Study ID	Page No.	Figure/Table No.
Evapotranspiration											
Populus deltoides	Ab	uses	95-134	cm/yr	May to Oct.				169	3215	Table 1
	Ab		125	cm/yr	May to Oct.				169	3215	Table 1
***Populus fremontii* (juvenile)**	Ab		2	m/yr					73	3625	Table 2
	Ab		1.2-2.9	m/yr					73	3625	Table 2
***Populus fremontii/Salix gooddingii* (juvenile)**	Ab		8.3	af/acre	annually				57	8	Table 2.2
Populus fremontii	Ab		1.35	m/yr	Before drought				170	77	
	Ab		1.3	m/yr	After drought				170	77	
	S		1000	mm			Perennial SW		97	51	Table 2.1, Figure 2.9
	S		500	mm			Intermittent SW		97	51	Table 2.1, Figure 2.12
	S		13.05(0.57)c	g/day			24 hr		181	291	Table 5
	Ab		0.0021	kPA					187	89	Table 2
	S		3.5-4.2	ft			Annually		234	no page #	Figure 2.5a
	S		4.0-4.5	ft			Annually		234	no page #	Figure 2.5a
	Ab		1.0-9.0	m/yr					285	234	Table 1
***Populus fremontii* (mature)**	Ab		1.8	m/yr					73	3625	Table 2
	Ab		1.1-2.6	m/yr					73	3625	Table 2
	Ab		5.0-5.8	af/acre					55	7	Table pg 7
***Populus fremontii/Salix gooddingii* (mature)**	Ab		5.0-5.8	af/acre	annually				57	8	Table 2.2
Populus fremontii (forest)	S		410	mm/yr			Intermittent SW		1	E-2	
	S		970	mm/yr			Perennial SW		1	E-2	
Populus	S		1.0-1.2	m/yr					183	440	Table 2

TABLE 9 CONTINUED. SUMMARY OF DATA ON FLOW NEEDS FOR COTTONWOODS (POPULUS)

Species	Ecology		Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Groundwater															
Populus deltoides	Ab		assoc. with	118-190	cm	May to Oct.							169	3215	Table 1
	Ab		depends upon	1.0-3.0	m								212	785	
	Ab	S		3-5	m/bls								390	6-21	Table 6.2
***Populus fremontii* (seedling)**	Ab		associated with	<0.82 ± 0.16 - <1.58 ± 0.14	m/bls						<4.4 ± 0.8	cm/day	70	584	Table 2
	Ab	S		<1	m/bls						~2	cm	83	126	
***Populus fremontii/Salix gooddingii* (seedling)**	S		depends upon	<2.91	m/bls								283	68	
	Ab		associated with	0.62±0.45	m/bls	Feb-April							401	177	Table 9
	Ab			0.95±0.43	m/bls	May-July							401	177	Table 9
	Ab			0.92±0.52	m/bls	Aug-Oct							401	177	Table 9
***Populus fremontii* (juvenile)**	Ab	S		0.3 to 1	m								56	3	Figure 2
	Ab	S		0.2-2.0	m/bls								83	123	Table 4
	Ab	S		0.9±0.5	m/bls								83	123	Table 4
	S			<2	m/bls								223	142	Figure 4
***Populus fremontii/Salix gooddingii* (juvenile)**	Ab	As		1.0 ± 0.6	m/bls								83	126	Table 6
	Ab	As		0.7 ± 0.6	m/bls								83	126	Table 6
Populus fremontii	Ab	As		<3	m/bls	>60% permanence			year round		<1	m flux	44	76	
	Ab			<1.5	m/bls								50	1978	Figure 3
	Ab	S		>3	m/bls	June/July							242	231235	Figure 1,
	Ab			1.0-3	m/bls								85	24	Figure 1.4
	S		depends upon	1.8-3.6	m/bls								208	349	Table 2
	Ab		associated with	9	ft/bls	May-June							52	25	
***Populus fremontii* (mature)**	Ab	S		0.1-5.1	m/bls								83	123	Table 4
	Ab			1.5±1.1	m/bls								83	123	Table 4
	S			<3.2	m/bls								223	142	Figure 4

TABLE 9 CONTINUED. SUMMARY OF DATA ON FLOW NEEDS FOR COTTONWOODS (POPULUS)

Species	Ecology		Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Groundwater continued															
Populus fremontii (forest)	Ab		depends upon	1 to 3	m								56	3	Figure 2
	Ab		assoc. with	3.5 ± 1.8	m/bls								83	126	Table 6
***Populus fremontii/Salix gooddingii* (forest)**	Ab		depends upon	<3	m/bls	April-June, October-March					<1	m/yr	79	374	Table 20.1
	Ab		associated with	<3	m/bls								83	126	
	Ab			1.9 ± 0.7	m/bls								83	126	Table 6
Populus/Salix (mature)	Ab			1.52±0.65	m/bls	Feb-April							401	177	Table 9
	Ab			1.78±0.63	m/bls	May-July							401	177	Table 9
	Ab			1.76±0.65	m/bls	Aug-Oct							401	177	Table 9
Populus	Ab			0.085, 0.44	P and $1-\beta$ for ANOVAs of plant and substrate water source	March							162	455	Table 4
	Ab			0.068, 0.41		June							162	455	Table 7
	Ab			0.001, 0.97		Sept.							162	455	Table 10
	Ab			0.159, 0.35		Aug.							162	455	Table 13
Surface Water															
***Populus angustifolia/Salix exigua* Forest**	Ab		associated with	~380	cfs		2-3	yrs					271		
***Populus angustifolia/Alnus incana* Forest**	As			2000	cfs		50-100	yrs					271	54	Figure 5
	As			~630	cfs		10-25	yrs					271	54	Figure 5
***Populus deltoides* (seedling)**	S		depends upon	Flooding			frequent		<50%	growing season			390	42176	Table 6.2
***Populus deltoides/Forestiera pubescens* forest**	Ab		associated with	~2228	cfs		1:5	yrs					271	51	Figure 2
	Ab			10.000-11.000	cfs		2-3	yrs					271	52	Figure 3
Populus fremontii/Populus deltoides	R		depends upon	60-150	cm above baseflow	June-July	1:5 - 1:10	yrs			<2.5	cm/day	349	635-641	Figure 3, Figure 4

Table 9 Continued. Summary of Data on Flow Needs for Cottonwoods (Populus)

Species	Ecology		Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Surface Water															
***Populus fremontii/Salix gooddingii* (seedling)**	Ab	S	assoc. with	300-600 and 400-2,500	cfs	Aug	annually		2-3	days			402	201	Figure 3
Populus fremontii	R		depends upon	198.2	m3/s	wet-year winter-spring floods	1:10	yrs					31	82	
	R			56.6	m3/s	dry year winter-spring floods minimum size	2-3	yrs					31	82	
	R										<2.5	cm/day	31	82	
	Ab			0.28	m3/s	wet and dry years							31	83	
	Ab			1.4	m3/s	wet years							31	83	
	Ab			2.8	m3/s	dry years							31	83	
	S			3×10^8	m3								210	12	
	S		associated with										181	287	Table 1
	R			142	m3/s								186	221	
	R			170	m3/s								186	221	
	R			170	m3/s								186	221	
	Ab	R		150-750	cfs	winter	1	yr			peak		223	146	Figure 7
	Ab	R		0.8-4.5	cfa	march	daily						223	147	Figure 7
***Populus fremontii/Salix gooddingii* (forest)**	Ab	R					ephemeral						120	120	Figure 2
	Ab			~655	cfs		10-25	yrs					271	53	Figure 4
	Ab			<3.0	m/bls				0.75				80	3	
Populus	Ab			5	cm/day								378	282	
	S												183	440	Table 2
	Ab			drains									272	5	
	R		depends upon	80–150	m3/s	Feb-April	4 to 5	yrs					351	870	

Table 10. Summary of Data on Flow Needs for Mesquite (Prosopis)

Species	Ecology	Relationship	Magnitude	Timing	Frequency	Duration	Rate of Change	Study ID	Page No.	Figure/Table No.
Evapotranspiration										
Prosopis velutina	S	uses	4.64 m/year					1	E-2	
	S		310 mm/yr					1	E-4	
	S		186-496 mm/yr					1	E-8-E-9	
	Ab		402 mm			growing season		25	297	
	Ab		0.0013 m/day					43	5	
	Ab		1.6 af/acre					55	7	
	Ab		330-638 mm			growing season		64	226	Table 2
	Ab		1 mm/day	May				65	254	Table 2
	Ab		1.8 mm/day	June				65	254	Table 2
	Ab		2 mm/day	July				65	254	Table 2
	Ab		2.4 mm/day	Aug.				65	254	Table 2
	Ab		2.3 mm/day	Sept.				65	254	Table 2
	Ab		0.6-2.4 m/yr					285	234	Table 1
	Ab		3 af/acre					55	7	Table pg 7
Prosopis velutina shrubland (dense)	S		600 mm			perennial SW		97	51	Table 2.1, Figure 2.7
Prosopis velutina shrubland (sparse)	S		300 mm			perennial SW		97	51	Table 2.1, Figure 2.6
Prosopis velutina forest	S		700 mm			intermittent SW		97	51	Table 2.1, Figure 2.11

Table 10 Continued. Summary of Data on Flow Needs for Mesquite (Prosopis)

Species	Ecology		Relationship	Magnitude		Timing	Frequency		Duration	Rate of Change		Study ID	Page No.	Figure/Table No.
Groundwater														
Prosopis pubescens	S		depends upon	<1.2	m/bls							208	349	Table 2
***Prosopis velutina* (juvenile)**	Ab	S	associated with	0.58	m/yr							73	3625	Table 2
	Ab			0.7-6.6	m/bls							83	123	Table 4
	Ab			2.9±1.6	m/bls							83	123	Table 4
	Ab	As		3.6 ± 1.5	m/bls							83	126	Table 6
Prosopis velutina	Ab	S	depends upon	4 to 8	m							56	3	Figure 2
	Ab	S		<6	m/bls							216	312	Figure 5
	Ab	S	associated with	2.0-4.75	m/bls							85	24	Figure 1.4
	Ab			>2	m/bls	June/July						242	231235	Figure 1, Figure 4
***Prosopis velutina* (mature)**	Ab			1.3	m/yr							73	3625	Table 2
	Ab	S		0.94	m/yr							73	3625	Table 2
	Ab			0.9-8.0	m/bls							83	123	Table 4
	Ab	As		3.4±1.7	m/bls							83	123	Table 4
	Ab			5.2 ± 1.4	m/bls							83	126	Table 6
Surface Water														
Prosopis glandulosa	Ab		associated with	arroyos								321	353	Table 5
Prosopis pubescens	Ab			0-450	kgH2O/m2	July						254	15	Figure 3
	Ab			0-440	kgH2O/m2	August						254	15	Figure 3
***Prosopis velutina* forest**	Ab								ephemeral			120	120	Figure 2

TABLE 11. SUMMARY OF DATA ON FLOW NEEDS FOR TAMARISK

Species	Ecology		Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Evapotranspiration															
Tamarix chinensis	Ab		uses	69-118	cm/yr	May to Oct.							169	3215	Table 1
	Ab			1.2	m/yr	Before drought							170	77	
	Ab			0.7	m/yr	After drought							170	77	
Tamarix ram.	S			375	mm/yr								1	E-2	
	S			750	mm/yr								1	E-2	
	S			8.25	g/day				24	hr			181	291	Table 3
	Ab			0.7-3.4	m/yr								285	234	Table 1
	Ab			16.3 +/- 3.9	mm/d	July							295	894	Table 4
	Ab			10.4 +/- 0.7	mm/d	Aug							295	894	Table 4
	Ab			7.2 +/- 0.4	mm/d	Sept							295	894	Table 4
	Ab			5.9 +/- 0.5	mm/d	Oct.							295	894	Table 4
	Ab			more		Flood season							355	120	Figure 41
	Ab			1.11	m/yr								387	1482	Figure 9
	S			3.0-4.1	ft				annually				234	no page #	Figure 2.5a
	S			2.5-3.0	ft				annually				234	no page #	Figure 2.5a
Tamarix ram. Prosopis velutina forest	S			410	mm/yr								1	E-3	
Tamarix	Ab			760	l/day								129	332	
	S			0.8-1.2	m/yr								183	440	Table 2

Table 11 Continued. Summary of Data on Flow Needs for Tamarisk

Species	Ecology		Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Groundwater															
Tamarix chinensis	Ab			213-385	cm	May to Oct.							169	3215	Table 1
***Tamarix chinensis* (juvenile)**	Ab	S		0.2-2.5	m/bls								83	123	Table 4
	Ab			1.3±0.6	m/bls								83	123	Table 4
***Tamarix chinensis* (mature)**	Ab	S		0.4-2.5	m/bls								83	123	Table 4
	Ab	S		1.4±0.6	m/bls								83	123	Table 4
***Tamarix ramossissima* (seedling)**	Ab		associated with	<0.44 ± 0.08 - <1.24 ± 0.14	m/bls						<1.2 ± 0.4	cm/day	70	584	Table 2
Tamarix ramossissima	Ab			<1.5	m/bls								50	1978	Figure 3
	Ab			2.0-4.0	m/bls								85	24	Figure 1.4
Tamarix	Ab			2.5-6.0	m								129	333	Table 2
	Ab			0.272, 0.25	P and 1-β for ANOVAs of plant and substrate water source	March							162	455	Table 2
	Ab			0.051,0.48		June							162	455	Table 5
	Ab			0.003, 0.93		Sept							162	455	Table 8
	Ab			0.127, 0.28		Sept							162	455	Table 11
Surface Water															
Tamarix ramossissima	Ab	R	associated with	0.3	IFM								27	143	Figure 5
	Ab					year round			<60% permanence				44	104	
	R			X		X	X						50	147	
	S												181	287	Table 1
	Ab			intermittent		regulated							217	386	
	Ab			0-1000	kgH2O/m2	July							254	15	Figure 3
	Ab			0-650	kgH2O/m2	August							254	15	Figure 3
Tamarix	S												183	440	Table 2
	Ab			1416	m3/s		regulated						316	4	

Table 12. Summary of Data on Flow Needs for Willow (Salix)

Species	Ecology		Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Evapotranspiration															
Salix gooddingii	S		uses	9.39	g/day				24	hr			181	291	Table 4
Groundwater															
***Salix gooddingii* (seedling)**	Ab		associated with	<0.82 ± 0.16 - <1.44 ± 0.14	m/bls						<3.1 ± 0.8	cm/day	70	584	Table 2
	0	S		<1	m/bls						~2	cm/day	83	126	
***Salix gooddingii* (juvenile)**	Ab	S		0.1-2	m/bls								83	123	Table 4
	Ab			0.6±0.6	m/bls								83	123	Table 4
***Salix gooddingii* (mature)**	Ab	S		0.09-3.2	m/bls								83	123	Table 4
	Ab			1.4±0.9	m/bls								83	123	Table 4
Salix gooddingii	Ab	As		<3	m/bls	year round			>60% permanence		<1	m flux	44	76	
	Ab			<1.5	m/bls								50	1978	Figure 3
	Ab	S		9	ft/bls	May-June							52	25	
	Ab			0.5-3.25	m/bls								85	24	Figure 1.4
	Ab	S		1.8-4.26	m/bls	year round							242	235	Figure 4
Salix nigra	S			1.2-2.4	m/bls								208	349	Table 2
Salix	Ab			0.267, 0.25	P and 1-β for ANOVAs of plant and substrate water source	March							162	455	Table 3
	Ab			0.058, 0.42		June							162	455	Table 6
	Ab			0.001, 0.96		Sept.							162	455	Table 9
	Ab			0.061, 0.46		Sept.							162	455	Table 12
Soil Moisture															
Salix	R		assoc. with	5	cm/day								378	282	

Table 12 Continued. Summary of Data on Flow Needs for Willow (Salix)

Species	Ecology		Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Surface Water															
Salix exigua	Ab		associated with	0-450	kgH2O/m2	July							254	15	Figure 3
	Ab			0-400	kgH2O/m2	August							254	15	Figure 3
***Salix exigua/Equisetum laevigatum* community**	Ab			~1010	cfs		1:1	yrs					271	51	Figure 2
Salix gooddingii	R		depends upon	198.2	m3/s	wet-year winter-spring	1:10	yrs					31	82	
	R			56.6	m3/s	dry year winter-spring floods minimum size	2-3	yrs					31	82	
	R			<2.5	cm/day		flood recession						31	82	
	Ab			0.28	m3/s	wet and dry years							31	83	
	Ab			1.4	m3/s	wet years							31	83	
	Ab			2.8	m3/s	dry years							31	83	
	S		assoc. with										181	287	Table 1
	S		depends upon	3×10^8	m3								210	12	
Salix	Ab		associated with	0.05 ± 0.05									251	197	Table 4
	Ab			13.10 ± 6.88									251	197	Table 4
	Ab			0.90 ± 0.57	m								251	197	Table 4
	Ab			drains									272	4	
	R		depends upon	80–150	m3/s	Feb-April	4 to 5	yrs					351	870	

Of the 153 studies (37%) that describe responses to changes in flow, only 44% quantify the flow amounts that impact species and ecosystems. Figures 20 and 21 display where flow responses have been studied and the number of species studied for flow responses. The most frequently studied species or genera for flow responses are Cottonwoods (*Populus*), Tamarisk (*Tamarix*), Willow (*Salix*) Mesquite (*Prosopis)*, and Silvery Minnow (*Hybognathus amarus*). Data on flow responses for these genera or species, sorted by groundwater and surface water, are summarized in Tables 13-17. The data on Tables 13-17 were standardized using meta-categories for describing the ecologic impacts of flow and hydrologic element, e.g., abundance for ecology and magnitude for hydrology. The ecology and hydrology are linked using the phrases: enhanced by, harmed by, not harmed by and influenced by. Influenced by was used when the authors discussed responses to changes in flow but did not indicate if the species were positively or negatively affected.

FIGURE 20: EXTENT AND NUMBER OF FLOW RESPONSE STUDIES

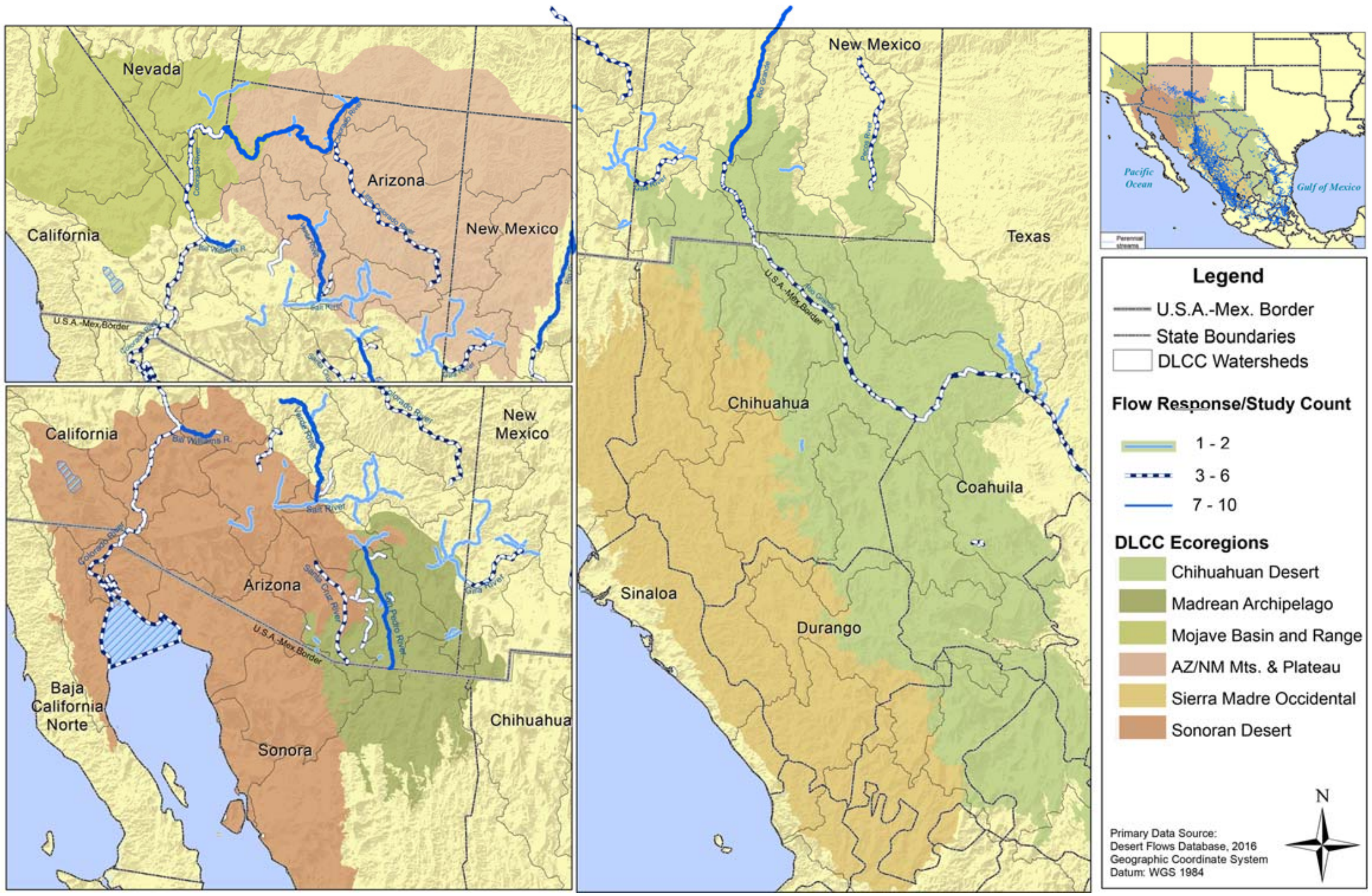


FIGURE 21. COUNT OF SPECIES BY RIVER WITH FLOW RESPONSE STUDIES

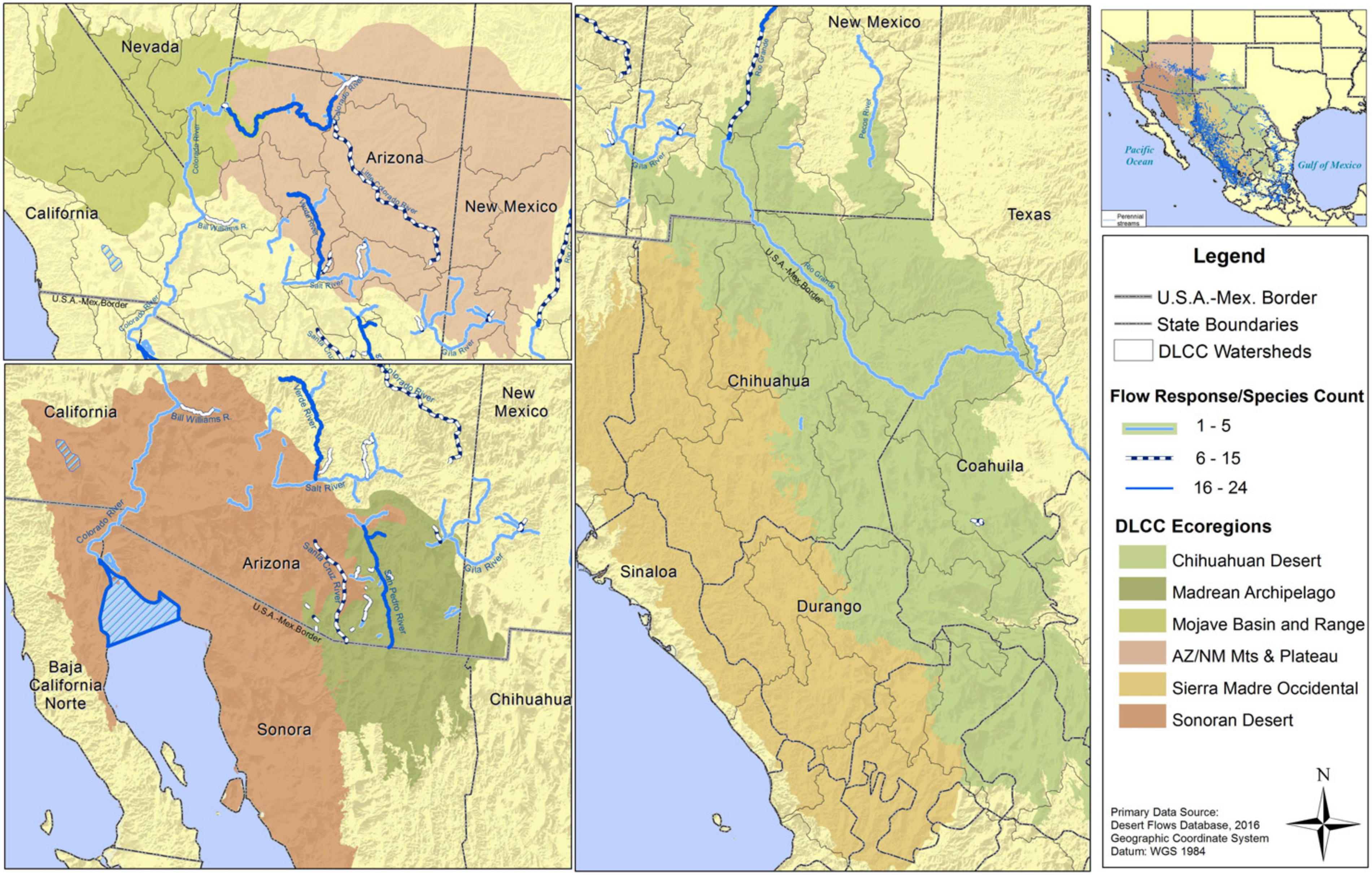


Table 13. Summary of Data on Flow Responses for Cottonwoods (*Populus*)

Species	Ecology			Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Groundwater																
Populus deltoides	As	S		harmed by	>2.5	m/bls	June					large fluctuations		246	49	
Populus fremontii **(seedling)**	Ab			enhanced by	0.5-2.25	m/bls								87	74	Figure 6-1
Populus fremontii	Ab			influenced by	1.1 - 1.8	m/bls								23	56	
	S				drawdown					9	days	2	cm/day	150	698	Table 2
	S				drawdown					20	days	5	cm/day	150	698	Table 2
	Ab				3.1 - 3.9	m/bls								23	56	
	S			enhanced by	3.5-4.0	m/bls				year round				34	1059	
	Ab				<2.6	m						<0.46	m	45	162	Table 7
	Ab				<2.8	m/bls		monthly						17	354, 360	Figure 3, Figure 9
	Ab				<1.5	m bls								103	1978	Figure 1
	S			harmed by	>2-3	m/bls	dry years							33	301	Figure 10
	S				>150	cm/bls	June-July					5-10	cm/day	235	55	Table 4
	Ab				>3	m/bls				abrupt		>1	m	87	74	Figure 6-1
Populus fremontii/ Salix gooddingii **(forest)**	R			enhanced by	< 2	m	March to Oct.			<0.5 - 1	m/growing season	<2	cm/day	18	3	
	Ab	S										<0.5	m/yr	283	73	Figure 5
	S						during first year					<2-3	cm/day	78	38	
	S				2-Jan	m/bls	summer							78	38	
	Ab	R			<2.6	m						<0.5	m	45	161	
	S			harmed by	>2.72-3.14	m/bls						1.11-2.28	m/yr	283	70	Figure 4
	S				1	m				permanent		abrupt		78	38	
	Ab				0.5	m				permanent		abrupt		78	38	

Table 13 Continued. Summary of Data on Flow Responses for Cottonwoods (Populus)

Species	Ecology			Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Surface Water																
Populus deltoides (seedling)	S			harmed by								3-4	cm/day	104	537	Figure 3
Populus fremontii	S			influenced by	alteration									107	738	Figure 3
	Ab			enhanced by										17	355, 357	Table 1, Table 4
	Ab				>7.4	% soil moisture								17	355, 357	Table 1, Table 4
	S	R			60-150	cm above low flow level	March-April					max 2.5	cm/day	67	35	Figure 25
	Ab	S			effluent									307	262, 263	Figure 1
	Ab	R		harmed by	alteration		alteration	alteration						50	144	
	Ab				>32	%		daily of monthly median						17	354, 360	Figure 3, Figure 9
	S				>1,000	cfs	March to October			> 50	days			18	3	
	S				>1,000	cfs	November to February			> 80	days			18	3	
	Ab	R			>0.2	IFM								27	143	Figure 4
	Ab				0.60×10^8	m3								190	109	Figure 5
	Ab				0	m3								190	109	Figure 5
	Ab	R			large floods		monsoon					peak		223	146	Figure 6, Table 1
	Ab				high		August							366	571	Table 4
	Ab				agricultural areas									352	316, 317	
***Populus fremontii/ Salix exigua* forest**	Ab				20,000-25,000	cfs	Spring or Winter	1	seasons	≥1				340	16	Table 1, Table 4
	Ab				> 50,000	cfs				>30				340	20	Table 1, Table 6

Table 13 Continued. Summary of Data on Flow Responses for Cottonwoods (Populus)

Species	Ecology			Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Surface Water																
***Populus fremontii/ Salix gooddingii* (forest)**	As			enhanced by	high intensity									84	11	
	Ab	As		enhanced by	decreased floods		increased summer flows							277	118	
	Ab	R		enhanced by	>76%									45	161	
	Ab			harmed by	5		May-June					3.1 +- 0.2	cm/day	7	384-386	Tables 1-2
	As	R		harmed by	<200	m3/s								277	121	
	Ab	S		harmed by	smaller floods									277	120	
	Ab			harmed by	reduced flooding									388	12	
Populus	Ab			enhanced by	flood pulse									224	294	
	Ab	S	R	harmed by	alteration							4000-6000	acres	255	999	

Table 14. Summary of Data on Flow Responses for Tamarisk

Species	Ecology	Relationship	Magnitude	Timing	Frequency	Duration	Rate of Change	Study ID	Page No.	Figure/Table No.
Groundwater										
Tamarix chinensis	S	harmed by	>2.5-3 m/bls	dry years				33	293	Figure 10
	S	enhanced by	3.5-4.0 m/bls			year round		34	1059	
Tamarix ram.	S	influenced by	drawdown			9 days	2 cm/day	150	698	Table 3
	S		drawdown			20 days	5 cm/day	150	698	Table 3
Surface Water										
	Ab	influenced by	flood	Winter				171	421	
	Ab S R		alteration					255	999	
	Ab		20,000-25,000 cfs	Oct-March		≥1 month		340	13, 16	Table 3, Table 4
	Ab		≤10,000 cfs	April-Sept		1-3 months		340	13, 17	Table 1
	Ab		intermittent				deep and fluctuating	84	12	
	Ab R	enhanced by	5 m3/sec	May-June			3.1 +- 0.2 cm/day	7	384-386	Tables 1-2
	S		floods			~2 mos		86	782	
	Ab		<42% perman-ence					45	162	Table 8
Tamarix ram.	Ab		alteration	alteration	alteration			50	146	
	As		high intensity					84	11	
	S R		floods	March				58	1	
	R		1161 m3/s	March		60 hours		58	20	
	S		floods			~10 mos		86	782	
	S	harmed by					3-4 cm/day	104	537	Figure 3
	S		66-69 m3/s	March	annually	7.5 hrs		140	2847, 2857	
	Ab R		20,000-25,000 cfs	April-Sept	4 seasons	≥1 months		340	13	Table 1, Table 3
	Ab		> 50,000 cfs			>30 days		340	20	Table 1
	Ab R		flood pulse	Early March				228	54	
	Ab S	enhanced by	floods	May-Sept				100	1068	Table 2
Tamarix ram./ Tamarix chi.	Ab S	harmed by	precipitation	July-Sept	yr. after germ			100	1068	Table 2
	S		decreasing					107	738	Figure 3
	Ab	influenced by	0.60×10^8 m3					190	109	Figure 5
Tamarix	Ab		0 m3					190	109	Figure 5
	Ab	enhanced by	flood pulse					224	294	

TABLE 15. SUMMARY OF DATA ON FLOW RESPONSES FOR WILLOW (SALIX)

Species	Ecology			Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Groundwater																
Salix gooddingii	S			enhanced by	3.5-4.0	m/bls	year round							34	1059	
	Ab				<2.6	m						<0.46	m	45	162	Table 7
	Ab				<2.8	m/bls		monthly						17	354, 360	Figure 3, Figure 9
	Ab				0-2.8	m/bls								87	75	Figure 6-2
	Ab			harmed by	>3	m/bls								44	105	
	S				>2.5-3	m/bls	dry years							33	293	Figure 10
Surface Water																
***Salix exigua* (seedling)**	S			harmed by								3-4	cm/day	104	537	Figure 3
Salix exigua	Ab			enhanced by	floods		early season			short				58	2	
***Salix exigua/Baccharis emoryi* shrubland**	Ab				>8000 but <25,000	cfs	April-Sept	daily		4	yrs	up to 8000	cfs/day	340	13	Table 1, Table 3
	Ab			harmed by	≥ 25,000	cfs				>30	days			340	20	Table 1, Table 6
***Salix gooddingii* (seedling)**	S				floods					~10	mos			86	782	
	S			enhanced by	floods					~2	mos			86	782	
Salix gooddingii	Ab				>32	%		daily of monthly median						17	354, 360	Figure 3, Figure 9
	Ab			harmed by	0.60×10^8	m3								190	109	Figure 5
	Ab				0	m3								190	109	Figure 5
	Ab													17	355, 357	Table 1, Table 4
	Ab				>7.4	%								17	355, 357	Table 1, Table 4
***Salix nigra* (seedling)**	S				dry					>5	days			390	6-21	Table 6.2
Salix nigra	Ab	S		enhanced by	effluent									307	262, 263	Figure 1
	S			not harmed by	saturation					>30	days			390	6-21	Table 6.2
Salix	Ab	S	R	harmed by	alteration							4000-6000	acres	255	999	

Table 16. Summary of Data on Flow Responses for Mesquite (Prospis)

Species	Ecology		Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change		Study ID	Page No.	Figure/Table No.
Groundwater															
Prosopis velutina	S		enhanced by	drawdown							rapid		106	1193	Table 5
	S		harmed by	14	m/bls								43	5	
	S			drawdown							rapid		106	1193	Table 5
***Prosopis velutina* (mature)**	Ab	S	enhanced by	<5	m/bls								375	32	
	S		harmed by	15-18	m/bls								375	32	
Surface Water															
Prosopis glandulosa	Ab		harmed by	0.60x10^8	m3								190	109	Figure 5
	Ab			> 50,000	cfs				>30	days			340	20	Table 1, Table 6
Prosopis velutina	Ab		harmed by	high intensity									84	11	
Prosopis	S		influenced by	flood pulses									153	377	Table 3

Table 17. Summary of Data on Flow Responses for Silvery Minnow (Hybpgnathus amaru)

Species	Ecology		Relationship	Magnitude		Timing	Frequency		Duration		Rate of Change	Study ID	Page No.	Figure/Table No.
Surface Water														
Hybognathus amarus	S		influenced by	flow levels								152	1264	Figure 1
	S			alteration								177	175	
	Ab	R		bendway weirs								322	818	
	Ab	R		bendway weirs								324	832	
	R		enhanced by	140	m3/s	May-June			5-10	days		348	209	Figure 6, Figure 7
	Ab	S		>100	km							236	2080	
	Ab		harmed by	alteration							gradual	191	82	Table 1
	Ab			alteration							gradual	191	82	Table 2
	Ab	S		<100	km							236	2080	

Relationships Between Riparian Vegetation and Terrestrial and Aquatic Species

As seen in the previous section, riparian trees are studied more frequently than any other flora or fauna. This was also true in the 2011 Arizona study of flow needs and responses. For this reason, and based on feedback from our initial survey of managers, we recorded simple information on the relationships between riparian vegetation and terrestrial and aquatic species in this study. For each study that discussed riparian vegetation and species, we used the same phrases as flow needs and flow responses (associated with, depends upon, enhanced by, etc.) to standardize and describe the relationship between the flora and fauna. Of the 408 studies in the Desert Flows Database, 17% contain information on the relationship between species and 12% are included only for this reason.

The most frequently discussed vegetation and how these vegetation “relate” to various species is shown in Table 18. The most frequently studied species is tamarisk, however, most of the studies discuss how various species are associated with tamarisk and only 8% document how species are harmed by the presence of tamarisk. Another notable aspect is that, among the most frequently mentioned vegetation, only Cottonwoods and Cottonwood/Willow forests are discussed as having species that are dependent upon them. Species that were indicated as depending upon cottonwoods include beaver, lesser goldfinch, western yellow-billed cuckoo, yellow warbler, bullock oriole, summer tanager, great blue heron, gila woodpecker, and summer tanager (studies 75, 245, and 406). Interestingly, the six studies that discuss the southwestern willow flycatcher were focused predominantly on tamarisk and only discussed how the birds are associated with tamarisk, willows, box elder, or Freemont cottonwoods (studies 210, 226, 231, 241, 298, 338). All other studies that discuss the dependence of species on vegetation discuss the relationship in general terms, e.g., Bell’s vireo is dependent upon riparian shrubland or New Mexico jumping mice are dependent upon herbaceous riparian vegetation.

Table 18. Most Common Riparian Vegetation Associated with Terrestrial or Aquatic Species

	associated with	depends upon	enhanced by	harmed by	influenced by	not associated with	not harmed by	Total Number of Entries
Tamarix	48%		3%	8%	36%	1%	4%	75
Populus	53%	8%	4%		36%			53
Non-Native					100%			48
Prosopisis	43%				57%			46
Salix	52%		3%		45%			33
Native riparian vegetation	10%		52%			38%		29
Baccharis	9%				91%			23
Populus/Salix Forest	36%	50%			14%			14
Larrea tridenta	50%				50%			12

Human Aspects of Environmental Flows Studied

Human aspects of environmental flows include studies that estimate the monetary value of species or ecosystems, exploration of ecosystem services, and general human values for species or ecosystems. Compared to studies of flow needs, human aspects of environmental flows do not reveal the amount of water necessary to provide to ecosystems, but they can provide valuable information for decision making because they provide evidence regarding certain approaches to ecosystem or species “value” in an economic context. As a result, these studies can inform policy regarding economic implications. The studies are classified according to their method used to estimate value. Methods used in the watersheds of the DLCC include: contingent valuation, expenditure indices, direct use market pricing, and hedonic. There are 83 studies in the database that include human aspects and 50 studies, or 12%, that are only contain information on human values for flows. Economic studies make up 23% of the studies, discussions of ecosystem services constitute 17%, surveys of non-economic values 5%, and the remaining 54% of studies were classified as using other methods to discuss or determine human values for environmental flows. Examples of studies in the “other” category include study 159 (Brock, Kelly, & Chapman, 2001), which describes a legal and institutional framework for restoring instream flows on the Rio Grande, and study 305 (Kaiser & Binion, 1998), which explores stakeholder satisfaction with current instream flow practices on the Rio Grande and outlines, through a preferences and feasibility analysis, those strategies favored by stakeholders.

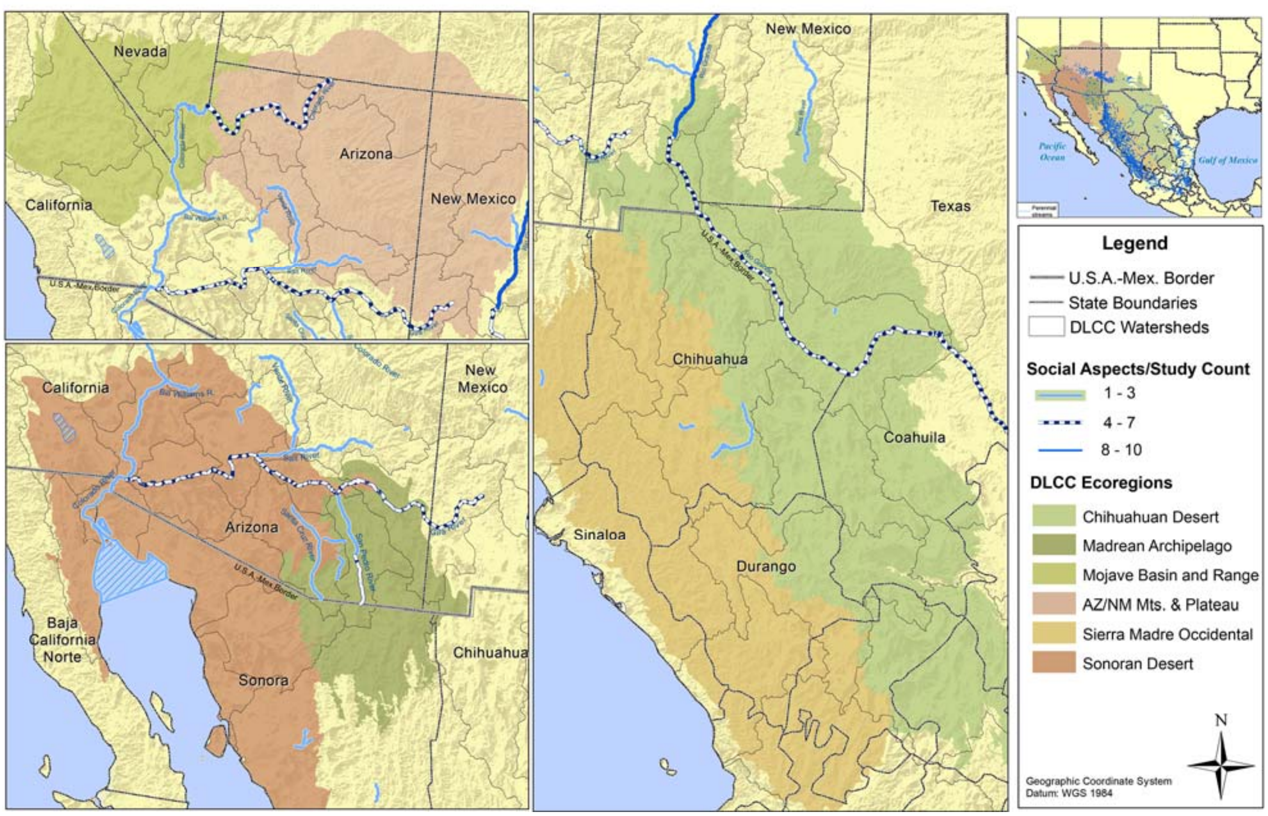
The Sonoran Desert ecoregion has the largest number of studies that discuss human values and the most economic and ecosystem services studies. Of the 114 studies conducted in the Sonoran Desert, 30% examined some aspect of human values. In the Chihuahuan Desert, 28% of studies examined human aspects, compared to 17% of studies in the Arizona/New Mexico and Plateau region (Table 19).

The rivers that have been examined most frequently in relation to human aspects of environmental flows are the Rio Grande (19 studies) and the Colorado River (15 studies). Other rivers with multiple studies include the Verde River and the San Pedro River (Figure 22).

Table 19. Human Aspects of Environmental Flows Studied by Technique and Ecoregion

EcoRegion	Human Aspect Description	Study Count	No. of Studies
AZ-NM Mountains/Plateau	Direct Use Market Pricing	1	26
	Expenditure Indices	1	
	Other Economic Study	4	
	Ecosystem Services	3	
	Values Survey	4	
	Other Human Aspects/Values Studied	13	
Chihuahuan	Other Economic Study	4	19
	Other Human Aspects/Values Studied	15	
Madrean	Expenditure Indices	2	7
	Ecosystem Services	4	
	Other Human Aspects/Values Studied	3	
Mojave	Other Human Aspects/Values Studied	3	3
Sonoran	Expenditure Indices	1	35
	Real Estate-Hedonic	5	
	Other Economic Study	5	
	Values Survey	1	
	Ecosystem Services	14	
	Other Human Aspects/Values Studied	9	

Figure 22. Location of Studies Considering Human Aspects of Environmental Flows



RISKS AND STRESSORS FOR ECOSYSTEMS AND SPECIES IN THE DESERT WATERSHEDS OF THE U.S. AND MEXICO

Riparian ecosystems are often threatened by anthropogenic activities related to the increasing demand on water related resources, in addition to natural impacts such as climate variability, wildfires, and associated geomorphologic changes. The most common risks and stressors reported in the study area include engineered structures, non-native species, altered flows, climate, groundwater impacts, and water quality. Together they account for 76% of the total stressors in the area (Figure 23).

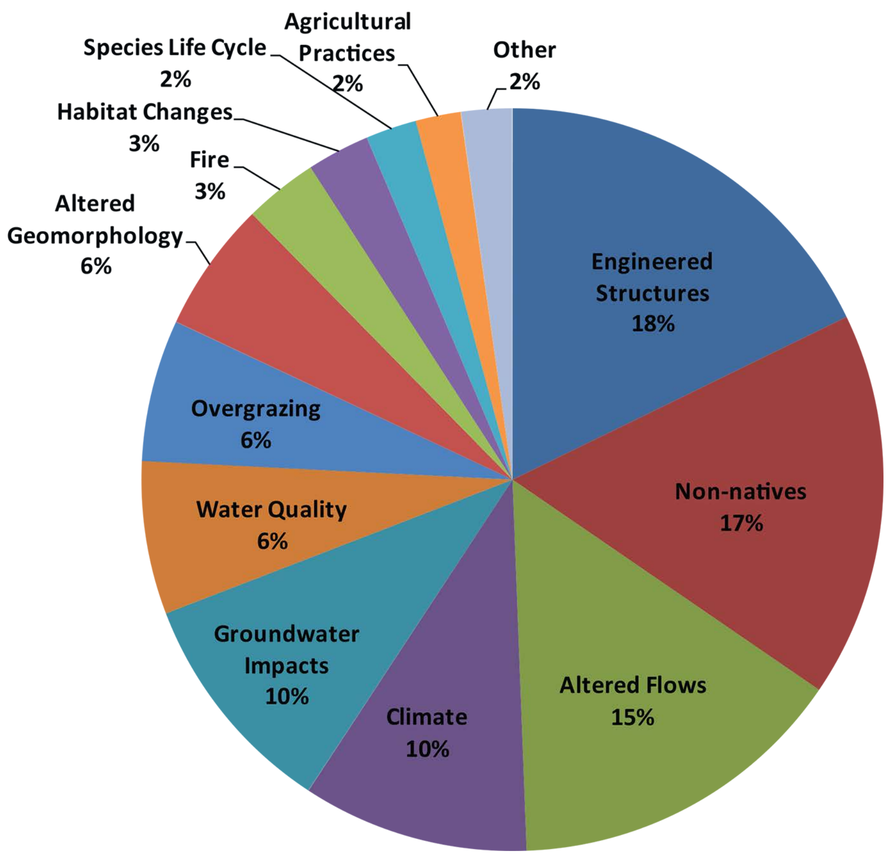


FIGURE 23. GENERAL CATEGORIES OF RISKS AND STRESSORS FOR THE DESERT WATERSHEDS OF THE U.S. AND MEXICO

Engineered structures such as dams (impoundment), diversions, and flood control projects generate water stress for vegetation and aquatic species, changes in nutrient exchange, fragmentation, and flood plain alteration. The introduction of non-native species has proven to be harmful for the native species they displace and the changes in habitat structure, soil characteristics, water balance and biochemistry of the area; nevertheless, they also represent a suitable habitat for birds, reptiles and insects. Altered flows are associated with streamflow reduction, spring flow reduction, streamflow permanence and reduced floods that generate changes in fluvial processes. The stressors particularly related to climate change include drought, floods, and increases in aridity; while groundwater impacts were associated with groundwater pumping, depression of floodplains and water tables, and fluctuation in water tables (Figure 24).

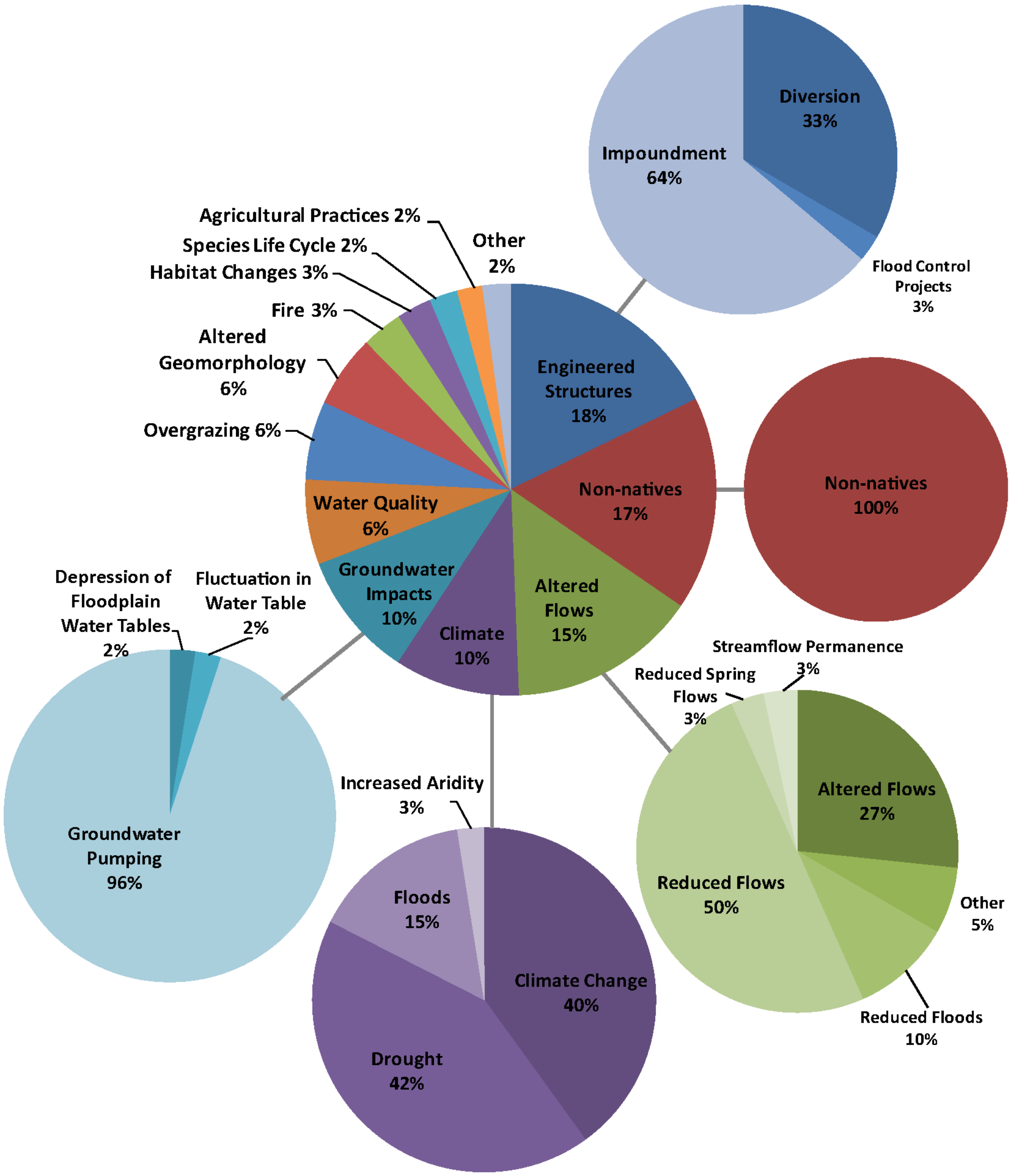


FIGURE 24. DETAILED RISKS AND STRESSORS FOR SELECTED GENERAL CATEGORIES

It is important to note that even though overgrazing and altered geomorphology did not represent a high percentage of the risks and stressors, they were identified as a threat for the DLCC deserts because they generate changes in channel processes associated with sediment transport that can impact riparian and aquatic ecosystems.

Figure 25 shows the number of studies by desert that reported the presence of the most common stressors, showing that, with the exception of the Madrean region where studies did not indicate water quality issues, the rest of the eco-regions appear to face similar problems with similar severity.

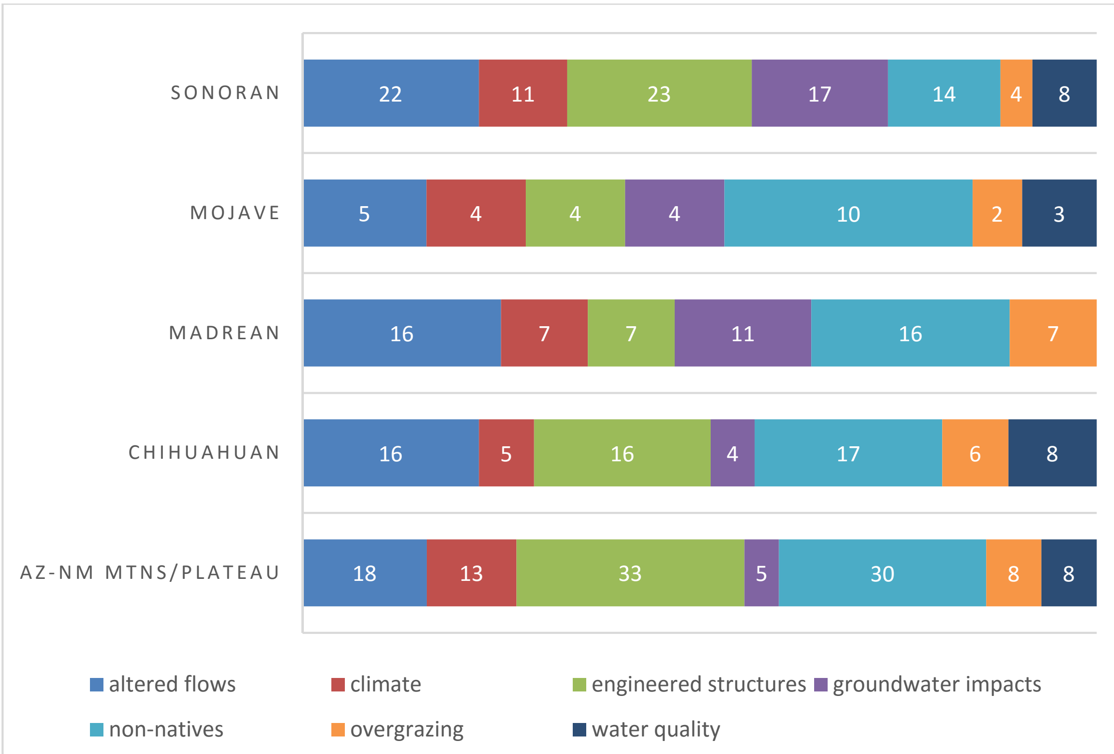


FIGURE 25. TOP SEVEN GENERAL RISKS AND STRESSORS BY ECOREGION

V. CONCLUSIONS AND RECOMMENDATIONS

Although research on flow needs and responses to changes in flow has been conducted across the desert watersheds of the United States and Mexico, there are significant areas with perennial streams, such as the Sierra Madre in Mexico and the White Mountains in the United States, that remain unexamined. As originally conceived, this study was to reveal the percentage of studied streams in each eco-region based on stream miles, which would have allowed for a more accurate assessment of understudied areas. We were unable to conduct this analysis because existing perennial stream datasets were incomplete and/or unreliable. Many of the streams displayed on the maps in this report as perennial are likely to be intermittent. It is also just as likely that perennial streams are missing from our maps.

Furthermore, unlike the Arizona Environmental Water Needs Assessment, we were unable to even display intermittent streams in the study area because consistent data on these streams was unavailable. Baseline data on surface flow extent is particularly important as temperatures increase and droughts persist. It is clear that **there is a need for further systematic evaluation of perennial and intermittent streams in the desert watersheds of the United States and Mexico and of flow needs and flow responses in the Sierra Madre in Mexico and the White Mountains in the United States.**

While the primary focus of this study was streams, environmental flow needs data for springs was also collected when available. Although spring environmental flow needs data constitute a very small portion of the overall studies, it is unclear if this is because of our search methods or because of a paucity of existing literature. **Also, the complexity of groundwater law and policy presents different environmental flow needs challenges for managing springs than streams solely dependent on surface water management.** Regardless, in assembling base data layers for this study, we discovered that spring layers currently only exist for the United States.

The Desert Flows Database contains flow need, flow response, or vegetation-species relationship information for 312 species and/or genera. While this appears to be an impressive diversity of information**, only one-third of the 312 species or genera have been studied more than once and only 15 genera (or 5%) have been studied five or more times** (Table 20). This begs the question, can we manage the entire system using existing data on riparian vegetation and fish species of concern, which are the most frequently studied riparian and aquatic elements? Moving forward, there should be a focus on working with the people who manage riparian and aquatic systems to determine if data on a handful of species are sufficient, or if a broader array of species need to be examined.

Perhaps the most important aspect of pulling these data into one repository is the ability to unequivocally say where the gaps exist and uncertainty remains. Two important findings are that the majority of flow studies are qualitative and climate change impacts are infrequently examined. **Further investigation is necessary to determine if qualitative studies provide sufficient information for land and water managers to establish and secure environmental flows. Studies that explicitly examine how species will be impacted by altered flow regimes due to changes in climate are needed as well.**

Table 20. Species and Genera Studied Five Times or More

Study Subject	Number of Studies	Taxa
Populus fremontii	33	Veg.
Tamarix Ramossissima	23	
Salix gooddingii	15	
Prosopis velutina	13	
Gila cypha	8	Fish
Gila robusta	8	
Hybognathus amarus	8	
Rhinichthys osculus	8	
Catostomus clarkii	7	
Cyprinella lutrensis	6	
Meda fulgida	6	
Baccharis salicifolia	6	Veg.
Platanus wrightii	6	
Pluchea sericea	6	
Castor canadensis	6	Mam.
Empidonax traillii	6	Bird
Popfre/Salgoo Forest	5	Veg.
Populus deltoides	5	
Sporobolus wrightii	5	
Populus	5	
Salix	5	
Tamarix	5	

A key consideration for the future is the maintenance of the tool itself. The Desert Flows Database is current through July 2015, but the long-term utility of this dataset is dependent upon periodic updates and maintenance. **We recommend the Desert Landscape Conservation Cooperative establish a protocol for periodic updates** and perhaps even use the critical management question teams or science working group, which are working groups comprised of federal, state, and local managers, non-profits, and academics, as the primary resources for updating and maintaining this tool. The information contained within the database also presents opportunities for identifying cross-jurisdictional and trans-boundary partnerships that are at the heart of the DLCC. Areas where similar studies have occurred can now be identified, and perhaps even more importantly, new studies should be designed specifically to span jurisdictions.

Data on environmental flow needs and flow responses for the desert watersheds of the U.S. and Mexico are not equally distributed among species or geographic regions. As a result, the information provided in the database and this report do not paint a complete picture of environmental flows for the region. Generalized findings, particularly those for well-studied genera like cottonwoods or tamarisk, may be transferrable to less-understood systems. It is problematic, however, to take any data presented here and directly apply it to other systems seeing as each has unique aspects, such as topography and soils, that impact flow needs, flow responses, or relationships among species. To account for the complexity of river systems, setting any targets for flows or groundwater levels using these data should be part of an adaptive management framework where conditions are monitored and standards are re-evaluated based on empirical data.

VI. References

Arizona Department of Water Resources. (2005). *Groundwater Use Estimates for Riparian Inventory of the Benson Sub-area* (Upper San Pedro AMA Review Report) (p. E–1). Arizona Department of Water Resources.

Bark, R. H., Osgood, D. E., Colby, B. G., Katz, G., & Stromberg, J. (2009). Habitat preservation and restoration: Do homebuyers have preferences for quality habitat? *Ecological Economics*, *68*(5), 1465–1475. http://doi.org/10.1016/j.ecolecon.2008.10.005

Brock, L., Kelly, M. E., & Chapman, K. (2001). Legal & Institutional Framework for Restoring Instream Flows in the Rio Grande: Fort Quitman to Amistad. *Texas Center for Policy Studies. Presented to the World Wildlife Fund March*, *16*, 33.

Capon, S. J., Chambers, L. E., Mac Nally, R., Naiman, R. J., Davies, P., Marshall, N., Williams, S. E. (2013). Riparian Ecosystems in the 21st Century: Hotspots for Climate Change Adaptation? *Ecosystems*, *16*(3), 359–381. http://doi.org/10.1007/s10021-013-9656-1

Center for the Future of Arizona. (2009). *The Arizona We Want* (p. 40). Phoenix, Arizona: Center for the Future of Arizona.

Chaney, E., W. Elmore, and W.S. Platt. 1990. Livestock grazing on western riparian areas. U.S. Environmental Protection Agency. Washington, DC.

Garrick, D., Jacobs, K., & Garfin, G. (2008). Models, Assumptions, and Stakeholders: Planning for Water Supply Variability in the Colorado River Basin 1. *JAWRA Journal of the American Water Resources Association*, *44*(2), 381–398. http://doi.org/10.1111/j.1752-1688.2007.00154.x

Hautzinger, A. B., Warner, A. T., Hickey, J., & Beauchamp, V. B. (2006). Summary of Unified Ecosystem Flow Requirements for the Bill Williams River Corridor (Chapter 8). In P. B. Shafroth & V. B. Beauchamp (Eds.), *Defining Ecosystem Flow Requirements for the Bill Williams River, Arizona* (Vols. 1–Book, 1–Section, p. 71).

Hirji, R., & Davis, R. (2009). *Environmental Flows in Water Resources Policies, Plans, and Projects: Findings and Recommendations*. The World Bank. Retrieved from http://elibrary.worldbank.org/doi/book/10.1596/978-0-8213-7940-0

Hornewer, N. J., & Wiele, S. M. (2007). *Flow velocity and sediment data collected during 1990 and 1991 at National Canyon, Colorado River, Arizona* (pp. 11–11). U.S. Geological Survey.

Johnson, R.R., L.T. Haight, and J.M. Simpson. 1977. Endangered species vs. endangered habitats: a concept. In: Johnson, R.R. and D.A. Jones (eds.) Importance, preservation and management of riparian habitat: a symposium. USDA Forest Service General Technical Report RM-43. Ft. Collins, CO. pp. 68-79.

Kaiser, R. A., & Binion, S. (1998). Untying the gordian knot: Negotiated strategies for protecting instream flows in Texas. *Nat. Resources J.*, *38*, 157.

Le Quesne, T., Kendy, E., & Weston, D. (2010). *The Implementation Challenge: Taking stock of government policies to protect and restore environmental flows*. World Wildlife Fund, The Nature Conservancy.

Loehman, E. T., & Charney, S. (2011). Further down the road to sustainable environmental flows: funding, management activities and governance for six western US states. *Water International*, *36*, 873–893. http://doi.org/10.1080/02508060.2011.628803

Marshall, R. M., Robles, M. D., Majka, D. R., & Haney, J. A. (2010). Sustainable Water Management in the Southwestern United States: Reality or Rhetoric? *PLoS ONE*, *5*(7), e11687. http://doi.org/10.1371/journal.pone.0011687

Megdal, S. B., Nadeau, J. B., & Tom, T. (2011). The Forgotten Sector: Arizona Water Law and the Environment. *Arizona Journal of Environmental Law and Policy*, *In Press*.

Pahl-Wostl, C., Arthington, A., Bogardi, J., Bunn, S. E., Hoff, H., Lebel, L., … Tsegai, D. (2013). Environmental flows and water governance: managing sustainable water uses. *Current Opinion in Environmental Sustainability*, *5*(3-4), 341–351. http://doi.org/10.1016/j.cosust.2013.06.009

Poff, B., Koestner, K. A., Neary, D. G., & Henderson, V. (2011). Threats to Riparian Ecosystems in Western North America: An Analysis of Existing Literature. *JAWRA Journal of the American Water Resources Association*, *47*, 1241–1254. http://doi.org/10.1111/j.1752-1688.2011.00571.x

Poff, N. L., Richter, B. D., Arthington, A. H., Bunn, S. E., Naiman, R. J., Kendy, E., Warner, A. (2010). The ecological limits of hydrologic alteration (ELOHA): a new framework for developing regional environmental flow standards: Ecological limits of hydrologic alteration. *Freshwater Biology*, *55*(1), 147–170. http://doi.org/10.1111/j.1365-2427.2009.02204.x

Roach, K. A. (2013). Texas water wars: how politics and scientific uncertainty influence environmental flow decision-making in the Lone Star state. *Biodiversity and Conservation*, *22*(3), 545–565. http://doi.org/10.1007/s10531-013-0443-2

Schmidt, J. C., Webb, R. H., Valdez, R. A., Marzolf, G. R., & Stevens, L. E. (1998). Science and Values in River Restoration in the Grand Canyon. *BioScience*, *48*(9), 735–747. http://doi.org/10.2307/1313336

Tarlock, A. D. (2014). Mexico and the United States Assume a Legal Duty to Provide Colorado River Delta Restoration Flows: An Important International Environmental and Water Law Precedent: Colorado River Delta Restoration Flows. *Review of European, Comparative & International Environmental Law*, n/a–n/a. http://doi.org/10.1111/reel.12066

Tharme, R. E. (2003). A Global Perspective on Environmental Flow Assessment: Emerging Trends in the Development and Application of Environmental Flow Methodologies for Rivers. *River Research and Applications*, *19*, 397–441.

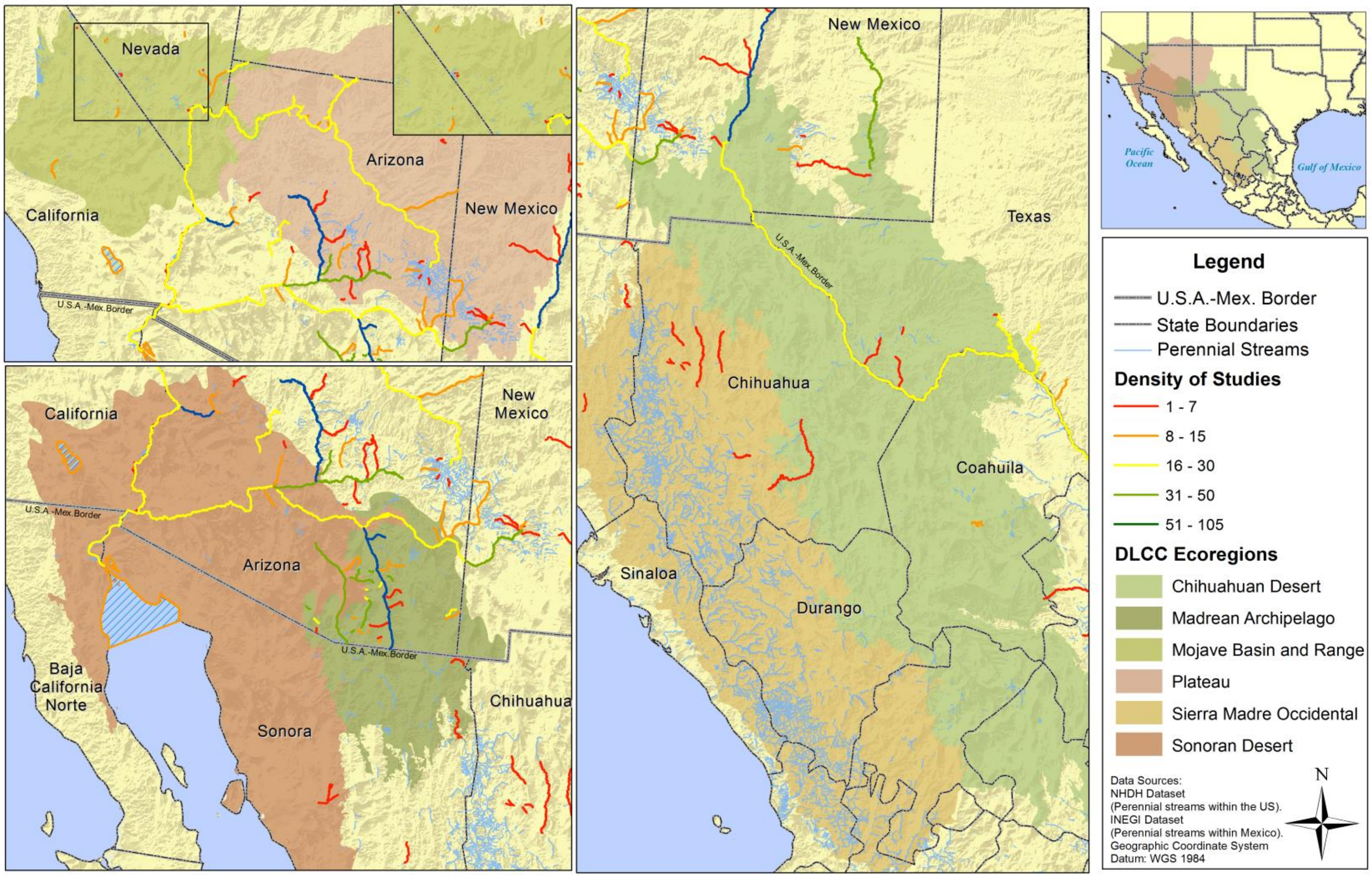
U.S. Bureau of Reclamation. (2012). *Colorado River Basin Water Supply and Demand Study: Study Report* (p. 95). Washington, D.C.: Department of the Interior. Retrieved from http://www.usbr.gov/lc/region/programs/crbstudy/finalreport/Study%20Report/CRBS_Study_Report_FINAL.pdf

Wiele, S. M., Hart, R. J., Darling, H. L., & Hautzinger, A. B. (2009). *Sediment transport in the Bill Williams River and turbidity in Lake Havasu during and following two high releases from Alamo Dam, Arizona, in 2005 and 2006* (pp. 22–22). U.S. Geological Survey.

Zaimes, G. (2007). *Understanding Arizona's Riparian Areas*. Tucson, Arizona: The University of Arizona Cooperative Extension.

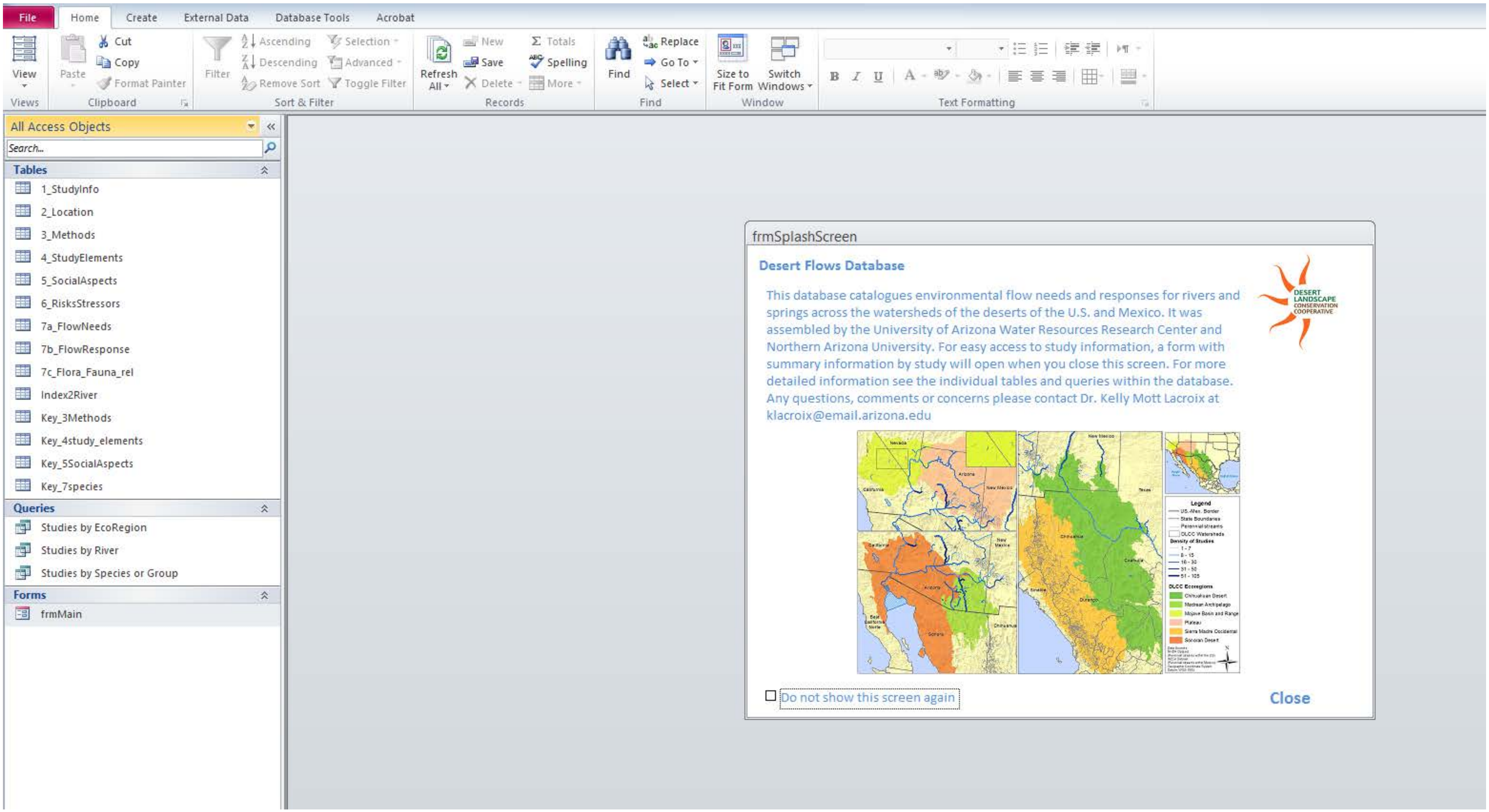
APPENDIX A: GUIDE FOR USE OF THE DESERT FLOWS DATABASE

The Desert Flows Database is a compilation of over 400 peer-reviewed articles, reports, and book chapters from across the watersheds that touch the Sonoran, Chihuahua, and Mojave Deserts. See below for the extent of this database:

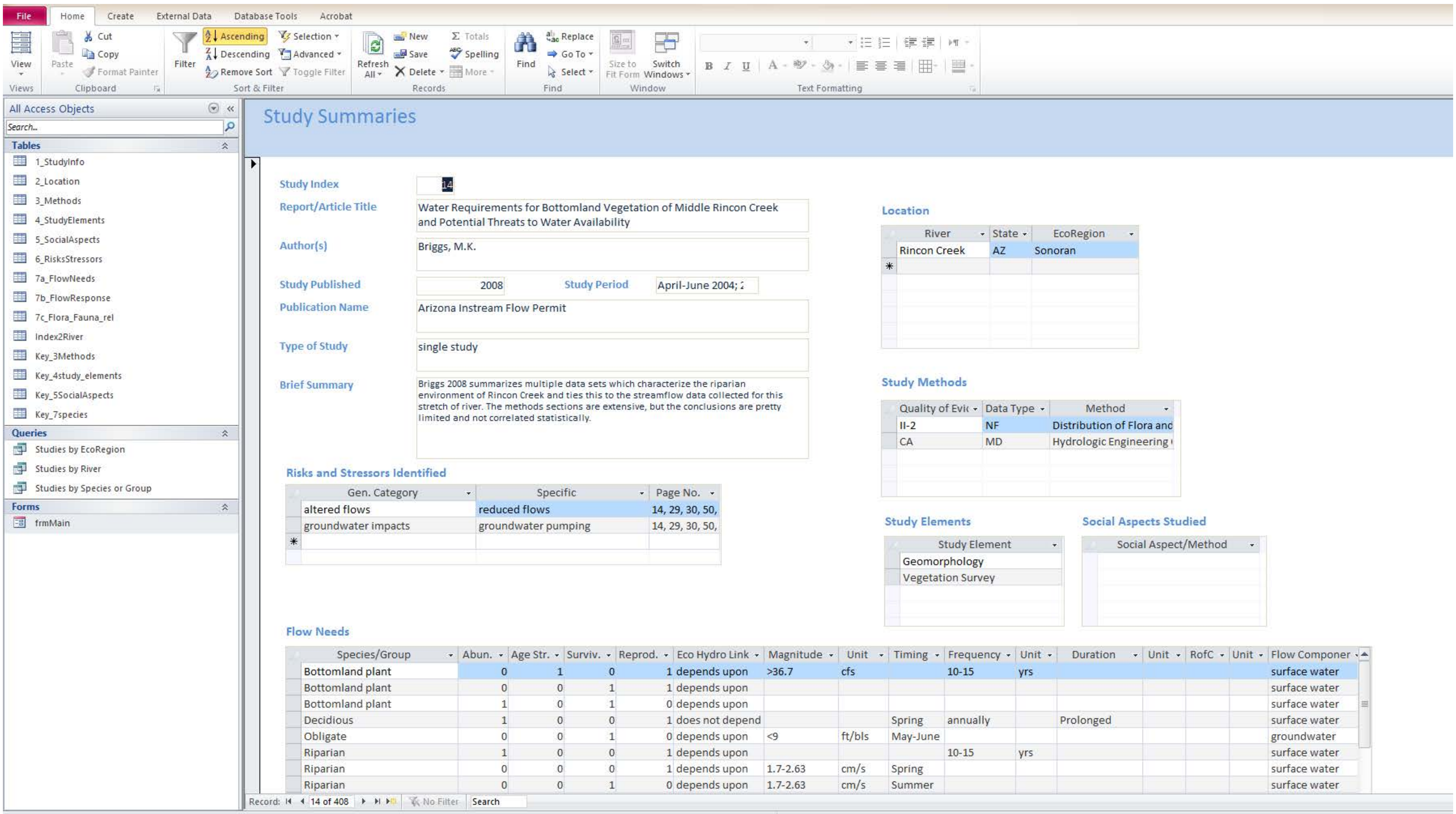


Funding for this project was provided by the Desert Landscape Conservation Cooperative (LCC). Information about environmental water needs within the database comes from many sources – studies done for the express purpose of answering questions about flow needs as well as studies performed for other purposes that have minimal reference to environmental water needs. As of 01/2016 the Desert Flows Database contains data through 07/2015. The database contains tabular data that can be linked to geospatial data on river segments studied.

To view the tabular data, open the database via Microsoft Access. To view the spatial data, you will need to access the database via ArcGIS. When you open the database you will see the following screen:



On the left are nine data tables, four keys for abbreviations, a table linking the studies to river segments (for use in ArcGIS), three basic data queries, and a form that summarizes the data from each study. When you click the close button the main **Study Summary Form** will open automatically. This form contains data from all of the different tables within the database. Note, however, that this form does not contain all the data and fields included in the tables. Most notably, for the sake of space, any comments associated with environmental flow needs or responses are not included in the form, but can be found within the needs/responses tables (Tables 7a and 7b).



A summary of information included in the data tables and queries is provided here, more detailed information about each table is below:

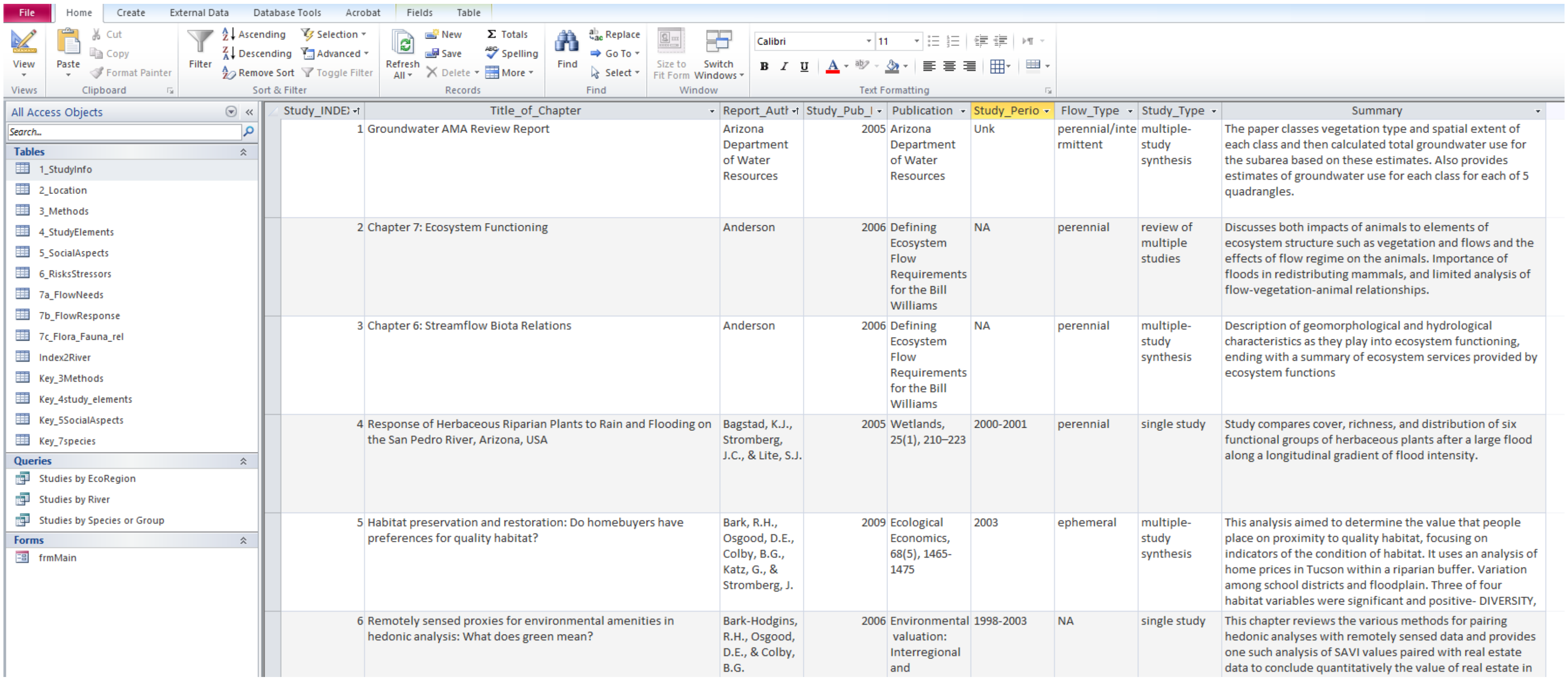
- 1_StudyInfo – Basic information on each study including title, authors, date, journal (publisher), and a summary of the study
- 2_Location – River, State, Ecoregion for each study
- 3_Methods – Methods used to determine environmental flow needs or flow responses, e.g., Ecological Response, HEC-RAS, Water Balance, and the quality of the methods as described in the study.
- 4_StudyElements – Additional elements studied that may be of interest, e.g., geomorphology, vegetation survey, water quality
- 5_SocialAspects - Social aspects included in the study, e.g., ecosystem services, economic valuation
- 6_RisksStressors – Risks and Stressors to ecosystem/species discussed in the study
- 7a_FlowNeeds and 7b_FlowResponses – Tables describing the relationship between the Ecology and Hydrology of species, genus, or ecosystems
- 7c_Flora_Fauna_rel – Information on relationships/dependencies between riparian vegetation and fauna.

Note that there are two indices within the database that connect all elements. The first is the **Study Index**. The Study Index is a unique identification number provided to each study within the database. The second is the **River Segment ID**. This is a unique identifier for each segment of all rivers that have been studied. The first portion of the River Segment ID indicates the river studied and the second the section of the river, for example all studies on the Colorado River have the prefix 14 and a study on the Colorado River between Lees Ferry and Lake Mohave is indexed as 14.2 The relationships between Study Index and River Segment ID are many to many relationships. Therefore the table **Index2River** serves as a key to connect Study ID information to River segment information for the purposes of mapping data.

To make the database more compact, most tables use abbreviations. Tables of abbreviations are noted with **Key_** and the name of the table.

Detailed description of each table

1_StudyInfo



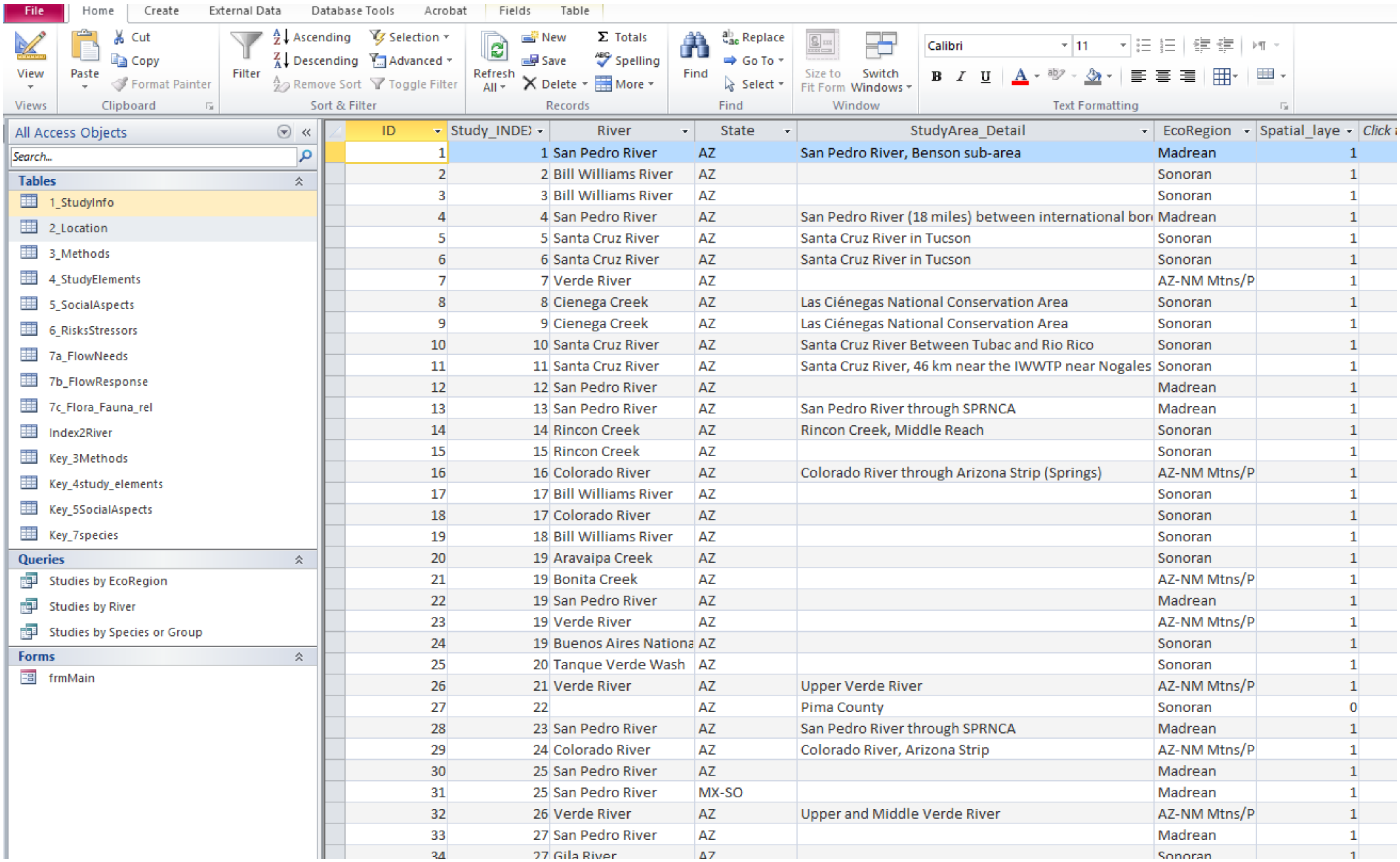
Study_INDEX	Title_of_Chapter	Report_Auth	Study_Pub_	Publication	Study_Perio	Flow_Type	Study_Type	Summary
1	Groundwater AMA Review Report	Arizona Department of Water Resources	2005	Arizona Department of Water Resources	Unk	perennial/intermittent	multiple-study synthesis	The paper classes vegetation type and spatial extent of each class and then calculated total groundwater use for the subarea based on these estimates. Also provides estimates of groundwater use for each class for each of 5 quadrangles.
2	Chapter 7: Ecosystem Functioning	Anderson	2006	Defining Ecosystem Flow Requirements for the Bill Williams	NA	perennial	review of multiple studies	Discusses both impacts of animals to elements of ecosystem structure such as vegetation and flows and the effects of flow regime on the animals. Importance of floods in redistributing mammals, and limited analysis of flow-vegetation-animal relationships.
3	Chapter 6: Streamflow Biota Relations	Anderson	2006	Defining Ecosystem Flow Requirements for the Bill Williams	NA	perennial	multiple-study synthesis	Description of geomorphological and hydrological characteristics as they play into ecosystem functioning, ending with a summary of ecosystem services provided by ecosystem functions
4	Response of Herbaceous Riparian Plants to Rain and Flooding on the San Pedro River, Arizona, USA	Bagstad, K.J., Stromberg, J.C., & Lite, S.J.	2005	Wetlands, 25(1), 210–223	2000-2001	perennial	single study	Study compares cover, richness, and distribution of six functional groups of herbaceous plants after a large flood along a longitudinal gradient of flood intensity.
5	Habitat preservation and restoration: Do homebuyers have preferences for quality habitat?	Bark, R.H., Osgood, D.E., Colby, B.G., Katz, G., & Stromberg, J.	2009	Ecological Economics, 68(5), 1465-1475	2003	ephemeral	multiple-study synthesis	This analysis aimed to determine the value that people place on proximity to quality habitat, focusing on indicators of the condition of habitat. It uses an analysis of home prices in Tucson within a riparian buffer. Variation among school districts and floodplain. Three of four habitat variables were significant and positive- DIVERSITY,
6	Remotely sensed proxies for environmental amenities in hedonic analysis: What does green mean?	Bark-Hodgins, R.H., Osgood, D.E., & Colby, B.G.	2006	Environmental valuation: Interregional and	1998-2003	NA	single study	This chapter reviews the various methods for pairing hedonic analyses with remotely sensed data and provides one such analysis of SAVI values paired with real estate data to conclude quantitatively the value of real estate in

This table contains: the study index; title of the article, chapter or study; authors; date published; publication name; study period; if the study covered perennial, intermittent, or ephemeral reaches; if the study was a single study, review of multiple studies[2], or a multiple study synthesis; and a very brief summary of the study.

NA indicates not applicable and Unk indicates information is unknown or not available. This is the core table that all other tables in the database link to.

[2] Note that reviews of multiple studies are a remnant from the original Arizona database. No new reviews of studies are included here and there are no data from study reviews included in the flow needs/responses tables because these data have been included from their original studies.

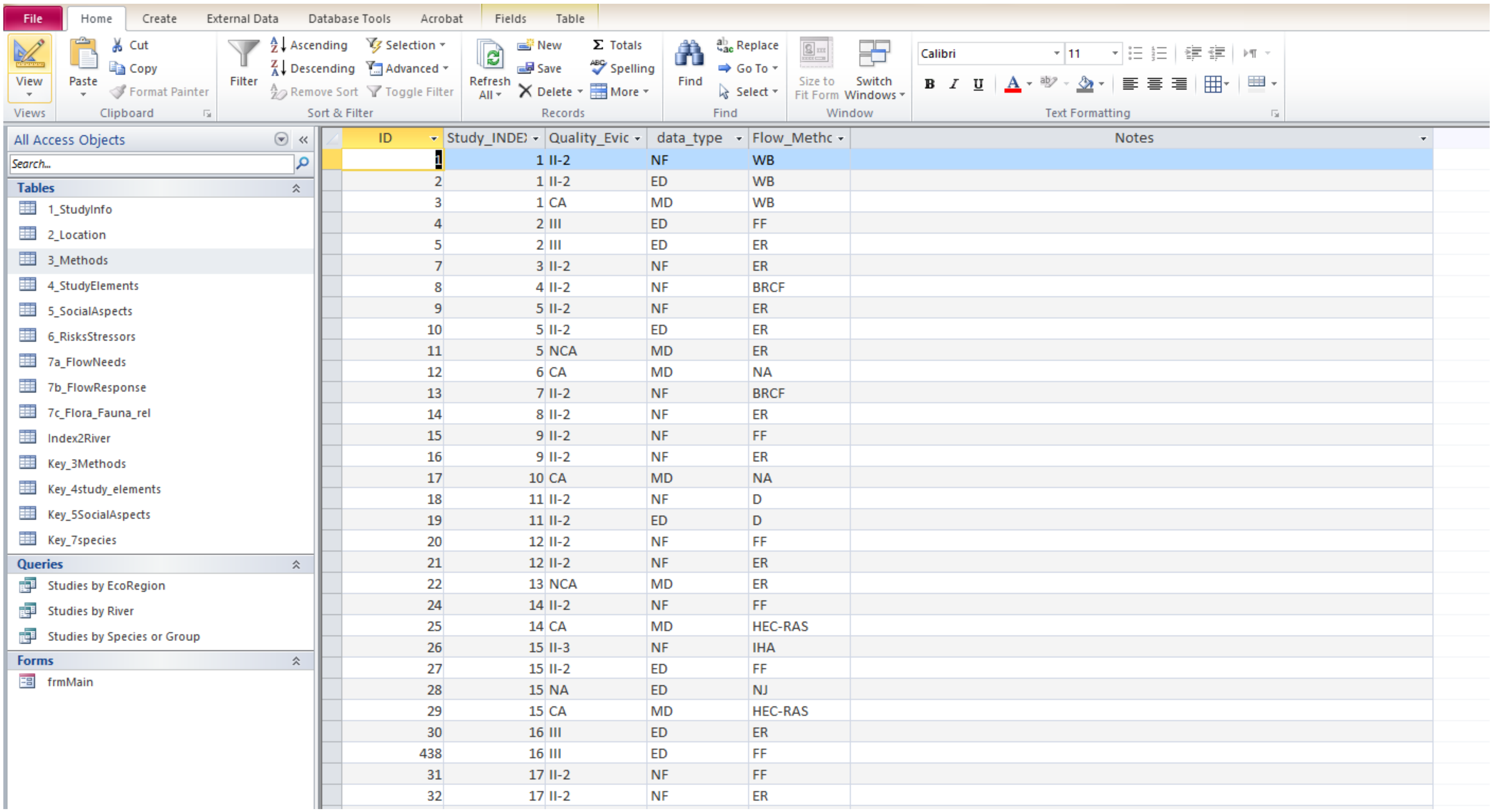
2_Location



ID	Study_INDE)	River	State	StudyArea_Detail	EcoRegion	Spatial_laye	Click
1	1	San Pedro River	AZ	San Pedro River, Benson sub-area	Madrean	1	
2	2	Bill Williams River	AZ		Sonoran	1	
3	3	Bill Williams River	AZ		Sonoran	1	
4	4	San Pedro River	AZ	San Pedro River (18 miles) between international bor	Madrean	1	
5	5	Santa Cruz River	AZ	Santa Cruz River in Tucson	Sonoran	1	
6	6	Santa Cruz River	AZ	Santa Cruz River in Tucson	Sonoran	1	
7	7	Verde River	AZ		AZ-NM Mtns/P	1	
8	8	Cienega Creek	AZ	Las Ciénegas National Conservation Area	Sonoran	1	
9	9	Cienega Creek	AZ	Las Ciénegas National Conservation Area	Sonoran	1	
10	10	Santa Cruz River	AZ	Santa Cruz River Between Tubac and Rio Rico	Sonoran	1	
11	11	Santa Cruz River	AZ	Santa Cruz River, 46 km near the IWWTP near Nogales	Sonoran	1	
12	12	San Pedro River	AZ		Madrean	1	
13	13	San Pedro River	AZ	San Pedro River through SPRNCA	Madrean	1	
14	14	Rincon Creek	AZ	Rincon Creek, Middle Reach	Sonoran	1	
15	15	Rincon Creek	AZ		Sonoran	1	
16	16	Colorado River	AZ	Colorado River through Arizona Strip (Springs)	AZ-NM Mtns/P	1	
17	17	Bill Williams River	AZ		Sonoran	1	
18	17	Colorado River	AZ		Sonoran	1	
19	18	Bill Williams River	AZ		Sonoran	1	
20	19	Aravaipa Creek	AZ		Sonoran	1	
21	19	Bonita Creek	AZ		AZ-NM Mtns/P	1	
22	19	San Pedro River	AZ		Madrean	1	
23	19	Verde River	AZ		AZ-NM Mtns/P	1	
24	19	Buenos Aires Nationa	AZ		Sonoran	1	
25	20	Tanque Verde Wash	AZ		Sonoran	1	
26	21	Verde River	AZ	Upper Verde River	AZ-NM Mtns/P	1	
27	22		AZ	Pima County	Sonoran	0	
28	23	San Pedro River	AZ	San Pedro River through SPRNCA	Madrean	1	
29	24	Colorado River	AZ	Colorado River, Arizona Strip	AZ-NM Mtns/P	1	
30	25	San Pedro River	AZ		Madrean	1	
31	25	San Pedro River	MX-SO		Madrean	1	
32	26	Verde River	AZ	Upper and Middle Verde River	AZ-NM Mtns/P	1	
33	27	San Pedro River	AZ		Madrean	1	
34	27	Gila River	AZ		Sonoran	1	

This table provides detail on the location of the study. The ID is a unique identifier for each entry. Study index links the information back to Table 1. River is the water body where the study occurred and includes the names of springs as well. Note, if a study occurred on a river that crosses state lines there will be two (or more) entries in this table. There are also a number of studies that were not specific to a river or spring, but rather over a larger geography such as a county or watershed. In this case the river field will be blank. Study area detail provides additional information about the location of the study. Ecoregions are based on Brown and Lowe's designations and include: Sonoran, Chihuahuan, Mojave, Madrean, or AZ-NM Mountains/Plateau. If the studied reach is included on the spatial layer a 1 appears in the Spatial_layer column. All defined reaches are included on the spatial layer. This is a one-to-many table, where the "one" is the Study Index and the many are the multiple rivers and/or states studied.

3_Methods



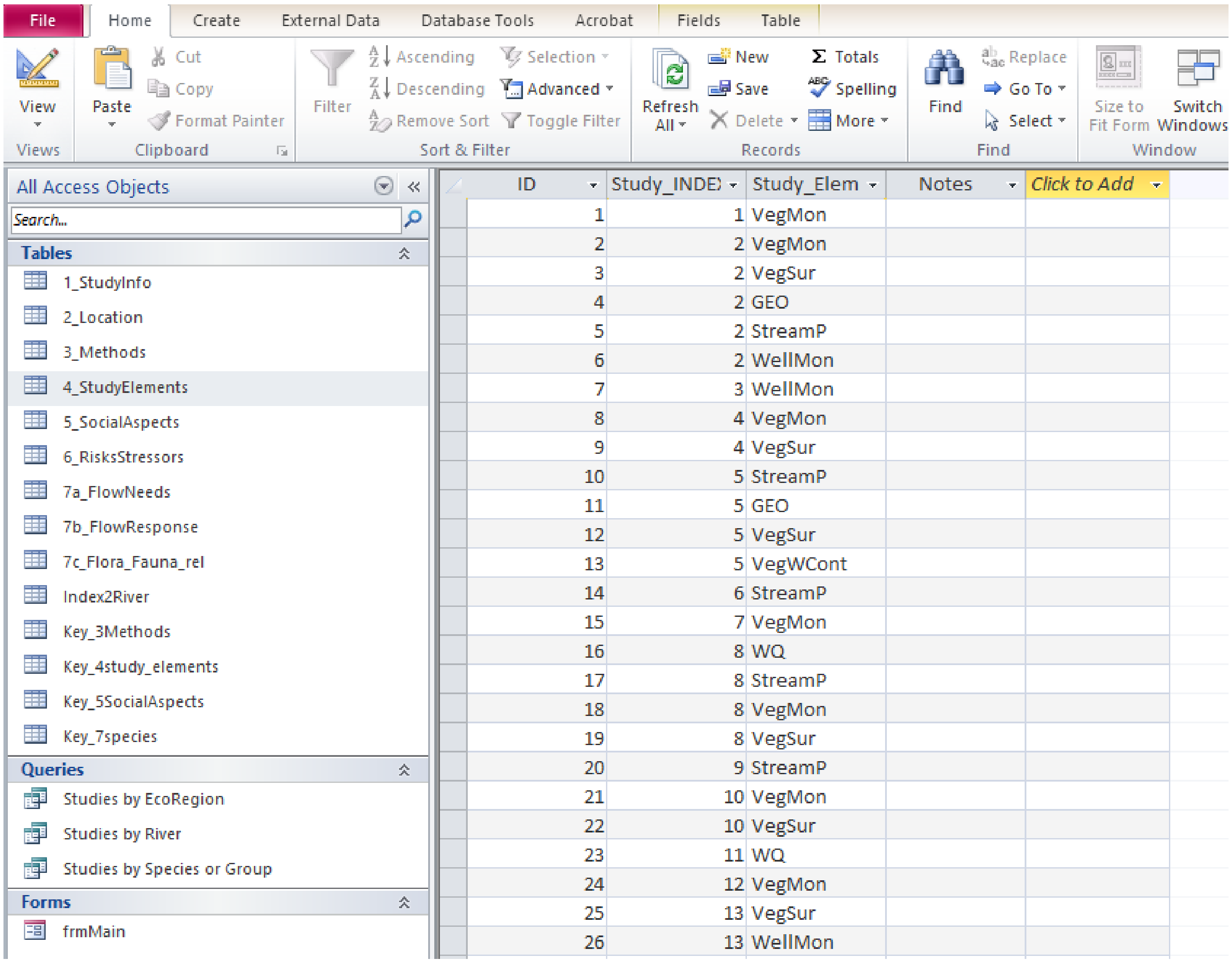
ID	Study_INDE)	Quality_Evic	data_type	Flow_Methc	Notes
1	1	II-2	NF	WB	
2	1	II-2	ED	WB	
3	1	CA	MD	WB	
4	2	III	ED	FF	
5	2	III	ED	ER	
7	3	II-2	NF	ER	
8	4	II-2	NF	BRCF	
9	5	II-2	NF	ER	
10	5	II-2	ED	ER	
11	5	NCA	MD	ER	
12	6	CA	MD	NA	
13	7	II-2	NF	BRCF	
14	8	II-2	NF	ER	
15	9	II-2	NF	FF	
16	9	II-2	NF	ER	
17	10	CA	MD	NA	
18	11	II-2	NF	D	
19	11	II-2	ED	D	
20	12	II-2	NF	FF	
21	12	II-2	NF	ER	
22	13	NCA	MD	ER	
24	14	II-2	NF	FF	
25	14	CA	MD	HEC-RAS	
26	15	II-3	NF	IHA	
27	15	II-2	ED	FF	
28	15	NA	ED	NJ	
29	15	CA	MD	HEC-RAS	
30	16	III	ED	ER	
438	16	III	ED	FF	
31	17	II-2	NF	FF	
32	17	II-2	NF	ER	

The methods table contains an ID for each entry and the study index. For each method in each study the quality of the methods were assessed according to the following rubric:

- I = strong evidence obtained from at least one properly designed, randomized controlled trial of appropriate size
- II-1 = evidence from well-designed controlled trials without randomization
- II-2 = evidence from a comparison of differences between sites with and without (controls) of a desired species of community
- II-3 = evidence obtained from multiple time series or from dramatic results in uncontrolled experiments
- III = opinions of respected authorities based on qualitative field evidence, descriptive studies or reports of expert committees
- IV = evidence inadequate owing to problems of methodology (e.g., sample size, length or comprehensiveness of monitoring) or conflicts of evidence
- CA = Calibrated model
- NCA = non-calibrated model
- NA = not applicable, usually applied to studies that were multiple-study synthesis were no new data were collected.

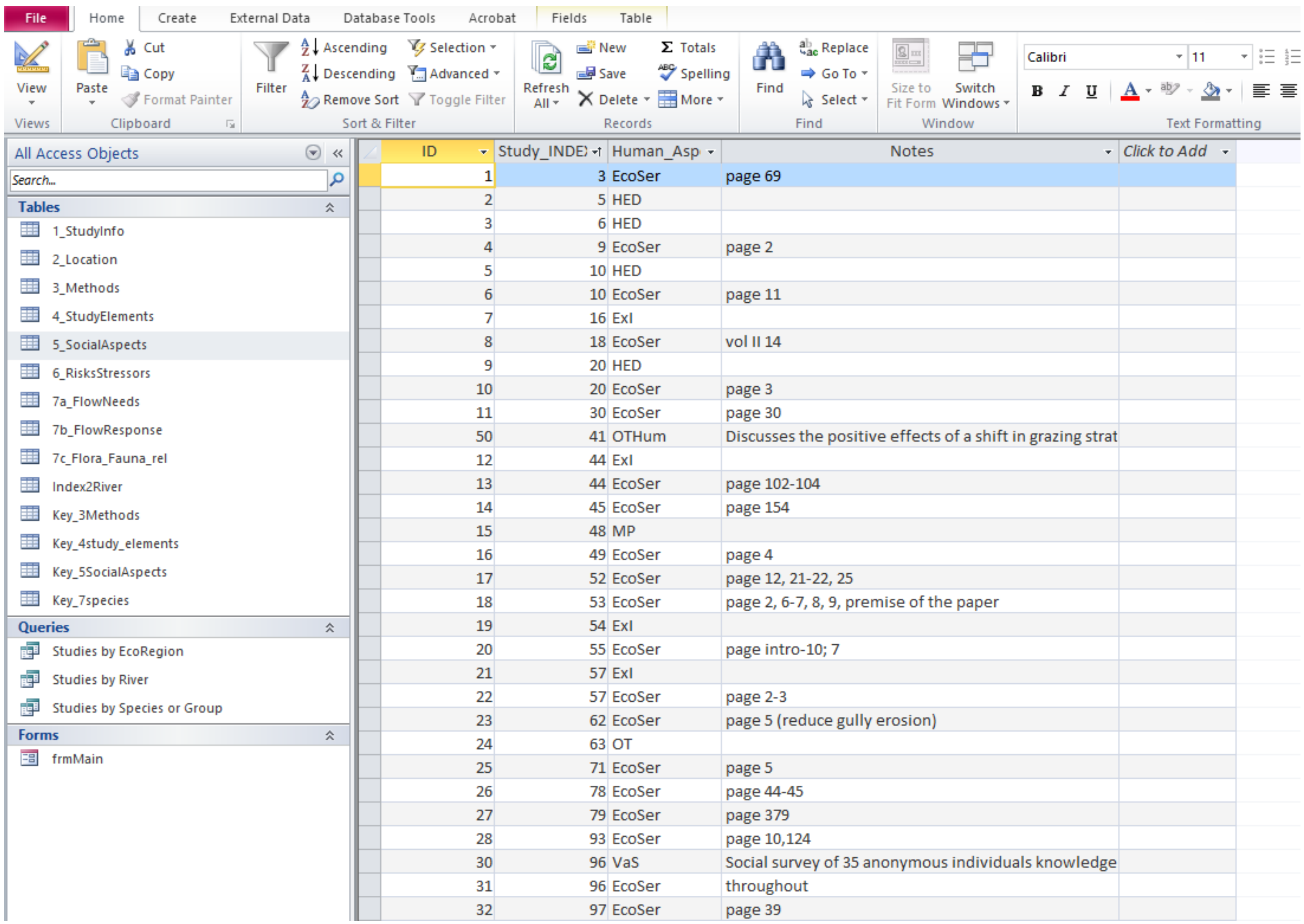
The data types include NF (new field), ED (existing data), and MD (modeled data). There are 43 different flow methods used in the studies included in the Desert Flows database. The key to the abbreviations can be found in table Key_3Methods. Note that the database user can also perform a query that will match the abbreviations to the key and display only the method name. This is a one-to-many table, where the "one" is the Study Index and the many are the multiple methods used.

4_StudyElements



The study elements table contains an ID for each entry, the study index, and elements examined in the study in addition to flow needs or responses. Table Key_4Study_elements provides the key for the abbreviations used. This is a one-to-many table, where the "one" is the Study Index and the many are the multiple elements within any study.

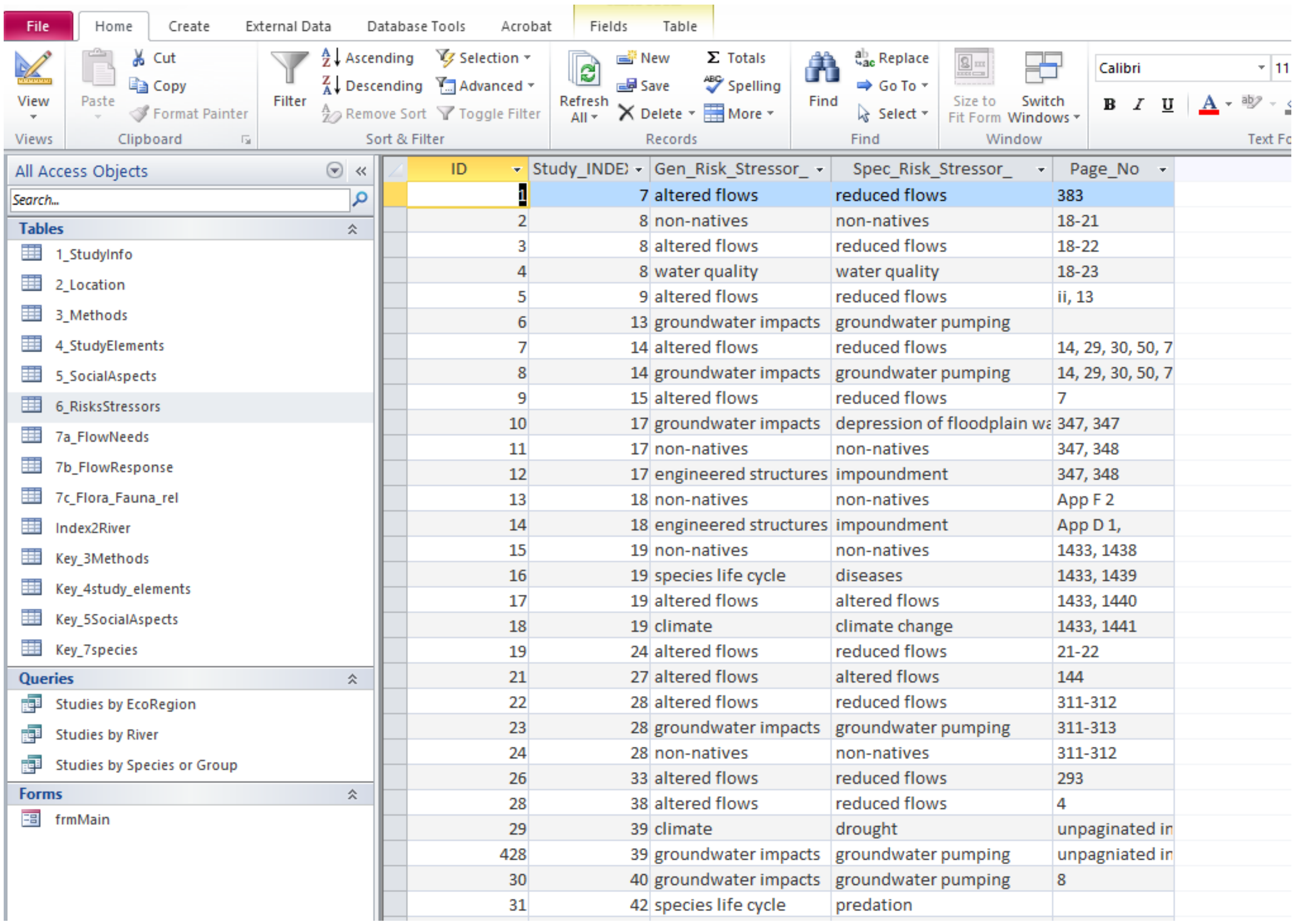
5_SocialAspects



ID	Study_INDEX	Human_Asp	Notes	Click to Add
1	3	EcoSer	page 69	
2	5	HED		
3	6	HED		
4	9	EcoSer	page 2	
5	10	HED		
6	10	EcoSer	page 11	
7	16	ExI		
8	18	EcoSer	vol II 14	
9	20	HED		
10	20	EcoSer	page 3	
11	30	EcoSer	page 30	
50	41	OTHum	Discusses the positive effects of a shift in grazing strat	
12	44	ExI		
13	44	EcoSer	page 102-104	
14	45	EcoSer	page 154	
15	48	MP		
16	49	EcoSer	page 4	
17	52	EcoSer	page 12, 21-22, 25	
18	53	EcoSer	page 2, 6-7, 8, 9, premise of the paper	
19	54	ExI		
20	55	EcoSer	page intro-10; 7	
21	57	ExI		
22	57	EcoSer	page 2-3	
23	62	EcoSer	page 5 (reduce gully erosion)	
24	63	OT		
25	71	EcoSer	page 5	
26	78	EcoSer	page 44-45	
27	79	EcoSer	page 379	
28	93	EcoSer	page 10,124	
30	96	VaS	Social survey of 35 anonymous individuals knowledge	
31	96	EcoSer	throughout	
32	97	EcoSer	page 39	

The social aspects table contains an ID for each entry and the study index. “Social elements” include economic valuation studies, ecosystem services, and other information on human dimensions of environmental flows for species and ecosystems. For economic valuation studies the method used to determine values is noted in the Human_Aspects column, e.g., hedonic, contingent valuation, etc. Table Key_5SocialAspects provides the key for the abbreviations used. If human aspects are discussed in only portions of the study page numbers are provided for quick reference. Note that we did not specifically search for human value studies so this is likely not a complete list of these types of studies for the Desert LCC region. This is a one-to-many table, where the “one” is the Study Index and the many are the human dimensions examined within any study.

6_RisksStressors



ID	Study_INDE	Gen_Risk_Stressor_	Spec_Risk_Stressor_	Page_No
1	7	altered flows	reduced flows	383
2	8	non-natives	non-natives	18-21
3	8	altered flows	reduced flows	18-22
4	8	water quality	water quality	18-23
5	9	altered flows	reduced flows	ii, 13
6	13	groundwater impacts	groundwater pumping	
7	14	altered flows	reduced flows	14, 29, 30, 50, 7
8	14	groundwater impacts	groundwater pumping	14, 29, 30, 50, 7
9	15	altered flows	reduced flows	7
10	17	groundwater impacts	depression of floodplain wa	347, 347
11	17	non-natives	non-natives	347, 348
12	17	engineered structures	impoundment	347, 348
13	18	non-natives	non-natives	App F 2
14	18	engineered structures	impoundment	App D 1,
15	19	non-natives	non-natives	1433, 1438
16	19	species life cycle	diseases	1433, 1439
17	19	altered flows	altered flows	1433, 1440
18	19	climate	climate change	1433, 1441
19	24	altered flows	reduced flows	21-22
21	27	altered flows	altered flows	144
22	28	altered flows	reduced flows	311-312
23	28	groundwater impacts	groundwater pumping	311-313
24	28	non-natives	non-natives	311-312
26	33	altered flows	reduced flows	293
28	38	altered flows	reduced flows	4
29	39	climate	drought	unpaginated ir
428	39	groundwater impacts	groundwater pumping	unpagniated ir
30	40	groundwater impacts	groundwater pumping	8
31	42	species life cycle	predation	

The risks and stressors table contains an ID for each entry and the study index. Risks and stressors occur in two categories: a general category and a more specific sub-category. The categories included are listed in the following table with bold indicating the general category:

agricultural practices
- agricultural practices

altered flows
- altered flows
- conversion from lotic to lentic habitat
- dewatering
- flow regulation
- reduced floods
- reduced flows
- reduced spring flows
- streamflow permanence

altered geomorphology
- altered geomorphology
- channelization
- erosion
- loss of floodplain functions
- sedimentation

habitat changes
- habitat fragmentation
- habitat modification
- loss of floodplain habitat

human activities
- human activities

land management
- deforestation
- habitat modification
- industrial demands
- land clearing
- land management
- mining
- recreation
- urbanization

natural events
- natural events

non-natives
- non-natives

climate
- climate change
- drought
- floods
- increased aridity

engineered structures
- diversion
- diversions
- flood control projects
- impoundment

Fire
- fire

groundwater impacts

depression of floodplain water tables
- fluctuation in water table
- groundwater pumping

overgrazing
- overgrazing

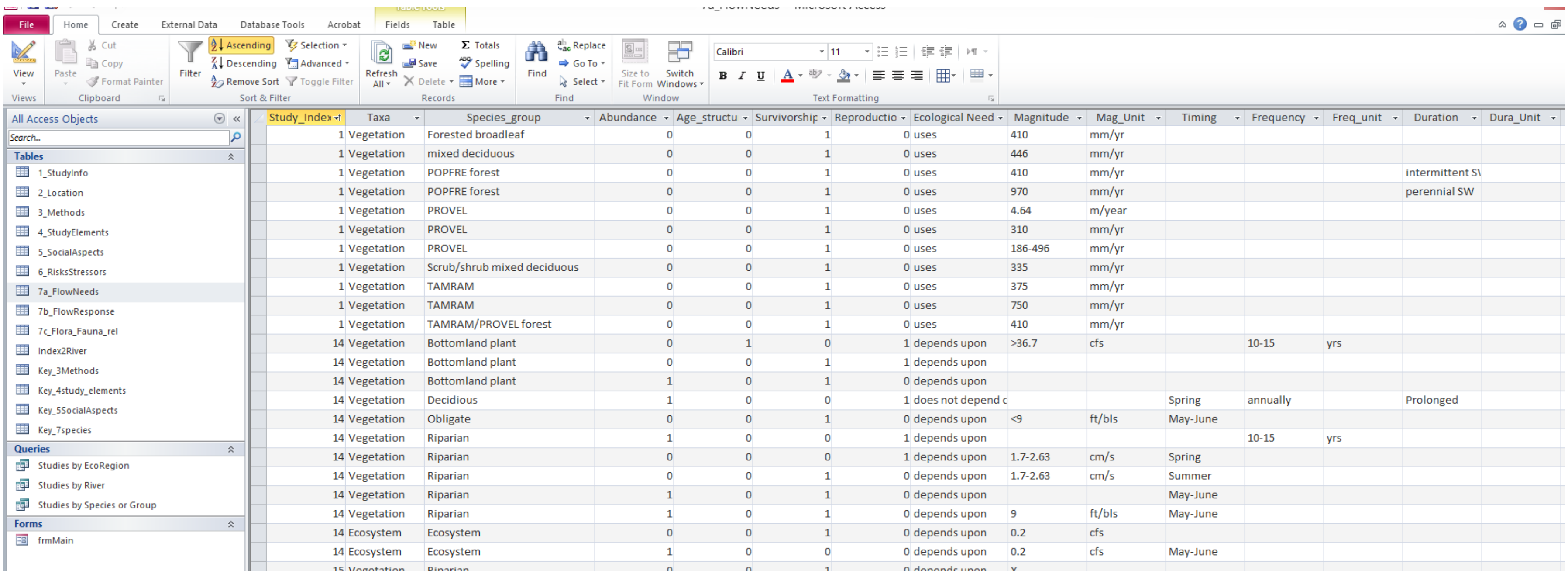
population growth
- population growth

species life cycle
- Diseases
- elimination of beavers
- hybridization
- parasitism
- predation

water quality
- contamination
- eutrophication
- Salinity
- sewage input
- water quality
- water temperature changes

The page number is provided for all paginated documents for quick reference to the risks and/or stressors identified in each study. This is a one-to-many table, where the “one” is the Study Index and the many are the risks or stressors mentioned within any study.

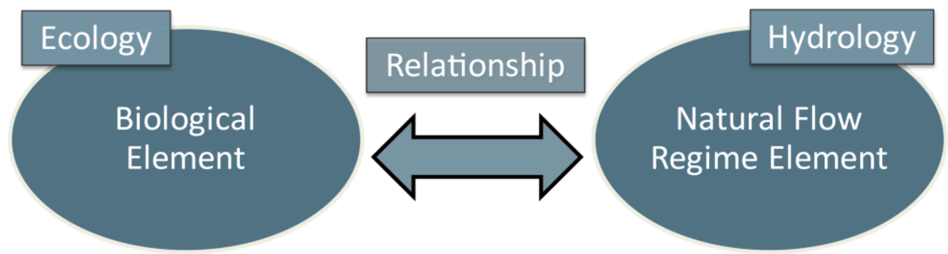
7a_FlowNeeds and 7b_FlowResponses



Study_Index	Taxa	Species_group	Abundance	Age_structu	Survivorship	Reproductio	Ecological Need	Magnitude	Mag_Unit	Timing	Frequency	Freq_unit	Duration	Dura_Unit
1	Vegetation	Forested broadleaf	0	0	1	0	uses	410	mm/yr					
1	Vegetation	mixed deciduous	0	0	1	0	uses	446	mm/yr					
1	Vegetation	POPFRE forest	0	0	1	0	uses	410	mm/yr				intermittent S\	
1	Vegetation	POPFRE forest	0	0	1	0	uses	970	mm/yr				perennial SW	
1	Vegetation	PROVEL	0	0	1	0	uses	4.64	m/year					
1	Vegetation	PROVEL	0	0	1	0	uses	310	mm/yr					
1	Vegetation	PROVEL	0	0	1	0	uses	186-496	mm/yr					
1	Vegetation	Scrub/shrub mixed deciduous	0	0	1	0	uses	335	mm/yr					
1	Vegetation	TAMRAM	0	0	1	0	uses	375	mm/yr					
1	Vegetation	TAMRAM	0	0	1	0	uses	750	mm/yr					
1	Vegetation	TAMRAM/PROVEL forest	0	0	1	0	uses	410	mm/yr					
14	Vegetation	Bottomland plant	0	1	0	1	depends upon	>36.7	cfs		10-15	yrs		
14	Vegetation	Bottomland plant	0	0	1	1	depends upon							
14	Vegetation	Bottomland plant	1	0	1	0	depends upon							
14	Vegetation	Decidious	1	0	0	1	does not depend c			Spring	annually		Prolonged	
14	Vegetation	Obligate	0	0	1	0	depends upon	<9	ft/bls	May-June				
14	Vegetation	Riparian	1	0	0	1	depends upon				10-15	yrs		
14	Vegetation	Riparian	0	0	0	1	depends upon	1.7-2.63	cm/s	Spring				
14	Vegetation	Riparian	0	0	1	0	depends upon	1.7-2.63	cm/s	Summer				
14	Vegetation	Riparian	1	0	1	0	depends upon			May-June				
14	Vegetation	Riparian	1	0	1	0	depends upon	9	ft/bls	May-June				
14	Ecosystem	Ecosystem	0	0	1	0	depends upon	0.2	cfs					
14	Ecosystem	Ecosystem	1	0	0	0	depends upon	0.2	cfs	May-June				

The flow needs table (7a) provides data by species, group, or ecosystem for each study that contained either quantitative or descriptive relationships between the flora/fauna and water needs. The flow responses table (7b) provides data by species, group, or ecosystem for each study that contained either quantitative or descriptive relationships between the flora/fauna and how they respond to changes in flow.

Meta-categories for describing the ecologic impacts of flow include: abundance, age structure, survivorship, and reproduction. Hydrologic meta-categories are the natural flow regime: magnitude, timing, duration, frequency, and rate of change. The natural flow regime elements are used for studies of shallow aquifer systems, surface water, and evapotranspiration. The ecology and hydrology are then linked using words to describe the relationship between them:



Ecology Keywords
Abundance
Age structure
Survivorship
Reproduction

Relationship Keywords
Flow Need
Depends upon, Does not depend upon, Uses, Associated with
Flow Response
Influenced, Enhanced, Harmed

Hydrology Keywords
Magnitude
Frequency,
Duration
Timing
Rate of change

Note that when describing their findings, in some studies, the authors did not indicate high degree of certainty in the relationship between the hydrology and ecology. Different relationship keywords are used to capture this uncertainty in Tables 7a and 7b. If the relationship between the ecology and hydrology was indicated with words such as "needs", "depends", and "requires", the keyword "depends upon" was used for flow needs. For example, Cottonwood (P. fremontii) health depends upon between 0.28 m3/s baseflow in wet and dry years (Hautzinger et al., 2006). If the study results implied a relationship using words such as "occurs", "found" and "associated with" but did not directly indicate it in their findings, "associated with" was used. For example, roundtail chub (Gila robusta) abundance and reproduction are associated with 505 m3/s and a temperature of 16-20 degrees C, respectively (Schmidt et al., 1998). Similarly, if the direction of the flow response was clear in the study, "enhanced" or "harmed" were used. If the author was not clear as to the direction of the response, "influenced" is indicated. For example, Cottonwood (P. fremontii) health is influenced by groundwater depths between 1.1 and 1.8 meters below land surface (Arizona Department of Water Resources, 2005).

The following is a description of the data in each column of the flow needs and flow responses tables:

- ID – unique identifier for each record
- Study Index – Study index relating this information back to Table 1
- Taxa – Amphibian, Bird, Ecosystem, Fish, Invertebrate, Mammal, Reptile, or Vegetation
- Species_Group – The species or genus studied. Species are abbreviated according to their scientific names. Vegetation abbreviations contain the first three letters of the genus and the first three letters of the species. All fauna (including invertebrates) are abbreviated with the first two letters of the

genus and species. A list of the species abbreviations, including the common name where known, are found in table Key_7species. If data were available for a genus, only the whole genus name appears in the table.

- Abundance – 1 appears if discussed, 0 if not. Keywords, aside from those that include the word abundance, grouped into the abundance category include cover and species presence/density.
- Age structure - 1 appears if discussed, 0 if not.
- Reproduction - 1 appears if discussed, 0 if not. Keywords, aside from those that include the word reproduction, grouped into the reproduction category include recruitment, breeding, and spawning.
- Survivorship - 1 appears if discussed, 0 if not.
- Ecological Need/Response linked to Hydro Element - phrase describing the relationship between ecology and hydrology (see description above).
- Magnitude – amount of water or depth of water and Mag_unit – unit of measurement for the magnitude, e.g., meters below land surface (m/bls) or cubic meters per second (m3/s).
- Timing – when does the flow occur or when is the groundwater used/necessary.
- Frequency - how often does the flow occur and frequ_unit – unit of measurement, e.g., years months or days.
- Duration – how long does the flow occur or does the groundwater need to be available for and dura_unit – unit of measurement, e.g., days, hours.
- RofC – Rate of Change, how quickly does/should the flows fluctuate or the depth to groundwater change and RofC_unit – unit of measurement, e.g., meters (m) or feet (ft).
- WQ – Water quality information and WQ_unit – unit of measurement for water quality, e.g., Celsius or parts per million (ppm).
- Flow component – type of "flow" studied – groundwater, surface water, soil moisture, or evapotranspiration (ET).
- Page – page number where data can be found in the study
- Figure_Table – if data are from a figure or table it is indicated here.
- Obs_Rec_Mod – if the data are observed (O) from field studies, recommended (R), or modeled (M)
- Comments – details on the flow need or response.

Example SQL Queries for Desert Flows Database Analysis:

For count of studies by state, river or ecoregion:

SELECT X(e.g., River), COUNT(Study_Index) AS StudyCount
FROM (SELECT DISTINCT Study_INDEX, River FROM 2_Location) AS [%$##@_Alias]
GROUP BY X (e.g. River);

For a table that counts flow needs or flow responses by species that can be joined to the shapefile (elements to change based on flow need or response or species in bold, note this is for all Mesquite, so just the beginning of the abbreviation is used, i.e., "PRO"):

SELECT [%$##@_Alias].Index2River.Riv_Seg_ID, Count(Index2River.Stdy_INDEX) AS StudyCount, Count([**7b_FlowResponse**].Species_group) AS SpeciesCount
FROM (SELECT [**7b_FlowResponse**].Study_Index, [**7b_FlowResponse**].Species_group, Index2River.Stdy_INDEX, Index2River.Riv_Seg_ID FROM **7b_FlowResponse** RIGHT JOIN Index2River ON [**7b_FlowResponse**].[Study_Index] = Index2River.[Stdy_INDEX]) AS [%$##@_Alias]
WHERE ((([**7b_FlowResponse**].[Species_group]) **Like 'PRO*'**))
GROUP BY [%$##@_Alias].Index2River.Riv_Seg_ID;

Appendix B - Study Information by Study Index

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
1	Groundwater AMA Review Report	Arizona Department of Water Resources	2005	Arizona Department of Water Resources	Unk	The paper classes vegetation type and spatial extent of each class and then calculated total groundwater use for the subarea based on these estimates. Also provides estimates of groundwater use for each class for each of 5 quadrangles.
2	Chapter 7: Ecosystem Functioning	Anderson	2006	Defining Ecosystem Flow Requirements for the Bill Williams River, Arizona; USGS Open-File Report	n/a	Discusses both impacts of animals to elements of ecosystem structure such as vegetation and flows and the effects of flow regime on the animals. Importance of floods in redistributing mammals, and limited analysis of flow-vegetation-animal relationships.
3	Chapter 6: Streamflow Biota Relations	Anderson	2006	Defining Ecosystem Flow Requirements for the Bill Williams River, Arizona; USGS Open-File Report	n/a	Description of geomorphological and hydrological characteristics as they play into ecosystem functioning, ending with a summary of ecosystem services provided by ecosystem functions
4	Response of Herbaceous Riparian Plants to Rain and Flooding on the San Pedro River, Arizona, USA	Bagstad, K.J., Stromberg, J.C., & Lite, S.J.	2005	Wetlands, 25(1), 210–223	2000-2001	Study compares cover, richness, and distribution of six functional groups of herbaceous plants after a large flood along a longitudinal gradient of flood intensity.
5	Habitat preservation and restoration: Do homebuyers have preferences for quality habitat?	Bark, R.H., Osgood, D.E., Colby, B.G., Katz, G., & Stromberg, J.	2009	Ecological Economics, 68(5), 1465-1475	2003	This analysis aimed to determine the value that people place on proximity to quality habitat, focusing on indicators of the condition of habitat. It uses an analysis of home prices in Tucson within a riparian buffer. Variation among school districts and floodplain.
6	Remotely sensed proxies for environmental amenities in hedonic analysis: What does green mean?	Bark-Hodgins, R.H., Osgood, D.E., & Colby, B.G.	2006	Environmental valuation: Interregional and intraregional perspectives	1998-2003	This chapter reviews the various methods for pairing hedonic analyses with remotely sensed data and provides one such analysis of SAVI values paired with real estate data to conclude quantitatively the value of real estate in proximity to riparian areas and places with relatively high greenness values. It also discusses the threats to these areas.
7	Flow Regulation of the Verde River, Arizona, Encourages Tamarix recruitment but has minimal effect on Populus and Salix stand density	Beauchamp, V.B., & Stromberg, J.C.	2007	Wetlands, 27(2), 381-389	2000-2002	This study links the recruitment of TAMRAM, POPFRE, and SALGOO to flood events approx. five years before vegetation sampling occurred. It finds that the recruitment of POPFRE and SALGOO is not affected by dam regulation along the Verde River, by comparing proximate reaches that are unregulated and regulated. This conclusion only pertains to changes/stability at the stand level, not the landscape-level changes of forest extent.
8	State of the Las Cienegas National Conservation Area. Gila Topminnow population status and trends 1989-2005	Bodner, G., Simms, J., & Gori, D.	2007	The Nature Conservancy	1989 - 2007	This report summarizes the population status of Gila topminnow at Cienega Creek, looking at statistically significant declines in the population and speculating cause/effect. There is no direct correlation with instream flow monitoring, but some anecdotal evidence that changes resulting from flooding and drought may have impacted the habitat conditions.
9	State of the Las Cienegas National Conservation Area. Part 3. Condition and Trend of Riparian Target Species, Vegetation and Channel Geomorphology	Bodner, G.& K.Simms	2008	The Nature Conservancy	1988 - 2008	This report summarizes the multiple vegetation and geomorphology studies that have occurred on the LCNCA and summarizes the findings of those studies. Some of the monitoring data is inconsistent; different types of monitoring took place at different frequencies and not all of the monitoring was repeated or repeatable. The report summarizes the findings of the monitoring, but does not make any conclusions about how much water is needed to maintain this degree of vegetation or hydrologic condition.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
10	The effect of the Santa Cruz River riparian corridor on single family home prices using the hedonic pricing method	Bourne, K.L.	2007	University of Arizona	2001-2005	This study used hedonic analysis to determine the real estate/riparian value connection in Rio Rico and Tubac. It used a straightforward distance to riparian area function to explain house prices, without any quantification of what the riparian area looked like or what the values were. Because this was riparian habitat restored by effluent flows, the study showing that home values went up is significant.
11	Natural and anthropogenic factors affecting the structure of the benthic macroinvertebrate community in an effluent-dominated reach of the Santa Cruz River, AZ	Boyle, T.P., & Fraleigh, H.D.	2003	Ecological Indicators, 3(2), 93-117	1997-1998	This study sampled benthic macroinvertebrates at intervals above and below the International Wastewater Treatment Plant in Nogales, AZ to establish a relationship between community structure and diversity and water quality.
12	Breeding and Migratory Birds: Patterns and Processes	Brand, L.A., Cerasale, D.J., & Rick, T.D.	2009	Ecology and Conservation of the San Pedro River	n/a	This chapter summarizes bird/vegetation relationships in the San Pedro, before and after livestock grazing cessation. It does describe bird relationships with both surface (direct) and groundwater (indirect), but many of the connections are with vegetation (which in turn reflects disturbance or flows).
13	Projecting avian response to linked changes in groundwater and riparian floodplain vegetation along a dryland river: a scenario analysis	Brand, L.A., Stromberg, J., Goodrich, D.C., Dixon, M.D., Lansey, K., Kang, D., & Cerasale, D.J.	2010	Ecohydrology, 4, 130-142	n/a	This paper classifies avian habitat and then assesses changes to that habitat based on groundwater pumping and recharge scenarios within the SPRNCA.
14	Water Requirements for Bottomland Vegetation of Middle Rincon Creek and Potential Threats to Water Availability	Briggs, M.K.	2008	Arizona Instream Flow Permit	April-June 2004; 2006	Briggs 2008 summarizes multiple data sets which characterize the riparian environment of Rincon Creek and ties this to the streamflow data collected for this stretch of river. The methods sections are extensive, but the conclusions are pretty limited and not correlated statistically.
15	Hydrologic Function and Channel Morphologic Analysis of the Santa Cruz River at the North Simpson Site	Briggs, M.K., Magirl, C., & Hess, S	2007	Tucson Audubon	2003-2005 (veg) 2002-2006 (channel morphology)	This report focuses on the physical characteristics of the lower Santa Cruz River as it crosses the North Simpson Farm site, specifically addressing the reach's channel morphologic and hydrologic characteristics. Changes in morphology and vegetation were monitored over time. This report also focused on the influence of effluent on the vegetation and hydrology of the site.
16	Final Environmental Assessment Experimental Releases from Glen Canyon Dam, Arizona 2008 through 2012	U.S.Bureau of Reclamation	2008	Department of the Interior	2008-2012	This document is an environmental assessment and documents current conditions in Glen, Marble, and Grand canyons below the Glen Canyon Dam. It describes the proposed action to release experimental flows from the dam between 2008 and 2010, which is designed to help assess the long-term benefits to the conservation of endangered humpback chub and fine sediment along the Colorado River downstream of the Glen Canyon dam.
17	Mechanisms Associated With Decline of Woody Species in Riparian Ecosystems of the Southwestern U.S	Busch, D.E., & Smith, S.D.	1995	Ecological Monographs, 65(3), 347.	Unk	This study assesses multiple variables in establishing the response of vegetation to hydrologic conditions.
18	Proposed Management Plan for Alamo Lake and the Bill Williams River	BWRC Technical Committee	1994	BWRC Technical Committee	1990-1994	This report identifies some available literature on flow requirements and flow responses of biota in the BWR ecosystem, and makes flow prescriptions tied to predicted and preferred outcomes for plants and wildlife. In some places, expert opinion appears to drive formulation of quantitative prescriptions more than do documented flow requirements.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
19	Comparison of Upper Thermal Tolerances of Native and Nonnative Fish Species in Arizona	Carveth, C.J., Widmer, A.M., & Bonar, S.A	2006	Transactions of the American Fisheries Society	NA	This study took native and non-native fish species and heated them in test tubes over a hotplate until they died. This was intended to inform about thermal limits of fish species under rapid change. The study acknowledges that this cannot be applied to nature conditions, but is a measure of relative tolerance among species.
20	Riparian Areas Generate Property Value Premium for Landowners	Colby, B.G., & Wishart, S.	2002	University of Arizona	1996-1999	This report quantifies the relative values of houses sold in various proximities to riparian corridors.
21	Upper Verde River: Review of Stream-Riparian Monitoring Efforts Conducted by the U.S. Forest Service Rocky Mountain Research Station	Dwire, K., Buffington, J., Merritt, D., Rieman, B.E., & Tait, C.	2008	U.S. Forest Service Rocky Mountain Research Station	NA	This report is an overview of the types of monitoring being conducted on the biological resources of the Upper Verde River. It assesses whether the conclusions based on the monitoring regarding management effects are really supported by the data and methods.
22	Aquifer Monitoring for Groundwater-Dependent Ecosystems, Pima County, Arizona	Fonseca, J.	2004	Report to the Pima County Board of Supervisors, Tucson, AZ	n/a	This report identifies the current monitoring efforts in Pima County and determines whether they are effective at monitoring ecological resources and detecting ecosystem change. It includes narrative and visual descriptions of types of wells, adequacies and inadequacies of existing monitoring methods, and ecosystem response to change.
23	Controls on transpiration in a semiarid riparian cottonwood forest	Gazal, R.M., Scott, R.L., Goodrich, D.C., & Williams, D.G.	2006	Agricultural and Forest Meteorology	2003	This paper specifically measures transpiration in cottonwood forests and concludes that canopy structure, atmospheric demand and depth to groundwater played significant roles in the seasonal fluctuation in transpiration rates. It also discusses the dependence of cottonwood trees on shallow groundwater sources, especially during periods of drought.
24	An Inventory, Assessment, And Development Of Recovery Priorities For Arizona Strip Springs, Seeps And Natural Ponds: A Synthesis Of Information	Gr& Canyon Wildl&s Council	2001	Grand Canyon Wildlands Council	2000-2002	This paper summarizes the state of knowledge regarding the springs of the Arizona Strip and the floral and faunal diversity that depends on these places. It provides an overview of the history of the region (including Native American occupation and mining) and provides case histories of springs where modification and monitoring has occurred.
25	Seasonal estimates of riparian evapotranspiration using remote sensing and in situ measurements	Goodrich, D.C., Scott, R., Qi, J., Goff, B., Unkrich, C.L., Moran, M.S., Ni, W., Cooper, W.E., Eichinger, W.J., Shuttleworth, Y.Kerr, R.& Marsett, W.N.	2000	Agricultural and Forest Meteorology, 105, 281-309.	1997	The report summarizes a series of field measurements conducted during the 1997 growing season to estimate the riparian ET originating from the groundwater over sections of the San Pedro River corridor. The study used remotely sensed estimates of vegetation cover, local meteorological and energy balance measurements, and sap flow measurements of POPFRE and SALGOO transpiration.
26	Ecological Implications of Verde River Flows	Haney, J.A., & Turner, D.S.	2008	Ecological Implications of Verde River Flows	2007-2008	This chapter identifies some key workshop outcomes, providing a roadmap of what is known with confidence about ecosystem flow needs and where additional research is needed.
27	Shifting dominance of riparian Populus and Tamarix along gradients of flow alteration in western North American rivers	Merritt, D.M. & Poff, N.L.	2010	Ecological Applications, 20(1), 135–152.	1993-2003	This paper discusses the changes from POPFRE to TAMRAM domination along riparian areas throughout the western U.S. They sampled along numerous rivers and quantified the successful recruitment of TAMRAM under various flow conditions. They created an index of flow modification (IFM) to correlate vegetation conditions with hydrologic alteration. Studied flow alteration but not biological variables on the BWR and San Pedro; studied both on the Gila, Colorado, Little Colorado, and Verde. Includes recommendations for restoration of populus.
28	Interbasin Groundwater Flow at the Benson Narrows, Arizona	Haney, J.	2005	The Nature Conservancy	n/a	This paper describes TNC's efforts to restore water to the San Pedro River and reports on the ways that they are monitoring to determine if their efforts are successful. However, there is no direct correlation between the restored flows (evidenced by the charts and graphs) and any of the vegetation results (which are not presented)

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
29	Terrestrial arthropod communities along the San Pedro: Three Case Studies (Chapter 7)	Hannon, L.E., Ries, L.& Williams, K.S.	2009	Ecology and Conservation of the San Pedro River	n/a	This chapter seems to summarize three studies that were conducted within the San Pedro regarding arthropod abundance/diversity, etc. and the authors link this to vegetation communities based on water availability.
30	How Much Water Do Stream-Dependent Species Need?	Hautzinger, A.B., Hickey, J., & Walker, D.	2008	Southwest Hydrology	Unk	This is a summary of the types of environmental flow studies currently being conducted and how/why they related to the requirements of the Endangered Species Act. More details provided in Shafroth et al 2010; paper does describe importance of floods for cottonwood recruitment.
31	Summary of Unified Ecosystem Flow Requirements for the Bill Williams River Corridor	Hautzinger, A., Warner, A., Hickey, J., & Beauchamp, V.B.	2006	Summary of Unified Ecosystem Flow Requirements for the Bill Williams River Corridor.	2005-2006	This chapter synthesizes flow requirements (floods and baseflows; defined by purpose, magnitude, frequency, timing, duration, rate of change, and uncertainties) for all biotic elements of the river and riparian ecosystem. The experts identified hypotheses for flow requirements as well as areas of uncertainty or information gaps.
32	Beaver dams, hydrological thresholds and controlled floods as a management tool in a desert riverine ecosystem, Bill Williams River, Arizona	Andersen, D.C., & Shafroth, P.B.	2010	Ecohydrology	2002-2008	Study of the effects of floods on beaver dam persistence in the Bill Williams River. Authors find that environmental flows prescribed to sustain desert riparian forest will also reduce beaver-created lentic habitat in a nonlinear manner determined by both beaver dam and flood attributes. If undesirable shifts in lotic habitat extent, vegetation pattern, the river-scale hydrologic budget (e.g. due to evaporative losses from ponds), or other factors make it desirable to hold the lotic : lentic ratio at a higher although, our results demonstrate that controlled releases can be used to remove dams and manage the ratio.
33	Responses of riparian trees to interannual variation in groundwater depth in a semi-arid river basin	Horton, J.L., Kolb, T.E. & Hart, S.C.	2001	Plant, Cell & Environment, 24(3), 293-304.	1997-1998	This study evaluated the water needs of POPFRE, SALGOO, and TAMCHI along the Hassayampa River along a gradient of surface water availability, and also was able to determine significant vegetation responses to groundwater availability, as well as differences among the species. It emphasizes annual variability and surface water variability in interpreting the dependence on groundwater.
34	Physiological Response to Groundwater Depth Varies among Species and with River Flow Regulation	Horton, J.L., Kolb, T.E. & Hart, S.C.	2001	Ecological Applications, 11(4), 1046.	1997	Compared Bill Williams and Hassayampa Rivers to study the effect of flow regulation on riparian trees and non-native TAMRAM. Demonstrates that TAMRAM has greater physiological tolerance for variable groundwater levels. Includes management implications.
35	Streamside herbaceous vegetation response to hydrologic restoration on the San Pedro River, Arizona	Katz, G.L., Stromberg, J.C., & Denslow, M.W.	2009	Ecohydrology, 2(2), 213–225.	2003-2008	This study compares the effects of hydrologic restoration with control sites over time by assessing the vegetation community responses.
36	Riparian vegetation responses: snatching defeat from the jaws of victory, and vice versa	Kearsley, M.J. & Ayers, T.J.	1999	In The controlled flood in Grand Canyon (pp. 309–327).	1995-1996	This study compared the vegetation and surface conditions of nine plots along the Colorado River before and after the 1995 flood event. This study quantified the differences in total vegetative cover, total classification cover to riparian and wetlands, the effects of vegetation canopy, effect on soil seed banks, the effect of loss of litter, and the homogenization of substrates due to the loss and burial of fine sediments. This study also found no significant recruitment of TAMRAM following the flood.
37	Predictive Models of the Hydrological Regime of Unregulated Streams in Arizona	Anning, D.W., & Parker, J.T.C.	2009	U.S. Geological Survey.		Three statistical models were developed by the U.S. Geological Survey in cooperation with the Arizona Department of Environmental Quality to improve the predictability of flow occurrence in unregulated streams throughout Arizona. The models can be used to predict the probabilities of the hydrological regime being perennial or intermittent.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
38	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	Kirkpatrick, C.	2007	U.S. Department of Defense, Legacy Resources Management Program	March to October 2006	This report connects riparian bird and arthropod abundance to the availability of surface water and the health of groundwater-dependent vegetation. It compares riparian areas to upland areas adjacent to riparian areas in order to demonstrate the dependence of numerous taxa on riparian habitats. The stated goal is provide a set of models for resource managers on military lands.
39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009	Arizona Game and Fish Department	2006-2008	This report connects riparian bird and arthropod abundance to the availability of surface water and the health of groundwater-dependent vegetation. It compares riparian areas to upland areas adjacent to riparian areas in order to demonstrate the dependence of numerous taxa on riparian habitats. It also looks at reproductive success of riparian birds species, and quantifies the percentage of the vegetation canopies that are dead or dormant.
40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009	U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit	2006-2008	This report connects riparian bird and arthropod abundance to the availability of surface water and the health of groundwater-dependent vegetation. It compares riparian areas to upland areas adjacent to riparian areas in order to demonstrate the dependence of numerous taxa on riparian habitats. It also looks at reproductive success of riparian birds species, and quantifies the percentage of the vegetation canopies that are dead or dormant.
41	Effects of high-flow experiments from Glen Canyon Dam on abundance, growth, and survival rates of early life stages of rainbow trout in the Lees Ferry reach of the Colorado River	Korman, J., Kaplinski, M., & Melis, T.S.	2010	U.S. Geological Survey, Open File Report 2010-1034	2003-2009	This study reports on the effects of HFEs in 2004 and 2008 on the early life stages of rainbow trout in the Lees Ferry Reach on the basis of monthly sampling of redds and the abundance of age-0 trout (fertilization to about 1-2 months from emergence) and their growth during a seven year period between 2003 and 2009. Multiple lines of evidence indicate that the March 2008 HFE resulted in a large increase in the survival rates of the age-0 trout because of improved habitat conditions. The age-0 abundance in July 2008 showed a fourfold increase. The statistical analyses that were conducted predict and confirm the ages of the fish, but no analysis was done that specifically ties the fish population to the quantity or magnitude of the HFE.
42	Variation in Streamflow Influences Abundance and Productivity of an Endangered Songbird, the Southwestern Willow Flycatcher	Koronkiewicz, T.J., Graber, A.E., & McLeod, M.A.	2010	Poster Presentation	1997-2009 (2004-2009)	This poster presents some key findings about the relationship of flycatcher territories with cfs (streamflow). The relationships are established as a function of time and magnitude.
43	Simulated effects of ground-water withdrawals and artificial recharge on discharge to streams, springs, and riparian vegetation in the Sierra Vista Subwatershed of the Upper San Pedro Basin, southeastern Arizona	Leake, S.A., Pool, D.R., & Leenhouts, J.M.	2008	US Geological Survey	n/a	This model was created to help study the groundwater/surface water connections in the Upper San Pedro using capture maps and predevelopment/development conditions. Also shows the response to artificial recharge of the water table in the basin-fill aquifer.
44	Hydrologic requirements of and consumptive ground-water use by riparian vegetation along the San Pedro River, Arizona	Leenhouts, J.M., Stromberg, J.C., & Scott, R.L	2006	U.S. Geological Survey.	2000-2003	This study characterizes the status and variability of hydrologic factors within the riparian system, relates spatial and temporal aspects of riparian changes and condition to the hydrologic variables, and derives groundwater use rates to determine riparian groundwater use by species within the SPRNCA, including yearly variation. Includes brief summary of values of streamflow and riparian bird habitat.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
45	Surface water and ground-water thresholds for maintaining Populus–Salix forests, San Pedro River, Arizona	Lite, S.J. & Stromberg, J.C.	2005	Biological Conservation, 125(2), 153–167.	2000-2002	Lite and Stromberg (2005) quantify the changes between riparian and xeroriparian vegetation types as groundwater availability shifts (groundwater and surface water depletion). Identifies hydrologic thresholds for native riparian trees, below which non-native Tamarix ramosissima (a shrub) will become dominant.; The structural differences in these species have impacts on habitat quality.
46	Riparian plant species richness along lateral and longitudinal gradients of water stress and flood disturbance, San Pedro River, Arizona, USA	Lite, S.J., Bagstad, K.J., & Stromberg, J.C.	2005	Journal of Arid Environments, 63(4), 785–813	2000-2001	Assesses the richness and cover of herbaceous and woody plant species along latitudinal and longitudinal gradients to determine responses to water availability (both surface and groundwater). This was done before and after summer monsoon flooding over two years.
47	Streamflow-Biota Relations: Fish and Aquatic Macroinvertebrates	Lytle, D.A.	2006	Defining Ecosystem Flow Requirements for the Bill Williams River, Arizona, U.S. Geological Survey	n/a	This chapter describes the known needs for and predicted responses of aquatic fish and macroinvertebrates to floods and streamflow changes. The authors highlight that the aquatic species vary greatly in their flow regime requirements. Knowledge is presented without citation in many instances.
48	Glen Canyon Dam Releases – Economic Considerations	Marcus, D.	2009	Grand Canyon Trust	Oct 2007 - Sept 2008	This study looked at the differential economics of various management alternatives for the Glen Canyon Dam in terms of electricity production. There is no ecosystem service or ecological values in the calculations.
49	2008 High-Flow Experiment at Glen Canyon Dam Benefits Colorado River Resources in Grand Canyon National Park	Melis, T.S., Topping, D.J., Grams, P.E., Rubin, D.M., Wright, S.A., Draut, A.E.& others	2010	US Geological Survey	2008	This is a brief summary of the HFE experiments on the Colorado River. The results of the experiment for several variables are summarized, but the methods, flow amounts, quantified results, etc. are not presented.
50	Linking streamflow and groundwater to avian habitat in a desert riparian system	Merritt, D.M. & Bateman, H.L.	2012	Ecological Applications, 22(7), 1973-1988	2008-2009	We measured riparian vegetation, groundwater and surface water, habitat structure, and bird occurrence along Cherry Creek, a perennial tributary of the Salt River in central Arizona, USA. The purpose of this work was to develop an integrated model of groundwater–vegetation–habitat structure and bird occurrence by: (1) characterizing structural and provisioning attributes of riparian vegetation through developing a bird habitat index (BHI), (2) validating the utility of our BHI through relating it to measured bird community composition, (3) determining the riparian plant species that best explain the variability in BHI, (4) developing predictive models that link important riparian species to fluvial disturbance and groundwater availability along an arid-land stream, and (5) simulating the effects of changes in flow regime and groundwater levels and determining their consequences for riparian bird communities.
51	Differential Selection by Flooding	Minckley, W.L. & Meffe, G.K.	1987	Evolutionary and community ecology of North American stream fishes. (Vols. 1–Book, 1–Section, pp. 93–104). Norman, OK: University of Oklahoma Press	1964-1985	This paper explains some of the morphological and physiological adaptations of native fish which, in turn, express their dependence/evolution in context of flood regimes in arid lands. The advantage over nonnative fish was demonstrated through sampling before and after flooding to determine the persistence of native populations, as well as in controlled experiments where the researchers observed fish response to high flume conditions. The paper cautions against the generation of "optimal" instream flows based on min/max and mathematical modeling in arid land systems.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
52	Assessment Report Water-Right Application No. 33-96733 Middle Reach of Rincon Creek	National Park Service 2008	2008	National Park Service	2003-2008	This report summarizes the multiple resource studies that were conducted along the middle reach of Rincon Creek in support of the NPS in-streamflow water right application. It quantifies the aquatic and riparian ecosystems elements and their relationship with surface and groundwater.
53	Developing an Ecosystem Services Online Decision Support Tool to Assess the Impacts of Climate Change and Urban Growth in the Santa Cruz Watershed; Where We Live, Work, and Play	Norman, L., Tallent-Halsell, N., Labiosa, W., Weber, M., McCoy, A., Hirschboeck, K., … Gray, F.	2010	Sustainability	n/a	This paper provides a thorough explanation of a research agenda for quantifying ecosystem services in the Santa Cruz watershed, and described which data sets and tools will be used in the models. It doesn't actually contain any quantitative data or results.
54	Nature-Oriented Visitors and Their Expenditures: Upper San Pedro River Basin	Orr, P. & Colby, B.	2002	Department of Agricultural and Resource Economics, University of Arizona	2001	This report characterizes the economic contribution of visitors to natural areas in the Upper San Pedro River through social survey.
55	Preliminary Riparian Protection, Management, and Restoration Element	Pima County	2000	Pima County	2000	This study uses mapping and field data studies to identify the location and names of perennial streams, groundwater-dependent riparian areas, and springs, that currently exist, as well as some information about habitats that are known to have existed in the past. Species associated with these habitats are described, as well as known threats to these ecosystems. The study makes recommendations for protection and offers guidelines for restoration, such as it states that instream flows sufficient for preserving ecosystems should be protected, but does not describe those in any more detail.
56	City of Tucson and Pima County Riparian Protection Technical Paper	Pima County	2009	Pima County	1984-2006 pumping trends	This paper provides a description of groundwater/shallow water dependent ecosystems, including known depths to groundwater needed to sustain vegetation and the status of groundwater depth within each County subarea. The paper also identifies sensitive riparian habitat found along intermittent and perennial stream courses and in shallow groundwater areas in eastern Pima County. Changes and trends that have or may occur to water sensitive riparian areas are discussed, but have no meaningful linkage to ecological needs besides the 50 foot minimum depth to groundwater.
57	City of Tucson and Pima County Water for the Environment Technical Paper	Pima County	2009	Pima County	Unk	This paper describes the known environmental water needs for preservation of existing vegetation and for restoration projects in Pima County, using data collected from other studies. It also describes potential sources of water and mechanisms to secure water for these environmental water needs.
58	Riparian vegetation response to the March 2008 short-duration, high-flow experiment; implications of timing and frequency of flood disturbance on nonnative plant establishment along the Colorado River below Glen Canyon Dam	Ralston, B.E.	2010	U.S. Geological Survey	2008	As part of the HFE, USGS monitored total plant species richness, nonnative species richness, plant percent cover, percent organic matter, and total carbon (from sediment samples) in Grand Canyon riparian vegetation zones immediately following and 6 months after the 2008 HFE. These comparisons were used to determine if susceptibility to nonnative species establishment varied among riparian vegetation zones and if the timing of the HFE affected nonnative plant establishment success. The HFE resulted in no change in riparian zones for nonnative cover, but significant variation in nonnative species richness. These results suggest that riparian zones subject to intermittent disturbance and near the river under normal dam operations are more susceptible to nonnative species introductions following a disturbance.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
59	Chapter 9: Reptiles and Amphibians	Rosen, P.C.	2009	Ecology and Conservation of the San Pedro River	n/a	This chapter focuses on the herpetofauna of the San Pedro River and the direct/indirect relationships these species have with surface water. It specifically discusses the positive/negative effects human disturbance may have on certain species of herps and the duration of water availability that is necessary for reproductive processes.
60	Short-term Effects Short-term effects of the 2008 high-flow experiment on macroinvertebrates in the Colorado River below Glen Canyon Dam, Arizona	Rosi-Marshall, E.J., Kennedy, T.A., Kincaid, D.W., Cross, W.F., Kelly, H.A., Behn, K.A., … Baxter, C.V.	2010	U.S. Geological Survey	2008	This paper reports on the effects of the high-flow experiment on the benthic macro-invertebrates of the Colorado River below Glen Canyon dam. The effects persisted as long as the study (15 months). The effects included increased in drifting invertebrates and initial decreases in the benthic biomass of some taxa at some sites. For other species, short-term reductions in biomass did not persist and these taxa recovered in 4 to 6 months. In contrast, downstream sites had no significant reduction in total assemblage biomass, but some taxa were lower following the HFE. Some taxa are more susceptible to the HFE than others. These data can be coupled with food resource data for fishes.
61	Greenfall Links Groundwater to Aboveground Food Webs in Desert River Floodplains	Sabo, J.L., McCluney, K.E., Marusenko, Y., Keller, A., & Soykan, C.U.	2008	Ecological Monographs, 78, 615–631.	2006	The overarching goal of the paper is to root the terrestrial riparian animal communities directly in the regional water cycle by quantifying fluxes of groundwater to a key aboveground primary consumer via green fall from the dominant woody plants in a desert floodplain ecosystem." Crickets prefer the wet cottonwood leaves at greater distances from the river and during the dry season, suggesting that they use the water content of the leaves to meet their water needs.
62	Final Report: Pantano Jungle Restoration, Cienega Creek Preserve	Scalero, D.	2009	Pima County Regional Flood Control District	1998-2008	Summarizes the revegetation/restoration project at the Cienega Creek Natural Preserve.
63	Science and Values in River Restoration Science and Values in River Restoration in the Grand Canyon	Schmidt, J.C., Webb, R.H., Valdez, R.A., Marzolf, G.R., & Stevens, L.E.	1998	BioScience, 48(9), 735–747	1983-1998	This paper is about the various restoration/management scenarios for flows in the Grand Canyon and the effects the various scenarios would have on the geomorphology and biota of the canyon.
64	A GIS-based Management Tool to Quantify Riparian Vegetation Groundwater Use	Scott, R.L., Goodrich, D.C. & Levick, L.R.	2003	Presented at the Proc. 1st Interagency Conf. on Research in the Watersheds	NA	This paper describes a prototype GIS-based tool that is designed to help agencies determine the total riparian vegetation groundwater use in the San Pedro Basin and analyze alternative scenarios under management or stochastic changes.
65	The water use of two dominant vegetation communities in a semiarid riparian ecosystem	Scott, R.L., Shuttleworth, W.J., Goodrich, D.C., & Maddock III, T.	2000	Agricultural and Forest Meteorology, 105(1), 241–256.	1996-1998	This study quantifies the water use/evapotranspiration of mesquite and sacaton vegetation communities using fairly straightforward monitoring data and equipment. The conclusion is that mesquite and sacaton rely a lot on precipitation and soil moisture, and that probably only the obligate phreatophytes are using groundwater.
66	Multiyear riparian evapotranspiration and groundwater use for a semiarid watershed	Scott, R.L., Cable, W.L., Huxman, T.E., Nagler, P.L., Hernandez, M., & Goodrich, D.C.	2008	Journal of Arid Environments, 72, 1232–1246.	2001-2005	Eddy covariance technique to measure atmospheric flux and estimate evapotranspiration along the riparian ecosystems of the San Pedro River. A water balance equation was used to determine annual groundwater use. This was tested against results from remotely sensed data from NASA MODIS sensor and the Enhanced Vegetation Index (EVI).
67	Streamflow-Biota Relations: Riparian Vegetation	Shafroth, P.B. & Beauchamp, V.B.	2006	Defining Ecosystem Flow Requirements for the Bill Williams River, Arizona. Open-File Report.	n/a	This chapter summarizes some of the general connections between flow and riparian vegetation, as well as some details for species that have been the subject of more intensive study, such as the recruitment parameters needed for cottonwood and known relationships between herbaceous species and flows.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
68	Modeling climate change impacts – and uncertainty –on the hydrology of a riparian system: The San Pedro Basin (Arizona/Sonora)	Serrat-Cepdevila, A., Valdes, J.B., Gonzales Perez, J., Baird, K., Mata, L.J., & Maddock III, T.	2007	Journal of Hydrology 347,48–66	NA	A three dimensional transient groundwater-surface water flow model is used to simulate the hydrology of the current century, from 2000 to 2100, under different climate scenarios and model estimates. Results suggest that recharge in the San Pedro basin will decrease, affecting the dynamics of the riparian area in the long term. It is shown that mean net stream gain, i.e. base flow, will decrease and the effects on the riparian area could be significant.
69	Ecosystem effects of environmental flows: modelling and experimental floods in a dryland river	Shafroth, P.B., Wilcox, A.C., Lytle, D.A., Hickey, J.T., Andersensen, D.C., Beauchamp, V.B., … Warner, A.	2010	Freshwater Biology, 55(1), 68–85.	2007	This paper is about the development of a quantitative approach (modelling) to predict ecosystem needs/responses to dam releases. The authors specifically identify the "Sustainable Rivers Project" as based on the holistic approach (Thame 2003) known as 'ecological sustainable water management.' They also specifically identify their approach as interchangeable with other basins in other parts of the world.
70	Establishment of Woody Riparian Vegetation in Relation to Annual Patterns of Streamflow, Bill Williams River, Arizona	Shafroth, P.B., Auble, G.T., Stromberg, J.C., & Patten, D.T.	1998	Wetlands, 18(4), 577–590.	1993-1995	This study retrospectively examines the establishment of four woody riparian species (POPFRE, SALGOO, TAMRAM, and BACSAL) along the Bill Williams River in relation to depth to groundwater and surface flow availability, as well as sediment type and quantity. The in situ plots were compared to a model that predicted germination.
71	A Living River - Charting the Health of the Upper Santa Cruz River	Sonoran Institute	2009	Sonoran Institute	2008	This report summarizes the state of knowledge on the Santa Cruz and the types of monitoring being done. It does not provide a methods section. In some cases the information reported is just a baseline; there haven't been enough monitoring events to report on trend. It also compares current conditions and/or trajectories to the parameters of riparian health that SI established. The parameters of riparian health include minimum depth to groundwater and groundwater variability for cottonwood, based on Lite and Stromberg (2005).
72	Causes and consequences of mammal species richness (Chapter 6)	Soykan, C.U., Brand, L.A. & Sabo, J.L.	2009	Ecology and Conservation of the San Pedro River	NA	This chapter is about the relationships of mammals to the vegetation communities of the San Pedro River. The relationship with surface water is briefly explored, and the relationship with groundwater is largely extrapolated from other vegetation studies, since this effect is indirect.
73	Coupling Groundwater and Riparian Vegetation Models to Assess Effects of Reservoir Releases	Springer, A.E., Wright, J.M., Shafroth, P.B., Stromberg, J.C., & Patten, D.T.	1999	Water Resources Research, 35(12).	Unk	This is a predictive study that simulates and assesses the impacts of dam releases on groundwater and riparian vegetation models. It calculates evapotranspiration and water needs for various riparian vegetation species. Being done to demonstrate potential ecosystem benefit from CAP recharge of groundwater along Agua Fria River. Model could be expanded to include other species, other abiotic factors, and could be applied to similar sites.
74	Fishes: Historical changes and an imperiled fauna	Stefferud, J.A., Marsh, P.C., & Clarkson, R.W.	2009	Ecology and Conservation of the San Pedro River. Ed. by JC Stromberg and BJ Tellman. Tucson: University of Arizona	NA	This chapter explains the threats and effects on native fish fauna in the San Pedro River. It describes the anthropogenic changes that have influenced the decline of native species. It also describes the habitat needs of each native species.
75	Wildlife and Flow Relationships in the Verde River Watershed	Stevens, L.E., Turner, D.S., & Supplee, V.	2008	Ecological Implications of Verde River Flows	NA	This chapter reviews the literature on wildlife habitat preferences/use to describe habitat types and faunal associations. Includes chart of flow needs for fish and bird species
76	Influence of streamflow regime and temperature on growth rate of the riparian tree, Platanus wrightii, in Arizona	Stromberg, J.C.	2001	Freshwater Biology, 46(2), 227–239.	1996-1997	This study was a straightforward assessment of the growth response of P. wrighttii to water availability and temperature.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
77	Effects of streamflow intermittency on riparian vegetation of a semiarid region river (San Pedro River, Arizona)	Stromberg, J.C., Bagstad, K.J., Leenhouts, J.M., Lite, S.J., & Makings, E.	2005	River Research and Applications, 21, 925–938.	2000-2003	Exploration of the relationship between herbaceous cover (hydric and mesic) and surface flows, flood disturbance and interannual variation, and, to some degree, channel morphology. Conclusions also pertain to the availability of groundwater.
78	Ecological Implications of Verde River Flows	Stromberg, J.C.	2008	Ecological Implications of Verde River Flows	NA	This chapter reviews the literature in order to describe the predicted flow responses of riparian vegetation. Primarily relying on conceptual modeling and classifications of plants according to sensitivity to streamflow decline, it does provide limited quantitative data on water needs (i.e. mortality thresholds) for specific plant species and relationships between plant indicators and streamflow and groundwater depth.
79	Status of the Upper San Pedro River (USA): Riparian Ecosystem	Stromberg, J., Dixon, M.D., Scott, R.L., Maddock, T., Baird, K., & Tellman, B.	2009	Ecology and Conservation of the San Pedro River. Ed. by JC Stromberg and BJ Tellman. Tucson: University of Arizona Press	NA	This chapter concludes with a qualified admission that the authors know how much water the San Pedro ecosystem needs, based on explorations of vegetation community responses to depth-to-groundwater, drivers of hydrologic change, and other influences. It reviews other studies and methods for estimating environment flows (such as building block and models) and explores the limits of these types of estimates.
80	Managing streamflow regimes for riparian ecosystem restoration	Stromberg, J., Lite, S.J., & Beauchamp, V.B.	2003	Presented at the 2003 Tamarisk Symposium.	Unk	Summary of vegetation responses along the San Pedro and the Verde Rivers in response to changing flow regimes. Some light management recommendations included.
81	Instream flow models for mixed deciduous riparian vegetation within a semiarid region	Stromberg, J.C.	1993	Regulated Rivers: Research & Management, 8(3), 225–235.	1991	This study finds that riparian abundance (foliage area, stem basal area, and stand width) vary in response to flow volumes. These instream flow models have management implications for riparian habitats.
82	Biotic integrity of Platanus wrightii riparian forests in Arizona: first approximation	Stromberg, J.C.	2001	Forest Ecology and Management, 142(1), 251–266.	1995-1996	This study attempts to quantify the predicted effects of groundwater declines on Platanus wrightii based on its differential responses at study sites around southern Arizona.
83	Effects of Groundwater Decline on Riparian Vegetation of Semiarid Regions: The San Pedro, Arizona	Stromberg, J.C., Tiller, R., & Richter, B.	1996	Ecological Applications, 6(1), 113.	1993	Stromberg et al (1996) found that several ecological indicators varied along a continuum with depth to groundwater, including a weighted average wetland indicator score, cover of plants within wetland indicator grounds, and frequency of indicator species. This paper gives estimated depth to groundwater requirements for a number of riparian species and predicts what would happen with groundwater level declines. They used detrended correspondence analysis for this study; DCA is used in ecological studies where there are continuum variables.
84	Effects of streamflow patterns on riparian vegetation of a semiarid river: Implications for a changing climate	Stromberg, J.C., Lite, S.J., & Dixon, M.D.	2009	River Research and Applications	2000-2001	Predicts how vegetation along the San Pedro River would be altered under various climate change scenarios, given the riparian vegetation's responsiveness to current flows and floods.
85	Riparian Vegetation: Pattern and Process	Stromberg, Lite, Dixon, & Tiller 2009b	2009	Ecology and Conservation of the San Pedro River	NA	Overview of general vegetation responses to the San Pedro hydrologic system. It is very general, but includes some specific quantitative information like depth-to-groundwater requirements of various species.
86	Responses of Salix Gooddingii and Tamarix Ramosissima to Flooding	Tallent-Halsell, N.G., & Walker, L.R.	2002	Wetlands, 22(4), 776–785.		This paper looks at the growth rates and survivorship of TAMRAM and SALGOO in a controlled experiment and then compares this to the anecdotal results of restoration projects along lake shores. It posits that restoration must include a look at whether species will survive the hydrologic cycle/regime of the site.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
87	Workshop Results: Steps Toward Understanding Ecological Response to Hydrologic Variation in the Verde River (Chapter 6)	Turner, D.S., & Haney, J.A.	2008	Ecological Implications of Verde River Flows.	2007-2008	Using data from literature review and an expert workshop, the authors developed what are primarily qualitative/conceptual flow-ecology response curves and the anticipated direction of trends in responses along two stream reaches for two flow scenarios. The main outcome in addition to the curves is the development of a detailed, prioritized research agenda. The ultimate goal of this effort is developing a set of expert-derived hypotheses in the form of flow-ecology response curves, testing the hypotheses using existing data, and then refining the curves as needed with additional monitoring data.
88	Fish and Wildlife Coordination Act Substantiating Report: Central Arizona Project Verde and East Verde River Water Diversions, Yavapai and Gila Counties,	U.S.Fish & Wildlife Service	1989	U.S. Fish and Wildlife Service	Unk	This is a summary of predictions of effects to biological resources if CAP diversions occur, based on the habitat needs of certain aquatic fishes and other aquatic and aquatic-dependent species.
89	Final Biological Opinion for the Operation of the Glen Canyon Dam	U.S.Fish & Wildlife Service	2008	U.S. Fish and Wildlife Service	2008-2012	This book provides extensive state-of-knowledge review for the humpback chub and Kanab ambersnail and predicts effects to these species at the flow magnitude/discharges proposed in the Glen Canyon release proposal. It is essentially a literature review, basing the conclusions of the BO on existing data. They do not collect any new data for the study.
90	Environmental flows studies of the Fort Collins Science Center, U.S. Geological Survey—Cherry Creek, Arizona	Waddle, T.J., & Bovee, K.D.	2009	U.S. Geological Survey.	2008	This study was designed to quantify the habitat available in Cherry Creek over the range and sequences of flow events occurring in the stream, to determine current use of streamflow by native fish and potential for impacts to fish from reduced flows, in support of an instream flow permit. This was a pretty modeling-intense method, that may not be replicable by all agencies/managers.
91	Biologic implications of the 1996 controlled food	Valdez, R.A., Shannon, J.P., & Blinn, D.W.	1999	The Controlled Flood in the Grand Canyon (pp. 343–350). Washington, D.C.: American Geophysical Union.	1996	This paper provides an overview of the effects of the 1996 controlled flood on the biological resources of the Colorado River in Grand Canyon. It also discusses the relative success or failure of the flood to alter these resources for management purposes, and provides management recommendations for future floods.
92	Streamflow-Biota Relations: Riparian Vegetation	Van Riper, C.J., & Paradzick, C.	2006	Defining Ecosystem Flow Requirements for the Bill Williams River, Arizona. U.S. Geological Survey Open-File Report,	NA	This chapter describes responses of major bird groups to flood flows and low flows, using the connection of riparian birds to the riparian plant community to connect their needs to streamflow and fluvial processes. Synthesis provided of quantitative knowledge about timing of flows needed for SWFL and western yellow-billed Cuckoo.
93	Land Use and Disturbance Interactions in Dynamic Arid Systems: Multiscale Remote Sensing Approaches for Monitoring and Analyzing Riparian Vegetation Change	Villarreal, M.L.	2009	Dissertation, University of Arizona	NA	The dissertation identifies the problem of loss of riparian habitats, discusses the causes of the declines worldwide, and uses the Santa Cruz River as a case study to test whether remote sensing can be used to monitor vegetation changes in response to natural and anthropogenic changes.
94	Managed Flood Effects on Beaver Pond Habitat in a Desert Riverine Ecosystem, Bill Williams River, Arizona USA	Andersensen, D.C., Shafroth, P.B., Pritekel, C.M., & O'Neill, M.W.	2011	Wetlands, 31(2), 195–206.	2007-2008	Measured physical attributes of beaver pond and adjacent lotic habitats on a regulated Sonoran Desert stream, the Bill Williams River, after ≥11 flood-free months in Spring 2007 and Spring 2008. Results indicate that beaver affect riverine processes in warm deserts much as they do in other biomes. However, effects may be magnified in deserts through the potential for beaver to alter the stream thermal regime and water budget.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
95	The Goldilocks effect: intermittent streams sustain more plant species than those with perennial or ephemeral flow	Katz, G.L., Denslow, M.W., & Stromberg, J.C.	2012	Freshwater Biology, 57(3), 467–480.	2003-2010; 2007-2010; 2006-2010	Paper examines effects of dry season hydrology on species richness, composition and cover of herbaceous plant communities in the streamside zone. At the annual time scale, species richness and herbaceous cover were higher at sites with perennial flow but the highest long-term richness occurred at intermittent sites. The perennial sites had more wetland and perennial species than the other two site types. The intermittent sites had more annual species than did the other two types. High long-term species richness and distinct species composition of intermittent sites are probably sustained by pronounced temporal variability in environmental conditions. Plants at these sites take advantage of greater moisture than those at ephemeral sites and also experience less competition from resident species than those at perennial sites.
96	Valuing the Verde River Watershed - An Assessment	West, P., Smith, D.H., & Auberle, W.	2009	Report	Unk	This paper reports the findings of a social survey that was conducted to interpret how people value the Verde River, for use/option/non-use and servicing/provisioning/regulating/cultural reasons.
97	Vegetation-hydrology interactions: Dynamics of riparian plant water use	Williams, D.G., & Scott, R.L.	2009	In J.C. Stromberg & B. J. Tellman (Eds.), Ecology and Conservation of the San Pedro River	NA	This is a chapter in a book about the San Pedro River. It briefly describes the complex evapotranspiration, water budgeting, and modelling approaches that can be undertaken to correlate vegetation needs for water.
98	Evaluating Dam Re-Operation for Freshwater Conservation in the Sustainable Rivers Project	Konrad, C.P., Warner, A., & Higgins, J.V.	2012	River Research and Applications, 28(6), 777–792.	2006-2009	Results from 5 demonstration sites, including the Bill Williams River, on the re-operation of dams to benefit the environment through the sustainable rivers project.
99	River drying lowers the diversity and alters the composition of an assemblage of desert riparian arthropods	Mccluney, K.E.& Sabo, J.L.	2012	Freshwater Biology, 57(1), 91–103.	2006	This study examines communities of riparian arthropods on the San Pedro through their associations with environmental factors such as distance to channel bank, presence of trees and water resources. The authors find higher diversity and abundance of most taxa at flowing water sites. Furthermore, changes in composition, taxon diversity, and abundance of representative taxa were associated with water availability.
100	The influence of floods and precipitation on Tamarix establishment in Grand Canyon, Arizona: consequences for flow regime restoration	Mortenson, S.G., Weisberg, P.J., & Stevens, L.E.	2012	Global Ecology and Biogeography	1935-2006 annual flow records; 2006-2007 veg sampling	Compared Tamarix ages to known floods pre and post-Glen Canyon dam construction to determine if restoration floods can be used to control Tamarix. Determined flood restoration is not effective in preventing Tamarix because historic flood timing (May-July) coincides with Tamarix seed release and floods may negatively impact native species. Determined total precipitation from May through Sept. the year following germination negatively impacts Tamarix.
101	Hydrological impacts of mesquite encroachment in the upper San Pedro watershed	Nie, W.; Y.Yuan, W.Kepner, C.Erickson, M.Jackson	2012	Biological Invasions, 14(5), 1061–1076.	NA	Modeled the progressive mesquite encroachments in the upper San Pedro watershed to assess hydrological consequences of mesquite encroachment. Annual average basin ET increases with the removal of grassland, surface runoff and percolation decreases with mesquite encroachment. Impacts of encroachment are more significant for subwatersheds with more grassland replaced by mesquite during wet periods. The impact on the simulated hydrological processes is significant when grassland removal is below a threshold (~40%).

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
102	Ecosystem response to removal of exotic riparian shrubs and a transition to upland vegetation	Reynolds, L.V., & Cooper, D.J	2011	Plant Ecology, 212(8), 1243–1261.	2005-2008	This study analyzed historic vegetation using soil seed banks and the effects of riparian shrub removal treatments and channel incision on ecosystem and plant community dynamics in Canyon de Chelly National Monument, Arizona. Researchers focused on how seeds, nutrients, and groundwater influence the floristic composition of post-treatment vegetation. Determined Russian olive and Tamarix do not influence groundwater levels in either treatment. Quantitative information available for impact of plant removal (top 10 ten species that most influenced differences in vegetation composition; complete species list and associated wetland indicator scores available for all species identified in pre and post removal as well as seed collection.)
103	Evaluating Hydrologic Effects of Water Acquisitions on the Middle Rio Grande	Harding, B.L., McCord, J.T.	2005	FY2004 Middle Rio Grande Endangered Species Act Collaborative Program Water Acquisition and Management Subcommittee	NA	Analysis of feasibility of providing wet water to meet water needs of silvery minnow. Authors estimate that the consumptive use arising from the water operations contemplated by the WAMS analysis would average about 7,000 acre-feet per year. Based on a consumptive irrigation requirement of 2.1 feet per acre, this would require the acquisition of approximately 3,300 acres of irrigated lands and their appurtenant water rights within the Middle Rio Grande valley.We also determined that, under current water management conditions, water rights acquisitions would not be effective in delivering “wet water” to the Rio Grande floodway. Without either strict priority administration of water rights in the Middle Rio Grande (and good measurement and reporting of diversions) or a cooperative agreement with the Middle Rio Grande Water Conservancy District, acquisition of water rights will not lead to a reduction in diversions from the River or increased storage in upstream reservoirs.
104	Elevated CO2 does not offset greater water stress predicted under climate change for native and exotic riparian plants	Perry, L.G., Shafroth, P.B., Blumenthal, D.M., Morgan, J.A., & LeCain, D.R.	2012	New Phytologist, 197(2), 532–543	Unk	Lab study to test the hypothesis that elevated CO2 might offset decreasing water availability for cottonwood and tamarisk seedlings. Results suggest that increased aridity will reduce riparian seedling growth despite elevated CO2, and will reduce growth more for native Salix and populus than for drought-tolerant exotic species.
105	Legacies of Flood Reduction on a Dryland River	Stromberg, J.C., Shafroth, P.B., & Hazelton, A.F.	2012	River Research and Applications, 28(2), 143–159.	1996-97, 2006-07	Contrast between riparian plant communities on Bill Williams and an upstream free-flowing tributary (Santa Maria). During first study period environmental controls on herbaceous species richness and richness among forest types were compared. Introduced Tamarix spp. Was more frequent at the Bill Williams, but all three main forest types (Tamarix, Salix/Populus, Prosopis) had low understory richness, as well as high stem density and low light, A second study focused on floristic richness at larger spatial scales and found that during spring, and for the study cumulatively the riparian zone of the unregulated river had considerably more plant species. Relative richness of exotic (vs. native) species did not differ. We conclude that: (1) The legacy of reduced scouring frequency and extent at the Bill Williams has reduced the open space available for colonization by annuals; and (2) Change in forest biomass structure, more so than change in forest composition, is the major driver of changes in plant species richness along this flow-altered river.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
106	Seed Size, Sediment, and Spatial Heterogeneity: Post-Flood Species Coexistence in Dryland Riparian Ecosystems	Stromberg, J.C., Butler, L., Hazelton, A.F., & Boudell, J.A.	2011	Wetlands, 31(6), 1187–1197.	2008-2009 soil, 2009-2010 seed	Ex situ study to determine how riparian seeds respond to burial by sediment and whether species diversity increases in response to heterogeneous sediment deposition. Found that seed mass, wetland affinity, and phylogeny all influence capacity to emerge from sediment depth; small seed species were abundant in flood wetting treatment with no sediment while presence of sediment shifted favor to large seed species; rapid drawdown of water increased emergence for large, buried seeds.
107	Environment tolerance of an invasive riparian tree and its potential for continued spread in the southwestern US	Reynolds, L.V., & Cooper, D.J.	2010	Journal of Vegetation Science.	2006-2007	Analysis of Tamarix and cottonwood vs. Russian olive tree seedling tolerance to dry/shady conditions; study of Russian olive ability to use tamarisk/cottonwood to facilitate invasion. Russian olive survival significantly higher in dense shade and low moisture than tamarisk or cottonwood (which cannot establish in dry, shaded habitats). Russian olive able to establish under canopies and can rely on upper soil water until 15 years of age before utilizing groundwater.
108	Salinity of the Little Colorado River in Grand Canyon Confers Anti-Parasitic Properties on a Native Fish	Ward, D.L.	2012	Western North American Naturalist, 72(3), 334–338.	2005, 2009	Experiment testing if the naturally high salinity of the Little Colorado River (0.3%) at baseflow is saline enough to interrupt the life cycle of Ich and increase survival of humpback chub. All freshwater treatment tanks (salinity <0.05%) were dead after 8 days from Ich infection while there was no roundtail chub mortality/sign of Ich in saltwater tanks (0.3% salinity). Determined salinity of LCR enhances the survival of Humpback chub population by preventing Ich and similar parasitic infections.
109	Resilience, Restoration, and Riparian Ecosystems: Case Study of a Dryland, Urban River	White, J.M., & Stromberg, J.C.	2011	Restoration Ecology, 19(1), 101–111.	2004-2005	Salt River sites studied to determine whether riparian vegetation is resilient to human impacts and if veg has adaptive capacity to persist in an urbanized landscape. Composition had shifted in diverted to stress tolerant xeroriparian shrubland with low diversity in both the seed bank and extant vegetation. Few differences were observed in vegetation and soil seed banks between the reference and urban reach suggesting that hydric riparian plant communities have the capacity to adapt to these modified conditions.
110	2008 High-Flow Experiment at Glen Canyon Dam—Morphologic Response of Eddy-Deposited Sandbars and Associated Aquatic Backwater Habitats along the Colorado River in Grand Canyon National Park	Grams, P.E., J.C.Schmidt, & M.E.Andersensen	2010	U.S. Geological Survey Open–File Report No. 2010–1032	2008	Study examining backwater habitat area and volume in the Grand Canyon after the 2008 high-flow experiment. Total habitat area increased by 30 percent to as much as a factor of 3 and that volume increased by 80 percent to as much as a factor of 15. a broader range of discharges than in February 2008. Topographic analyses of the sandbar and backwater morphologic data collected in this study demonstrate that steady flows are associated with a greater amount of continuously available backwater habitat than fluctuating flows, which result in a greater amount of intermittently available habitat. National Park. Data from fish sampling in backwaters, demonstrates that both native and nonnative species were present in the backwaters monitored for this study.
111	Distribution and Abundance of Saltcedar and Russian Olive in the Western United States	Nagler, P.L., Glenn, E.P., Jarnevich, C.S., & Shafroth, P.B.	2011	Critical Reviews in Plant Sciences, 30(6), 508–523.	NA	Literature review for Russian olive and tamarisk to look at (1) the history of introduction, planting, and spread of saltcedar and Russian olive; (2) their current distribution; (3) their current abundance; (4) factors controlling their current distribution and abundance; and (5) models that have been developed to predict their future distribution and abundance

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
112	Site-occupancy monitoring of an ecosystem indicator: Linking characteristics of riparian vegetation to beaver occurrence	Breck, S.W., Goldstein, M.I., & Pyare, S	2013	American Naturalist, 72(4), 432–441.	2008	Investigation of beaver occurrence based on vegetation cover. Results indicate that quantifying amount of riparian vegetation in close proximity to a river helps determine occurrence of beaver. The relative importance scores for Tamarix and Pluchea vegetation classes were 1.5–2.5 times larger than those for all other vegetation classes, indicating that occurrence of beaver sign was most strongly associated with the cover of these 2 vegetation classes.
113	The relevance of wetland conservation in arid regions: A re-examination of vanishing communities in the American Southwest	Minckley, T.A., Turner, D.S., & Weinstein, S.R.	2013	Journal of Arid Environments, 88, 213–221.	2006-2010	Analysis of the distribution, conservation status and restoration potential of ciénegas in the Apache Highlands Ecoregion (AZ, NM and northern MX). Results identified 97 ciénegas of which only 60 had information useful for our analysis. Of these, 46 ciénegas were considered functional, or extant, while the others were either dry or so altered that they no longer maintained their original ecological function. Using the ranking scheme of the National Gap Analysis Program we found that 80% of extant ciénegas fall into the lowest categories of land stewardship, Gap 3 or 4, indicating conservation stewardship is largely lacking across all land management agencies, public or private. Our assessment suggests that increased and targeted habitat conservation of desert wetlands would yield great benefit to the maintenance of global biodiversity.
114	On the multiple ecological roles of water in river networks	Sponseller, R.A., Grimm, N.B., Boulton, A.J., & Sabo, J.L.	2013	Ecosphere, 4(2)	NA	Theory paper on the relative importance of quantity of water for intermittent and ephemeral reaches as opposed to timing, duration and rate of change to perennial reaches using research from Sycamore Creek.
115	Crayfish impact desert river ecosystem function and litter-dwelling invertebrate communities through association with novel detrital resources	Moody, E.K. & J.L.Sabo	2013	PLoS ONE, 8(5)	2011	Testing of the impact of both virile crayfish (Orconectes virilis) and litter type on benthic invertebrates and the effect of crayfish on detrital resources across a gradient of riparian vegetation drought-tolerance. Virile crayfish increased breakdown rate of novel drought-tolerant salt cedar (Tamarix ramosissima), but did not impact breakdown of drought-tolerant seep willow (Baccharis salicifolia) or hydric Fremont cottonwood (Populus fremontii) and Goodding's willow (Salix goodingii). Effects on invertebrate diversity were observed at the litter bag scale, but no effects were found at the cage scale. Through impacts at multiple trophic levels, crayfish have a significant effect on desert stream ecosystems.
116	Food-web dynamics in a large river discontinuum	Cross, W.F., Baxter, C.V., Rosi-Marshall, E.J., Hall Jr, R.O., Kennedy, T.A., Donner, K.C., … Yard, M.D.	2013	Ecological Monographs, 83(3), 311–337.	2008	We constructed flow food webs at six locations along a 386-km segment of the Colorado River in Grand Canyon (Arizona, USA) for three years. We characterized food-web structure and production, trophic basis of production, energy efficiencies, and interaction-strength distributions across a spatial gradient of perturbation (i.e., distance from Glen Canyon Dam), as well as before and after an experimental flood. We found strong longitudinal patterns in food-web characteristics that strongly correlated with the spatial position of large tributaries. Consistent with theory, downstream food webs were less responsive to the experimental flood than sites closest to the dam. We show how human-induced shifts to food web structure can affect energy flow and interaction strengths, and we show that these changes have consequences for food-web function and response to perturbations.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
117	Framing Scenarios of Binational Water Policy with a Tool to Visualize, Quantify and Evaluate Changes in Ecosystem Services	Norman, L., Villarreal, M., Niraula, R., Meixner, T., Frisvold, G., & Labiosa, W.	2013	Water, 5(3), 852–874	2012	In this paper, we outline an approach for modeling and visualizing impacts of management decisions in terms of rare terrestrial and aquatic wildlife, vegetation, surface water, groundwater recharge, real-estate values and socio-environmental vulnerable communities. We identify and quantify ecosystem services and model the potential reduction in effluent discharge to the U.S. that is under scrutiny by binational water policy makers and of concern to stakeholders. Results of service provisioning are presented, and implications for policy makers and resource managers are discussed. This paper presents a robust ecosystem services assessment of multiple scenarios of watershed management as a means to discern eco-hydrological responses and consider their potential values for future generations living in the borderlands.
118	Floods, drought, and seed mass of riparian plant species	Stromberg, J.C., & Boudell, J.A	2013	Journal of Arid Environments, 97, 99–107.	n/a	For dryland riparian plant communities, we asked, does seed mass vary with water availability and flood frequency? We compared community seed mass between sites that vary in flow permanence (longitudinal water gradient) and between hydrogeomorphic surfaces within sites (lateral gradients of moisture and disturbance). Using data from four rivers in Arizona, we contrasted seed mass between plant groups. We found community seed mass to be greater at sites with ephemeral than perennial flow, and to increase laterally from wet, frequently-flooded channel edges to dry, less disturbed terraces. We conclude that small seed mass is independently associated with wet and disturbed conditions in dryland riparian ecosystems.
119	Invertebrate assemblages of pools in arid-land streams have high functional redundancy and are resistant to severe drying	Boersma, K.S., Bogan, M.T., Henrichs, B.A., & Lytle, D.A	2014	Freshwater Biology, 59(3), 491–501.	2011	We used aquatic mesocosms to test two competing hypotheses of the relationship between richness and pool drying for arid-land stream invertebrates: (i) the drought vulnerability hypothesis (richness gradually decreases with drying) and (ii) the drought resistance hypothesis (richness remains constant until complete drying occurs). Taxonomic richness and composition did not differ between drying treatments, providing strong support for the drought resistance hypothesis. Severe drying was associated with lower invertebrate abundances and higher densities than the moderate and control treatments. This finding suggests that density-dependent processes generated by decreased available habitat may be more important determinants of community composition during droughts than abiotic stress in this system.
120	Distribution of Riparian Vegetation in Relation to Streamflow in Pima County, Arizona	Fonseca, J.E.& M.List	2013	Pima County	n/a	We compared the distribution of riparian forest and woodlands relative to water resource availability for a 2.3 million-acre region for the Sonoran Desert Conservation Plan (SDCP). Our results support the importance of identifying and protecting ephemeral and intermittent streams, particularly those having shallow groundwater tables, in the Southwestern United States.
121	Babocomari River Riparian Protection Project	Robinett, D. & Kennedy, L.	2013	U.S. Forest Service	2009-2011	Study objectives: Construct 2 miles of riparian boundary fence to restrict access by livestock from the Babocomari River. Install six stream riparian vegetation and geomorphic monitoring transects and six vegetation and geomorphic transects on riparian grasslands (sacaton) on tributaries to the Babocomari River. Analyze and summarize data annually and present that information to the participating ranch properties for use in making management decisions.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
122	Are Cicadas (Diceroprocta apache) Both a "Keystone" and a "Critical-Link" Species in Lower Colorado River Riparian Communities?	Andersenson, D.	1994	The Southwestern Naturalist, Vol. 39, No. 1 (Mar., 1994), pp. 26-33	1992	Up to 1.3 cm (13 1/m2) of water may be added to the upper soil layers annually through the feeding activities of cicada nymphs, which is equivalent to 12% of the annual precipitation received in Parker, AZ region. Apache cicadas may have significant effects on ecosystem functioning via effects on water transport and thus act as a critical- link species in this southwest desert riverine ecosystem. Resource managers in this region should be sensitive to the multiple and strong effects that Apache cicadas may have on ecosystem structure and functioning
123	Cienega de Santa Clara, a remnant wetland in the Rio Colorado delta (Mexico): vegetation distribution and the effects of water flow reduction	Zengel, S., Meretsky, V., Felger, R., & Ortiz, D.	1995	Ecological Engineering Vol. 4	1992-1994	We examined the existing vegetation patterns and effects of flow disruption on vegetation using seasonal aerial and ground surveys. Depths to water in wetland and riparian vegetation communities vary from zero to about 1.6 m, except at one periodically dewatered site. Where maximum depths reach > 2.6 m at this site, no young trees are present.
124	Environmental Flows in a Human-Dominated System: Integrated Water Management Strategies for the Rio Grande/Bravo Basin	Albin Lane, B.A.	2014	University of California, San Diego	2014	Dam-induced hydrogeomorphic alteration has degraded the binationally protected Chihuahuan desert riverine ecosystem along the Big Bend Reach of the RGB. This thesis addresses the need for integrated water resources management in the Big Bend by exploring the performance of alternative water management policies and developing an operational reservoir rule curve to improve human and environmental water management trade-offs.
125	Regeneration of native trees in response to flood releases from the United States into the delta of the Colorado River, Mexico	Zamora-Arroyo, F., Nagler, P.L., Briggs, M., Radtke, D., Rodriquez, H., Garcia, J., Valdes, C., Huete, A., & Glenn, E.P.	2001	Journal of Arid Environments 49:49-64	1992-1999	Discharges below Morelos Dam produce overbank floods that germinate new cohorts of Populus fremontii and Salix gooddingii trees. Relatively little flood water from the United States is required to support a pulse flood regime that can result in regrowth of native vegetation in the delta. Based on analysis of past flows and existing tree populations, we estimate that a February–April flow of 3x109 cubic meters at 80–120 cubic m/s is sufficient to germinate and establish new cohorts of native trees. The study also found a positive correlation between frequency of flows and total vegetation cover demonstrating that more frequent flows would increase vegetation cover.
126	Facilitating Sustainable Use of the Rio Grande: A Social-Ecological Perspective	AlexAndersen, K.A.	2012	Texas State University, San Marcos	2012	The institutional structure underlying the management framework of the transboundary Rio Grande basin was examined to provide insight into the status and efficacy of the institutional controls that underlie management of the river.
127	Texas freshwater fish assemblages following decades of environmental change	Andersenson, A.A., Hubbs, C., Winemiller K.O., & Edwards R.J.	1995	The Southwestern Naturalist, Vol. 40, No. 3 (Sept., 1995), pp. 314-321	1953-1886	A survey of freshwater habitats throughout the state of Texas was made in 1953 and 1986. The analysis reveals reductions of biological diversity on a local scale, but relative stability in statewide and regional ichthyofaunas.
128	Status changes of bird species using revegetated riparian habitats on the Lower Colorado River from 1977 to 1984	Andersenson, B.W., Hunter, W.C., & Ohmart, R.D.	1988	California Riparian Systems Conference	1977-1984	Two dredge-spoil sites were revegetated on the lower Colorado River with native riparian trees. Another was cleared of exotic saltcedar (Tamarix chinensis) and revegetated with native shrubs. Sites were censused for birds through all phases of revegetation. Most species responded positively within 2 years after planting.
129	Impact, Biology, and Ecology of Saltcedar (Tamarix spp.) in the Southwestern United States	Di Tomaso, J.M.	1998	Weed Technology, Vol. 12, No. 2		This paper discusses the impact, biology and ecology of Saltcedar in the Southwestern United States
130	Climate Change and Ecosystems of the Southwestern United States	Archer, S.R., & Predick K.I.	2008	Society for Range Management		Climate change impacts for the Mohave, Sonoran and Chihuahuan Desert are discussed in this article.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
131	Population trends of migratory landbirds along the Middle Rio Grande	Yong, W., Finch, D.M.	1997	THE SOUTHWESTERN NATURALIST 42(2):137-147	1985-1994	Based on multiple years of banding data in the Middle Rio Grande and comparisons to national data authors hypothesize that riparian habitat along the middle Rio Grande functions as a funnel that constricts habitat use during migration for species whose breeding and wintering populations are spread over broader geographic areas and that local population changes detected during mass migration may reflect widespread and large-scale changes.
132	Stopover ecology of landbirds migrating along the middle Rio Grande in spring and fall	Yong, W., Finch, D.M.	2002	Gen. Tech. Rep. RMRS-GTR-99	1994-1996	Study of stopover ecology for migratory landbirds in riparian habitats on Rio Grande. Found highest density of birds in willow habitat in spring and agricultural fields in fall. Lowest overall species richness was in saltcedar.
133	Minimal genetic structure in the Rio Grande Cooter (Pseudemys Gorzugj)	Bailey, I.A., Dixon, J.R., Hudson, R., & Forstner, M.R.J	2008	The Southwestern Naturalist, Vol. 53, No. 3 (Sept., 2008), pp. 406-411		Occurrence of Pseudemys gorzugi reveal a low population density and a paucity of juveniles in the Rio Grande Basin.This research provides essential data to determine if additional conservation efforts are necessary to protect this species.
134	Status of Freshwater Mussels in Texas	Winemiller, K., Lujan, N.K., Wilkins, R.N., Snelgrove, R.T., Dube, A.M., Skow, K.L., Grones Snelgrove, A.	2010	Texas A&M Institute of Renewable Natural Resources		Summary of status of freshwater mussels across Texas with information relating to abundance and habitat conditions of multiple mussel species.
135	Habitat use by bats in a riparian corridor of the Mojave Desert in southern Nevada	Williams, J.A., O'Farrell, M.J., Riddle, B.R.	2006	Journal of Mammalogy, 87(6):1145-115	2000-2001	Riparian woodlands accounted for more than 50% of all bat activity, whereas riparian marshes were the least used habitat. High species richness and differences in habitat use demonstrates importance of a diversity of riparian habitats. The existence of native and nonnative (palm tree) habitat may elevate bat species richness and increase the degree of differential habitat use to levels higher than would be expected if only native habitat existed at the study site.
136	Impact of Non-Native Plant Removal on Lizards in Riparian Habitats in the Southwestern United States	Bateman, H.L., Chung-MacCoubrey, A., & Snell, H.L.	2008	Society for Ecological Restoration International	2000-2006	Reptilian responses to restoration efforts were evaluated by sampling communities of lizards at 12 study sites invaded by non-native plants along the Middle Rio Grande in New Mexico. Removal of non-native plants seems beneficial, or at least is non-damaging for lizard communities.
137	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	1985	Journal of the Arizona-Nevada Academy of Science, Vol. 20, No. 1 pp. 1-61		We identify 164 fishes from North American deserts. (Note, in database only those species with a clear flow relationship are included) Forty-six of these fishes are herein considered endangered. Fifteen ecosystems are identified as providing habitat for 83 of these vanishing fishes. A discussion of these ecosystems and their vanishing fishes, amphibians, reptiles and invertebrates are provided.
138	Abundance and reproduction of toads (Bufo) along a regulated river in the southwestern United States: Importance of flooding in riparian ecosystems	Bateman, H.L., Harner, M.J., & MacCoubrey, A.C.	2008	Journal of Arid Environments	2000-2006	Abundance and size of toads (Bufo woodhousii and B. cognatus) were related to precipitation, river flow, and groundwater over 7 years along the Middle Rio Grande, a regulated river in the semi-arid southwestern United States.
139	Abundance and species richness of snakes along the Middle Rio Grande Riparian Forest in New Mexico	Bateman, H.L., MacCoubrey, A.C., Snell, H.L.& Finch, D.M.	2009	Herpetological Conservation and Biology		The effects of removal of non-native plants and fuels on wildlife in the riparian forest of the Middle Rio Grande in New Mexico were analyzed by monitoring snakes from 2000 to 2006 using trap arrays of drift fences, pitfalls, and funnel traps.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
140	Coupled hydrogeomorphic and woody-seedling responses to controlled flood releases in a dryland river	Wilcox, A.C., Shafroth, P.B.	2012	Water Resources Research, VOL. 49, 2843–2860	2006-2010	Examination of differential mortality among native and nonnative riparian seedlings, associated flood hydraulics and geomorphic changes, and the temporal evolution of feedbacks among vegetation, channel form, and hydraulics. Study found floods produced geomorphic and vegetation responses that varied with distance downstream of a dam, with scour and associated seedling mortality closer to the dam and aggradation and burial-induced mortality in a downstream reach.
141	Effect of River Flow Manipulation on Wolf Spider Assemblages at Three Desert Riparian Sites	Wenniger, E.J., Fagan, W.F.	2000	The Journal of Arachnology 28:115-122	1998	Wolf spider abundance at each site was independent of prey availability, but instead depended upon moisture and temperature regimes among sites. Results suggest that wolf spiders experienced a significant effect from disturbance of their habitat by the dam, and that abiotic habitat attributes such as moisture and temperature may be more important for wolf spider abundance than prey availability alone in desert riparian systems.
142	Ground-water surface-water interactions and long-term change in riverine riparian vegetation in the southwestern United States	Webb, R., Leake, S.A.	2006	Journal of Hydrology 320:302-323	1870s-2000s	Repeat photography using more than 3000 historical images of rivers indicates that riparian vegetation has increased over much of the region. These increases appear to be related to several factors, notably the reduction in beaver populations by trappers in the 19th century, downcutting of arroyos that drained alluvial aquifers between 1880 and 1910, the frequent recurrence of winter floods during discrete periods of the 20th century, an increased growing season, and stable ground-water levels.
143	Phenological events and their environmental triggers in Mojave Desert ecosystems	Beatley, J.C.	1974	Ecology	1960-1972	The relation between rainfall and phonological event is determined for the Mojave Desert in southern Nevada.
144	Propagation and Establishment of Native Aquatic Plants in Reservoirs	Webb, M.A., Ott, R.A., Bonds, C.C., Smart, R.M., Dick, G.O., Dodd, L.	2012	Texas Parks and Wildlife Department, Inland Fisheries Division		In this document, we present an approach for accelerating community succession using native aquatic plant founder colonies. By ensuring that propagules, such as seed or plant fragments, are present in sufficient numbers when conditions are suitable for natural establishment, the time required for vegetative colonization to occur is shortened. Recommendations for production of suitable propagules include their growth requirements, operation of production facilities, and selection of different propagule types by species. Recommendations for establishment of these propagules in reservoir ecosystems includes site selection, season of establishment, planting techniques, defining individual phases of an establishment project and monitoring and adaptive management after species are introduced.
145	Arbuscular mycorrhizal fungi associated with Populus- Salix stands in a semiarid riparian ecosystem	Beauchamp, V.B., Stromberg J.C., & Stutz J.C.	2006	New Phytologist	2001	This study examined the activity, species richness, and species composition of the arbuscular mycorrhizal fungal (AMF) community of Populus-Salix stands on the Verde River (Arizona, USA), quantified patterns of AMF richness and colonization along complex floodplain gradients, and identified environmental variables responsible for structuring the AMF community
146	Notes on the ecology of a population of Eumeces obsoletus (scincidae) in New Mexico	Belfit, S.C., & Belfit V.F.	1985	The Southwestern Naturalist, Vol. 30, No. 1 (Nov., 1985), pp. 612-614	1978	This paper presents data on the relative abundance and habitat associations of a population of E. obsoletus in an artificially created mesic habitat within the Chihuahuan Desert (Rio Grande).

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
147	A joint investigation of public support and public values: case of instream flows in New Mexico	Berrens, R.P., Bohara, A.K., Jenkins-Smith, H., Silva, C.L., GAndersenton.P., & Brookshire, D.	1998	Ecological Economics, 68(5), 1465-1475	1995-1996	Using the combined results from two statewide telephone surveys, this study jointly investigates stated voting preferences for a proposed institutional change and stated valuation preferences for minimum instream flow protection
148	Valuing the Protection of Minimum Instream Flows in New Mexico	Berrens, R.P., Andersenton P., & Silva, C.L.	1996	Journal of Agricultural and Resource Economics , Vol. 21, No. 2	1988 and 1996	Using the contingent valuation (CV) method, we investigate the nonmarket benefits of protecting minimum instream flows in New Mexico.
149	Contingent values for New Mexico instream flows: With tests of scope, group-size reminder and temporal reliability	Berrens, R.P., Bohara, A.K., Silva, C.L., Brookshire, D., & McKee, M.	2000	Journal of Environmental Management Vol. 58 (1)	1995-1996	This contingent valuation study investigates the non-market benefits of protecting minimum instream flows in New Mexico
150	Controlled flooding and staged drawdown for restoration of native cottonwoods in the middle Rio Grande Valley, New Mexico, USA	Bhattacharjee, J., Taylor, J.P., & Smith, L.M.	2006	Wetlands, Vol. 25, No. 3	2002	We evaluated two drawdown rates, 2 cm/day and 5 cm/day to determine if cottonwood seedling density could be increased. We also conducted a mid-season, an end-season, and an over-winter vegetation sampling to observe changes in seedling densities over time.
151	Importance of sycamores to riparian birds in southeastern Arizona	Bock, C.E., & Bock, J.H.	1984	Journal of Field Ornithology, Vol. 55, No. 1	1982-1983	Our objectives were to describe the avifaunas of the riparian ecosystems in Research Ranch- Lyle Creek, and to assess the importance of sycamores to the birds associated with them.
152	Instream Flows and Endangered Species in an International River Basin: The Upper Rio Grande	Booker, J.F., & Ward, F.A.	1999	American Journal of Agricultural Economics, Vol. 81, No. 5		This research tests the hypothesis that new intrastate, interstate, and international institutions are required, particularly during drought, to protect endangered species (silvery minnow).
153	Flood pulsing and metacommunity dynamics in a desert riparian ecosystem	Boudell, J.A., & Stromberg, J.C.	2008	Journal of Vegetation Science, Vol. 19, No. 3	1998	This study evaluates the effects of flood pulsing as a driver of meta-community dynamics and an insurance against catastrophic flooding in desert southwestern riparian ecosystems.
154	Seasonal Fecundity and Source-Sink Status of Shrub-Nesting Birds in a Southwestern Riparian Corridor	Brand, L.A., & Noon, B.R.	2011	The Wilson Journal of Ornithology, 123(1)	1999-2001	We monitored 86 Arizona Bell's Vireo (Vireo bellii arizonae), 147 Abert's Towhee (Melozone aberti), and 154 Yellow-breasted Chat (Icteriavirens) nests to assess reproductive parameters in cottonwood-willow (Populus-Salix), saltcedar, and mesquite (Prosopis Spp.) stands along the San Pedro River, during 1999–2001.
155	Avian Density and Nest Survival on the San Pedro River: Importance of Vegetation Type and Hydrologic Regime	Brand, L.A., Stromberg, J.C., & Noon, B.R.	2010	The Journal of Wildlife Management, Vol. 74, No. 4	1998-2001	We estimated the densities of 40 bird species and for species grouped on the basis of nest height and dependence on surface water in gallery cottonwood-willow (Populus spp.-Salix spp.) forests, saltcedar (Tamarix spp.) shrub lands, and terrace vegetation types along a gradient in the hydrologic regime of the San Pedro River.
156	Factors influencing species richness and community composition of breeding birds in a desert riparian corridor	Brand, L.A., White, G.C., & Noon, B.R.	2008	The Condor 110(2)	1998-2001	Bird species richness and community composition metrics were estimated by using methods that incorporated species detection probabilities. Data was collected at 160 points at 23 sites on the San Pedro River. Species richness, co-occurrence, and uniqueness were estimated as a function of four riparian vegetation types (cottonwood-willow, salt cedar, mesquite, and grassland), three hydrologic regimes (perennial, intermittent, and ephemeral), and riparian location (floodplain and terrace).

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
157	Ecohydrology and ecophysiology of Arundo donax (giant reed)	Watts, D., Moore, G.		Report to the Pima County Board of Supervisors, Tucson, AZ	UNK	The primary objective of this research was the investigation of the impact of the invasive grass species, ArundodonaxL. (giant reed), on the water cycle. At this site, A. donax used roughly 9 mm of water per day, We determined that the major controls on stand scale transpiration were evaporative demand, leaf area index, and water availability. Stand transpiration varied greatly but tended to be highest in measurements made following precipitation events, which suggests that A. donax may use soil moisture derived from precipitation rather than groundwater.
158	Economic Impacts of Instream Flow Protection for the Rio Grande Silvery Minnow in the Rio Grande Basin	Ward, F.A., Booker, J.F.	2006	Reviews in Fisheries Science,14:1–16		This article estimates economic impacts associated providing minimum streamflows to protect the Silvery Minnow through reduced surface diversions in central NM during low flow dry years. Using a 44-year forecast of future basin streamflows, our results show that central New Mexico Agricultural users suffer economic damages, New Mexico water users as a whole do not incur damages from reductions in streamflow depletions needed to support the minnow's habitat. There are benefits to downstream users: average annual benefits of $200,000 per year for southern New Mexico agriculture, about the same per for west Texas agriculture, and over $1 million for El Paso municipal and industrial water users. Economic impacts are highest in drought years
159	Legal & Institutional Framework for Restoring Instream Flows in the Rio Grande: Fort Quitman to Amistad	Brock, L., Kelly, M.E., & Chapman.K.	2001	World Wildlife Fund		Describes the legal and institutional framework for restoring instream flows. Includes information on water use, availability, quality, planning, rights and permitting; in addition to federal leverages and designations for both the US and Mexico.
160	Nesting-Habitat Relationships of Riparian Birds along the Colorado River in Grand Canyon, Arizona	Brown, B.T., Trosset, M.W.	1989	The Southwestern Naturalist, Vol. 34, No. 2	1982-1985	Vegetation structure and the numbers of shrubs were measured at nest sites of 11 species of riparian birds in a tamarisk community to characterize breeding habitat by species.
161	Systematics, Distribution and Life History Notes on Notropis chihuahua (Pisces: Cyprinidae)	Burr, B.M., Mayden R.L.	1981	Copeia, Vol. 1981, No. 2		The poorly known Chihuahua shiner, Notropis chihuahua, is redescribed because of recent modifications occurring in the Chihuahuan Desert. Status and ecological requirements are included.
162	Water Uptake in Woody Riparian Phreatophytes of the Southwestern United States: A Stable Isotope Study	Busch, D.E., Ingraham, N.L., & Smith, S.D.	1992	Ecological Applications, Vol. 2, No. 4	1990	Research was undertaken to determine water uptake patterns for dominant native and introduced woody taxa of riparian plant communities in southwestern US. Isotopic rations were compared to elucidate patterns of water absorption.
163	Water budget for agricultural and aquatic ecosystems in the delta of the Colorado River, Mexico: Implications for obtaining water for the environment	Carrillo-Guerreo, Y., Glenn, E.P., & Hinojosa-Huerta, O.	2013	Ecological Engineering 59	2008	We evaluated the relationships between water use in the Mexicali Irrigation District (DR014) and the water supply for the Colorado River delta wetlands.
164	Colonization of the eastern bluebird along the Rio Grande in New Mexico	Carton, J.L., Means, M.D., Hawksworth, D.L & Finch, D.M.	2007	Western Birds Vol. 38	2005-2006	We report on an apparent surge in the number of breeding eastern Bluebirds during 2005 and 2006 along a 90-km stretch of the Rio Grande in central New Mexico. Detailed information on local nesting habitat and chronology is provided.
165	Natural flow regime, temperature and the composition and richness of invertebrate assemblages in streams of the western United States	Chinnayakanahalli, K.J., Hawkins, C.P., Tarboton D.G., & Hill, R.A.	2011	Freshwater Biology Vol. 56		We tested how strongly aquatic macroinvertebrate taxa richness and composition were associated with natural variation in both flow regime and stream temperatures across streams of the western United States.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
166	Herpetological Communities of the Middle Rio Grande Bosque: What Do We Know, What Should We Know, and Why?	Chung-MacCoubrey, A.L., & Bateman, H.L.	2006	USDA Forest Service Proceedings RMRS-P-42CD	2000-2003	In 1999, the U.S. Forest Service- Rocky Mountain Research Station initiated a study to monitor and evaluate the response of vegetation and wildlife to three fuel reduction treatments in the Middle Rio Grande bosque.
167	Influence of monsoon-related riparian phenology on yellow-billed cuckoo habitat selection in Arizona	Wallace, C.S., Villarreal, M.L., van Riper III, C.	2013	Journal of Biogeography, 40, 2094–2107	1998-1999	The models reveal that yellow-billed cuckoos prefer areas that experience peak greenness 29 days later, are 36% more dynamic and slightly (<1%) more productive than their average cottonwood–willow habitat. The results support a scenario in which cuckoos migrate northwards, following the greening of riparian corridors and surrounding landscapes in response to monsoon precipitation, but then select a nesting site based on optimizing the near-term foraging potential of the neighbourhood. The identification of preferred phenotypes within recognized habitat can be used to inform habitat response to climate change.
168	The Bullfrog, Rana catesbeiana Shaw, in the Lower Colorado River, Arizona-California	Clarkson, R.W., & deVos J.C.Jr.	2015	Journal of Herpetology, Vol. 20, No. 1	1981	A comparison of bullfrog breeding behavior in riverine and lentic populations is presented in this article.
169	Riparian ecohydrology: Regulation of water flux from the ground to the atmosphere in the Middle Rio Grande, New Mexico	Cleverly, J.R., Dahm, C.N., Thibault, J.R., Donnell, D.E., & Coonrod, J.E.	2006	Hydrological Processes, Vol. 20	2000-2004	This paper provides a general overview of the ecological, hydrological, and atmospheric issues surrounding riparian ET in the Middle Rio Grande. Long term measurements of ET, water table depth, and micro-meteorological conditions have been made at sites dominated by cottonwood and saltcedar.
170	Groundwater, vegetation, and atmosphere: Comparative riparian evapotranspiration, restoration, and water salvage	Cleverly, J.R., Dahm, C.N., Thibault, J.R., Donnell, D.E., & Coonrod, J.E.	2006	USDA Forest Service Proceedings RMRS-P-42CD	2000-2003	This study focuses upon long-term measurement of evapotranspiration (ET) by native and non-native riparian species along the Middle Rio Grande (MRG) in New Mexico where riparian ET has been estimated to be 20 to 50 percent of water budget depletions.
171	Impact of Flooding in a Sonoran Desert Stream, including Elimination of an Endangered Fish Population (Poeciliopsis o. occidentalis, Poeciliidae)	Collins, J.P., Young, C., Howell, J., & Minckley, W.L.	1981	The Southwestern Naturalist. Vol. 26, No. 4.	1977-1978	The impact of the 1978 extensive flooding in Tule Creek is analyzed in this paper.
172	Experimental flooding in Grand Canyon	Collier, M.P., Webb, R.H., & &rews, E.D.	1998	Scientific American Inc.	1996	Scientists monitor a controlled deluge that was staged in the early spring of 1996 solely for the benefit of the environment in and around the Colorado River
173	Environmental impacts in Cuatro Ciénegas, Coahuila, Mexico: A commentary	Contreras-Balderas, S.	1984	Journal of the Arizona-Nevada Academy of Science. Vol 19, No. 1.		Anthropogenic damages such as loss of water, temperature imbalance and species loss in the Cuatro Cienegas Valley are described in this paper.
174	Habitat relationships of subadult humpback chub in the Colorado River through Grand Canyon: spatial variability and implications of flow regulation	Converse, Y.K., Hawkins, C.P., & Valdez, R.A.	1998	Regulated Rivers: Research & Management. Vol. 14		We examined subadult humpback chub densities in the Colorado River to determine associations between subadult humpback chub habitat use and geomorphic differences; and how discharge, during baseflow conditions, was related to subadult humpback chub habitat conditions.
175	Ecological Characterization of a Riparian Corridor Along the Río Conchos, Chihuahua, Mexico	Cornell, J.E., Gutierrez, M., Wait, D.A., & Rubio-Arias, H.O.	2008	The Southwestern Naturalist, Vol. 63, No. 1		The ecological integrity of a 40-km-long riparian corridor along the middle Río Conchos is characterized in this paper.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
176	Impacts of Non-native Plant Removal on Vertebrates along the Middle Rio Grande (New Mexico)	Bateman, H.L., Chung-MacCoubrey, A., Finch, D.M., Snell, H.L.& Hawksworth, D.L.	2008	Ecological Restoration. Vol. 26, No. 3	2000-2007	In 2000 the USDA Forest Service Rocky Mountain Research Station began monitoring amphibians, reptiles, birds, and bats in riparian forests dominated by Rio Grande cottonwood and a non-native plant midstory to investigate the impacts of restoration treatments on vertebrate species.
177	Strategies for Ecological Restoration of the Middle Rio Grande in New Mexico and Recovery of the Endangered Rio Grande Silvery Minnow	Cowley, D.E.	2006	Reviews in Fisheries Science, 14:1-2		This article explores issues arising from human use of water in a semi-arid to arid landscape as it affects conservation and management of fishes.
178	Rodent Communities in Native and Exotic Riparian Vegetation in the Middle Rio Grande Valley of Central New Mexico	Ellis, L.M., Crawford, C.S., & Molles Jr., M.C.	1997	The Southwestern Naturalist, Vol. 42, No. 1	1991	Rodent communities were monitored in two native cottonwood (Populus deltoides spp. wislizenii) and two exotic saltcedar (Tamarix ramosissima) riparian forest sites in the Middle Rio Grande Valley.
179	Distribution and Habitat of the Arizona Gray Squirrel (Sciurus arizonensis) in New Mexico	Frey, J.K., Hill, M.T., Christman, B.L., Truett, J.C., & MacDonald, S.O.	2008	The Southwestern Naturalist, Vol. 53, No. 2		We compiled information on museum specimens, literature records, and observations by credible persons to document the distribution and habitats of S. arizonensis in New Mexico.
180	Status of Beavers (Castor canadensis frondator) in Rio Bavispe, Sonora, Mexico	Gallo-Reynoso, J.P., Suárez-Gracida, G., Cabrera-Santiago, H., Coria-Galindo, E., Egido-	2002	The Southwestern Naturalist, Vol. 47, No. 3	1999	The purpose of the study was to determine the status of beavers in Rio Bavispe, Sonora, Mexico.
181	Growth rates, salt tolerance and water use characteristics of native and invasive riparian plants from the delta of the Colorado River, Mexico	Glenn, E., Tanner, R., Mendez, S., Kehret, T., Moore, D., Garcia, J., & Valdes, C.	1998	Journal of Arid Environments . Vol. 40	1997	Six riparian plant species representing native and invasive species from the Colorado River delta in the Sonoran Desert of Mexico were tested for salt tolerance and water use characteristics in a greenhouse study in Tucson, Arizona.
182	Effects of Water Management on the Wetlands of the Colorado River Delta, Mexico	Glenn, E.P., Lee, C., Felger, R., & Zengel, S.	1996	Conservation Biology, Vol. 10, No. 4		The effects of water management on wetlands of the Colorado River Delta are described in this article.
183	Comparative ecophysiology of Tamarix ramosissima and native trees in western U.S. riparian zones	Glenn, E.P., & Nagler, P.L.	2005	Journal of Arid Environments. Vol. 61, No. 3.		Comparison of saltcedar, cottonwoods and mesquites with respect to ecophysiological traits of adaptive value in southwestern US riparian habitats.
184	Survey of aquatic macroinvertebrates and amphibians at Wupatki National Monument, Arizona, USA: An evaluation of selected factors affecting species richness in ephemeral pools	Graham, T.B.	2002	Hidrobiologia. Volume 486, No. 1.	1997	Ten pools of five different origins and ages were surveyed in August and/or September 1997 for aquatic organisms; a total of 13 surveys were conducted.
185	Avian Species Richness in Different-Aged Stands of Riparian Forest Along the Middle Rio Grande, New Mexico	Farley, G.H., Ellis, L.M., Stuart, J.N., Scott, N.K.Jr.	1994	Conservation Biology, Vol. 8, No. 4		Three areas were revegetated with native trees using pole planting and cattle exclosures, and changes in vegetation structure were quantified after 2, 3, and 5 years of growth. Year- round avian use of the revegetated sites was compared with a mature cottonwood forest site of approximately 30 years of age.
186	On the Imminent Decline of Rio Grande Cottonwoods in Central New Mexico	Howe, W.H., & Knopf, F.L.	1991	The Southwestern Naturalist, Vol. 36, No. 2	1988	T-Increment cores from 144 Fremont cottonwoods (Populus fremontii var. wislizeni) were taken at three riparian woodland sites along the Rio Grande in New Mexico.
187	Population Structure, Physiology and Ecohydrological Impacts of Dioecious Riparian Tree Species of Western North America	Hultine, K.R., Bush, S.E., West, A.G., & Ehleringer, J.T.	2007	Oecologia, Vol. 154, No. 1		We review the current literature on sex ratio patterns and physiology of dioecious riparian tree species. Then develop a conceptual framework of the mechanisms that underlie population structure of dominant riparian tree species. We identify linkages between population structure and ecohydrological processes such as evapotranspiration and streamflow.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
188	An integrated model for evaluating hydrology, hydrodynamics, salinity and vegetation cover in a coastal desert wetland	Huckelbridge, K.H., Stacey, M.T., Glenn, E.P., & Dracup, J.A.	2010	Ecological Engineering, Vol. 36, No. 7		An integrated model describing hydrology, hydrodynamics, salt dynamics and vegetation was developed to predict the evolution of the Ciénega de Santa Clara
189	Environmental Correlates to the Abundance of Spring-Adapted versus Stream-Adapted Fishes	Hubbs, C.	2001	Texas Journal of Science, Vol. 53, No. 4		A series of 8 to 16 minnow traps were set at the headsprings and downstream of eight spring systems over a two year period. Seven environmental parameters were measured at each trap and correlated to the fish captured.
190	Effects of drought on birds and riparian vegetation in the Colorado River Delta, Mexico	Hinojosa-Huerta, O., Nagler, P.L., Carrillo-Guererro, Y., Glenn, E.P.	2013	Ecological Engineering, Vol. 59		We studied the effects of a regional drought on riparian vegetation and avian abundance and diversity from 2002 to 2007, during which time surface flows were markedly reduced compared to the period from 1995 to 2002.
191	Changing Fish Faunas in Two Reaches of the Rio Grande in the Albuquerque Basin	Hoagstrom, C.W., Remshardt, W.J., Smith, J.R., Brooks, J.E.	2010	The Southwestern Naturalist, Vol. 55, No. 1	1998-2001	We sampled fishes from two reaches of the Rio Grande within the Albuquerque Basin during 1998–2001, compared our findings with those from 1984, and compiled a list of all fishes known from the two reaches. Structure of assemblages was similar between reaches in 1998–2001, but the faunas had low taxonomic similarity.
192	Status of marsh birds in the wetlands of the Colorado River delta, México	Hinojosa-Huerta, O., Guzmán-Olachea, R., Butrón-Méndez, J., Butrón-Rodríguez, J.J., & Calvo-Fonseca, A.	2013	Ecological Engineering, Vol. 59	1999-2011	Our goal was to assess the status (2010–2011) and detect population changes (1999–2011) of marsh birds in the Colorado River delta. This effort was focused on the Cienega de Santa Clara and the recent disturbance events that occurred in this wetland (changes in inflows, dredging and wildfires), but included other areas of the delta as well.
193	Distribution and abundance of the Yuma clapper rail (Rallus longirostris yumanensis) in the Colorado River delta, México	Hinojosa-Huerta, O., DeStefano, S., & Shaw, W.W.	2001	Journal of Arid Environments, Vol. 9, No. 1.	1999-2000	We estimated the abundance of Yuma clapper rails in the Cienega de Santa Clara and determined the distribution of the subspecies in the Colorado River delta region in Mexico.
194	Erosional Consequence of Saltcedar Control	Vincent, K.R., Friedman, J.M., Griffin, E.R.	2009	Environmental Management 44:218–227	2003	Widespread control of dominant species can lead to unintended erosion. Helicopter herbicide along a 12-km reach of the Rio Puerco, New Mexico, eliminated saltcedar as well as the native species sandbar willow. A flood three years later eroded about 680,000 m3 of sediment, increasing mean channel width of the sprayed reach by 84%. Erosion upstream and downstream from the sprayed reach during this flood was inconsequential.
195	Community-based restoration of desert wetlands: the case of the Colorado River Delta	Hinojosa-Huerta, O., Briggs, M., Carrillo-Guerrero, Y., Glenn, E.P., Lara-Flores, M., & Román-Rodríguez, M.	2005	USDA Forest Service General Technical Report PSW-GTR-191		In this paper we discuss the opportunities for restoration in the Colorado River delta, initial restoration projects, and the critical role that local communities can play in the long-term success of such efforts.
196	Ecology of a population of the narrow-headed garter snake (thamnophis rufipunctatus) in New Mexico: catastrophic decline of a river specialist	Hibbitts, T.J., Painter, C.W., & Holycross, A.T.	2009	The Southwestern Naturalist, Vol. 54, No. 4	1995, 1996, 2004	We studied natural history and ecology of Thamnophis rufipunctatus at San Francisco Hot Springs, Catron County, New Mexico.
197	Regimens of Ecological Flow Rates on the Pilón River	Vidales-Contreras, J.A., Pissani-Zuñiga, J.F., Rodríguez-Fuentes, H., Olivares-Sáenz, E., Ar&a-Ruiz, J., Luna-Maldonado, A.I.	2014	Journal of Experimental Biology and Agricultural Sciences, Volume –2(4)	1940-2004	Study uses hydrological indexes:minimum flow rates (Qmin) to dry years and means flow rates (Qmed) to wet years to estimate ecological flows for the Pilón River

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
198	The Hydrobiid Snails (Gastropoda: Rissoacea) of the Cuatro Cienegas Basin: Systematic Relationships and Ecology of a Unique Fauna	Hershler, R.	1984	Journal of the Arizona-Nevada Academy of Science, Vol. 19, No. 1	1980	Results of the study of the morphology, systematics, and ecology of the Cuatro Cienegas hydrobiids are given
199	Vertical Hydrologic Exchange and Ecological Stability of a Desert Stream Ecosystem	Valett, H.M., Fisher, S.G., Grimm, N.B., Camill, P.	1994	Ecology, Vol. 75, No. 2, pp. 548-560		The influence of hydrologic linkage between hyporheic and surface subsystems was investigated in sand-bottomed reaches of Sycamore Creek. Dissolved NO3-N in surface water was higher over or immediately downstream from upwelling zones. Loss of continued supply from the hyporheic zone and intense assimilatory demand by surface autotrophs generated longitudinal declines in NO-N and lower nutrient concentrations in downwelling zones. Algal standing crop (as chlorophyll a) was significantly higher in upwelling zones than in areas without positive VHG. Post flood trajectories of chlorophyll a indicated that algae at upwelling zones recovered from disturbance significantly faster than those at downwelling zones. Hydrologic linkage integrates surface and hyporheic subsystems and increases ecosystem stability by enhancing resilience of primary producers following flash flood disturbance.
200	Intra-Annual Variation in Fish Communities and Habitat Associations in a Chihuahua Desert Reach of the Rio Grande/Rio Bravo Del Norte	Heard, T.C., Perkin, J.S., & Bonner, T.H.	2012	Western North American Naturalist, Vol. 72, No. 1	2006	The goal of this study was to assess relationships between fish communities and environmental variables in a relatively intact portion of the Rio Grande / Rio Bravo del Norte in the southwestern US and northern MX.
201	Evaluation of the instream flow requirements of the native fishes of Aravaipa Creek by the IFIM	Turner, P.R., Tafenelli, R.J.	1983	U.S. Fish and Wildlife Service	1980-1981	Study of the instream flow requirements of native fishes of Aravaipa Creek using the Incremental Methodology. An IFG4 hydraulic simulation of the changes in habitat was completed for a typical stream reach and probability of use curved made for Meda fulgida and Tiaroga cobitis. A min discharge of 13 cfs would be an acceptable min flow during low-flow periods in summer and fall,
202	Instream Flow-Habitat Relationships in the Upper Rio Grande River Basin	Trungale Engineering & Science	2012	Texas Water Development Board Contract Report Number 1248311376	unk	report documents analysis performed to develop predictive relationships that describe the instream available habitat over a range of flows in Rio Grande basin using hydraulic modeling.
203	Ecological monitoring of the endangered Huachuca water umbel (Lilaeopsis schaffneriana ssp. recurva: Apiaceae)	Titus, P.J., Titus, J.H.	2008	The Southwestern Naturalist, Vol. 53, No. 4	2001-2006	Study of ecology of Lilaeopsis schaffneriana ssp. recurva (Huachuca water umbel)
204	System dynamics modeling for community-based water planning: Application to the Middle Rio Grande	Tidwell, V.C., Passell, H.D., Conrad, S.H., Thomas, R.P	2004	Aquatic Sciences 66 (357-372)		System dynamics modeling to assist in community-based water planning for a three-county region in north-central New Mexico. The planning region is centered on a ~165-km reach of the Rio Grande that includes the greater Albuquerque metropolitan area. A description of the model and the planning process are given along with results and perspectives drawn from both
205	Desert Spring Fishes	Texas Parks & Wildlife				Summary of desert spring fish in western texas. Information taken from recovery plans for individual fish
206	Multi Scaled Habitat Selection by Elegant Trogons in Southeastern Arizona	Hall, L.S., & Mannan R.W.	1999	The Journal of Wildlife Management, Vol 64, No. 2.	1993-1995	We studied habitat selection by the elegant trogon at 4 spatial scales (mountain range, canyon, home range, nest site) in southeastern Arizona to determine what resources constituted high-quality habitat.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
207	Restoration potential of the aquatic ecosystems of the Colorado River Delta, Mexico: Introduction to special issue on "Wetlands of the Colorado River Delta"	Glenn, E.P., Flessa, K.W., & Pitt, J.	2013	Ecological Engineering, Vol. 59		This paper briefly describes the wetlands and documents recent binational efforts to provide environmental flows to the Colorado River delta. Serves as an introduction to a special issue of Ecological Engineering, Wetlands of the Colorado River Delta, which contributes 17 new research articles to the science based on these diverse aquatic habitats.
208	Restoration of Saltcedar (Tamarix sp.)-Infested Floodplains on the Bosque del Apache National Wildlife Refuge	Taylor, J.P, McDaniel, K.C.	1998	Weed Technology, Vol. 12, No. 2	1978-1991	Soil salinity and depth to water are the principal physical features limiting revegetation efforts on the Bosque del Apache National Wildlife Refuge near Socorro, NM. Cottonwood and black willow plantings and natural regeneration after timed irrigations produced diverse habitats that support a wide array of faunal species in areas previously occupied by homogeneous saltcedar
209	Cienega de Santa Clara: Endangered Wetland in the Colorado River Delta, Sonora, Mexico	Glenn, E.P., Felger, R.S., Borquez, A., Turner, D.S.	1992	Natural Resources Journal, Vol. 32		We describe the present status of the wetland and raise questions on the future of the area when the desalting plant reaches full capacity.
210	Ecology and conservation biology of the Colorado River Delta, Mexico.	Glenn, E.P., Zamora-Arroyo, F., Nagler, P., Briggs, M., Shaw, W., & Flessa, K.	2001	Journal of Arid Environments, Vol. 49		This review discusses the terminus of the river, the delta of the Colorado River in Mexico, which has had a resurgence in vegetation since the filling of the dam system on the river in 1981
211	Herpetofaunal Use of a Desert Riparian Island and its Adjacent Habitat	Szaro, R.C., Belfit, S.C.	1986	Journal of Wildlife Management 50(4):752-761	1982	The restriction of water flow in 1959 in Queen Creek in Whitlow Ranch Dam, Pinal County, Arizona, has caused the development of a 15-ha riparian island upstream behind the dam. The herpetofauna of the riparian interior, riparian edge, desert wash, and upland habitats were sampled to assess the value of this type of development for mitigating continued losses of riparian habitat. Regression models for species abundance emphasize the importance of using floristic information rather than summary variables in developing animal-habitat relationships.
212	Flood Regime and Leaf Fall Determine Soil Inorganic Nitrogen Dynamics in Semiarid Riparian Forests	Follstad, J.J., & Dahm, C.N.	2008	Ecological Applications, Vol. 18, No. 3	2001-2004	We examined the effects of flood regime on plant community and soil inorganic nitrogen (N) dynamics in riparian forests dominated by native Populus deltoides var. wislizenii Eckenwalder and nonnative Tamarix chinensis Lour, along the regulated middle Rio Grande of New Mexico.
213	Sparrow migration along a river corridor in desert grassland	Finch, D.M., & Yong, W.	1996	UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE GENERAL TECHNICAL REPORT RM	1985-1994	We analyzed trends of sparrows and towhees captured in fall at the Rio Grande Nature Center, Albuquerque, New Mexico from 1985 to 1994.
214	Nesting ecology and nest success of the Blue Grosbeak along two rivers in New Mexico	Cartron, J.E., Finch, D.M., Hawksworth, D.L., Stoleson, S.H.	2013	Western Birds, Vol. 44	1997-2008	From 1997 through 2008, we studied the nesting habits and nest success of the Blue Grosbeak along the middle Gila River and the middle Rio Grande in New Mexico. Differences between the two sites in floristic composition and vegetation structure appeared to affect the placement of Blue Grosbeak nests more than they did nest success.
215	Bird Species Distribution Patterns in Riparian Habitats in Southeastern Arizona	Strong, T.R., Bock, C.E.	1990	The Condor, Vol. 92, No. 4		Bird species densities were determined for summer and winter on 132 study plots grouped into 25 riparian habitats in or near the Huachuca Mountains of southeastern Arizona. The type of dominant riparian tree species influenced bird species richness and total density during the breeding season. Cottonwood habitats had the greatest richness, and both cottonwood and sycamore habitats had high densities.Riparian stand size was a relatively poor predictor of avian density or richness in either season.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
216	Vegetation-Hydrology Models: Implications for Management of Prosopis Velutina (Velvet Mesquite) Riparian Ecosystems	Stromberg, J.C., Wilkins, S.D., Tress, J.A.	1993	Ecological Applications, Vol. 3, No. 2	1990-1991	Authors developed models for Prosopis velutina stands across a xeric-to-mesic moisture gradient. The models expressed canopy height, basal area, leaf area index, vegetation volume, and leaflet area as functions of plant water potential, and they expressed plant water potential and riparian stand structure as functions of water table depth. These data indicated that stand structure was strongly related to water availability. Management applications of the models include the ability (1) to identify minimum water-table depths for riparian stand maintenance and (2) to detect stressful hydrological conditions, via water potential measurements, before the onset of structural degradation
217	Altered streamflow regimes and invasive plant species: the Tamarix case	Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	2007	Global Ecology and Biogeography, 16, 381– 393		Stream-flow regimes are strong determinants of riparian vegetation structure, and hydrological alterations can drive dominance shifts to introduced species that have an adaptive suite of traits. Deep alluvial groundwater on intermittent rivers favours the deep-rooted, stress-adapted Tamarix Over the shallower-rooted and more competitive Populus And Salix. On flow-regulated rivers,shifts in flood timing favour the reproductively opportunistic Tamarix over Populus And Salix, both of which have narrow germination windows.These results reaffirm the importance of reinstating streamflow regimes (inclusive of groundwater flows) for re-establishing the native pioneer trees as the dominant forest type
218	Fremont Cottonwood-Goodding Willow Riparian Forests: A Review of Their Ecology, Threats,and Recovery Potential	Stromberg, J.C.	1993	Journal of the Arizona-Nevada Academy of Science, Vol. 27, No. 1		Manipulation of water resources and fluvial processes pose some of the greatest threats to Sonoran cottonwood-willow systems, with other threats to these species-rich ecosystems coming from land uses such as livestock grazing and sand and gravel mining. The reproductive biology of Fremont cottonwood and Goodding willow is strongly tied to fluvial processes, with seedling recruitment of both species dependent upon periodic flood flows to deposit and moisten alluvial sediment bars. Mature plants often become isolated on high floodplains some distance from the active channel, but continue to remain hydrologically dependent on a shallow riparian water table. Restoration and preservation of these species-rich forests depends upon removal of activities which interfere with natural ecosystem processes (e.g., livestock which destabilize and erode recruitment bars; dams and diversions that lower water tables and prevent channel meandering and sedimentation).
219	Dryland Riparian Ecosystems In the American Southwest:Sensitivity and Resilience to Climatic Extremes	Stromberg, J.C., McCluney, K.E., Dixon, M.D., Meixner, T.	2013	Ecosystems 16: 411-415	NA	Summary of existing research on vegetation and animal species and how changes in climate may impact them
220	Integrated river basin management in the Conchos River basin, Mexico: A case study of freshwater climate change adaptation	Barrios, E.J., Rodríguez-Pineda, J.A., & De la Maza Benignos, M.	2011	Climate and Development, Vol. 1, No. 3		Evaluates the results gained after five years of an integrated river basin management program in the Conchos River in northern Mexico. Adaptation measures included: modernization of irrigation practices; pilot sustainable watershed management projects in the upper basin; development of an environmental flow assessment and a proposal to improve water allocation; and the creation of the Inter-institutional Working Group as a basin organization.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
221	Importance of low-flow and high-flow characteristics to restoration of riparian vegetation along rivers in arid south-western United States	Stromberg, J.C., Beauchamp, V.B., Dixon, M.D., Lite, S.J., Paradzick, C.	2007	Freshwater Biology 52, 651–679	NA	Summary of research on the impacts of low and high flow to riparian vegetation on dryland rivers. Based on this evidence authors conclude that determining causes of vegetation change are critical for determining riparian restoration strategies.
222	Regional patterns of plant community response to changes in water: Owens Valley, California	Elmore, A.J., Mustard, J.F., Manning, S.J.	2003	Ecological Applications, Vol. 13, No. 2	1986-1998	Explores vegetation changes over a 13-yr period for an entire water management area in eastern California. Using remotely sensed measurements of vegetation live cover, a recent vegetation map, field data and observations, precipitation records, and data on water table depth, we characterize the responses of xeric, phreatophytic, and exotic Great Basin plant communities.
223	Dynamics of Fremont cottonwood (Populus fremontii) and saltcedar (Tamarix Chinensis) populations along the San Pedro River, Arizona	Stromberg, J.C.	1998	Journal of Arid Environments, Vol. 40: 133-155	1997	Examination of the relationship between streamflow and cottonwood versus tamarisk vegetation. Salt cedar dominates only at the drier sites where the surface and groundwater conditions no longer support cottonwood/willow forests. At sites with perennial or near-perennial streamflow, salt cedar is co-dominant with Fremont cottonwood. However, salt cedar has been declining ing importance at these sites perhaps due to current conditions that favor cottonwood establishment.
224	Comparison of litter dynamics in native and exotic riparian vegetation along the Middle Rio Grande of central New Mexico, USA	Ellis, L.M., Crawford, C.S., & Molles Jr., M.	1998	Journal of Arid Environments	1993-1995	We compared litter dynamics at sites dominated by native cottonwoods or exotic saltcedar in the Middle Rio Grande Valley of central New Mexico. Flooding may help reduce the impact of fires by increasing decomposition and reducing the standing stock of forest floor organic matter
225	Influence of Experimental Flooding on Litter Dynamics in a Rio Grande Riparian Forest, New Mexico	Ellis, L.M., Molles Jr., M., & Crawford, C.S.,	1999	Restoration Ecology	1991-1995	We investigated managed flooding as a means of restoring ecosystem function. After collecting baseline data during 1991 and 1992 in two riparian forest sites that had not flooded for about 50 years, we flooded an experimental site for 27–32 days during late spring of 1993, 1994, and 1995, leaving the reference site unflooded.
226	Microhabitat use by breeding southwestern willow flycatchers on the Gila River, New Mexico	Stoleson, S.H., Finch, D.M.	2003	Studies in Avian Biology No. 26:91-95		Information on nesting habitat characteristics of Willow Flycatchers in the largest extant population of the subspecies along the upper Gila River in New Mexico. A logistic regression model identified three variables as significant predictors of flycatcher use: foliage density in the subcanopy, percent canopy cover, and number of boxelder (Acer negundo) stems. The relative nest height, preference for dense foliage, and proximity to water were typical for the subspecies.
227	Breeding Biology of Lucy's Warbler in Southwestern New Mexico	Stoleson, S.H., Shook, R.S., Finch, D.M.	2000	Western Birds, Vol. 44	1997-1999	Study focused on breeding of Lucy's Warbler. Found birds prefer large cottonwoods and willows for nests

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
228	Tamarisk Reproductive Phenology and Colorado River Hydrography, Southwestern USA	Stevens, L.E., Siemion, G.	2012	Journal of the Arizona-Nevada Academy of Science, Vol. 44, No. 1, pp. 46-58	1965-2008	To improve understanding of tamarisk reproductive plasticity, we compiled elevation, date, and phenology data from specimens in Southwestern herbaria, and we conducted field studies in Glen and Grand Canyons from 1984-2009. We modeled tamarisk reproductive seed-release phenology across elevation in relation to hydrography and flow management in the Colorado River Basin. We compared the potential for tamarisk recruitment in the pre- and post-dam Colorado River mainstream with that in Lake Mead and Lake Powell reservoirs and in tributaries with low- or high-elevation headwaters. Flooding timed with seed release was likely to result in tamarisk recruitment. Conversely, planned floods from Glen Canyon Dam that specifically avoided the May-June peak tamarisk seed-release period resulted in little tamarisk recruitment downstream in Grand Canyon. Failing recruitment in the post-dam Colorado River mainstream in Grand Canyon has occurred because: (1) the spring-summer hydrograph is generally unsuitable for tamarisk seedling establishment, and (2) post-dam flooding has coarsened grain size, resulting in less stable soils with lower nutrient concentrations. Hydrograph management can result in reduced tamarisk recruitment, while poorly timed floods, simulated natural flow regimes, and unregulated tributary flows permit tamarisk establishment.
229	Conservation and status of the fish communities inhabiting the Rio Conchos basin and middle Rio Grande, Mexico and USA	Edwards, R.J., Garrett, G.P., & Marsh-Matthews, E.	2003	Reviews in Fish Biology and Fisheries, Vol. 12, No. 2-3	1992-1995	We present data from 15 localities in the Río Conchos and the Rio Grande/Río Bravo basins obtained between 1992 and 1995 and discuss the fish communities found.
230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995	Ecological Applications, Vol. 5, No. 4, pp. 1025-1039		In a study of fluvial marsh development and composition on the COlorado River through Grand Canyon authors found that marshes varied in relation to local and reach-based geomorphology and microsite gradients in inundation frequency and soil texture. Paper contains a discussion of implications of flow management on the marsh assemblages, and the need for consensus on priorities for management of regulated fluvial wetland
231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007	USGS Open FIle Report. 2008–1303.	1993-2007	This rangewide data synthesis was designed to meet two objectives: (1) identify all known Southwestern willow flycatcher breeding sites and (2) assemble data to estimate population size, location, habitat, and other information for all breeding sites, for as many years as possible, from 1993 through 2007.
232	Planned Flooding and Colorado River Riparian Trade-offs Downstream from Glen Canyon Dam, Arizona	Stevens, L.E., Ayers, T.J., Bennett, J.B., Christensen, K., Kearsley, M.J.C., Meretsky, V.J., Phillips III, A.M., Parnell, R.A., Spence, J., Sogge, M.K., Springer, A.E., Wegner, D.L.	2001	Ecological Applications,Vol. 11, No. 3	1996	We review the terrestrial (wetland and riparian) impacts of a 1274 m3/s test flood conducted by the U.S. Bureau of Reclamation in March/April 1996, which was designed to improve understanding of sediment transport and management downstream from Glen Canyon Dam in the Colorado River ecosystem. The test flood successfully restored sandbars throughout the river corridor and was timed to prevent direct impacts to species of concern.Careful design of planned flood hydrograph shape and seasonal timing is required to mitigate terrestrial impacts during efforts to restore essential fluvial geomorphic and aquatic habitats in regulated river ecosystems.
233	Fish fauna of the Bavícora Basin, Chihuahua, Mexico	Stefferud, J.A., Propst, D.L.	1996	The Southwestern Naturalist, Vol. 41, No. 4	1994	Description of habitat and presence of Mexican stoneroller, Campostoma ornatum, beautiful shiner, Cyprinella formosa, and an undescribed chub, Gila sp. in the Bavicora Basin

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
234	Riparian Groundwater Models for the Middle Rio Grande: ESA Collaborative Program FY04	S.S.Papadopulos & Associates, Inc., New Mexico Interstate Stream Commission	2006	The Middle Rio Grande Endangered Species Act Collaborative Program	NA	This study, expands on work conducted under a first-year project in FY03. This project refines the three riparian groundwater models developed for simulation of shallow groundwater conditions and exchanges between surface water and shallow groundwater within the floodplain of the Rio Grande, develops two new riparian models, and develops a framework for extending models south to Fort Craig. The riparian models were developed to support analysis of water management and restoration plans that are impacted by dynamic hydrologic processes occurring in this area.
235	Restoration of Riparian Habitat Using Experimental Flooding	Sprenger, M.D., Smith, L.M., Taylor, J.P.	2002	Wetlands,Vol. 22, No. 1	1997-1998	Following saltcedar (Tamarix ramosissima) removal treatments, impoundments were flooded and water levels were reduced to stimulate native species re-establishment from seed. Water manipulations within saltcedar-removal areas consisted of stage drawdowns of 5 cm/day and 10 cm/day. Cottonwood seedling density and survival did not differ between 5 cm/day and 10 cm/day stage drawdowns and decreased throughout summer as a result of excessive moisture stress. The absence of a drawdown treatment effect indicates that both drawdowns were too fast for seedling roots to keep up with declining water tables. Seedlings that survived were using moisture from the unsaturated zone
236	Flow regulation and fragmentation imperil pelagic-spawning riverine fishes	Dudley, R.K., & Platania, S.P.	2007	Ecological Applications, Vol. 17, No. 7		Transport velocity and distance were determined for passively drifting particles, which mimicked physical properties of ichthyoplankton, in two large, regulated rivers.
237	Social, Political, and Institutional Setting: Water Management Problems of the Rio Grande	Douglas, A.J.	2009	Journal of Water Resources Planning and Management, Vol. 135		This paper discusses various water management issues facing federal, state, and local agencies charged with managing the water resources of the Rio Grande River Basin and its major tributaries
238	Abundance of wind scorpions Solifugae: Eremobatidae) in riparian forests disturbed by grazing, fire, and flood in Central New Mexico, USA	Smith, D.M., & Finch, D.M.	2011	IX International Rangeland Congress: Diverse Rangelands for a Sustainable Society	2004	In this paper, we report abundances of the predatory pallid windscorpion (Eremobates pallipes) in riparian forest plots subjected to flooding, wildfire, and cattle grazing.
239	Water transfer effects on peri-urban land use/land cover: A case study in a semi-arid region of Mexico	Díaz-Caravantes, R.E., & Sánchez-Flores, E.	2011	Applied Geography, Vol. 31, No. 2	1987-2007	This study evaluated the LULC change dynamics and their effects in the peri-urban area of the city of Hermosillo, (Mexico) by combining interviews and remote sensing analysis. This study demonstrates that urban expansion causes at least two other types of LULC changes beyond the urban fringe that are not usually detected or explained in common LULC change studies.
240	Responses of macroinvertebrate communities to long-term flow variability in a Sonoran Desert stream	Sponseller, R.A., Grimm, N.B., Boulton, A.J., & Sabo, J.L.	2010	Global Change Biology 16, 2891–2900	1983-1999	This study assessed the potential response of aquatic macroinvertebrates to inter-annual variation in hydrology in a spatially intermittent desert stream (Sycamore Creek, AZ). Results show that while the size of floods initiating sequences had little explanatory power, changes in macroinvertebrate community structure during post flood succession were closely associated with antecedent flooding and drought.Our observations highlight the potential for predicted climate changes in this region to have marked and long-lasting consequences for benthic communities in desert streams.
241	Saltcedar and Southwestern Willow Flycatchers: Lessons From Long-term Studies in Central Arizona	Sogge, M.K., Paxton, E.H., Tudor, A.A.	2006	Monitoring science and technology symposium: RMRSP-42CD.	NA	Summary of findings on SW Willow flycatcher and impacts of tamarisk

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
242	Water sources used by riparian trees varies among stream types on the San Pedro River, Arizona	Snyder, K.A., Williams, D.G.	2000	Agricultural and Forest Meteorology 105	1997	The fraction of tree transpiration water derived from the unsaturated soil zone and groundwater in a riparian forest was quantified for Populus fremontii, Salix gooddingii, and Prosopis velutina across a gradient of groundwater depth and streamflow regime on the San Pedro River in southeastern Arizona, US. Comparisons of O and H isotpes from tree xylem water with that of potential water sources indicated thatSalix gooddingii did not take up water in the upper soil layers during the summer rainy period, but instead used only groundwater, even at an ephemeral stream site where depth to groundwater exceeded 4 m.Populus fremontii, also used mainly groundwater, but at the ephemeral stream site during the summer rainy season this species derived between 26 and 33% of its transpiration water from upper soil layers. Similarly, at the ephemeral stream site during the summer rainy period,Prosopis velutina derived a greater fraction of its transpiration water from uppersoil layers, than at a perennial stream site where groundwater depth was less than 2 m.
243	Influences of Disturbance and Vegetation on Abundance of Native and Exotic Detritivores in a Southwestern Riparian Forest	Smith, D.M., Kelly, J.F., Finch, D.M.	2006	Environmental Entomology 35(6)	2004	To determine how disturbance history affects the abundance of detritivores, we installed pitfall traps in plots that had flooded, burned, or had no recent disturbance. Results show that flooding can lessen the negative impact of wildfire on native detritivores and reduce the abundance of exotic species
244	Water Relations of Riparian Plants from Warm Desert Regions	Smith, S.D., Devitt, D.A., Sala, A., Cleverly, J.R., Busch, D.E.	1998	Wetlands, Vol 18, No. 4	NA	Analysis of water loss rates indicate that Tamarix-dominated stands can have extremely high evapotranspiration rates when water tables are high but not necessarily when water tables are lower. Tamarix has leaf-level transpiration rates that are comparable to native species, whereas sap-flow rates per unit sapwood area are higher than in natives, suggesting that Tamarix maintains higher leaf area than can natives, probably due to its greater water stress tolerance.
245	Cicada Emergence in Southwestern Riparian Forest: Influences of Wildfire and Vegetation Composition	Smith, D.M., Kelly, J.F., Finch, D.M.	2006	Ecological Applications, Vol. 16, No. 4	2003-2004	Because cicadas are consumed by a variety of animal species, disturbances that alter timing of their emergence or abundance could have consequences for species at higher trophic levels. We trapped emerging cicadas (Tibicen dealbatus) in burned and unburned riparian forest plots along the Middle Rio Grande in central New Mexico (USA) to determine effects of wildfire and vegetation structure on their density and phenology. Emergence density was similar in wildfire and unburned plots, though emergence date averaged earlier in wildfire plots and experimentally heated traps. We identified models containing cottonwood proximity (distance from the nearest cottonwood tree) and cottonwood canopy coverage as the most parsimonious explanations of emergence density at each trap.
246	Post-Wildfire Recovery of Riparian Vegetation During a Period of Water Scarcity in the Southwestern USA	Smith, D.M., Finch, D.M., Gunning, C., Jemison, R., Kelly, J.	2009	Fire Ecology Special Issue Vol. 5, No. 1	2003-2006	Our observations suggest that, in the absence of ideal hydrologic and climatic conditions, fire can reduce cottonwood density in the bosque and promote the spread of saltcedar. Increasingly xeric conditions predicted under most climate change scenarios could result in greater recovery of exotic saltcedar over native vegetation
247	Ambrysus hungerfordi hungerfordi (Hemiptera: Naucoridae) Occurrence in the United States	Sites, R.W., Bowles, D.E.	1995	Journal of the Kansas Entomological Society, Vol. 68, No. 4	1994-1995	Description of habitat and presence of Ambrysus h. hungerfordi

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
248	Environmental flows for rivers and economic compensation for irrigators	Sisto, N.P	2009	Journal of Environmental Management 90		This paper analyses a proposal to restore and maintain ecosystems on a stretch of the Rıo Conchos in northern Mexico, downstream from a large irrigation district that consumes nearly all local flows. Paper presents estimates for environmental flows and computes compensation figures for irrigators.
249	Establishment Patterns of Native Populus and Salix in the Presence of Invasive Nonnative Tamarix	Sher, A.A., Marshall, D.L., Taylor, J.P.	2002	Ecological Applications,Vol. 12, No. 3		Study of Tamarisk and Cottonwood/Willow communities that had established after over-bank flooding was allowed to occur in two protected areas in New Mexico. Although Tamarix seedling densities were an order of magnitude greater than those of the native species at initial establishment, mortality of Tamarix was also much greater than for Populus or Salix and occurred primarily in plots where native species were the most dense. Both natives were taller and grew faster above ground than Tamarix in the first 4 yr, and growth of Tamarix was negatively correlated with neighbor densities. In contrast, Populus and Salix growth and survival were never correlated with Tamarix densities. These results have positive implications for managers who wish to reestablish the native dominants of riparian forests through reinstatement of flooding.
250	Quantifying Groundwater and Surface-Water Discharge from Evapotranspiration Processes in 12 Hydrographic Areas of the Colorado Regional Ground-Water Flow System, Nevada, Utah, and Arizona	DeMeo, G.A., Smith, Jl., Damar, N.A., & Darnell, J.	2008	U. S. Geological Survey		This report presents estimates of ground and surface water discharge from ET across 3.5 million acres in 12 hydrographic areas of the Colorado Regional Ground-Water Flow System.
251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001	The Southwestern Naturalist, Vol. 46, No. 2	1994-1995	Fifteen canyons on the Coronado National Forest in southeastern Arizona were sampled to study the woody riparian overstory. Environmental site data included elevation, stream gradient, stream width and depth, terrace height, stream direction, and watershed area.
252	Influence of Livestock Grazing Strategies on Riparian Response to Wildfire in Northern Nevada	Dalldorf, K.N., Swanson, S.R., Kozlowski, D.F., Schmidt, K.M., Shane, R.S., & Fern&ez, G.	2013	Rangeland Ecology & Management, Vol. 66, No. 1	2005	A comparison of pre- and post fire stream surveys provided a unique opportunity to statistically assess changes in stream survey attributes at 43 burned and 38 unburned streams, helping to understand the interactive effects of wildfires, livestock grazing, and natural hydrologic characteristics.
253	Restoration and Monitoring in the Middle Rio Grande Bosque: Current Status of Flood Pulse Related Efforts	Crawford, C.S., & Umbreit, N.E.	1999	Rio Grande Ecosystems: Linking Land, Water, and People		Discusses the current status of flood pulse related efforts at the Rio Grande Bosque.
254	Invasive capacity of Tamarix ramosissima in a Mojave Desert floodplain: the role of drought	Cleverly, J.R., Smith, S.D., Sala, A., & Devitt, D.A.	1997	Oecologia, Vol. 111, No. 1	1994	This study, we compared the gas exchange and water use of T. ramosissima and three co-occurring native phreatophytes [Pluchea sericea (Nutt.) Cov. (arrowweed), Prosopis pubescens Benth. (screwbean mesquite), and Salix exigua Nutt. (coyote willow)] in a low-runoff year characterized by water and heat stress.
255	Resurrecting the dammed: a look at Colorado River restoration	Cohn, J.P.	2001	BioScience, Vol. 51, No. 12		Describes the Colorado river water allocations and the effects on the CR flora and fauna.
256	An Overview of the Southern Nevada Agency Partnership Science and Research Synthesis	Chambers, J.C., Brooks, M.L., Turner, K., Raish, C.B., & Ostoja, S.M.	2013	USDA Forest Service Gen. Tech. Rep. RMRS-GTR-30		Describes the strategies and management challenges of the Southern Nevada Agency Partnership (SNAP)

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
257	The Southern Nevada Agency Partnership Science and Research Synthesis: Science to Support Land Management in Southern Nevada	Chambers, J.C., Brooks, M.L., Pendleton, B.K., & Raish, C.B.	2013	USDA Forest Service Gen. Tech. Rep. RMRS-GTR-30		This synthesis provides information related to the Southern Nevada Agency Partnership (SNAP) Science and Research Strategy Goal 1 and Goal 2.
258	Habitat Selection by Sympatric Brood Parasites in Southeastern Arizona: The Influence of Landscape, Vegetation, and Species Richness	Chace, J.F.	2004	The Southwestern Naturalist, Vol. 49, No. 1	1998-1999	The abundance and distribution of brown-headed cowbirds and bronzed cowbirds and the hosts they parasitize was compared across 151 point-count locations in 10 major habitat types in the Huachuca Mountains and San Pedro River valley
259	Ground arthropods as potential indicators of flooding regime in the riparian forest of the middle Rio Grande, New Mexico	Cartron, J.E., Molles, M.C., Schuetz, J.F., Crawford, C.S., & Dahm, C.N.	2003	Environmental entomology, Vol. 32, No. 5	2001-2002	We pit trapped arthropods at eight riparian forest sites along the middle Rio Grande, four characterized by flooding in some years and four others where periodic flooding no longer occurs.
260	Chapter 2. Fishes of Grand Canyon	Gloss, S.P., & Coggins, L.G.	2005	USGS Circular 1282	1991-2004	The State of the Colorado River Ecosystem in Grand Canyon. Intended to provide decision makers and the American public with relevant scientific information about the status and recent trends of the natural, cultural, and recreational resources of those portions of Grand Canyon National Park and Glen Canyon National Recreation Area affected by Glen Canyon Dam operations.
261	Chapter 5. Aquatic Ecology: The role of organic matter.	Kennedy, T.A., & Gloss, S.P.	2005	USGS Circular 1283	1991-2005	The State of the Colorado River Ecosystem in Grand Canyon. Intended to provide decision makers and the American public with relevant scientific information about the status and recent trends of the natural, cultural, and recreational resources of those portions of Grand Canyon National Park and Glen Canyon National Recreation Area affected by Glen Canyon Dam operations.
262	Chapter 6. Riparian vegetation and associated wildlife	Ralston, B.E.	2005	USGS Circular 1284	1991-2006	The State of the Colorado River Ecosystem in Grand Canyon. This chapter describes changes in the riparian and fluvial marsh communities along the Colorado River in Grand Canyon from the closure of the Glen Canyon Dam and the beginning of the regulation of the river in 1963 to the present.
263	Chapter 7. Birds of the Colorado River in Grand Canyon: a Synthesis of Status, Trends, and Dam Operation Effects	Holmes, J.A., Spence, J.R., & Sogge, M.K.	2005	USGS Circular 1285	1991-2007	The State of the Colorado River Ecosystem in Grand Canyon. Intended to provide decision makers and the American public with relevant scientific information about the status and recent trends of the natural, cultural, and recreational resources of those portions of Grand Canyon National Park and Glen Canyon National Recreation Area affected by Glen Canyon Dam operations.
264	Chapter 9. Recreation Use Values and Nonuse Values	Loomis, J., Douglas, A.J., & Harpman D.A.	2005	USGS Circular 1286	1991-2008	The State of the Colorado River Ecosystem in Grand Canyon. Intended to provide decision makers and the American public with relevant scientific information about the status and recent trends of the natural, cultural, and recreational resources of those portions of Grand Canyon National Park and Glen Canyon National Recreation Area affected by Glen Canyon Dam operations.
265	Chapter 12. Recreational values and campsites	Kaplinski, M., Behan, J., Hazel, J.E., Parnell, R.A., & Fairley, H.C.	2005	USGS Circular 1287	1991-2009	The State of the Colorado River Ecosystem in Grand Canyon. Intended to provide decision makers and the American public with relevant scientific information about the status and recent trends of the natural, cultural, and recreational resources of those portions of Grand Canyon National Park and Glen Canyon National Recreation Area affected by Glen Canyon Dam operations.
266	Bats in the riparian-restoration sites along the Lower Colorado River, Arizona	Calvert, A.W., & Neiswenter, S.A.	2012	The Southwestern Naturalist, Vol. 57, No. 3	2007-2010	We captured the western red bat and Arizona myotis in riparian restoration areas along de lower Colorado River.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
267	Rain and Rodents: Complex Dynamics of Desert Consumers	Brown, J.H., & Ernest, S.M.	2002	BioScience, Vol. 52, No. 11	1977-2000	Although water is the primary limiting resource in desert ecosystems, the relationship between rodent population dynamics and precipitation is complex and nonlinear
268	A Record of the Southern River Otter, Lutra longicaudis, from the Rio Yaqui, Sonora, Mexico	Brown, B.T., Warren, P.L., Andersenson, L.S., & Gori, D.F.	1982	Arizona-Nevada Academy of Science, Vol. 17, No. 1	1982	The authors registered the first record of the Southern River Otter from below 1540 m elevation on the mainstream Rio Yaqui.
269	Fishes, Amphibians, and Reptiles of the Lower Mojave River System	Brown, T.	1978	Bureau of Land Management. Contract CA-CT8-000046	1978	A field study was made to determine the status of all fishes, amphibians and reptiles occurring in the lower Mojave River System
270	Monitoring Riparian Ecosystems: An Inventory of Riparian Habitat Along Rincon Creek Near Tucson, Arizona	Briggs, M., Schmid, M.K., & Halvorson, W.L.	1997	Cooperative National Park Resources Studies Unit. Technical Report 58		This report describes the methods and results of the initial baseline Rincon Creek riparian habitat inventory.
271	A preliminary riparian wetland vegetation community classification of the Upper and Middle Rio Grande Watersheds in New Mexico	Durkin, P., Muldavin, E., Bradley, M., Carr, S.E.	1996	Desired future conditions for Southwestern riparian ecosystems: Bringing interests and concerns together	1992-1994	The riparian wetland vegetation communities of the upper and middle Rio Grande watersheds in New Mexico were classified in terms of species composition and vegetation structure. The resulting Community Types are related to soil conditions, hydrological regime, and temporal dynamics. The classification is part of a comprehensive effort to develop a systematic understanding of the diversity of riparian/wetland communities and how they are influenced by specific hydrologic, edaphic and climatic environments.
272	Terrestrial Vegetation Inventory of Water Delivery Systems Between San Acacia Diversion and the Bosque Del Apache National Wildlife Refuge	Boren, J.C., Terrell, T., Cowley, D., Mason, G., Eaton, S., & Hurd, B.	2005	New Mexico Water Resources Research Institute, New Mexico State University	2003	Transects parallel and perpendicular to water conveyance structures of the Socorro Division of the Middle Rio Grande Conservancy District were used to characterize vegetation associated with them. Thirty-two plant species were identified in association with canals and drains.
273	Summer bird/vegetation associations in Tamarisk and native habitat along the Pecos River, southeastern New Mexico	Livingston, M.F.	1996	Desired future conditions for Southwestern riparian ecosystems: Bringing interests and concerns together	1994-1995	Our research is part of a long term study investigating hydrological and wildlife response to tamarisk removal on the Pecos river in Eddy County, New Mexico. Our objectives were to collect baseline data and describe avian/vegetation associations at the treatment site and two non-treatment (control) sites prior to herbicide application. Factors including vegetation structure, grazing, habitat patchiness, and human disturbance are offered to explain differences in bird community patterns between sites.
274	Tolerance values of stream caddisflies (Trichoptera) in the lower Colorado River Basin, USA	Blinn, D.W., & Ruiter, D.E.	2006	The Southwestern Naturalist, Vol 51, No. 3	2002-2003	We collected physico-chemical information and caddisflies from stream sites through the lower Colorado River and established the relation with channel embeddedness
275	Seedling competition between native cottonwood and exotic saltcedar: implications for restoration	Bhattacharjee, J., Taylor, J.P., Smith, L.M., & Haukos, D.A.	2009	Biological Invasions, Vol. 11, No. 8		We evaluated competitive aspects of these co-occurring species in an extant riparian habitat in the arid southwestern US.
276	Distribution, Status, and Notes on the Ecology of Gila robusta (Cyprinidae) in the Gila River Drainage, New Mexico	Bestgen, K.R., & Propst, D.L.	1989	The Southwestern Naturalist, Vol. 34, No. 3	1982-1985	This paper describes the past and present distribution of the roundtail chub in the Gila River drainage in New Mexico, its abundance, habitat characteristics, present status and reasons for the species decline.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
277	Riparian vegetation response to altered disturbance and stress regimes	Shafroth, P.B., Stromberg, J., Patten, D.T.	2002	Ecological Applications, 12(1), pp. 107-123	1953-1996, 1996-1997	We studied the Bill Williams River in western Arizona, USA, to understand dam-induced changes in channel width and in the areal extent, structure, species composition, and dynamics of woody riparian vegetation. Multiple regression analysis revealed significant relationships among flood power, summer flows, intermittency (independent variables), and channel width (dependent variable). Woody vegetation along the Bill Williams River was denser than that along the Santa Maria River, though basal areas were similar. Patches dominated by the exotic Tamarix ramosissima were marginally (P = 0.05) more abundant along the Bill Williams River than along the Santa Maria River, whereas the abundance of patches dominated by the native Populus fremontii or Salix gooddingii was similar across rivers (P = 0.30).
278	Dispersal and Life History Traits of Notropis girardi (Cypriniformes: Cyprinidae), Introduced into the Pecos River, New Mexico	Bestgen, K.R., Platania, S.P., Brooks, J.E., & Propst, D.L.	1989	American Midland Naturalist, Vol. 122, No. 2	1986-1987	In this paper we document the introduction, dispersal and aspects of the life history of Notropis Girardi in the Pecos River drainage, NM. Habitats and biological attributes of the introduced population and native populations from the Arkansas River drainage were compared.
279	A natural resource survey for proposed reservoir sites and selected stream segments in Texas	Bauer, J., Frye, R., & Spain, B.	1991	Texas Parks and Wildlife Department, Austin, Texas		Presents stream sites surveys where water development projects are proposed, and existing information on important habitats, wildlife, fisheries, and recreation.
280	Floristic composition, beta diversity, and nestedness of reference sites for restoration of xeroriparian areas	Beauchamp, V.B., & Shafroth, P.B.	2011	Ecological Applications, Vol. 21, No. 2		Determine whether the composition of xeroriparian plant communities at reference sites could be predicted based primarily on simple and inexpensive soil tests accessible to restoration ecologists.
281	Indirect effects of biocontrol of an invasive riparian plant (Tamarix) alters habitat and reduces herpetofauna abundance	Bateman, H.L., Merritt, D.M., Glenn, E.P., & Nagler, P.L.	2015	Biological Invasions, Vol. 17, No. 1	2009-2012	Our objectives related herpetofauna abundance to vegetation cover and indices and timing of biocontrol defoliation.
282	A sampling plan for riparian birds of the Lower Colorado River-Final Report	Bart, J., Dunn, L., & Leist, A.	2010	USGS Open FIle Report. 2010–1158.		
283	Woody Riparian Vegetation Response to Different Alluvial Water Table Regimes	Shafroth, P.B., Stromberg, J.C., Patten, D.T.	2000	Western North American Naturalist 60(1), pp. 66–76	1995-1997	We observed groundwater dynamics and the response of Populus fremontii, Salix gooddingii,and Tamarix ramosissima saplings at 3 sites between 1995 and 1997 along the Bill Williams River, Arizona.At a site where the lowest observed groundwater level in 1996 (–1.97 m) was 1.11 m lower than that in 1995 (–0.86 m),92–100% of Populus and Salixsaplings died, whereas 0–13% of Tamarixstems died. A site with greater absolute water table depths in 1996 (–2.55 m), but less change from the 1995 condition (0.55 m), showed less Excavations of sapling roots suggest that root distribution is related to groundwater history.Therefore, a decline in water table relative to the condition under which roots developed may strand plant roots where they cannot obtain sufficient moisture.
284	History of watershed research in the Central Arizona Highlands	Baker, Jr.; Malchus B.	1999	U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station		This report assembles the pertinent details of all watershed research accomplished by the USDA Forest Service and its cooperators in the region and provides highlights of the results.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
285	Control of Tamarix in the Western United States:Implications for Water Salvage, Wildlife Use, and Riparian Restoration	Shafroth, P.B., Cleverly, J.R., Dudley, T.L., Taylor, J.P., Van Riper III, C., Weeks, E.P., Stuart, J.N.	2005	Environmental Management Vol. 35, No. 3, pp. 231-246	NA	We review the literature on saltcedar control, water use,wildlife use, and riparian restoration to provide resource managers, researchers, and policy-makers with a balanced summary of the state of the science. To best ensure that the desired outcomes of removal programs are met, scientists and resource managers should use existing information and methodologies to carefully select and prioritize sites for removal, apply the most appropriate and cost-effective control methods, and then rigorously monitor control efficacy,revegetation success, water yield changes, and wildlife use
286	Habitat and Conservation Status of the Beaver in the Sierra San Luis Sonora, México	Pelz Serrano, K., Ponce Guevara, E., Lopez Gonzales, C.A.	2005	USDA Forest Service Proceedings RMRS-P-36	2003	We surveyed the Cajon Bonito River to assess the beaver's status and habitat and found five colonies. Limiting factors appear to be pollution due to animal waste, deforestation of riparian trees, and human exploitation. Beavers did not appear to require habitat diversity as much as dense riparian and aquatic vegetation in waters with low organic content.
287	Habitat Restoration as a Means of Controlling Non-Native Fish in a Mojave Desert Oasis	Scoppettone, G.G., Rissler, P.H., Gourley, C., Martinez, C.	2005	Restoration Ecology Vol. 13, No. 2, pp. 247–256	1998-1999	In this investigation we identified habitats favoring native over non-native fish in a Mojave Desert oasis (Ash Meadows) and used this information to restore one of its major warmwater spring systems (Kings Pool Spring).
288	Hydrological Feasibility of Environmental Flows in the Rio Grande/Bravo Basin	S&oval-Solis, S., McKinney D.C.	2009	Proceedings from World Environmental and Water Resources Congress 2009: Great Rivers	2007-2008	Even though environmental flows in several locations along the Rio Grande/Rio Bravo basin have been determined (e.g., the Rio Conchos tributary), the quantification and availability of the water necessary to provide these environmental flows has not been determined. In this paper we evaluate the hydrological feasibility of environmental flows in the Rio Conchos tributary to the Rio Grande. This evaluation is done in a basin model constructed in the Water Evaluation and Planning system (WEAP) software. An analysis of the available water has been defined to determine the amount of water required to provide the environmental flows. The description and evaluation of the environmental flows are presented along with a comparison against the current water management policies.
289	Speciation and Geographic Variation in Black-Tailed Gnatcatchers	Atwood, J.L.	1988	Ornithological Monographs, no. 42	1979-1985	Provides information on morphological character variation in three sibling species: P. melanura, P. californica, and P. nigriceps.
290	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	Oberlin, G.E., Shannon, J.P., Blinn, D.W.	1999	The Southwestern Naturalist 44(1):17-30	1991, 1993, 1994, 1996	Based on identification, distribution and phenology of 42 insect genera from ten major tributaries of the Colorado River through Grand Canyon, AZ, the authors found significant variability in macroinvertebrate biomass between tributaries and seasonal differences within tributaries. Some of these differences can be explained in terms of stream source and watershed characteristics, such as local spring-fed tributaries vs. tributaries draining large watersheds from outside the Grand Canyon. Tributaries with substantial reliance on terrestrial runoff typically are less stable, have higher turbidity, and fewer food resources so that fewer species and/or individuals can be sustained. Irrigation, grazing, and other land use practices that reduce flow and increase sedimentation within these watersheds may have repercussions far downstream of where they occur.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
291	Cuatro Cienegas fishes: research review and a local test of diversity versus habitat size	Minckley, W.L.	1984	Journal of the Arizona-Nevada Academy of Science Vol. 19, No. 1	1958-1981	The Cuatro Cienegas basin, Coahuila, Mexico, supports at least 16 native fish species, 8 of which are endemic. Research on this fauna is reviewed. Fishes occupy springs, spring-fed rivers, marshes, playa lakes, ephemeral pools, and artificial canals. Number of species per collection is positively correlated with habitat size in stable springs and spring-fed rivers, but not spectacularly so in unstable natural habitats or canals.
292	Integrated Water Management for Environmental Flows in the Rio Grande	S&oval-Solis, S., McKinney D.C.	2014	Journal of Water Resources Planning and Management, Vol. 135	NA	This research focuses on the Big Bend, a reach located along the Rio Grande mainstem. In this paper is estimated the maximum volume of water available for environmental flows without affecting human and international water requirements, and without increasing the flood risk in Presidio-Ojinaga .A reservoir reoperation policy for Luis L. Leon reservoir is proposed to supply environmental flows without violating the system constraints. The policy that supplies the maximum water to the environment is two-thirds (66%) of the prior reservoir alteration conditions; it also improves human water supply, treaty obligations, and decreases flood risk.
293	Associations between Riparian Ecosystem Parameters in Happy Valley, Arizona	Jemison, R.L.	1999	General technical report RM/USDA Forest Service (USA)	1986-1988	The Objective of this study was to determine the associations, in time and space, between the hydrologic inputs, vegetation and soils in a low mountain riparian ecosystem.
294	Big Spring spinedace and associated fish populations and habitat conditions in Condor Canyon, Meadow Valley Wash, Nevada	Jezorek, I.G., Connolly, P.J., Munz, C.S., & Dixon, C.	2011	USGS Open-File Report 2011–1072	2008	Project designed to document habitat conditions and populations of native and non-native fish within the 8-km Condor Canyon section of Meadow Valley Wash, with an emphasis on Big Spring spinedace.
295	Water Use by Tamarix Ramosissima and Associated Phreatophytes in a Mojave Desert Floodplain	Sala, A., Smith, S.D., Devitt, D.A.	1996	Ecological Applications, 6(3), pp. 888-898	1993	Using sap flow measurements authors determine that under moderate to high water availability (water table <3 m), water use by Tamarix on a leaf-area basis is no different than that of Pluchea sericea, Prosopis pubescens, or Salix exigua.
296	Anthropogenic Changes in Biogeography of Great Basin Aquatic Biota	Sada, D.W., Vinyard, G.L.	2002	Smithsonian Contributions to the Earth Sciences	NA	Summary of status of aquatic biota in the Great Basin. Declines have been the greatest in the most narrowly distributed and vulnerable populations. The summary within this paper is not included in the database, it includes extensive lists of species and the type of habitat where they are found.
297	Associations among spring-dependent aquatic assemblages and environmental and land use gradients in a Mojave Desert mountain range	Sada, D.W., Fleishman, E., Murphy, D.D.	2005	Diversity and Distributions, 11, 91–99	1995	We examined whether species richness and composition of aquatic macroinvertebrates at 45 springs in the Spring Mountains, an isolated mountain range in the eastern Mojave Desert (Nevada, USA), could be predicted using readily measured environmental gradients and estimates of disturbance intensity. Our results suggested that species richness of aquatic macroinvertebrates in the Spring Mountains system may be greatest at intermediate levels of natural and human disturbance. Discharge and springbrook length appeared to be only weakly correlated with species richness, whereas neither elevation,nor water temperature, nor electrical conductance was significantly associated with species richness.
298	Chapter 3. Southwestern Willow Flycatcher Nest Records and Potential for Future Breeding along the Upper San Pedro River, Arizona	Johnson, G.E., & Van Riper, C.	2014	USGS Open File Report 2014-1121	2005	We reviewed Southwestern Willow Flycatcher (Empidonax traillii extimus) nest records and investigated the potential for future breeding along the upper San Pedro River in southeastern Arizona.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
299	The probable effects of groundwater use proposed by the Las Vegas Valley Water District on spring-dwelling animals in southern Nevada and southeastern California	Sada, D.W., Deacon, J.E.	1994	unknown	NA	Summary of potential impacts to 10 spring systems in the Mojave desert as a result of increased pumping due to development. Study includes many descriptions of species and habitat associations, only those with some quantified information are included here.
300	Understanding the habitat needs of the declining western yellow-billed cuckoo	Johnson, M.J.	2009	US Department of the Interior, US Geological Survey	1998-1999	Discusses habitat needs and characteristics of the western yellow billed cuckoo, in addition of historical and current distribution.
301	Do riparian plant community characteristics differ between Tamarix (L.) invaded and uninvaded sites on the upper Verde River, Arizona?	Johnson, T.D., Kolb, T.E., & Medina, A.L.	2010	Biological Invasions, Vol. 12, No. 8	1997-2007	This study sought to determine whether riparian vegetation characteristics differed between sites where Tamarix was present and sites where Tamarix was absent during the invasion of the upper Verde.
302	Herpetofauna associated with arroyos and uplands in foothills of the Chihuahuan Desert	Jorgensen, E.E., & Demarais, S.	1998	The Southwestern Naturalist, Vol. 43, No. 4	1993-1994	We studied herpetofaunal habitat associations of arroyos and uplands in foot- hills of the Sacramento Mountains in the Tularosa Valley
303	Life History and Ecology of the Humpback Chub in the Little Colorado and Colorado Rivers of the Grand Canyon	Kaeding, L.R., & Zimmerman, M.A.	1983	Transactions of the American Fisheries Society, Vol. 112, No. 5	1980	Discusses the life history and ecology of the humpback chub in the Little Colorado and Colorado Rivers and possible reasons of migration to the first one.
304	The importance of Colorado River flow to nursery habitats of the Gulf corvina (Cynoscion othonopterus)	Rowell, K., Flessa, K.W., Dettman, D.L., Roman, M,	2005	Canadian Journal of Fisheries and Aquatic Sciences 62 (12): 2874-2885	1997,1998, 2000-2002	We test the hypothesis that Colorado River flow is important in providing nursery habitat for the Gulf Corvina (Cynoscion othonopterus), a commercially valuable and endemic fish in the upper Gulf of California. We use oxygen isotopes in otoliths to determine when these fish inhabit isotopically different bodies of water (Gulf of California versus the Colorado Estuary). Our results support the hypothesis that declines in commercial landings can be at least partially attributed to reduced river flow. Increased flow would increase nursery habitat and likely benefit recruitment
305	Untying the gordian knot: Negotiated strategies for protecting instream flows in Texas	Kaiser, R.A., & Binion, S.	1998	Nat. Resources J. Vol. 38		The article explores stakeholder satisfaction with current instream flow practices and outlines, through a preferences and feasibility analysis, those strategies favored by stakeholders.
306	Restoration of Rio Grande cutthroat trout Oncorhynchus clarkii virginalis to the Mescalero Apache Reservation.	Kalb, B.W., & Caldwell, C.	2014	U.S. Fish and Wildlife Service. Cooperator Science Series. Report #111-2014	2010-2012	The goal of this project was to assess the suitability of the Rio Ruidoso within the Mescalero Apache Reservation to support a self-sustaining RGCT population by conducting a systematic and comprehensive survey.
307	Tree production in desert regions using effluent and water harvesting	Karpiscak, M.M., & Gottfried, G.J.	2000	USDA Forest Service Proceedings RMRS-P-13	1997-1998	Assess the potential of growing trees using mixtures of effluent and potable water in Arizona. Initial results show high survival of analyzed species.
308	Penaeid shrimp landing in the upper Gulf of California in relation to Colorado River freshwater discharge	Galindo-Bect, M.S., Glenn, E.P., Page, H.M., Fitzsimmons K., Galindo-Bect, L.A., Hern&ez-Ayon, J.M., Petty, R.L., Garcia-Hern&ez, J., Moore, D.	2000	Fisheries Bulletin 98:222–225	1977-1996	Analysis of Colorado RIver flows into the delta vis a vis shrimp catch in the gulf

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
309	Dead delta's former productivity: Two trillion shells at the mouth of the Colorado River	Kowalewski, M., Avila Serrano, G.E., Flessa, K.W., Goodfriend, G.A.	2000	Geology 28 (12) p. 1059–1062	1999-2000	At least 2 × 10^12 shells of bivalve mollusks make up the current beaches and islands of the delta. The 125 individual valves dated using 14C-calibrated amino acid racemization indicate that these shells range in age from A.D. 950 to 1950. The most conservative calculation based on these numbers indicates that during the time of natural river flow, an average standing population of ~6 × 10^9 bivalve mollusks (population density ~50/m2) thrived on the delta. In contrast, the present abundance of shelly benthic macroinvertebrates is ~94% lower (3/m2in 1999–2000).
310	Biology, Ecology, and Management of Russian Olive in Western North America	Katz, G.L., & Shafroth, P.B.	2003	Wetlands, Vol. 23, No. 4	NA	This paper reviews the pertinent scientific literature in order to determine the status of E. angustifolia as riparian invader and to suggest ecological reasons for its success.
311	Linkages between primary seed dispersal, hydrochory and flood timing in a semi-arid region river	Kehr, J.M., Merritt, D.M., & Stromberg, J.C.	2001	Journal of Vegetation Science, Vol. 25, No. 1	2009	Investigated the relation between seed release and hydrochory of riparian plants coupled with seasonal flood pulses for a river with bimodal flows
312	Chapter 5: WIldlife and Biological Resources	Ch&ra, S., Abella, S.R., Albrecht, B.A.et al	2013	A synthesis of aquatic science for management of Lakes Mead and Mohave. USGS Circular 1381	NA	Comprehensive summary of wildlife and biological resources for Lakes Mead and Mohave. Provides an overview of the food web, summarizes information on aquatic and aquatic-dependent wildlife and discusses biological diversity.
313	Water Management in the Binational Texas/Mexico Rio Grande/Rio Bravo Basin	Kelly, M.	2001	Texas Center for Policy Studies, Vol. 44	NA	Describes the water management challenges between the US and Mexico at the Rio Grande/Bravo basin.
314	Ecological Condition Assessments of California's Perennial Wadeable Streams: Highlights from the Surface Water Ambient Monitoring Program's Perennial Streams Assessment (PSA) (2000-2007).	Ode, P.R., Kincaid, T.M., Fleming, T., Rehn, A.C.	2011	California Perennial Streams Assessment: A collaboration between the State Water Resources Control Board's Nonpoint Source Pollution Control Program (NPS Program), Surface Water Ambient Monitoring Program (SWAMP), California Department of Fish and Game Aq	2000-2007	Multi-year inter-agency study sought to monitor water quality affecting aquatic resources in wadeable perennial streams in California, with particular emphasis on probability survey designs and biological condition indicators/biological endpoints to guide more efficient and effective monitoring efforts over time.
315	Eradication of invasive Tamarix ramosissima along a desert stream increases native fish density	Kennedy, T.A., Finlay, J.C., & Hobbie, S.E.	2005	Ecological Applications, Vol. 15, No. 6	1998	We quantified the response of aquatic consumers to large scale saltcedar removal and identified the mechanism underlying consumer response to the removal.
316	Regulation leads to increases in riparian vegetation, but not direct allochthonous inputs, along the Colorado River in Grand Canyon, Arizona	Kennedy, T.A., & Ralston, B.E.	2012	River Research and Applications, Vol. 28, No. 1		We developed a novel method for estimating direct allochthonous that utilized a GIS vegetation map, empirical and literature-derived litter production data for the dominant vegetation types, and virtual shorelines of annual peak discharge.
317	Valuing recreation and environmental flows in the Colorado River Delta utilizing contingent valuation method	Kerna, A.	2012	University of Arizona. M.S. Thesis		The goal of this contingent valuation methodology study is to determine visitors willingness to pay for a guaranteed source of water needed to sustain the Colorado River Delta's ecosystem.
318	Site Preferences and Community Characteristics of Cupressus arizonica Greene (Cupressaceae) in Southeastern Arizona	Parker, A.J.	1980	The Southwestern Naturalist, Vol. 25, No. 1, p. 9-21		Environmental and compositional data from Cupressus arizonica Greene stands are used to establish site preference patterns and community characteristics of C. arizonica.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
319	Middle Rio Grande ecosystem : bosque biological management plan - The first decade: a review and update	Robert, L.	2005	Aurora Publishing, LLC	1990-2005	Detailed overview of the physical and social history of the Bosque in the Middle Rio Grande.
320	Middle RIo Grande Ecosystem: Bosque Biological Management Plan	Crawford, C.S., Cully, A.C., Leutheuser, R., Sifuentes, M.S., White, L.H., Wilber, J.P.	1993	Middle Rio Grande Biological Interagency Team	1993	Comprehensive summary of recommendations for management of the middle Rio Grande Bosque ecosystem. Recommendations describe the need to maintain the natural hydrograph and have localized flooding (for example) but do not provide quantified recommendations
321	Nutrient resorption in shrubs growing by design, and by default in Chihuahuan Desert arroyos	Killingbeck, K., & Whitford, W.	2001	Oecologia, Vol. 128, No. 3	1994	To explore the variability in resorption among species cohabiting arroyo margins we measured nitrogen (N) and phosphorus (P) resorption efficiency and proficiency in six winter-deciduous shrub species that grow in arroyos in southern New Mexico.
322	Bendway weirs: Could they create habitat for the endangered Rio Grande silvery minnow	Kinzli, K.-D., & Myrick, C.A.	2010	River Research and Applications, Vol. 26, No. 7	NA	We conducted a theoretical study on the flow conditions created by bendway weirs to determine if it is possible to create physical habitat for Rio Grande silvery minnow while simultaneously protecting the riverbank.
323	Desired future condition: Fish habitat in southwestern riparian-stream habitats	Rinne, J.N.	1996	Desired future conditions for Southwestern riparian ecosystems: Bringing interests and concerns together	1993-1994	An analysis of habitat components important to native fishes was made based on the literature, case histories, and unpublished and observational data. Results suggest a natural, surface water hydrograph and lack of introduced species of fishes being the two most critical habitat components delimiting sustainability of native fishes in the Southwest. Vegetation. channel characteristics and instream hydrological features (i.e. depth, velocity, and substrate) are important in distribution and sustainability of native fishes but secondary to the first two and are more important or relevant as management activities affect them
324	Predicting velocity in bendway weir eddy fields	Kinzli, K.-D., & Thornton, C.I.	2010	River Research and Applications, Vol 26, No. 7	NA	A physical model of a reach of the MRG was constructed to develop empirical design equations for eddy velocities in bendway weir fields.
325	Physical habitat use by loach minnow Tiaroga cobitis (pisces: cyprinidae) in southwestern desert streams	Rinne, J.N.	1989	The Southwestern Naturalist 34(1):109-117		Description of habitat and requirements for Loach Minnow through study in Aravaipa Creek. Differential use of physical habitat by Tiaroga relative to stream size, in part, reflects habitat variability and availability. It further suggests that Tiaroga is widely adaptable to varying physical habitat across its range
326	Vulnerability of species to climate change in the Southwest: terrestrial species of the Middle Rio Grande	Friggens, M.M., Finch, D.M., Bagne, K.E., Coe, S.J., Hawksworth, D.L.	2013	General technical report RMRS-GTR-306	NA	We used a vulnerability scoring system to assess the vulnerability of 117 vertebrate species that occur in the Middle Rio Grande Bosque (MRGB) to expected climate change. The purpose of this project was to guide wildlife managers on options and considerations for climate change adaptation. The 117 species occur regularly in the MRGB during the breeding season, winter, or year-round. In general, future climate scenarios predict warmer temperatures with an altered precipitation regime that will likely lead to reduced water levels in the MRGB. This assessment points to several key issues relating to future habitat changes and individual species physiology that are expected to affect species survival under climate change. Riparian-dependent species received some of the highest vulnerability scores. Species already at the southern limit of their distributional range were also predicted to be more likely to be vulnerable to climate change. We review the specific implications of climate change for wildlife in the MRGB in order to identify intervention points and approaches that may achieve management goals

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
327	Ecological flows in New Mexico -- It has been done	Oglesby, A.	2009	The Nature Conservancy presentation	NA	Summary of federally managed ecological flows and water rights on selected rivers in New Mexico
328	Estimating recruitment dynamics and movement of rainbow trout (Oncorhynchus mykiss) in the Colorado River in Grand Canyon using an integrated assessment model	Korman, J., Martell, S.J.D., Walters, C.J., Makinster, A.S., Coggins, L.G., Yard, M.D., & Persons, W.R.	2012	Canadian Journal of Fisheries and Aquatic Sciences, Vol. 69, No. 11	1990-2010	We used an integrated assessment model to examine effects of flow from Glen Canyon Dam, Arizona, USA, on recruitment of nonnative rainbow trout in the Colorado River and to estimate downstream migration from Glen Canyon to Marble Canyon.
329	Associations of small migratory and resident birds with two scrub habitats during late winter and spring in the northern Chihuahuan Desert, New Mexico	Kozma, J.M., Burkett, L.M., & Matthews, N.E.	2012	The Southwestern Naturalist, Vol. 57, No. 1	1993-1997	We used mist nets to survey small migrant and resident birds of scrub habitats in arroyos and adjacent uplands of the northern Chihuahuan Desert.
330	Breeding bird communities and nest plant selection in Chihuahuan Desert habitats in south-central New Mexico	Kozma, J.M., & Matthews, N.E.	1997	The Wilson Bulletin, Vol. 109, No. 3	1993-1995	We examined the significance of arroyo-riparian habitat to birds in the Chihuahuan Desert of south-central New Mexico.
331	Mojave River Vole	Laabs, D.	1998	Biosearch Wildlife Surveys	NA	Describes natural history, characteristics, distribution, habitats, threats and biological standards of the Mojave River Vole.
332	Connectivity in Desert Aquatic Ecosystems: The Devils Hole Story	Riggs, A.C., Deacon, J.E.	2002	Conference Proceedings. Spring-fed Wetlands: Important Scientific and Cultural Resources of the Intermountain Region.	NA	Detailed history of the human and scientific study aspects of Devils Hole. Provides a summary of the conflict, the prehistoric genesis of the spring and the pupfish. Describes the habitat and complexities of the pupfish's survival in Devil's Hole.
333	Development of a Shared Vision for Groundwater Management to Protect and Sustain Baseflows of the Upper San Pedro River, Arizona, USA	Richter, H.E., Gungle, B., Lacher, L.J., Turner, D.S., Bushman, B.M.	2014	Water (6): 2519-2538	NA	Included for human aspects. Description of San Pedro River consortium of 23 agencies, business interests, and non-governmental organizations and how they pooled their collective resources to develop the scientific understanding and technical tools required to optimize the management of a complex, interconnected groundwater-surface water system. After groundwater modeling results suggested that strategic near-stream recharge could reasonably sustain baseflows at or above 2003 levels until the year 2100, even in the presence of continued groundwater development, a group of collaborators worked for four years to acquire 2250 hectares of land in key locations along 34 kilometers of the river specifically for this purpose.
334	Dam Impacts on and restoration of an alluvial river - Rio Grande, New Mexico	Richard, G.Julien, P.	2003	International Journal of Sediment Research, Vol. 18, No. 2, pp. 89-9	1918-2001	The wealth of pre and post-regulation data on the Middle Rio Grande, New Mexico, provides an excellent case study of river regulation, channel adjustments, and restoration efforts. Prior to dam construction, the Rio Grande was a wide, sandy, and braided river. Following dam construction, the downstream channel bed degraded and coarsened to gravel size, and the planform shifted to a more meandering pattern. Ecological implications of the geomorphic changes include detachment of the river from the floodplain, reduced recruitment of riparian cottonwoods, encroachment of non-native saltcedar and Russian olive into the floodplain, and degraded aquatic habitat for the Rio Grande silvery minnow.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
335	Abandoned floodplain plant communities along a regulated dryland river	Reynolds, L.V., Shafroth, P.B., House, P.K.	2014	River Research and Applications 30: 1084–1098		Using a hydraulic flow model, geomorphic mapping and field surveys, we addressed the following questions along the Bill Williams River, Arizona: (i) What percent of the bottomland do abandoned floodplains comprise? and (ii) Are abandoned floodplains quantitatively different from adjacent xeric and riparian surfaces in terms of vegetation composition and surface sediment? We found that nearly 70% of active channel and floodplain area was abandoned following dam installation. Abandoned Floodplains along the Bill Williams River tend to be similar to each other yet distinct from neighbouring habitats: they have been altered physically from their historic state, leading to distinct combinations of surface sediments, hydrology and plant communities.
336	Annual Ground-water Discharge by Evapotranspiration from Areas of Spring-fed Riparian Vegetation Along the Eastern Margin of Death Valley, 2000-02	Laczniak, R.J., Smith, J.L., & DeMeo, G.A.	2006	USGS Scientific Investigations Report 2006–5145	2000-2002	Describes the procedures used to develop estimates of ground-water discharge for the Grapevine Springs area and the amount of ground water being evaporated and transpired by local riparian vegetation at the major spring-discharge areas along the eastern margin of Death Valley.
337	Summary report of responses of key resources to the 2000 low steady summer flow experiment, along the Colorado River downstream from Glen Canyon Dam, Arizona	Ralston, B.E.	2011	USGS Open-File Report 2011–1220	2000	Summary of results from the 2000 low steady summer flow experiment. Concludes that changes in flow were not sufficiently different from regular dam operations to have immediate (w/in one year) impacts on Humpback chub habitat/status
338	The" forgotten river" of the Rio Grande/Rio Bravo: Investigation into the reclamation of an arid riparian ecosystem	L&is, M.E.	2001	University of Texas at El Paso		Investigates the feasibility of utilizing a Riparian Restoration Reservoir to mimic the natural flow patterns for this segment of the Rio Grande. By storing 30,000 acre-feet of these winter flows for release in June, a hydrographic flow regime could be produced which mirrors the annual flow pattern originally present in this reach of the Rio Grande.
339	Hydrologic, abiotic and biotic interactions: plant density, wind speed, leaf size and groundwater all affect oak water use efficiency	Law, D.J., & Finch, D.M.	2011	Ecohydrology, Vol. 4, No. 6	2008-2007	We determined whether groundwater associated with intermittent and/or ephemeral streams can be within a meter of the soil surface and therefore support certain riparian species , how often groundwater remains within 1 meter of the soil surface, if plants associated with these streams are more or less water use efficient and how plant diversity interacts with groundwater.
340	State-and-Transition Prototype Model of Riparian Vegetation Downstream of Glen Canyon Dam, Arizona	Ralston, B.E., Starfield, A.M., Black, R.S., Van Lonkhuyzen, R.A.	2014	U.S. Geological Survey Open-File Report 2014-1095	NA	Frame-based, state-and-transition models of riparian vegetation for reattachment bars, separation bars,and the channel margin found on the Colorado River downstream of Glen Canyon Dam were constructed using information from the literature. The models described here include seven community states and five dam operations that cause transitions between states. Each model divides operations into growing (April–September) and non-growing seasons (October–March) and incorporates upper and lower bar models, using stage elevation as a division. The inputs (operations) can be used by stakeholders to evaluate flows that may promote dynamic riparian vegetation states, or identify those flow options that may promote less desirable states (for example,Tamarisk [Tamarix Sp.]temporarily flooded shrubland).This prototype model, although simple, can still elicit discussion about operational options and vegetation response

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
341	Distribution and Status of the Chihuahua Chub (Teleostei: Cyprinidae: Gila nigrescens), with Notes on Its Ecology and Associated Species	Propst, D.L., Stefferud, J.A.	1994	The Southwestern Naturalist 39(3):224-234	1987-1991	Surveys in the historic range of the Chihuahua chub, Gila nigrescens (Girard) (Mimbres River in New Mexico, Guzmin and Laguna Bustillos basins in Chihuahua, Mexico) during 1987- 1991 documented current distribution and status, life history attributes and habitat, and factors contributing to the decline of the species. The Chihuahua chub has decreased dramatically in range and abundance during the past century, and is now comparatively common only in remote areas relatively free of habitat modification.
342	Natural flow regimes, nonnative fishes, and native fish persistence in arid-land river systems	Propst, D.L., Gido, K.B., Stefferud, J.A.	2008	Ecological Applications, Vol. 18, No. 5 pp. 1236-1252		By evaluating a 19-year data set across six sites in the relatively unaltered upper Gila River basin, New Mexico, USA, we tested how natural flow regimes and presence of nonnative species affected long-term stability of native fish assemblages. Overall, we found that native fish density was greatest during a wet period at the beginning of our study and declined during a dry period near the end of the study. Nonnative fishes, particularly predators, generally responded in opposite directions to these climatic cycles. Our data suggested that chronic presence of nonnative fishes, coupled with naturally low flows reduced abundance of individual species and compromised persistence of native fish assemblages. We also found that a natural flow regime alone was unlikely to ensure persistence of native fish assemblages. Rather, active management that maintains natural flow regimes while concurrently suppressing or excluding nonnative fishes from remaining native fish strongholds is critical to conservation of native fish assemblages in a system, such as the upper Gila River drainage, with comparatively little anthropogenic modification.
343	Habitat Selection by Riparian Songbirds Breeding in Southern Arizona	Powell, B.P., Steidl, R.J.	2002	The Journal of Wildlife Management, Vol. 66, No. 4 pp. 1096-1103	1997-1998	We quantified patterns of nest-site selection of 7 species in a riparian songbird community (n = 162 nests) at 2 spatial scales in southeastern Arizona, USA. We compared vegetation characteristics at nests to points chosen at random both near each nest (nest-patch scale) and within the entire study area (canyon scale). At the nest-patch scale, riparian vegetation-particularly Arizona sycamore (Platanus wrightii) and netleaf hackberry (Celtis reticulata)-was selected strongly by most species. At the canyon scale, most species nested in areas with higher vegetation density and volume than available at random.
344	Habitat fragmentation and modifications affecting distribution of the Rio Grande silvery minnow	Porter, M.D., Massong, T.M.	2004	GIS/Spatial Analyses in Fishery and Aquatic Sciences	1996-2001	This research uses ArcMap (Environmental Systems Research Institute - ESRI) to analyse the interactions of diversion and mainstem dams on river channel geomorphology, silvery minnow populations and habitat to provide insights for designing restoration projects. The objective of this study is development of a spatial model using population indicators for silvery minnows to evaluate ecological parameters that may affect recovery of this endangered minnow species. Spatial analyses examine habitat fragmentation by diversion dams, water quality as a population limiting factor, and preliminary habitat features for silvery minnow egg and larvae nursery areas as potential variables in a spatial habitat model.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
345	Integrating Environmental Flows into Multi-Objective Reservoir Management for a Transboundary,Water-Scarce River Basin: Rio Grande/Bravo	Porse, E.C., S&oval-Solis, S., Lane, B.A.	2015	Water Resources Management 29:2471-2484		We analyzed reservoir operation strategies in the Rio Grande basin to integrate environmental flow (EF) considerations into existing management objectives using a linear programming model to assess reservoir operation policies. Five potential EF regimes are evaluated for improving aquatic and riparian habitat in the Big Bend region. The model uses the historical hydrologic record of river inflows, data for flood control and bi-national water allocation requirements, and parameters for human demands and infrastructure; to compare current and optimized operations of Luis L. Leon reservoir for multiple objectives. Results indicate that alternative operational policies for monthly reservoir storage (compared to historic values) can increase EF allocations without affecting water deliveries or treaty allocations. Some tradeoffs may exist, however, in managing reservoirs for both EFs and flood control.
346	Response of the Shrimp Population in the Upper Gulf of California to Fluctuations in Discharges of the Colorado River	Perez-Arvizu, E.M., Aragon-Noriega, E.A., Espinosa Carreon, L.	2009	Crustaceana, Vol. 82, No. 5, pp. 615-625	1995-2002	In this study, a relationship was determined between the Colorado River freshwater discharge, the abundance of blue shrimp, Litopenaeus stylirostris (Stimpson, 1874) postlarvae, and the density of adult shrimp in the Upper Gulf of California (UGC). Data on Colorado River flow from 1904 to 2002, blue shrimp postlarvae from 1993 to 1997, and records of daily catches from pangas (small boats) of the commercial fleet operating in UGC from 1995 to 2002, were analysed. Catch per unit effort (CPUE) was used as a measure of the average daily density of adult shrimp. Two groups of CPUE and postlarvae abundance were found, with significant differences between them. The highest population density was observed in the years when the river flow was greater than 80 m3/s .We conclude that the response of the shrimp population is nonlinear and that postlarvae abundance and commercial fleet CPUE increased during the years in which freshwater discharge was highest, possibly because habitat volume and therefore food availability increased.
347	Comparative growth and consumption potential of rainbow through and humpback chub in the Colorado River, Grand Canyon, Arizona under different temperature scenarios	Paukert, C.P., Petersen, J.H.	2007	The Southwestern Naturalist, 52(2):234-242	NA	We used bioenergetics models for humpback chub, Gila cypha, and rainbow trout,Oncorhynchus mykiss, to examine how warmer water temperatures in the Colorado River, Grand Canyon, Arizona, through a proposed selective withdrawal system (SWS) at Glen Canyon Dam, would affect growth, consumption, and predation rates. Consumption by the rainbow trout population was at least 10 times higher than by the smaller humpback chub population. Water temperature increases of 6C during autumn increased growth of humpback chub and likely increased their survival by reducing the time vulnerable to predation. Water temperature increases caused by drought in 2005 did not alter humpback chub growth as much as the SWS. Increased temperatures might cause changes to the invertebrate community and the distribution and abundance of other warmwater nonnative fishes.
348	Habitat use of the Rio Grande silvery minnow (Hybognathus Amarus) during a long-term flood pulse in the Middle Rio Grande, New Mexico	Magana, H.A.	2012	Environmental Biology of Fish 95:210-212	2005	This study documents habitat selection by larval fishes in a restored floodplain in the Rio Grande, NM. Larval fishlight traps captured 394 larvae representing four cyprinid species (Pimephales promelas, H. amarus,Cyprinella lutrensis and Cyprinus carpio). Results for CCA indicate that Hybognathus amarus prefer shallow, low velocity habitats. A general linear model indicated that only depth and velocity were significantly different among the species.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
349	Streamflow requirements for cottonwood seedling recruitment - an integrative model	Mahoney, J.M., Rood, S.B.	1998	Wetlands, Vol 18, No. 4	NA	This paper describes the 'recruitment box,' an integrative model that defines the stream stage patterns that enable successful establishment of riparian cottonwood seedlings.
350	Quantifying ichthyofaunal zonation and species richness along a 2800-km reach of the Rio Chama and Rio Grande (USA)	McGarvey, D.J.	2011	Ecology of Freshwater Fish 20, 231-242	NA	Several studies have documented zonation within the Rio Grande, but this is the first to quantitatively test the zonation hypothesis along a continuous 2800-km river profile, extending from the Rio Chama headwaters to the Gulf of Mexico. Using a large, multi-source dataset, I detected three ichthyofaunalzones: a high gradient (▯1.5%) ‘upper’ zone, a moderate gradient (▯0.2%) ‘middle’ zone and a low gradient (<0.1%)‘lower’ zone. Species richness was lowest in the upper zone and highest in the lower zone, and all zones containedlarge numbers of nonnative species. However, species richness did not accumulate in a consistent, downstream manner. Instead, it tracked local-scale changes in mean annual discharge. This demonstrates the strong effect of river regulation and irrigation withdraws on fish diversity in the Rio Grande
351	Riparian vegetation dynamics and evapotranspiration in the riparian corridor in the delta of the Colorado River, Mexico	Nagler, P.L., Glenn, E.P., Hinojosa-Huerta, O., Zamora, F., Howard, K.	2007	Journal of Environmental Management 88 (2008) 864–874	2000-2004	We conclude that the riparian ET is supported mainly by the shallow regional aquifer, derived from agricultural return flows, that approaches the surface in the riparian zone. Nevertheless, surface flows are important in germinating cohorts of native trees, in washing salts from the soil and aquifer, and in providing aquatic habitat, thereby enriching the habitat value of the riparian corridor for birds and other wildlife.
352	Ecological condition of the East Fork of the Gila River and selected tributaries: Gila National Forest, New Mexico	Ohmart, R.D.	1995	United States Department of Agriculture Forest Service General Technical Report RM		An assessment of the ecological condition of the East Fork of the Gila River and its major tributaries in New Mexico is provided which documents the heavily degraded riparian habitat, with a focus on anthropogenic causes and the potential for recovery to proper functioning condition with management intervention.
353	Evaluation of Simulations to Understand Effects of Groundwater Development and Artificial Recharge on Surface Water and Riparian Vegetation, Sierra Vista Subwatershed, Upper San Pedro Basin, Arizona	Leake, S.A., & Gungle, B.	2005	USGS Open File Report 2012–1206		This report evaluates the use of the USGS groundwater flow model of Pool and Dickinson (2007). Provides a general information on effects of groundwater pumping and artificial recharge on connected surface water and evapotranspiration.
354	Water Supply Analysis for Restoring the Colorado River Delta, Mexico	Medellin-Azuara, J., Lund, J.R., Howitt, R.E.	2007	Journal of Water Resources Planning and Management 133:5	NA	This paper employs an economic-engineering optimization model to explore water supply options for environmental restoration of the Colorado River Delta, Mexico. Potential water sources include reductions in local agricultural and urban water use through water markets, wastewater reuse, and additional Colorado River flows from the United States. For these alternatives, the optimization model estimates operating and water scarcity costs, water scarcity volumes, and marginal economic costs of environmental flows and values of additional Colorado River flows from the United States over a range of required delta environmental flows.
355	Importance of groundwater depth, soil texture and rooting depth on arid riparian evapotranspiration	Moayyad, B.	2001	Thesis: New Mexico Institute of Mining and Technology	UNK	Study of evapotranspiration rates of cottonwood/willow and tamarisk at the bosque del apache refuge in NM. Findings include: groundwater depth is most strongly correlated to ET rate, fine soils hold more water and allow for more ET, and deeper rooted vegetation transpires more than shallow rooted vegetation.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
356	The Humpback Chub of Grand Canyon	Van Haverbeke, D.R.	2010	Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2008	2001-2008	The U.S. Fish and Wildlife Service (USFWS) conducts research on humpback chub in the Little Colorado River in Grand Canyon. Scientists documented a substantial decline of humpback chub during the 1990s, but recent efforts show them making a comeback. In the past 2 years, the numbers of spawning adults and year-round residents in the Little Colorado River have significantly increased. The USFWS also conducts a project involving translocation. Since 2003, juvenile humpback chub have been moved from lower reaches of the Little Colorado River to previously unoccupied habitat higher in the watershed. Some of the fish have remained where relocated, displayed high growth rates, and may be partially contributing to the overall increase in population size of humpback chub.
357	Evaluating Effects of a High-Flow Event on Rainbow Trout Movement in Glen and Marble Canyons, Arizona, by Using Acoustic Telemetry and Relative Abundance Measures	Hilwig, K.D., Makinster, A.S.	2010	Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2008	2008	In March 2008, the Department of the Interior conducted a high-flow event (HFE) This study evaluated the impact of the HFE on movement of adult and juvenile rainbow trout (Oncorhynchus mykiss) in Lees Ferry. We determined that rainbow trout relative abundance indices were similar before and after the HFE. Acoustic tagged rainbow trout did not appear to displace downstream, and relative movement was similar before and after the HFE. Other evidence suggests that populations of young rainbow trout (age-0 and age-1 less than 100 millimeters) were not impacted by the March 2008 HFE. However, a threefold decrease in population size of young rainbow trout was observed during the November 2004 HFE. These data suggest the need for further studies to track the fate of young rainbow trout and other environmental and temporal factors that may cause movement during future HFEs.
358	Water Velocity of the Colorado River: Implications for Native Fishes	Magirl, C.S., Andersensen, M.E.	2010	Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2009	NA	The native aquatic biota in bedrock-controlled reaches of the Colorado River and its tributaries evolved in highly variable conditions of streamflow and habitat structure. This article summarizes the hydraulic data that have thus far been collected and suggests where future research is needed to better understand the interactions between aquatic ecology and hydraulics in the Colorado River
359	Economic Values for National Park System Resources Within the Colorado River Watershed	Duffield, J.W., Neher, C.J., Patterson, D.A.	2010	Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2010	2005	This paper provides a literature review of economic valuation studies of recreational use and other ecosystem services provided by National Park Service (NPS) resources in the Colorado River watershed. The available economic valuation estimates for these resources are not comprehensive, do not consider Tribal perspectives, and are generally dated

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
360	Diversity of terrestrial avifauna in response to distance from the shoreline of the Salton Sea	Mendelsohn, M.B., Boarman, W.I., Fisher, R.N., Hathaway, S.A.	2007	Journal of Arid Environments 68: 574–587	2001-2002	We performed point counts for landbirds and shorebirds monthly or every other month between March 2001 and February 2002 across a sampling grid of 35 points along the west edge of Salton Sea. We found that avian diversity (numbers of species and numbers per species) was dependent on proximity to the Sea. Diversity was at a maximum nearest the shore, and was significantly lower away from the Sea's edge, at all surveyed distances up to 1 km from the shore. Cover by the dominant shrubs on the study site also corresponded to proximity to the water's edge. Whereas one may hypothesize that the avian diversity patterns are caused by these differences in vegetation structure, our data did not support this. Future management schemes at the Salton Sea that include reductions of water sources should be carefully analyzed, so as to not jeopardize the terrestrial avifauna at this unique ecosystem.
361	An Assessment of Riparian Environmental Quality by Using Butterflies and Disturbance Susceptibility Scores	Nelson, S.M., Andersensen, D.C.	1994	The Southwestern Naturalist, Vol. 39, No. 2 (Jun., 1994), pp. 137-142	1992	The butterfly community at a revegetated riparian site on the lower Colorado River was compared to a reference riparian site. Data indicated that the herbaceous plant community, which was lacking in the revegetated site, was important to several butterfly taxa.
362	Simulated effects of groundwater pumping and artificial recharge on surface-water resources and riparian vegetation in the Verde valley sub-basin, central Arizona	Leake, S A., & Pool, D.R.	2012	USGS Open File Report 2010–5147		This report presents results for the upper two model layers of the Northern Arizona Regional Groundwater Flow Model by Pool and others to understand the effects of groundwater pumping on surface water flow and evapotranspiration at the Verde Valley sub-basin.
363	Assemblages of Rodents in Riparian Forests Along the Rio Grande in Big Bend National Park, Texas: Current and Historic Insights on the Effects of Invasion by Saltcedar	Leavitt, D.J	2012	The Southwestern Naturalist, Vol. 57, No. 2	2009-2010	Comparisons of assemblages of rodents along the Rio Grande in Big Bend National Park, Brewster County, Texas, were made using recent (2009–2010) and historic (1977) data to evaluate the effects of invasion by saltcedar.
364	Managed Flooding for Riparian Ecosystem Restoration	Molles, M.C., Crawford, C.S., Ellis, L.M., Valett, H.M., Dahm, C.N.	1998	BioScience,Vol. 48, No. 9	1991, 1993-1995	Study of the impact of flooding on the riparian ecosystem of the Rio Grande through Bosque del Apache in NM. Authors investigate ecological response to the restoration of flooding in three phases: the initial disconnected phase, represented in this study by the two dry control sites; a reorganization phase initiated by managed floods and represented in this study by the experimental flood site; and a steady-state phase that will approximate conditions prior to flood control, represented in this study by the natural flood site.
365	Water Use by Riparian Plants on the Lower Colorado River	Nagler, P.L., & Glenn, E.P.	2010	Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2008, Scottsdale, Arizona: coming together, coordination of science and restoration activities for the Colorado River ecosystem	2007-2008	We used sap-flow sensors to determine water use by saltcedar and other riparian species at six sites at Cibola National Wildlife Refuge in 2007 and 2008. We also measured leaf area index (LAI) and fractional ground cover (fc) of saltcedar stands.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
366	Does river regulation increase the dominance of invasive woody species in riparian landscapes?	Mortenson, S.G., Weisberg, P.J.	2010	Global Ecology and Biogeography,19, 562–574	1904-2007	We sampled the canopy cover of woody species on 179 point bars along seven non-dammed and thirteen dammed river segments. Wilcoxon rank sum tests were used to determine differences between flow parameters in dammed and undammed rivers and correlation analyses and generalized linear model comparisons to examine associations of flow parameters and canopy cover of native (Populus and Salix) and non-native (Tamarix and Elaeagnus) taxa. An index of flow alteration that was created using principal components analysis was regressed with vegetation cover.Tamarix cover was positively related to drainage area, flow constancy,August and May median flow and flow recession rate, but Elaeagnus cover was unrelated to flow variables.Rivers with a large drainage area and low flow variability are inherently more vulnerable to invasions.
367	Effects of flooding on native and exotic plant seedlings: implications for restoring south-western riparian forests by manipulating water and sediment flows	Levine, C.M., & Stromberg, J.C.	2001	The Southwestern Naturalist, Vol. 47, No. 3		We determined relative seedling growth success and survival thresholds of P. fremontii, S. gooddingii, B. salicifolia, and T. ramosissima in response to the physical fluvial processes of sediment burial and simulated scour and prescribed ecological methods for curtailing the spread of Tamarix and restoring native trees to dominance.
368	Odonata of Ash Meadows National Wildlife Refuge, Southern Nevada, USA	Stevens, L.E., Bailowitz, R.A.	2008	Journal of the Arizona-Nevada Academy of Science Vol. 40, No. 2	2004-2005	The Odonata of Ash Meadows National Wildlife Refuge (AMNWR) in southern Nevada were studied bimonthly in 2004 and 2005, revealing 32 species, a moderately high level of diversity for this relatively small, semi-isolated southern Nevada valley. Odonata larval density/m2 and overall species richness (but not Shannon-Weiner diversity) were highest in the largest AMNWR wetlands, regardless of whether they were natural or anthropogenic, and were greater in two restored springs.
369	Fish and Other Aquatic Resource Trends in the United States	Loftus, A.J., & Flather, C.H.	2000	U.S. Department of Agriculture, Forest Service		This report documents the general trends in fisheries and aquatic resources for the nation as required by the Renewable Resources Planning Act (RPA) of 1974. The report highlights major trends in water quality, specific fish populations, resource utilization, and imperiled aquatic fauna.
370	Riparian Vegetation of the Lower Rio Grande	Lonard, R.I., & Judd, F.W.	2002	The Southwestern Naturalist, Vol. 47, No. 3	1993-1995	Riparian vegetation was studied at 7 locations along the Rio Grande between the mouth of the river and Falcon Dam.
371	Restoration of the Rio Grande/Rio Bravo in the Juarez Valley: An analysis	Muniz, I., Salas Plata, J., Turner, C.	2005	UCWR Conference Proceedings	Unk	The main purpose of this work is to establish the basis for the ecological restoration of the Rio Grande/Rio Bravo in El Paso/Ciudad Juárez-Fort Quitman/Cajoncitos section. The methodology consists of the revision and analysis of the historic hydrological data and the water quality in this region to define a minimum ecological flow rate to the river, supported on hydrological studies; in addition, an inventory of flora and fauna will be made through an exhaustive bibliographical revision, interviews with officials of the Mexican government, representatives of water users of the Irrigation District 009, and people from the Juarez Valley, and field visits.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
372	Integrated Hydrologic-Economic-Institutional Model of Environmental Flow Strategies for Rio Yaqui Basin, Sonora, Mexico	Munoz-Hern&ez, A., Mayer, A.S., Watkins Jr., D.W.	2011	Journal of Water Resources Planning and Management Vol. 137, No. 2	1970-2003	An integrated hydrologic-economic-institutional water model was developed for the Rio Yaqui Basin, with the objective of assessing the impacts on agricultural economic benefits from strategies for allocating environmental flow. This paper focuses on the creation of simulation models that estimate the agricultural net benefits under different environmental flow scenarios and surface water allocation strategies. The results illustrate a trade-off between interannual variability of environmental flows and variability in agricultural benefits, corresponding to economic risk, for three allocation strategies. Results also show that environmental flow allocations affect groundwater levels through impacts on surface-groundwater interactions.
373	Restoration of Soldier Spring: an isolated habitat for native Apache trout	Long, J.W., Burnett, B.M., Medina, A.L., & Parker, J.L.	2004	Proceedings of the 16th International Conference, Society for Ecological Restoration		We treated an actively degrading stream that harbored a unique population of Apache trout using a combination of fencing to abate ungulate grazing, sedge transplants to speed recovery of degraded streambanks, and placement of rock riffle formations to stabilize the channel and restore aquatic habitat.
374	The riparianness of a desert herpetofauna	Lowe, C.H.	1989	California Riparian Systems Conference		Quantitative aspects of desertness, riparianness, species richness, non desert taxa are examined.
375	Evaluation of hydrologic and riparian resources in Saguaro National Park, Tucson, Arizona	Baird, K., MacNish, R., Guertin, D.P.	2000	Department of Hydrology and Water Resources, University of Arizona	UNK	
376	Recent records of Cycleptus in the Río Conchos, Chihuahua, Mexico	Lozano-Vilano, M.de L.	2010	The Southwestern Naturalist, Vol. 55, No. 2	2005-2006	We obtained samples of fish from three expeditions to the Rio Conchos were we found Cycleptus, an specie that was absent for 51 years.
377	What we know and don't know about amphibian declines in the West	Corn, P.S.	1994	USDA Forest Service, General Technical Report RM-247 (May 1994)		My objective for this review is to summarize the current knowledge of amphibian declines in the western United States.
378	The Middle Rio Grande Bosque: An Endangered Ecosystem	Crawford, C.S., Ellis, L.M., & Molles, M.C.	1996	New Mexico Journal of Science, Vol. 36		Ecological review of the Middle Rio Grande Bosque
379	A River Transformed: Historic Geomorphic Changes of the Lower Rio Grande in the Big Bend Region of Texas, Chihuahua, and Coahuila	Dean, D.J.	2009	Utah State University		Describes channel changes of the lower Rio Grande using remote sensing methods applied at several spatial and temporal scales.
380	Management of natural resources in riparian corridors.	Debano, L.F., Rinne, J.N., & Baker, M.B.	2003	Journal of the Arizona-Nevada Academy of Science, Vol. 35, No. 1		Describes management of existing riparian corridors and restoration concerns for the riparian habitats in Arizona and the Southwest.
381	Status of federal and state listed warmwater fishes of the Gila River basin, with recommendations for management	Desert Fishes Team	2003	Desert Fishes Team. Report Number 1	post 1967	Reviews the status of the twelve federal and state listed native warmwater fishes in the Gila River basin and the post 1967 recovery and conservation actions taken by all agencies, organizations, or parties. Includes recommendations for future actions for each species.
382	Status of unlisted native fishes of the Gila River basin, with recommendations for management	Desert Fishes Team	2004	Desert Fishes Team. Report Number 2	post 1967	Reviews the status of seven native warmwater fishes in the Gila River basin of central Arizona, southwestern New Mexico, and northern Sonora that are not listed under the federal Endangered Species Act.
383	Analysis of recovery plan implementation for threatened and endangered warmwater fishes of the Gila River basin	Desert Fishes Team	2006	Desert Fishes Team. Report Number 3		This report documents extent of implementation of existing recovery plans for the federally-listed warmwater fishes in the Gila River basin.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
384	Estimating Riparian and Agricultural Actual Evapotranspiration by Reference Evapotranspiration and MODIS Enhanced Vegetation Index	Nagler, P.L., Glenn, E.P., Nguyen, U., Scott, R.S., Doody, T.	2013	Remote Sensing 5, 3849-3871	2004-2007	We developed an algorithm for estimating actual evapotranspiration (ETa) based on the Enhanced Vegetation Index (EVI) from the Moderate Resolution Imaging Spectrometer (MODIS) sensor on the EOS-1 Terra satellite and locally-derived measurements of reference crop ET (ETo).
385	Economic valuation of environmental services sustained by water flows in the Yaqui River Delta	Ilija Ojeda, M., Mayer, A.S., Solomon, B.D.	2008	Ecological Economics 65: 155-166	2006	A contingent valuation survey in 40 neighborhoods in the most populated Delta city, Ciudad Obregon, was administered to estimate non-market values of instream uses. Respondents were given a current and hypothetical Delta scenario (the latter assumed restored water flows in the River) and asked a willingness-to-pay (WTP) questions regarding purchasing water for environmental flows through higher water bills. Results From 148 in-person interviews indicated that households would pay an average of 73 pesos monthly. WTP was found related to key variables suggested by economic theory and contingent valuation studies elsewhere: income, educational level, number of children in the household, and initial bid amount. These results will allow decision makers to compare the benefits generated by different water uses, including environmental services, and to manage scarce water resources under a long-term sustainable approach.
386	Functions and values of riparian habitat to wildlife in Arizona : a literature review	Ohmart, R.D., Zisner, C.	1993	Contract No. G30025-B, AZ Game and Fish Department	1950s-1993	Extensive literature review of features of riparian habitats that are important to wildlife. Note, because it is a literature review the data from the tables are not included within the database, these tables are, however, appended to the database.
387	Synthesis of ground and remote sensing data for monitoring ecosystem function in the Colorado River Delta, Mexico	Nagler, P.A., Glenn, E.P., Hinojosa-Huerta, O.	2009	Remote Sensing of Environment 113: 1473–1485	1999, 2002	We developed ground-validated, remote sensing methods to monitor the vegetation status, habitat value, and water use of wetland and riparian ecosystems using multi-temporal, multi-resolution images. The integrated methodology allowed us to project species composition, leaf area index, fractional cover, habitat value, and evapotranspiration over seasons and years throughout the delta, in response to variable water flows from the U.S. to Mexico.
388	Long-term decrease in satellite vegetation indices in response to environmental variables in an iconic desert riparian ecosystem:the Upper San Pedro, Arizona, United States	Nguyen, U., Glenn, E.P., Nagler, P.L., Scott, R.L.	2014	Ecohydrology, DOI 10.1002/eco.1529	1984-2012	We used satellite vegetation indices to quantify the green leaf density of the groundwater-dependent riparian forest from 1984 to 2012. Pre-monsoon (June) Landsat normalized difference vegetation index (NDVI) values showed a 20% drop for the northern reach ($P<0{\cdot}001$) and no net change for the southern reach ($P>0{\cdot}05$). NDVI and enhanced vegetation index values were positively correlated ($P<0{\cdot}05$) with river flows, which decreased over the study period in the northern reach, and negatively correlated ($P<0{\cdot}05$) with air temperatures in both reaches, which have increased by 1·4°C from 1932 to 2012.NDVI in the uplands around the river did not increase from 1984 to 2012, suggesting that increased evapotranspiration in the uplands was not a factor in reducing riverflows. Climate change, regional groundwater pumping, changes in the intensity of monsoon rain events and lack of overbank flooding are feasible explanations for deterioration of the riparian forest in the northern reach.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
389	Vegetation Response Following Invasive Tamarisk (Tamarix spp.) Removal and Implications for Riparian Restoration	Harms, R.S., Hiebert, R.D.	2006	Restoration Ecology Vol. 14, No. 3, pp. 461–472		Using a retrospective study of tamarisk removal sites across five states in the southwestern United States, we investigated (1) decreases in tamarisk cover; (2) the effects of tamarisk removal on vegetation; and (3) whether cutting or burning tamarisk has differing effects on plant communities. Our study provides an important first step in recognizing the effects of removing a dominant invasive species on meeting long-term goals of riparian restoration.We found that (1) both cutting and burning reduced mean tamarisk foliar cover by 82–95%, and this reduction was sustained over time. (2) Native foliar cover was 2- to 3-fold higher on tamarisk removal sites, but total foliar cover remained 60–75% lower than on control transects.No trend toward increases in native cover was noted overtime. Differences in diversity were found to be driven by differences in evenness; overall species richness did not change following tamarisk removal. Sites in the Mojave showed the strongest increase in native foliar cover and diversity, Chihuahuan-transition sites showed a slight increase, and sites on the Colorado Plateau showed no overall increase.Our research indicates that vegetation response to tamarisk removal is often negligible.
390	Texas Riparian Areas	Hardy, T.B., Davis, N.	2013	Texas Water Development Board	NA	Synthesis book of available information on riparian habitats across Texas. Majority of information, particularly regarding environmental flows is for areas outside of DLCC, however, specific information about Rio Grande species are included.
391	Environmental Flows Recommendations Report	Upper Rio Gr&e Basin & Bay Expert Science Team	2012	Final Submission to the Environmental Flows Advisory Group, Rio Grande Basin and Bay Area Stakeholders Committee, and Texas Commission on Environmental Quality	NA	The Upper Rio Grande BBEST (URG BBEST) study area includes the Rio Grande basin upstream of Amistad Reservoir and below Presidio, including the Pecos and Devils river basins. This report is written to provide a summary of the best available science regarding this reach of the Rio Grande and its tributaries. It includes river-specific definitions of a Sound Ecological Environment (SEE) and discussion of whether such an environment exists for specific river and tributary segments. It also includes environmental flow regime recommendations to sustain the SEE consistent with the Texas 80th legislature Senate Bill 3 Environmental Flows process.
392	Dynamic Human Landscapes of the Rio del Oso: Restoration and the Simulation of Past Ecological Conditions in The Upper Rio Grande Basin	Periman, R.D.	1999	USDA Forest Service Proceedings RMRS-P-7. 1999		Describes how prehistoric peoples have altered ecological processes and changed the vegetation and overall physiography of northern New Mexico's Rio del Oso Valley.
393	Simulation of Rio Grande Floodplain Inundation Using FLO-2D	O'Brien, J.S., & Fullerton, W.T.	1999	USDA Forest Service Proceedings RMRS-P-7. 1999		To predict flood-plain inundation, a two-dimensional flood routing model FLO-2D will be applied to various reaches of the Rio Grande. The model will be used to investigate the potential for limited overbank flooding along various reaches to enhance the natural functions of the bosque biological community and to increase opportunities for cottonwood tree germination.
394	Watershed/River Channel Linkages: the Upper Rio Grande Basin and the Middle Rio Grande Bosque	Whitney, J.	1999	USDA Forest Service Proceedings RMRS-P-7. 1999		Discusses demands of water management and allocation, and the relationship to ecological integrity of the Rio Grande riparian ecosystem.
395	How Great a Thirst? Assembling a River Restoration Toolkit	Harris, S.	1999	USDA Forest Service Proceedings RMRS-P-7. 1999		To restore the Rio Grande River's biologically troubled status we talk about a "toolkit" that holds authorities, knowledge, and skills needed to correct historical neglect and abuse.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
396	Effects of Livestock Grazing on Morphology, Hydrology and Nutrient Retention in Four Riparian/Stream Ecosystems, New Mexico, USA	Thibault, J.R., Moyer, D.L., Dahm, C.N., Valett, H.M., & Marshall, M.C.	1999	USDA Forest Service Proceedings RMRS-P-7. 2000	1997	Four streams were selected to determine the impact of moderate livestock grazing on morphology, solute transport, and nutrient retention.
397	Restoration Efforts in the Rio Grande Valley State Park	Linderoth, O.C.	1999	USDA Forest Service Proceedings RMRS-P-7. 2000		Techniques for native cottonwood (Populus fremontii) regeneration are being investigated in the Rio Grande Valley State Park. Experimentation with flooding of riparian zones using different techniques is beginning to show promising results
398	River Bar Vegetation Mowing Response in the Middle Rio Grande	Muldavin, E., Milford, E., & Chauvin, Y.	1999	USDA Forest Service Proceedings RMRS-P-7. 2000	1994	The Bureau of Reclamation routinely mows vegetation on side bars along the Rio Grande to assist with river flow management. To address the question of how such mowing affects vegetation composition and structure, three bars in the middle Rio Grande near Albuquerque, New Mexico were selected in 1994 for an experimental mowing program.
399	A Guide to managing, Restoring, and Conserving Springs in the Western United States.	Sada, D.W., Williams, J.E., Silvery, J.C., Anne, H., Ramakka, J., Summers, P., & Lewis, L.	2001	U.S. Department of the Interior Bureau of Land Management. Technical Reference 1737-17		The purpose of this technical reference is to provide information on the characteristics of springs in Western U.S. and to identify All Major Federal policies, Executive orders and legislation to direct management of aquatic and riparian habitats
400	Determinación de caudales ambientales para ríos de la cuenca del Río San Juan mediante la aplicación de métodos hidrológicos.	Martínez Zepeda, L.M.	2012	Universidad Autónoma de Nuevo León		Environmental flows were calculated for the San Juan river using hydrologic methods
401	Chapter 7: Groundwater and Surface Water Interactions in the Cliff-Gila Valley, NM	Soles, E.S., Cooper, M.S.	2014	Gila Flow Needs Assessment, The Nature Conservancy	2008-2012	The goal of this chapter is to identify the range of hydrologic conditions that currently sustain the ecological resilience and diversity of the Gila River and its associated vegetation communities.
402	Chapter 8. Riparian Vegetation of the Upper Gila River and Southwestern Streams	Kindscher, K.	2014	Gila Flow Needs Assessment, The Nature Conservancy	2008	This chapter provides an overview of riparian vegetation in the southwestern United States with emphasis on characteristics of vegetation in the Cliff-Gila Valley of the Gila River in New Mexico. More specifically, this work focuses on how these riparian corridors may be affected by future reductions in streamflow.
403	Chapter 9. Aquatic Invertebrates of the Cliff-Gila Valley, NM: Effects of Flow Regime on Invertebrate Community Structure	Bogan, M.T.	2014	Gila Flow Needs Assessment, The Nature Conservancy	NA	In this report, I discuss the relationships between physical habitat and flow and aquatic invertebrate communities in the Gila River. I focus on four factors, water temperature, reduced flow volume, snowmelt hydrology, and floodplain habitat dynamics that are most likely to be altered by flow diversions and climate change. Specifically, I address: 1) the effects of warmer water temperatures on aquatic invertebrates, 2) how anthropogenic flow reductions can alter benthic habitat conditions and invertebrate communities, 3) the effects of snowmelt-dominated flow regimes on benthic habitat conditions and invertebrates, and 4) how mosaics of floodplain habitats promote invertebrate biodiversity.
404	Chapter 10. Effects of Altered Flow Regimes and Habitat Fragmentation on Gila River Fishes	Turner, T.F., Propst, D.L.	2014	Gila Flow Needs Assessment, The Nature Conservancy	1988-2012	In this chapter, we assessed fish biodiversity patterns and relationships of physical habitat features and flow regime to fish abundance and distribution at local, reach-wide, and basin-wide scales in the Gila River Basin. We characterized local-scale relationships using a 25-year time series of annual fish community samples obtained from a permanent monitoring site in the Cliff-Gila Valley. Analyses revealed a critical threshold in the effect of mean spring discharge on fish densities.

Study Index	Article, Book, or Chapter Title	Authors	Date Published	Publication	Study Period	Summary
405	Chapter 11. Gila River Herpetofauna: Streamflow Regimes and Ecological Relationships	Gori, D.	2014	Gila Flow Needs Assessment, The Nature Conservancy	NA	Provides a summary of diet, habitat, breeding phenology, and flow needs for 10 herpetofauna: narrow-headed gartersnake, northern Mexican gartersnake, Sonoran mud turtle, nonnative bullfrog, Madrean alligator lizard, Gila spotted whiptail, Clark's spiny lizard, Great Plain's toad, and Woodhouse's toad
406	Chapter 12. Gila River Avifauna: Streamflow Regimes and Ecological Relationships	Walker, H.A.	2014	Gila Flow Needs Assessment, The Nature Conservancy	NA	In this chapter, I examined how the 59 riparian obligate bird species found in the Valley are associated with one of five habitat types that vary in presence of or proximity to surface water and wet soils.
407	Chapter 13. Riparian Mammals of the Gila River, New Mexico: Impacts of Flow	Frey, J.K.	2014	Gila Flow Needs Assessment, The Nature Conservancy	NA	Summary of key flow-ecology relationships for mammals in Gila River, New Mexico
408	Chapter 14. Workshop Outcomes: Ecological Response to Hydrologic Variability in the Gila River, Cliff-Gila Valley	Gori, D., Cooper, M.S., Lyons, D.	2014	Gila Flow Needs Assessment, The Nature Conservancy	NA	Results of an expert workshop to identify flow-ecology relationships for the Upper Gila River

Appendix C - Study Information by Study Author

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Albin Lane, B.A.	Environmental Flows in a Human-Dominated System: Integrated Water Management Strategies for the Rio Grande/Bravo Basin	2014	University of California, San Diego	124
AlexAndersen, K.A.	Facilitating Sustainable Use of the Rio Grande: A Social-Ecological Perspective	2012	Texas State University, San Marcos	126
Andersen, D.C., & Shafroth, P.B.	Beaver dams, hydrological thresholds and controlled floods as a management tool in a desert riverine ecosystem, Bill Williams River, Arizona	2010	Ecohydrology	32
Andersensen, D.C., Shafroth, P.B., Pritekel, C.M., & O'Neill, M.W.	Managed Flood Effects on Beaver Pond Habitat in a Desert Riverine Ecosystem, Bill Williams River, Arizona USA	2011	Wetlands, 31(2), 195–206.	94
Andersenson, A.A., Hubbs, C., Winemiller K.O., & Edwards R.J.	Texas freshwater fish assemblages following decades of environmental change	1995	The Southwestern Naturalist, Vol. 40, No. 3 (Sept., 1995), pp. 314-321	127
Andersenson, B.W., Hunter, W.C., & Ohmart, R.D.	Status changes of bird species using revegetated riparian habitats on the Lower Colorado River from 1977 to 1984	1988	California Riparian Systems Conference	128
Andersenson, D.	Are Cicadas (Diceroprocta apache) Both a "Keystone" and a "Critical-Link" Species in Lower Colorado River Riparian Communities?	1994	The Southwestern Naturalist, Vol. 39, No. 1 (Mar., 1994), pp. 26-33	122
Anderson	Chapter 7: Ecosystem Functioning	2006	Defining Ecosystem Flow Requirements for the Bill Williams River, Arizona; USGS Open-File Report	2
Anderson	Chapter 6: Streamflow Biota Relations	2006	Defining Ecosystem Flow Requirements for the Bill Williams River, Arizona; USGS Open-File Report	3
Anning, D.W., & Parker, J.T.C.	Predictive Models of the Hydrological Regime of Unregulated Streams in Arizona	2009	U.S. Geological Survey.	37
Archer, S.R., & Predick K.I.	Climate Change and Ecosystems of the Southwestern United States	2008	Society for Range Management	130
Arizona Department of Water Resources	Groundwater AMA Review Report	2005	Arizona Department of Water Resources	1
Atwood, J.L.	Speciation and Geographic Variation in Black-Tailed Gnatcatchers	1988	Ornithological Monographs, no. 42	289
Bagstad, K.J., Stromberg, J.C., & Lite, S.J.	Response of Herbaceous Riparian Plants to Rain and Flooding on the San Pedro River, Arizona, USA	2005	Wetlands, 25(1), 210–223	4
Bailey, I.A., Dixon, J.R., Hudson, R., & Forstner, M.R.J	Minimal genetic structure in the Rio Grande Cooter (Pseudemys Gorzugj)	2008	The Southwestern Naturalist, Vol. 53, No. 3 (Sept., 2008), pp. 406-411	133
Baird, K., MacNish, R., Guertin, D.P.	Evaluation of hydrologic and riparian resources in Saguaro National Park, Tucson, Arizona	2000	Department of Hydrology and Water Resources, University of Arizona	375
Baker, Jr.; Malchus B.	History of watershed research in the Central Arizona Highlands	1999	U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station	284
Bark, R.H., Osgood, D.E., Colby, B.G., Katz, G., & Stromberg, J.	Habitat preservation and restoration: Do homebuyers have preferences for quality habitat?	2009	Ecological Economics, 68(5), 1465-1475	5
Bark-Hodgins, R.H., Osgood, D.E., & Colby, B.G.	Remotely sensed proxies for environmental amenities in hedonic analysis: What does green mean?	2006	Environmental valuation: Interregional and intraregional perspectives	6
Barrios, E.J., Rodríguez-Pineda, J.A., & De la Maza Benignos, M.	Integrated river basin management in the Conchos River basin, Mexico: A case study of freshwater climate change adaptation	2011	Climate and Development, Vol. 1, No. 3	220
Bart, J., Dunn, L., & Leist, A.	A sampling plan for riparian birds of the Lower Colorado River-Final Report	2010	USGS Open FIle Report. 2010–1158.	282

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Bateman, H.L., Chung-MacCoubrey, A., & Snell, H.L.	Impact of Non-Native Plant Removal on Lizards in Riparian Habitats in the Southwestern United States	2008	Society for Ecological Restoration International	136
Bateman, H.L., Chung-MacCoubrey, A., Finch, D.M., Snell, H.L.& Hawksworth, D.L.	Impacts of Non-native Plant Removal on Vertebrates along the Middle Rio Grande (New Mexico)	2008	Ecological Restoration. Vol. 26, No. 3	176
Bateman, H.L., Harner, M.J., & MacCoubrey, A.C.	Abundance and reproduction of toads (Bufo) along a regulated river in the southwestern United States: Importance of flooding in riparian ecosystems	2008	Journal of Arid Environments	138
Bateman, H.L., MacCoubrey, A.C., Snell, H.L.& Finch, D.M.	Abundance and species richness of snakes along the Middle Rio Grande Riparian Forest in New Mexico	2009	Herpetological Conservation and Biology	139
Bateman, H.L., Merritt, D.M., Glenn, E.P., & Nagler, P.L.	Indirect effects of biocontrol of an invasive riparian plant (Tamarix) alters habitat and reduces herpetofauna abundance	2015	Biological Invasions, Vol. 17, No. 1	281
Bauer, J., Frye, R., & Spain, B.	A natural resource survey for proposed reservoir sites and selected stream segments in Texas	1991	Texas Parks and Wildlife Department, Austin, Texas	279
Beatley, J.C.	Phenological events and their environmental triggers in Mojave Desert ecosystems	1974	Ecology	143
Beauchamp, V.B., & Shafroth, P.B.	Floristic composition, beta diversity, and nestedness of reference sites for restoration of xeroriparian areas	2011	Ecological Applications, Vol. 21, No. 2	280
Beauchamp, V.B., & Stromberg, J.C.	Flow Regulation of the Verde River, Arizona, Encourages Tamarix recruitment but has minimal effect on Populus and Salix stand density	2007	Wetlands, 27(2), 381-389	7
Beauchamp, V.B., Stromberg J.C., & Stutz J.C.	Arbuscular mycorrhizal fungi associated with Populus- Salix stands in a semiarid riparian ecosystem	2006	New Phytologist	145
Belfit, S.C., & Belfit V.F.	Notes on the ecology of a population of Eumeces obsoletus (scincidae) in New Mexico	1985	The Southwestern Naturalist, Vol. 30, No. 1 (Nov., 1985), pp. 612-614	146
Berrens, R.P., Andersenton P., & Silva, C.L.	Valuing the Protection of Minimum Instream Flows in New Mexico	1996	Journal of Agricultural and Resource Economics , Vol. 21, No. 2	148
Berrens, R.P., Bohara, A.K., Jenkins-Smith, H., Silva, C.L., GAndersenton.P., & Brookshire, D.	A joint investigation of public support and public values: case of instream flows in New Mexico	1998	Ecological Economics, 68(5), 1465-1475	147
Berrens, R.P., Bohara, A.K., Silva, C.L., Brookshire, D., & McKee, M.	Contingent values for New Mexico instream flows: With tests of scope, group-size reminder and temporal reliability	2000	Journal of Environmental Management Vol. 58 (1)	149
Bestgen, K.R., & Propst, D.L.	Distribution, Status, and Notes on the Ecology of Gila robusta (Cyprinidae) in the Gila River Drainage, New Mexico	1989	The Southwestern Naturalist, Vol. 34, No. 3	276
Bestgen, K.R., Platania, S.P., Brooks, J.E., & Propst, D.L.	Dispersal and Life History Traits of Notropis girardi (Cypriniformes: Cyprinidae), Introduced into the Pecos River, New Mexico	1989	American Midland Naturalist, Vol. 122, No. 2	278
Bhattacharjee, J., Taylor, J.P., & Smith, L.M.	Controlled flooding and staged drawdown for restoration of native cottonwoods in the middle Rio Grande Valley, New Mexico, USA	2006	Wetlands, Vol. 25, No. 3	150
Bhattacharjee, J., Taylor, J.P., Smith, L.M., & Haukos, D.A.	Seedling competition between native cottonwood and exotic saltcedar: implications for restoration	2009	Biological Invasions, Vol. 11, No. 8	275
Blinn, D.W., & Ruiter, D.E.	Tolerance values of stream caddisflies (Trichoptera) in the lower Colorado River Basin, USA	2006	The Southwestern Naturalist, Vol 51, No. 3	274
Bock, C.E., & Bock, J.H.	Importance of sycamores to riparian birds in southeastern Arizona	1984	Journal of Field Ornithology, Vol. 55, No. 1	151
Bodner, G.& K.Simms	State of the Las Cienegas National Conservation Area. Part 3. Condition and Trend of Riparian Target Species, Vegetation and Channel Geomorphology	2008	The Nature Conservancy	9

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Bodner, G., Simms, J., & Gori, D.	State of the Las Cienegas National Conservation Area. Gila Topminnow population status and trends 1989-2005	2007	The Nature Conservancy	8
Boersma, K.S., Bogan, M.T., Henrichs, B.A., & Lytle, D.A	Invertebrate assemblages of pools in arid-land streams have high functional redundancy and are resistant to severe drying	2014	Freshwater Biology, 59(3), 491–501.	119
Bogan, M.T.	Chapter 9. Aquatic Invertebrates of the Cliff-Gila Valley, NM: Effects of Flow Regime on Invertebrate Community Structure	2014	Gila Flow Needs Assessment, The Nature Conservancy	403
Booker, J.F., & Ward, F.A.	Instream Flows and Endangered Species in an International River Basin: The Upper Rio Grande	1999	American Journal of Agricultural Economics, Vol. 81, No. 5	152
Boren, J.C., Terrell, T., Cowley, D., Mason, G., Eaton, S., & Hurd, B.	Terrestrial Vegetation Inventory of Water Delivery Systems Between San Acacia Diversion and the Bosque Del Apache National Wildlife Refuge	2005	New Mexico Water Resources Research Institute, New Mexico State University	272
Boudell, J.A., & Stromberg, J.C.	Flood pulsing and metacommunity dynamics in a desert riparian ecosystem	2008	Journal of Vegetation Science, Vol. 19, No. 3	153
Bourne, K.L.	The effect of the Santa Cruz River riparian corridor on single family home prices using the hedonic pricing method	2007	University of Arizona	10
Boyle, T.P., & Fraleigh, H.D.	Natural and anthropogenic factors affecting the structure of the benthic macroinvertebrate community in an effluent-dominated reach of the Santa Cruz River, AZ	2003	Ecological Indicators, 3(2), 93-117	11
Brand, L.A., & Noon, B.R.	Seasonal Fecundity and Source-Sink Status of Shrub-Nesting Birds in a Southwestern Riparian Corridor	2011	The Wilson Journal of Ornithology, 123(1)	154
Brand, L.A., Cerasale, D.J., & Rick, T.D.	Breeding and Migratory Birds: Patterns and Processes	2009	Ecology and Conservation of the San Pedro River	12
Brand, L.A., Stromberg, J., Goodrich, D.C., Dixon, M.D., Lansey, K., Kang, D., & Cerasale, D.J.	Projecting avian response to linked changes in groundwater and riparian floodplain vegetation along a dryland river: a scenario analysis	2010	Ecohydrology, 4, 130-142	13
Brand, L.A., Stromberg, J.C., & Noon, B.R.	Avian Density and Nest Survival on the San Pedro River: Importance of Vegetation Type and Hydrologic Regime	2010	The Journal of Wildlife Management, Vol. 74, No. 4	155
Brand, L.A., White, G.C., & Noon, B.R.	Factors influencing species richness and community composition of breeding birds in a desert riparian corridor	2008	The Condor 110(2)	156
Breck, S.W., Goldstein, M.I., & Pyare, S	Site-occupancy monitoring of an ecosystem indicator: Linking characteristics of riparian vegetation to beaver occurrence	2013	American Naturalist, 72(4), 432–441.	112
Briggs, M., Schmid, M.K., & Halvorson, W.L.	Monitoring Riparian Ecosystems: An Inventory of Riparian Habitat Along Rincon Creek Near Tucson, Arizona	1997	Cooperative National Park Resources Studies Unit. Technical Report 58	270
Briggs, M.K.	Water Requirements for Bottomland Vegetation of Middle Rincon Creek and Potential Threats to Water Availability	2008	Arizona Instream Flow Permit	14
Briggs, M.K., Magirl, C., & Hess, S	Hydrologic Function and Channel Morphologic Analysis of the Santa Cruz River at the North Simpson Site	2007	Tucson Audubon	15
Brock, L., Kelly, M.E., & Chapman.K.	Legal & Institutional Framework for Restoring Instream Flows in the Rio Grande: Fort Quitman to Amistad	2001	World Wildlife Fund	159
Brown, B.T., Trosset, M.W.	Nesting-Habitat Relationships of Riparian Birds along the Colorado River in Grand Canyon, Arizona	1989	The Southwestern Naturalist, Vol. 34, No. 2	160
Brown, B.T., Warren, P.L., Andersenson, L.S., & Gori, D.F.	A Record of the Southern River Otter, Lutra longicaudis, from the Rio Yaqui, Sonora, Mexico	1982	Arizona-Nevada Academy of Science, Vol. 17, No. 1	268
Brown, J.H., & Ernest, S.M.	Rain and Rodents: Complex Dynamics of Desert Consumers	2002	BioScience, Vol. 52, No. 11	267

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Brown, T.	Fishes, Amphibians, and Reptiles of the Lower Mojave River System	1978	Bureau of Land Management. Contract CA-CT8-000046	269
Burr, B.M., Mayden R.L.	Systematics, Distribution and Life History Notes on Notropis chihuahua (Pisces: Cyprinidae)	1981	Copeia, Vol. 1981, No. 2	161
Busch, D.E., & Smith, S.D.	Mechanisms Associated With Decline of Woody Species in Riparian Ecosystems of the Southwestern U.S	1995	Ecological Monographs, 65(3), 347.	17
Busch, D.E., Ingraham, N.L., & Smith, S.D.	Water Uptake in Woody Riparian Phreatophytes of the Southwestern United States: A Stable Isotope Study	1992	Ecological Applications, Vol. 2, No. 4	162
BWRC Technical Committee	Proposed Management Plan for Alamo Lake and the Bill Williams River	1994	BWRC Technical Committee	18
Calvert, A.W., & Neiswenter, S.A.	Bats in the riparian-restoration sites along the Lower Colorado River, Arizona	2012	The Southwestern Naturalist, Vol. 57, No. 3	266
Carrillo-Guerreo, Y., Glenn, E.P., & Hinojosa-Huerta, O.	Water budget for agricultural and aquatic ecosystems in the delta of the Colorado River, Mexico: Implications for obtaining water for the environment	2013	Ecological Engineering 59	163
Carton, J.L., Means, M.D., Hawksworth, D.L & Finch, D.M.	Colonization of the eastern bluebird along the Rio Grande in New Mexico	2007	Western Birds Vol. 38	164
Cartron, J.E., Finch, D.M., Hawksworth, D.L., Stoleson, S.H.	Nesting ecology and nest success of the Blue Grosbeak along two rivers in New Mexico	2013	Western Birds, Vol. 44	214
Cartron, J.E., Molles, M.C., Schuetz, J.F., Crawford, C.S., & Dahm, C.N.	Ground arthropods as potential indicators of flooding regime in the riparian forest of the middle Rio Grande, New Mexico	2003	Environmental entomology, Vol. 32, No. 5	259
Carveth, C.J., Widmer, A.M., & Bonar, S.A	Comparison of Upper Thermal Tolerances of Native and Nonnative Fish Species in Arizona	2006	Transactions of the American Fisheries Society	19
Ch&ra, S., Abella, S.R., Albrecht, B.A.et al	Chapter 5: WIldlife and Biological Resources	2013	A synthesis of aquatic science for management of Lakes Mead and Mohave. USGS Circular 1381	312
Chace, J.F.	Habitat Selection by Sympatric Brood Parasites in Southeastern Arizona: The Influence of Landscape, Vegetation, and Species Richness	2004	The Southwestern Naturalist, Vol. 49, No. 1	258
Chambers, J.C., Brooks, M.L., Pendleton, B.K., & Raish, C.B.	The Southern Nevada Agency Partnership Science and Research Synthesis: Science to Support Land Management in Southern Nevada	2013	USDA Forest Service Gen. Tech. Rep. RMRS-GTR-30	257
Chambers, J.C., Brooks, M.L., Turner, K., Raish, C.B., & Ostoja, S.M.	An Overview of the Southern Nevada Agency Partnership Science and Research Synthesis	2013	USDA Forest Service Gen. Tech. Rep. RMRS-GTR-30	256
Chinnayakanahalli, K.J., Hawkins, C.P., Tarboton D.G., & Hill, R.A.	Natural flow regime, temperature and the composition and richness of invertebrate assemblages in streams of the western United States	2011	Freshwater Biology Vol. 56	165
Chung-MacCoubrey, A.L., & Bateman, H.L.	Herpetological Communities of the Middle Rio Grande Bosque: What Do We Know, What Should We Know, and Why?	2006	USDA Forest Service Proceedings RMRS-P-42CD	166
Clarkson, R.W., & deVos J.C.Jr.	The Bullfrog, Rana catesbeiana Shaw, in the Lower Colorado River, Arizona-California	2015	Journal of Herpetology, Vol. 20, No. 1	168
Cleverly, J.R., Dahm, C.N., Thibault, J.R., Donnell, D.E., & Coonrod, J.E.	Riparian ecohydrology: Regulation of water flux from the ground to the atmosphere in the Middle Rio Grande, New Mexico	2006	Hydrological Processes, Vol. 20	169
Cleverly, J.R., Dahm, C.N., Thibault, J.R., Donnell, D.E., & Coonrod, J.E.	Groundwater, vegetation, and atmosphere: Comparative riparian evapotranspiration, restoration, and water salvage	2006	USDA Forest Service Proceedings RMRS-P-42CD	170
Cleverly, J.R., Smith, S.D., Sala, A., & Devitt, D.A.	Invasive capacity of Tamarix ramosissima in a Mojave Desert floodplain: the role of drought	1997	Oecologia, Vol. 111, No. 1	254

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Cohn, J.P.	Resurrecting the dammed: a look at Colorado River restoration	2001	BioScience, Vol. 51, No. 12	255
Colby, B.G., & Wishart, S.	Riparian Areas Generate Property Value Premium for Landowners	2002	University of Arizona	20
Collier, M.P., Webb, R.H., & &rews, E.D.	Experimental flooding in Grand Canyon	1998	Scientific American Inc.	172
Collins, J.P., Young, C., Howell, J., & Minckley, W.L.	Impact of Flooding in a Sonoran Desert Stream, including Elimination of an Endangered Fish Population (Poeciliopsis o. occidentalis, Poeciliidae)	1981	The Southwestern Naturalist. Vol. 26, No. 4.	171
Contreras-Balderas, S.	Environmental impacts in Cuatro Ciénegas, Coahuila, Mexico: A commentary	1984	Journal of the Arizona-Nevada Academy of Science. Vol 19, No. 1.	173
Converse, Y.K., Hawkins, C.P., & Valdez, R.A.	Habitat relationships of subadult humpback chub in the Colorado River through Grand Canyon: spatial variability and implications of flow regulation	1998	Regulated Rivers: Research & Management. Vol. 14	174
Corn, P.S.	What we know and don't know about amphibian declines in the West	1994	USDA Forest Service, General Technical Report RM-247 (May 1994)	377
Cornell, J.E., Gutierrez, M., Wait, D.A., & Rubio-Arias, H.O.	Ecological Characterization of a Riparian Corridor Along the Río Conchos, Chihuahua, Mexico	2008	The Southwestern Naturalist, Vol. 63, No. 1	175
Cowley, D.E.	Strategies for Ecological Restoration of the Middle Rio Grande in New Mexico and Recovery of the Endangered Rio Grande Silvery Minnow	2006	Reviews in Fisheries Science, 14:1-2	177
Crawford, C.S., & Umbreit, N.E.	Restoration and Monitoring in the Middle Rio Grande Bosque: Current Status of Flood Pulse Related Efforts	1999	Rio Grande Ecosystems: Linking Land, Water, and People	253
Crawford, C.S., Cully, A.C., Leutheuser, R., Sifuentes, M.S., White, L.H., Wilber, J.P.	Middle RIo Grande Ecosystem: Bosque Biological Management Plan	1993	Middle Rio Grande Biological Interagency Team	320
Crawford, C.S., Ellis, L.M., & Molles, M.C.	The Middle Rio Grande Bosque: An Endangered Ecosystem	1996	New Mexico Journal of Science, Vol. 36	378
Cross, W.F., Baxter, C.V., Rosi-Marshall, E.J., Hall Jr, R.O., Kennedy, T.A., Donner, K.C., … Yard, M.D.	Food-web dynamics in a large river discontinuum	2013	Ecological Monographs, 83(3), 311–337.	116
Dalldorf, K.N., Swanson, S.R., Kozlowski, D.F., Schmidt, K.M., Shane, R.S., & Fern&ez, G.	Influence of Livestock Grazing Strategies on Riparian Response to Wildfire in Northern Nevada	2013	Rangeland Ecology & Management, Vol. 66, No. 1	252
Danzer, S.J., Jemison, R., & Guertin, D.P.	Riparian Plant Communities in the Mountains of Southeastern Arizona	2001	The Southwestern Naturalist, Vol. 46, No. 2	251
Dean, D.J.	A River Transformed: Historic Geomorphic Changes of the Lower Rio Grande in the Big Bend Region of Texas, Chihuahua, and Coahuila	2009	Utah State University	379
Debano, L.F., Rinne, J.N., & Baker, M.B.	Management of natural resources in riparian corridors.	2003	Journal of the Arizona-Nevada Academy of Science, Vol. 35, No. 1	380
DeMeo, G.A., Smith, Jl., Damar, N.A., & Darnell, J.	Quantifying Groundwater and Surface-Water Discharge from Evapotranspiration Processes in 12 Hydrographic Areas of the Colorado Regional Ground-Water Flow System, Nevada, Utah, and Arizona	2008	U. S. Geological Survey	250
Desert Fishes Team	Status of federal and state listed warmwater fishes of the Gila River basin, with recommendations for management	2003	Desert Fishes Team. Report Number 1	381
Desert Fishes Team	Status of unlisted native fishes of the Gila River basin, with recommendations for management	2004	Desert Fishes Team. Report Number 2	382
Desert Fishes Team	Analysis of recovery plan implementation for threatened and endangered warmwater fishes of the Gila River basin	2006	Desert Fishes Team. Report Number 3	383

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Di Tomaso, J.M.	Impact, Biology, and Ecology of Saltcedar (Tamarix spp.) in the Southwestern United States	1998	Weed Technology, Vol. 12, No. 2	129
Díaz-Caravantes, R.E., & Sánchez-Flores, E.	Water transfer effects on peri-urban land use/land cover: A case study in a semi-arid region of Mexico	2011	Applied Geography, Vol. 31, No. 2	239
Douglas, A.J.	Social, Political, and Institutional Setting: Water Management Problems of the Rio Grande	2009	Journal of Water Resources Planning and Management, Vol. 135	237
Dudley, R.K., & Platania, S.P.	Flow regulation and fragmentation imperil pelagic-spawning riverine fishes	2007	Ecological Applications, Vol. 17, No. 7	236
Duffield, J.W., Neher, C.J., Patterson, D.A.	Economic Values for National Park System Resources Within the Colorado River Watershed	2010	Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2010	359
Durkin, P., Muldavin, E., Bradley, M., Carr, S.E.	A preliminary riparian wetland vegetation community classification of the Upper and Middle Rio Grande Watersheds in New Mexico	1996	Desired future conditions for Southwestern riparian ecosystems: Bringing interests and concerns together	271
Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	2007	USGS Open FIle Report. 2008–1303.	231
Dwire, K., Buffington, J., Merritt, D., Rieman, B.E., & Tait, C.	Upper Verde River: Review of Stream-Riparian Monitoring Efforts Conducted by the U.S. Forest Service Rocky Mountain Research Station	2008	U.S. Forest Service Rocky Mountain Research Station	21
Edwards, R.J., Garrett, G.P., & Marsh-Matthews, E.	Conservation and status of the fish communities inhabiting the Rio Conchos basin and middle Rio Grande, Mexico and USA	2003	Reviews in Fish Biology and Fisheries, Vol. 12, No. 2-3	229
Ellis, L.M., Crawford, C.S., & Molles Jr., M.	Comparison of litter dynamics in native and exotic riparian vegetation along the Middle Rio Grande of central New Mexico, USA	1998	Journal of Arid Environments	224
Ellis, L.M., Crawford, C.S., & Molles Jr., M.C.	Rodent Communities in Native and Exotic Riparian Vegetation in the Middle Rio Grande Valley of Central New Mexico	1997	The Southwestern Naturalist, Vol. 42, No. 1	178
Ellis, L.M., Molles Jr., M., & Crawford, C.S.,	Influence of Experimental Flooding on Litter Dynamics in a Rio Grande Riparian Forest, New Mexico	1999	Restoration Ecology	225
Elmore, A.J., Mustard, J.F., Manning, S.J.	Regional patterns of plant community response to changes in water: Owens Valley, California	2003	Ecological Applications, Vol. 13, No. 2	222
Farley, G.H., Ellis, L.M., Stuart, J.N., Scott, N.K.Jr.	Avian Species Richness in Different-Aged Stands of Riparian Forest Along the Middle Rio Grande, New Mexico	1994	Conservation Biology, Vol. 8, No. 4	185
Finch, D.M., & Yong, W.	Sparrow migration along a river corridor in desert grassland	1996	UNITED STATES DEPARTMENT OF AGRICULTURE FOREST SERVICE GENERAL TECHNICAL REPORT RM	213
Follstad, J.J., & Dahm, C.N.	Flood Regime and Leaf Fall Determine Soil Inorganic Nitrogen Dynamics in Semiarid Riparian Forests	2008	Ecological Applications, Vol. 18, No. 3	212
Fonseca, J.	Aquifer Monitoring for Groundwater-Dependent Ecosystems, Pima County, Arizona	2004	Report to the Pima County Board of Supervisors, Tucson, AZ	22
Fonseca, J.E.& M.List	Distribution of Riparian Vegetation in Relation to Streamflow in Pima County, Arizona	2013	Pima County	120
Frey, J.K.	Chapter 13. Riparian Mammals of the Gila River, New Mexico: Impacts of Flow	2014	Gila Flow Needs Assessment, The Nature Conservancy	407
Frey, J.K., Hill, M.T., Christman, B.L., Truett, J.C., & MacDonald, S.O.	Distribution and Habitat of the Arizona Gray Squirrel (Sciurus arizonensis) in New Mexico	2008	The Southwestern Naturalist, Vol. 53, No. 2	179

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Friggens, M.M., Finch, D.M., Bagne, K.E., Coe, S.J., Hawksworth, D.L.	Vulnerability of species to climate change in the Southwest: terrestrial species of the Middle Rio Grande	2013	General technical report RMRS-GTR-306	326
Galindo-Bect, M.S., Glenn, E.P., Page, H.M., Fitzsimmons K., Galindo-Bect, L.A., Hern&ez-Ayon, J.M., Petty, R.L., Garcia-Hern&ez, J., Moore, D.	Penaeid shrimp landing in the upper Gulf of California in relation to Colorado River freshwater discharge	2000	Fisheries Bulletin 98:222–225	308
Gallo-Reynoso, J.P., Suárez-Gracida, G., Cabrera-Santiago, H., Coria-Galindo, E., Egido-Villarreal, J., Ortiz, L.C.	Status of Beavers (Castor canadensis frondator) in Rio Bavispe, Sonora, Mexico	2002	The Southwestern Naturalist, Vol. 47, No. 3	180
Gazal, R.M., Scott, R.L., Goodrich, D.C., & Williams, D.G.	Controls on transpiration in a semiarid riparian cottonwood forest	2006	Agricultural and Forest Meteorology	23
Glenn, E., Tanner, R., Mendez, S., Kehret, T., Moore, D., Garcia, J., & Valdes, C.	Growth rates, salt tolerance and water use characteristics of native and invasive riparian plants from the delta of the Colorado River, Mexico	1998	Journal of Arid Environments . Vol. 40	181
Glenn, E.P., & Nagler, P.L.	Comparative ecophysiology of Tamarix ramosissima and native trees in western U.S. riparian zones	2005	Journal of Arid Environments. Vol. 61, No. 3.	183
Glenn, E.P., Felger, R.S., Borquez, A., Turner, D.S.	Cienega de Santa Clara: Endangered Wetland in the Colorado River Delta, Sonora, Mexico	1992	Natural Resources Journal, Vol. 32	209
Glenn, E.P., Flessa, K.W., & Pitt, J.	Restoration potential of the aquatic ecosystems of the Colorado River Delta, Mexico: Introduction to special issue on "Wetlands of the Colorado River Delta"	2013	Ecological Engineering, Vol. 59	207
Glenn, E.P., Lee, C., Felger, R., & Zengel, S.	Effects of Water Management on the Wetlands of the Colorado River Delta, Mexico	1996	Conservation Biology, Vol. 10, No. 4	182
Glenn, E.P., Zamora-Arroyo, F., Nagler, P., Briggs, M., Shaw, W., & Flessa, K.	Ecology and conservation biology of the Colorado River Delta, Mexico.	2001	Journal of Arid Environments, Vol. 49	210
Gloss, S.P., & Coggins, L.G.	Chapter 2. Fishes of Grand Canyon	2005	USGS Circular 1282	260
Goodrich, D.C., Scott, R., Qi, J., Goff, B., Unkrich, C.L., Moran, M.S., Ni, W., Cooper, W.E., Eichinger, W.J., Shuttleworth, Y.Kerr, R.& Marsett, W.N.	Seasonal estimates of riparian evapotranspiration using remote sensing and in situ measurements	2000	Agricultural and Forest Meteorology, 105, 281-309.	25
Gori, D.	Chapter 11. Gila River Herpetofauna: Streamflow Regimes and Ecological Relationships	2014	Gila Flow Needs Assessment, The Nature Conservancy	405
Gori, D., Cooper, M.S., Lyons, D.	Chapter 14. Workshop Outcomes: Ecological Response to Hydrologic Variability in the Gila River, Cliff-Gila Valley	2014	Gila Flow Needs Assessment, The Nature Conservancy	408
Gr& Canyon Wildl&s Council	An Inventory, Assessment, And Development Of Recovery Priorities For Arizona Strip Springs, Seeps And Natural Ponds: A Synthesis Of Information	2001	Grand Canyon Wildlands Council	24
Graham, T.B.	Survey of aquatic macroinvertebrates and amphibians at Wupatki National Monument, Arizona, USA: An evaluation of selected factors affecting species richness in ephemeral pools	2002	Hidrobiologia. Volume 486, No. 1.	184
Grams, P.E., J.C.Schmidt, & M.E.Andersensen	2008 High-Flow Experiment at Glen Canyon Dam—Morphologic Response of Eddy-Deposited Sandbars and Associated Aquatic Backwater Habitats along the Colorado River in Grand Canyon National Park	2010	U.S. Geological Survey Open–File Report No. 2010–1032	110

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Hall, L.S., & Mannan R.W.	Multi Scaled Habitat Selection by Elegant Trogons in Southeastern Arizona	1999	The Journal of Wildlife Management, Vol 64, No. 2.	206
Haney, J.	Interbasin Groundwater Flow at the Benson Narrows, Arizona	2005	The Nature Conservancy	28
Haney, J.A., & Turner, D.S.	Ecological Implications of Verde River Flows	2008	Ecological Implications of Verde River Flows	26
Hannon, L.E., Ries, L.& Williams, K.S.	Terrestrial arthropod communities along the San Pedro: Three Case Studies (Chapter 7)	2009	Ecology and Conservation of the San Pedro River	29
Harding, B.L., McCord, J.T.	Evaluating Hydrologic Effects of Water Acquisitions on the Middle Rio Grande	2005	FY2004 Middle Rio Grande Endangered Species Act Collaborative Program Water Acquisition and Management Subcommittee	103
Hardy, T.B., Davis, N.	Texas Riparian Areas	2013	Texas Water Development Board	390
Harms, R.S., Hiebert, R.D.	Vegetation Response Following Invasive Tamarisk (Tamarix spp.) Removal and Implications for Riparian Restoration	2006	Restoration Ecology Vol. 14, No. 3, pp. 461–472	389
Harris, S.	How Great a Thirst? Assembling a River Restoration Toolkit	1999	USDA Forest Service Proceedings RMRS-P-7. 1999	395
Hautzinger, A., Warner, A., Hickey, J., & Beauchamp, V.B.	Summary of Unified Ecosystem Flow Requirements for the Bill Williams River Corridor	2006	Summary of Unified Ecosystem Flow Requirements for the Bill Williams River Corridor.	31
Hautzinger, A.B., Hickey, J., & Walker, D.	How Much Water Do Stream-Dependent Species Need?	2008	Southwest Hydrology	30
Heard, T.C., Perkin, J.S., & Bonner, T.H.	Intra-Annual Variation in Fish Communities and Habitat Associations in a Chihuahua Desert Reach of the Rio Grande/Rio Bravo Del Norte	2012	Western North American Naturalist, Vol. 72, No. 1	200
Hershler, R.	The Hydrobiid Snails (Gastropoda: Rissoacea) of the Cuatro Cienegas Basin: Systematic Relationships and Ecology of a Unique Fauna	1984	Journal of the Arizona-Nevada Academy of Science, Vol. 19, No. 1	198
Hibbitts, T.J., Painter, C.W., & Holycross, A.T.	Ecology of a population of the narrow-headed garter snake (thamnophis rufipunctatus) in New Mexico: catastrophic decline of a river specialist	2009	The Southwestern Naturalist, Vol. 54, No. 4	196
Hilwig, K.D., Makinster, A.S.	Evaluating Effects of a High-Flow Event on Rainbow Trout Movement in Glen and Marble Canyons, Arizona, by Using Acoustic Telemetry and Relative Abundance Measures	2010	Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2008	357
Hinojosa-Huerta, O., Briggs, M., Carrillo-Guerrero, Y., Glenn, E.P., Lara-Flores, M., & Román-Rodríguez, M.	Community-based restoration of desert wetlands: the case of the Colorado River Delta	2005	USDA Forest Service General Technical Report PSW-GTR-191	195
Hinojosa-Huerta, O., DeStefano, S., & Shaw, W.W.	Distribution and abundance of the Yuma clapper rail (Rallus longirostris yumanensis) in the Colorado River delta, México	2001	Journal of Arid Environments, Vol. 9, No. 1.	193
Hinojosa-Huerta, O., Guzmán-Olachea, R., Butrón-Méndez, J., Butrón-Rodríguez, J.J., & Calvo-Fonseca, A.	Status of marsh birds in the wetlands of the Colorado River delta, México	2013	Ecological Engineering, Vol. 59	192
Hinojosa-Huerta, O., Nagler, P.L., Carrillo-Guererro, Y., Glenn, E.P.	Effects of drought on birds and riparian vegetation in the Colorado River Delta, Mexico	2013	Ecological Engineering, Vol. 59	190

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Hoagstrom, C.W., Remshardt, W.J., Smith, J.R., Brooks, J.E.	Changing Fish Faunas in Two Reaches of the Rio Grande in the Albuquerque Basin	2010	The Southwestern Naturalist, Vol. 55, No. 1	191
Holmes, J.A., Spence, J.R., & Sogge, M.K.	Chapter 7. Birds of the Colorado River in Grand Canyon: a Synthesis of Status, Trends, and Dam Operation Effects	2005	USGS Circular 1285	263
Horton, J.L., Kolb, T.E. & Hart, S.C.	Responses of riparian trees to interannual variation in groundwater depth in a semi-arid river basin	2001	Plant, Cell & Environment, 24(3), 293-304.	33
Horton, J.L., Kolb, T.E. & Hart, S.C.	Physiological Response to Groundwater Depth Varies among Species and with River Flow Regulation	2001	Ecological Applications, 11(4), 1046.	34
Howe, W.H., & Knopf, F.L.	On the Imminent Decline of Rio Grande Cottonwoods in Central New Mexico	1991	The Southwestern Naturalist, Vol. 36, No. 2	186
Hubbs, C.	Environmental Correlates to the Abundance of Spring-Adapted versus Stream-Adapted Fishes	2001	Texas Journal of Science, Vol. 53, No. 4	189
Huckelbridge, K.H., Stacey, M.T., Glenn, E.P., & Dracup, J.A.	An integrated model for evaluating hydrology, hydrodynamics, salinity and vegetation cover in a coastal desert wetland	2010	Ecological Engineering, Vol. 36, No. 7	188
Hultine, K.R., Bush, S.E., West, A.G., & Ehleringer, J.T.	Population Structure, Physiology and Ecohydrological Impacts of Dioecious Riparian Tree Species of Western North America	2007	Oecologia, Vol. 154, No. 1	187
Ilija Ojeda, M., Mayer, A.S., Solomon, B.D.	Economic valuation of environmental services sustained by water flows in the Yaqui River Delta	2008	Ecological Economics 65: 155-166	385
Jemison, R.L.	Associations between Riparian Ecosystem Parameters in Happy Valley, Arizona	1999	General technical report RM/USDA Forest Service (USA)	293
Jezorek, I.G., Connolly, P.J., Munz, C.S., & Dixon, C.	Big Spring spinedace and associated fish populations and habitat conditions in Condor Canyon, Meadow Valley Wash, Nevada	2011	USGS Open-File Report 2011–1072	294
Johnson, G.E., & Van Riper, C.	Chapter 3. Southwestern Willow Flycatcher Nest Records and Potential for Future Breeding along the Upper San Pedro River, Arizona	2014	USGS Open File Report 2014-1121	298
Johnson, M.J.	Understanding the habitat needs of the declining western yellow-billed cuckoo	2009	US Department of the Interior, US Geological Survey	300
Johnson, T.D., Kolb, T.E., & Medina, A.L.	Do riparian plant community characteristics differ between Tamarix (L.) invaded and uninvaded sites on the upper Verde River, Arizona?	2010	Biological Invasions, Vol. 12, No. 8	301
Jorgensen, E.E., & Demarais, S.	Herpetofauna associated with arroyos and uplands in foothills of the Chihuahuan Desert	1998	The Southwestern Naturalist, Vol. 43, No. 4	302
Kaeding, L.R., & Zimmerman, M.A.	Life History and Ecology of the Humpback Chub in the Little Colorado and Colorado Rivers of the Grand Canyon	1983	Transactions of the American Fisheries Society, Vol. 112, No. 5	303
Kaiser, R.A., & Binion, S.	Untying the gordian knot: Negotiated strategies for protecting instream flows in Texas	1998	Nat. Resources J. Vol. 38	305
Kalb, B.W., & Caldwell, C.	Restoration of Rio Grande cutthroat trout Oncorhynchus clarkii virginalis to the Mescalero Apache Reservation.	2014	U.S. Fish and Wildlife Service. Cooperator Science Series. Report #111-2014	306
Kaplinski, M., Behan, J., Hazel, J.E., Parnell, R.A., & Fairley, H.C.	Chapter 12. Recreational values and campsites	2005	USGS Circular 1287	265
Karpiscak, M.M., & Gottfried, G.J.	Tree production in desert regions using effluent and water harvesting	2000	USDA Forest Service Proceedings RMRS-P-13	307
Katz, G.L., & Shafroth, P.B.	Biology, Ecology, and Management of Russian Olive in Western North America	2003	Wetlands, Vol. 23, No. 4	310
Katz, G.L., Denslow, M.W., & Stromberg, J.C.	The Goldilocks effect: intermittent streams sustain more plant species than those with perennial or ephemeral flow	2012	Freshwater Biology, 57(3), 467–480.	95
Katz, G.L., Stromberg, J.C., & Denslow, M.W.	Streamside herbaceous vegetation response to hydrologic restoration on the San Pedro River, Arizona	2009	Ecohydrology, 2(2), 213–225.	35

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Kearsley, M.J. & Ayers, T.J.	Riparian vegetation responses: snatching defeat from the jaws of victory, and vice versa	1999	In The controlled flood in Grand Canyon (pp. 309–327).	36
Kehr, J.M., Merritt, D.M., & Stromberg, J.C.	Linkages between primary seed dispersal, hydrochory and flood timing in a semi-arid region river	2001	Journal of Vegetation Science, Vol. 25, No. 1	311
Kelly, M.	Water Management in the Binational Texas/Mexico Rio Grande/Rio Bravo Basin	2001	Texas Center for Policy Studies, Vol. 44	313
Kennedy, T.A., & Gloss, S.P.	Chapter 5. Aquatic Ecology: The role of organic matter.	2005	USGS Circular 1283	261
Kennedy, T.A., & Ralston, B.E.	Regulation leads to increases in riparian vegetation, but not direct allochthonous inputs, along the Colorado River in Grand Canyon, Arizona	2012	River Research and Applications, Vol. 28, No. 1	316
Kennedy, T.A., Finlay, J.C., & Hobbie, S.E.	Eradication of invasive Tamarix ramosissima along a desert stream increases native fish density	2005	Ecological Applications, Vol. 15, No. 6	315
Kerna, A.	Valuing recreation and environmental flows in the Colorado River Delta utilizing contingent valuation method	2012	University of Arizona. M.S. Thesis	317
Killingbeck, K., & Whitford, W.	Nutrient resorption in shrubs growing by design, and by default in Chihuahuan Desert arroyos	2001	Oecologia, Vol. 128, No. 3	321
Kindscher, K.	Chapter 8. Riparian Vegetation of the Upper Gila River and Southwestern Streams	2014	Gila Flow Needs Assessment, The Nature Conservancy	402
Kinzli, K.-D., & Myrick, C.A.	Bendway weirs: Could they create habitat for the endangered Rio Grande silvery minnow	2010	River Research and Applications, Vol. 26, No. 7	322
Kinzli, K.-D., & Thornton, C.I.	Predicting velocity in bendway weir eddy fields	2010	River Research and Applications, Vol 26, No. 7	324
Kirkpatrick, C.	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	2007	U.S. Department of Defense, Legacy Resources Management Program	38
Kirkpatrick, C., Conway, C.J., & LaRoche, D.	Surface Water Depletion and Riparian Birds	2009	Arizona Game and Fish Department	39
Kirkpatrick, C., Conway, C.J., & LaRoche, D.	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	2009	U.S. Geological Survey, Arizona Cooperative Fish and Wildlife Research Unit	40
Konrad, C.P., Warner, A., & Higgins, J.V.	Evaluating Dam Re-Operation for Freshwater Conservation in the Sustainable Rivers Project	2012	River Research and Applications, 28(6), 777–792.	98
Korman, J., Kaplinski, M., & Melis, T.S.	Effects of high-flow experiments from Glen Canyon Dam on abundance, growth, and survival rates of early life stages of rainbow trout in the Lees Ferry reach of the Colorado River	2010	U.S. Geological Survey, Open File Report 2010-1034	41
Korman, J., Martell, S.J.D., Walters, C.J., Makinster, A.S., Coggins, L.G., Yard, M.D., & Persons, W.R.	Estimating recruitment dynamics and movement of rainbow trout (Oncorhynchus mykiss) in the Colorado River in Grand Canyon using an integrated assessment model	2012	Canadian Journal of Fisheries and Aquatic Sciences, Vol. 69, No. 11	328
Koronkiewicz, T.J., Graber, A.E., & McLeod, M.A.	Variation in Streamflow Influences Abundance and Productivity of an Endangered Songbird, the Southwestern Willow Flycatcher	2010	Poster Presentation	42
Kowalewski, M., Avila Serrano, G.E., Flessa, K.W., Goodfriend, G.A.	Dead delta's former productivity: Two trillion shells at the mouth of the Colorado River	2000	Geology 28 (12) p. 1059–1062	309
Kozma, J.M., & Matthews, N.E.	Breeding bird communities and nest plant selection in Chihuahuan Desert habitats in south-central New Mexico	1997	The Wilson Bulletin, Vol. 109, No. 3	330
Kozma, J.M., Burkett, L.M., & Matthews, N.E.	Associations of small migratory and resident birds with two scrub habitats during late winter and spring in the northern Chihuahuan Desert, New Mexico	2012	The Southwestern Naturalist, Vol. 57, No. 1	329

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
L&is, M.E.	The" forgotten river" of the Rio Grande/Rio Bravo: Investigation into the reclamation of an arid riparian ecosystem	2001	University of Texas at El Paso	338
Laabs, D.	Mojave River Vole	1998	Biosearch Wildlife Surveys	331
Laczniak, R.J., Smith, J.L., & DeMeo, G.A.	Annual Ground-water Discharge by Evapotranspiration from Areas of Spring-fed Riparian Vegetation Along the Eastern Margin of Death Valley, 2000-02	2006	USGS Scientific Investigations Report 2006–5145	336
Law, D.J., & Finch, D.M.	Hydrologic, abiotic and biotic interactions: plant density, wind speed, leaf size and groundwater all affect oak water use efficiency	2011	Ecohydrology, Vol. 4, No. 6	339
Leake, S A., & Pool, D.R.	Simulated effects of groundwater pumping and artificial recharge on surface-water resources and riparian vegetation in the Verde valley sub-basin, central Arizona	2012	USGS Open File Report 2010–5147	362
Leake, S.A., & Gungle, B.	Evaluation of Simulations to Understand Effects of Groundwater Development and Artificial Recharge on Surface Water and Riparian Vegetation, Sierra Vista Subwatershed, Upper San Pedro Basin, Arizona	2005	USGS Open File Report 2012–1206	353
Leake, S.A., Pool, D.R., & Leenhouts, J.M.	Simulated effects of ground-water withdrawals and artificial recharge on discharge to streams, springs, and riparian vegetation in the Sierra Vista Subwatershed of the Upper San Pedro Basin, southeastern Arizona	2008	US Geological Survey	43
Leavitt, D.J	Assemblages of Rodents in Riparian Forests Along the Rio Grande in Big Bend National Park, Texas: Current and Historic Insights on the Effects of Invasion by Saltcedar	2012	The Southwestern Naturalist, Vol. 57, No. 2	363
Leenhouts, J.M., Stromberg, J.C., & Scott, R.L	Hydrologic requirements of and consumptive ground-water use by riparian vegetation along the San Pedro River, Arizona	2006	U.S. Geological Survey.	44
Levine, C.M., & Stromberg, J.C.	Effects of flooding on native and exotic plant seedlings: implications for restoring south-western riparian forests by manipulating water and sediment flows	2001	The Southwestern Naturalist, Vol. 47, No. 3	367
Linderoth, O.C.	Restoration Efforts in the Rio Grande Valley State Park	1999	USDA Forest Service Proceedings RMRS-P-7. 2000	397
Lite, S.J. & Stromberg, J.C.	Surface water and ground-water thresholds for maintaining Populus–Salix forests, San Pedro River, Arizona	2005	Biological Conservation, 125(2), 153–167.	45
Lite, S.J., Bagstad, K.J., & Stromberg, J.C.	Riparian plant species richness along lateral and longitudinal gradients of water stress and flood disturbance, San Pedro River, Arizona, USA	2005	Journal of Arid Environments, 63(4), 785–813	46
Livingston, M.F.	Summer bird/vegetation associations in Tamarisk and native habitat along the Pecos River, southeastern New Mexico	1996	Desired future conditions for Southwestern riparian ecosystems: Bringing interests and concerns together	273
Loftus, A.J., & Flather, C.H.	Fish and Other Aquatic Resource Trends in the United States	2000	U.S. Department of Agriculture, Forest Service	369
Lonard, R.I., & Judd, F.W.	Riparian Vegetation of the Lower Rio Grande	2002	The Southwestern Naturalist, Vol. 47, No. 3	370
Long, J.W., Burnett, B.M., Medina, A.L., & Parker, J.L.	Restoration of Soldier Spring: an isolated habitat for native Apache trout	2004	Proceedings of the 16th International Conference, Society for Ecological Restoration	373
Loomis, J., Douglas, A.J., & Harpman D.A.	Chapter 9. Recreation Use Values and Nonuse Values	2005	USGS Circular 1286	264
Lowe, C.H.	The riparianness of a desert herpetofauna	1989	California Riparian Systems Conference	374
Lozano-Vilano, M.de L.	Recent records of Cycleptus in the Río Conchos, Chihuahua, Mexico	2010	The Southwestern Naturalist, Vol. 55, No. 2	376

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Lytle, D.A.	Streamflow-Biota Relations: Fish and Aquatic Macroinvertebrates	2006	Defining Ecosystem Flow Requirements for the Bill Williams River, Arizona, U.S. Geological Survey	47
Magana, H.A.	Habitat use of the Rio Grande silvery minnow (Hybognathus Amarus) during a long-term flood pulse in the Middle Rio Grande, New Mexico	2012	Environmental Biology of Fish 95:210-212	348
Magirl, C.S., Andersensen, M.E.	Water Velocity of the Colorado River: Implications for Native Fishes	2010	Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2009	358
Mahoney, J.M., Rood, S.B.	Streamflow requirements for cottonwood seedling recruitment - an integrative model	1998	Wetlands, Vol 18, No. 4	349
Marcus, D.	Glen Canyon Dam Releases – Economic Considerations	2009	Grand Canyon Trust	48
Martínez Zepeda, L.M.	Determinación de caudales ambientales para ríos de la cuenca del Río San Juan mediante la aplicación de métodos hidrológicos.	2012	Universidad Autónoma de Nuevo León	400
Mccluney, K.E.& Sabo, J.L.	River drying lowers the diversity and alters the composition of an assemblage of desert riparian arthropods	2012	Freshwater Biology, 57(1), 91–103.	99
McGarvey, D.J.	Quantifying ichthyofaunal zonation and species richness along a 2800-km reach of the Rio Chama and Rio Grande (USA)	2011	Ecology of Freshwater Fish 20, 231-242	350
Medellin-Azuara, J., Lund, J.R., Howitt, R.E.	Water Supply Analysis for Restoring the Colorado River Delta, Mexico	2007	Journal of Water Resources Planning and Management 133:5	354
Melis, T.S., Topping, D.J., Grams, P.E., Rubin, D.M., Wright, S.A., Draut, A.E.& others	2008 High-Flow Experiment at Glen Canyon Dam Benefits Colorado River Resources in Grand Canyon National Park	2010	US Geological Survey	49
Mendelsohn, M.B., Boarman, W.I., Fisher, R.N., Hathaway, S.A.	Diversity of terrestrial avifauna in response to distance from the shoreline of the Salton Sea	2007	Journal of Arid Environments 68: 574–587	360
Merritt, D.M. & Bateman, H.L.	Linking streamflow and groundwater to avian habitat in a desert riparian system	2012	Ecological Applications, 22(7), 1973-1988	50
Merritt, D.M. & Poff, N.L.	Shifting dominance of riparian Populus and Tamarix along gradients of flow alteration in western North American rivers	2010	Ecological Applications, 20(1), 135–152.	27
Minckley, T.A., Turner, D.S., & Weinstein, S.R.	The relevance of wetland conservation in arid regions: A re-examination of vanishing communities in the American Southwest	2013	Journal of Arid Environments, 88, 213–221.	113
Minckley, W.L.	Cuatro Cienegas fishes: research review and a local test of diversity versus habitat size	1984	Journal of the Arizona-Nevada Academy of Science Vol. 19, No. 1	291
Minckley, W.L. & Meffe, G.K.	Differential Selection by Flooding	1987	Evolutionary and community ecology of North American stream fishes. (Vols. 1–Book, 1–Section, pp. 93–104). Norman, OK: University of Oklahoma Press	51
Moayyad, B.	Importance of groundwater depth, soil texture and rooting depth on arid riparian evapotranspiration	2001	Thesis: New Mexico Institute of Mining and Technology	355
Molles, M.C., Crawford, C.S., Ellis, L.M., Valett, H.M., Dahm, C.N.	Managed Flooding for Riparian Ecosystem Restoration	1998	BioScience,Vol. 48, No. 9	364
Moody, E.K. & J.L.Sabo	Crayfish impact desert river ecosystem function and litter-dwelling invertebrate communities through association with novel detrital resources	2013	PLoS ONE, 8(5)	115
Mortenson, S.G., Weisberg, P.J.	Does river regulation increase the dominance of invasive woody species in riparian landscapes?	2010	Global Ecology and Biogeography,19, 562–574	366

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Mortenson, S.G., Weisberg, P.J., & Stevens, L.E.	The influence of floods and precipitation on Tamarix establishment in Grand Canyon, Arizona: consequences for flow regime restoration	2012	Global Ecology and Biogeography	100
Muldavin, E., Milford, E., & Chauvin, Y.	River Bar Vegetation Mowing Response in the Middle Rio Grande	1999	USDA Forest Service Proceedings RMRS-P-7. 2000	398
Muniz, I., Salas Plata, J., Turner, C.	Restoration of the Rio Grande/Rio Bravo in the Juarez Valley: An analysis	2005	UCWR Conference Proceedings	371
Munoz-Hern&ez, A., Mayer, A.S., Watkins Jr., D.W.	Integrated Hydrologic-Economic-Institutional Model of Environmental Flow Strategies for Rio Yaqui Basin, Sonora, Mexico	2011	Journal of Water Resources Planning and Management Vol. 137, No. 2	372
Nagler, P.A., Glenn, E.P., Hinojosa-Huerta, O.	Synthesis of ground and remote sensing data for monitoring ecosystem function in the Colorado River Delta, Mexico	2009	Remote Sensing of Environment 113: 1473–1485	387
Nagler, P.L., & Glenn, E.P.	Water Use by Riparian Plants on the Lower Colorado River	2010	Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2008, Scottsdale, Arizona: coming together, coordination of science and restoration activities for the Colorado River ecosystem	365
Nagler, P.L., Glenn, E.P., Hinojosa-Huerta, O., Zamora, F., Howard, K.	Riparian vegetation dynamics and evapotranspiration in the riparian corridor in the delta of the Colorado River, Mexico	2007	Journal of Environmental Management 88 (2008) 864–874	351
Nagler, P.L., Glenn, E.P., Jarnevich, C.S., & Shafroth, P.B.	Distribution and Abundance of Saltcedar and Russian Olive in the Western United States	2011	Critical Reviews in Plant Sciences, 30(6), 508–523.	111
Nagler, P.L., Glenn, E.P., Nguyen, U., Scott, R.S., Doody, T.	Estimating Riparian and Agricultural Actual Evapotranspiration by Reference Evapotranspiration and MODIS Enhanced Vegetation Index	2013	Remote Sensing 5, 3849-3871	384
National Park Service 2008	Assessment Report Water-Right Application No. 33-96733 Middle Reach of Rincon Creek	2008	National Park Service	52
Nelson, S.M., Andersensen, D.C.	An Assessment of Riparian Environmental Quality by Using Butterflies and Disturbance Susceptibility Scores	1994	The Southwestern Naturalist, Vol. 39, No. 2 (Jun., 1994), pp. 137-142	361
Nguyen, U., Glenn, E.P., Nagler, P.L., Scott, R.L.	Long-term decrease in satellite vegetation indices in response to environmental variables in an iconic desert riparian ecosystem:the Upper San Pedro, Arizona, United States	2014	Ecohydrology, DOI 10.1002/eco.1529	388
Nie, W.; Y.Yuan, W.Kepner, C.Erickson, M.Jackson	Hydrological impacts of mesquite encroachment in the upper San Pedro watershed	2012	Biological Invasions, 14(5), 1061–1076.	101
Norman, L., Tallent-Halsell, N., Labiosa, W., Weber, M., McCoy, A., Hirschboeck, K., … Gray, F.	Developing an Ecosystem Services Online Decision Support Tool to Assess the Impacts of Climate Change and Urban Growth in the Santa Cruz Watershed; Where We Live, Work, and Play	2010	Sustainability	53
Norman, L., Villarreal, M., Niraula, R., Meixner, T., Frisvold, G., & Labiosa, W.	Framing Scenarios of Binational Water Policy with a Tool to Visualize, Quantify and Evaluate Changes in Ecosystem Services	2013	Water, 5(3), 852–874	117
Oberlin, G.E., Shannon, J.P., Blinn, D.W.	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	1999	The Southwestern Naturalist 44(1):17-30	290
O'Brien, J.S., & Fullerton, W.T.	Simulation of Rio Grande Floodplain Inundation Using FLO-2D	1999	USDA Forest Service Proceedings RMRS-P-7. 1999	393

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Ode, P.R., Kincaid, T.M., Fleming, T., Rehn, A.C.	Ecological Condition Assessments of California's Perennial Wadeable Streams: Highlights from the Surface Water Ambient Monitoring Program's Perennial Streams Assessment (PSA) (2000-2007).	2011	California Perennial Streams Assessment: A collaboration between the State Water Resources Control Board's Nonpoint Source Pollution Control Program (NPS Program), Surface Water Ambient Monitoring Program (SWAMP), California Department of Fish and Game Aq	314
Oglesby, A.	Ecological flows in New Mexico -- It has been done	2009	The Nature Conservancy presentation	327
Ohmart, R.D.	Ecological condition of the East Fork of the Gila River and selected tributaries: Gila National Forest, New Mexico	1995	United States Department of Agriculture Forest Service General Technical Report RM	352
Ohmart, R.D., Zisner, C.	Functions and values of riparian habitat to wildlife in Arizona : a literature review	1993	Contract No. G30025-B, AZ Game and Fish Department	386
Orr, P. & Colby, B.	Nature-Oriented Visitors and Their Expenditures: Upper San Pedro River Basin	2002	Department of Agricultural and Resource Economics, University of Arizona	54
Parker, A.J.	Site Preferences and Community Characteristics of Cupressus arizonica Greene (Cupressaceae) in Southeastern Arizona	1980	The Southwestern Naturalist, Vol. 25, No. 1, p. 9-21	318
Paukert, C.P., Petersen, J.H.	Comparative growth and consumption potential of rainbow through and humpback chub in the Colorado River, Grand Canyon, Arizona under different temperature scenarios	2007	The Southwestern Naturalist, 52(2):234-242	347
Pelz Serrano, K., Ponce Guevara, E., Lopez Gonzales, C.A.	Habitat and Conservation Status of the Beaver in the Sierra San Luis Sonora, México	2005	USDA Forest Service Proceedings RMRS-P-36	286
Perez-Arvizu, E.M., Aragon-Noriega, E.A., Espinosa Carreon, L.	Response of the Shrimp Population in the Upper Gulf of California to Fluctuations in Discharges of the Colorado River	2009	Crustaceana, Vol. 82, No. 5, pp. 615-625	346
Periman, R.D.	Dynamic Human Landscapes of the Rio del Oso: Restoration and the Simulation of Past Ecological Conditions in The Upper Rio Grande Basin	1999	USDA Forest Service Proceedings RMRS-P-7. 1999	392
Perry, L.G., Shafroth, P.B., Blumenthal, D.M., Morgan, J.A., & LeCain, D.R.	Elevated CO2 does not offset greater water stress predicted under climate change for native and exotic riparian plants	2012	New Phytologist, 197(2), 532–543	104
Pima County	Preliminary Riparian Protection, Management, and Restoration Element	2000	Pima County	55
Pima County	City of Tucson and Pima County Riparian Protection Technical Paper	2009	Pima County	56
Pima County	City of Tucson and Pima County Water for the Environment Technical Paper	2009	Pima County	57
Porse, E.C., S&oval-Solis, S., Lane, B.A.	Integrating Environmental Flows into Multi-Objective Reservoir Management for a Transboundary,Water-Scarce River Basin: Rio Grande/Bravo	2015	Water Resources Management 29:2471-2484	345
Porter, M.D., Massong, T.M.	Habitat fragmentation and modifications affecting distribution of the Rio Grande silvery minnow	2004	GIS/Spatial Analyses in Fishery and Aquatic Sciences	344
Powell, B.P., Steidl, R.J.	Habitat Selection by Riparian Songbirds Breeding in Southern Arizona	2002	The Journal of Wildlife Management, Vol. 66, No. 4 pp. 1096-1103	343
Propst, D.L., Gido, K.B., Stefferud, J.A.	Natural flow regimes, nonnative fishes, and native fish persistence in arid-land river systems	2008	Ecological Applications, Vol. 18, No. 5 pp. 1236-1252	342

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Propst, D.L., Stefferud, J.A.	Distribution and Status of the Chihuahua Chub (Teleostei: Cyprinidae: Gila nigrescens), with Notes on Its Ecology and Associated Species	1994	The Southwestern Naturalist 39(3):224-234	341
Ralston, B.E.	Riparian vegetation response to the March 2008 short-duration, high-flow experiment; implications of timing and frequency of flood disturbance on nonnative plant establishment along the Colorado River below Glen Canyon Dam	2010	U.S. Geological Survey	58
Ralston, B.E.	Chapter 6. Riparian vegetation and associated wildlife	2005	USGS Circular 1284	262
Ralston, B.E.	Summary report of responses of key resources to the 2000 low steady summer flow experiment, along the Colorado River downstream from Glen Canyon Dam, Arizona	2011	USGS Open-File Report 2011–1220	337
Ralston, B.E., Starfield, A.M., Black, R.S., Van Lonkhuyzen, R.A.	State-and-Transition Prototype Model of Riparian Vegetation Downstream of Glen Canyon Dam, Arizona	2014	U.S. Geological Survey Open-File Report 2014-1095	340
Reynolds, L.V., & Cooper, D.J	Ecosystem response to removal of exotic riparian shrubs and a transition to upland vegetation	2011	Plant Ecology, 212(8), 1243–1261.	102
Reynolds, L.V., & Cooper, D.J.	Environment tolerance of an invasive riparian tree and its potential for continued spread in the southwestern US	2010	Journal of Vegetation Science.	107
Reynolds, L.V., Shafroth, P.B., House, P.K.	Abandoned floodplain plant communities along a regulated dryland river	2014	River Research and Applications 30: 1084–1098	335
Richard, G.Julien, P.	Dam Impacts on and restoration of an alluvial river - Rio Grande, New Mexico	2003	International Journal of Sediment Research, Vol. 18, No. 2, pp. 89-9	334
Richter, H.E., Gungle, B., Lacher, L.J., Turner, D.S., Bushman, B.M.	Development of a Shared Vision for Groundwater Management to Protect and Sustain Baseflows of the Upper San Pedro River, Arizona, USA	2014	Water (6): 2519-2538	333
Riggs, A.C., Deacon, J.E.	Connectivity in Desert Aquatic Ecosystems: The Devils Hole Story	2002	Conference Proceedings. Spring-fed Wetlands: Important Scientific and Cultural Resources of the Intermountain Region, 2002.	332
Rinne, J.N.	Desired future condition: Fish habitat in southwestern riparian-stream habitats	1996	Desired future conditions for Southwestern riparian ecosystems: Bringing interests and concerns together	323
Rinne, J.N.	Physical habitat use by loach minnow Tiaroga cobitis (pisces: cyprinidae) in southwestern desert streams	1989	The Southwestern Naturalist 34(1):109-117	325
Robert, L.	Middle Rio Grande ecosystem : bosque biological management plan - The first decade: a review and update	2005	Aurora Publishing, LLC	319
Robinett, D. & Kennedy, L.	Babocomari River Riparian Protection Project	2013	U.S. Forest Service	121
Rosen, P.C.	Chapter 9: Reptiles and Amphibians	2009	Ecology and Conservation of the San Pedro River	59
Rosi-Marshall, E.J., Kennedy, T.A., Kincaid, D.W., Cross, W.F., Kelly, H.A., Behn, K.A., … Baxter, C.V.	Short-term Effects Short-term effects of the 2008 high-flow experiment on macroinvertebrates in the Colorado River below Glen Canyon Dam, Arizona	2010	U.S. Geological Survey	60
Rowell, K., Flessa, K.W., Dettman, D.L., Roman, M,	The importance of Colorado River flow to nursery habitats of the Gulf corvina (Cynoscion othonopterus)	2005	Canadian Journal of Fisheries and Aquatic Sciences 62 (12): 2874-2885	304
S&oval-Solis, S., McKinney D.C.	Hydrological Feasibility of Environmental Flows in the Rio Grande/Bravo Basin	2009	Proceedings from World Environmental and Water Resources Congress 2009: Great Rivers	288
S&oval-Solis, S., McKinney D.C.	Integrated Water Management for Environmental Flows in the Rio Grande	2014	Journal of Water Resources Planning and Management, Vol. 135	292

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
S.S.Papadopulos & Associates, Inc., New Mexico Interstate Stream Commission	Riparian Groundwater Models for the Middle Rio Grande: ESA Collaborative Program FY04	2006	The Middle Rio Grande Endangered Species Act Collaborative Program	234
Sabo, J.L., McCluney, K.E., Marusenko, Y., Keller, A., & Soykan, C.U.	Greenfall Links Groundwater to Aboveground Food Webs in Desert River Floodplains	2008	Ecological Monographs, 78, 615–631.	61
Sada, D.W., Deacon, J.E.	The probable effects of groundwater use proposed by the Las Vegas Valley Water District on spring-dwelling animals in southern Nevada and southeastern California	1994	unknown	299
Sada, D.W., Fleishman, E., Murphy, D.D.	Associations among spring-dependent aquatic assemblages and environmental and land use gradients in a Mojave Desert mountain range	2005	Diversity and Distributions, 11, 91–99	297
Sada, D.W., Vinyard, G.L.	Anthropogenic Changes in Biogeography of Great Basin Aquatic Biota	2002	Smithsonian Contributions to the Earth Sciences	296
Sada, D.W., Williams, J.E., Silvery, J.C., Anne, H., Ramakka, J., Summers, P., & Lewis, L.	A Guide to managing, Restoring, and Conserving Springs in the Western United States.	2001	U.S. Department of the Interior Bureau of Land Management. Technical Reference 1737-17	399
Sala, A., Smith, S.D., Devitt, D.A.	Water Use by Tamarix Ramosissima and Associated Phreatophytes in a Mojave Desert Floodplain	1996	Ecological Applications, 6(3), pp. 888-898	295
Scalero, D.	Final Report: Pantano Jungle Restoration, Cienega Creek Preserve	2009	Pima County Regional Flood Control District	62
Schmidt, J.C., Webb, R.H., Valdez, R.A., Marzolf, G.R., & Stevens, L.E.	Science and Values in River Restoration Science and Values in River Restoration in the Grand Canyon	1998	BioScience, 48(9), 735–747	63
Scoppettone, G.G., Rissler, P.H., Gourley, C., Martinez, C.	Habitat Restoration as a Means of Controlling Non-Native Fish in a Mojave Desert Oasis	2005	Restoration Ecology Vol. 13, No. 2, pp. 247–256	287
Scott, R.L., Cable, W.L., Huxman, T.E., Nagler, P.L., Hernandez, M., & Goodrich, D.C.	Multiyear riparian evapotranspiration and groundwater use for a semiarid watershed	2008	Journal of Arid Environments, 72, 1232–1246.	66
Scott, R.L., Goodrich, D.C. & Levick, L.R.	A GIS-based Management Tool to Quantify Riparian Vegetation Groundwater Use	2003	Presented at the Proc. 1st Interagency Conf. on Research in the Watersheds	64
Scott, R.L., Shuttleworth, W.J., Goodrich, D.C., & Maddock III, T.	The water use of two dominant vegetation communities in a semiarid riparian ecosystem	2000	Agricultural and Forest Meteorology, 105(1), 241–256.	65
Serrat-Cepdevila, A., Valdes, J.B., Gonzales Perez, J., Baird, K., Mata, L.J., & Maddock III, T.	Modeling climate change impacts – and uncertainty –on the hydrology of a riparian system: The San Pedro Basin (Arizona/Sonora)	2007	Journal of Hydrology 347,48–66	68
Shafroth, P.B. & Beauchamp, V.B.	Streamflow-Biota Relations: Riparian Vegetation	2006	Defining Ecosystem Flow Requirements for the Bill Williams River, Arizona. Open-File Report.	67
Shafroth, P.B., Auble, G.T., Stromberg, J.C., & Patten, D.T.	Establishment of Woody Riparian Vegetation in Relation to Annual Patterns of Streamflow, Bill Williams River, Arizona	1998	Wetlands, 18(4), 577–590.	70
Shafroth, P.B., Cleverly, J.R., Dudley, T.L., Taylor, J.P., Van Riper III, C., Weeks, E.P., Stuart, J.N.	Control of Tamarix in the Western United States:Implications for Water Salvage, Wildlife Use, and Riparian Restoration	2005	Environmental Management Vol. 35, No. 3, pp. 231-246	285
Shafroth, P.B., Stromberg, J., Patten, D.T.	Riparian vegetation response to altered disturbance and stress regimes	2002	Ecological Applications, 12(1), pp. 107-123	277

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Shafroth, P.B., Stromberg, J.C., Patten, D.T.	Woody Riparian Vegetation Response to Different Alluvial Water Table Regimes	2000	Western North American Naturalist 60(1), pp. 66–76	283
Shafroth, P.B., Wilcox, A.C., Lytle, D.A., Hickey, J.T., Andersensen, D.C., Beauchamp, V.B., … Warner, A.	Ecosystem effects of environmental flows: modelling and experimental floods in a dryland river	2010	Freshwater Biology, 55(1), 68–85.	69
Sher, A.A., Marshall, D.L., Taylor, J.P.	Establishment Patterns of Native Populus and Salix in the Presence of Invasive Nonnative Tamarix	2002	Ecological Applications,Vol. 12, No. 3	249
Sisto, N.P	Environmental flows for rivers and economic compensation for irrigators	2009	Journal of Environmental Management 90	248
Sites, R.W., Bowles, D.E.	Ambrysus hungerfordi hungerfordi (Hemiptera: Naucoridae) Occurrence in the United States	1995	Journal of the Kansas Entomological Society, Vol. 68, No. 4	247
Smith, D.M., & Finch, D.M.	Abundance of wind scorpions Solifugae: Eremobatidae) in riparian forests disturbed by grazing, fire, and flood in Central New Mexico, USA	2011	IX International Rangeland Congress: Diverse Rangelands for a Sustainable Society	238
Smith, D.M., Finch, D.M., Gunning, C., Jemison, R., Kelly, J.	Post-Wildfire Recovery of Riparian Vegetation During a Period of Water Scarcity in the Southwestern USA	2009	Fire Ecology Special Issue Vol. 5, No. 1	246
Smith, D.M., Kelly, J.F., Finch, D.M.	Influences of Disturbance and Vegetation on Abundance of Native and Exotic Detritivores in a Southwestern Riparian Forest	2006	Environmental Entomology 35(6)	243
Smith, D.M., Kelly, J.F., Finch, D.M.	Cicada Emergence in Southwestern Riparian Forest: Influences of Wildfire and Vegetation Composition	2006	Ecological Applications, Vol. 16, No. 4	245
Smith, S.D., Devitt, D.A., Sala, A., Cleverly, J.R., Busch, D.E.	Water Relations of Riparian Plants from Warm Desert Regions	1998	Wetlands, Vol 18, No. 4	244
Snyder, K.A., Williams, D.G.	Water sources used by riparian trees varies among stream types on the San Pedro River, Arizona	2000	Agricultural and Forest Meteorology 105	242
Sogge, M.K., Paxton, E.H., Tudor, A.A.	Saltcedar and Southwestern Willow Flycatchers: Lessons From Long-term Studies in Central Arizona	2006	Monitoring science and technology symposium: RMRSP-42CD.	241
Soles, E.S., Cooper, M.S.	Chapter 7: Groundwater and Surface Water Interactions in the Cliff-Gila Valley, NM	2014	Gila Flow Needs Assessment, The Nature Conservancy	401
Sonoran Institute	A Living River - Charting the Health of the Upper Santa Cruz River	2009	Sonoran Institute	71
Soykan, C.U., Brand, L.A. & Sabo, J.L.	Causes and consequences of mammal species richness (Chapter 6)	2009	Ecology and Conservation of the San Pedro River	72
Sponseller, R.A., Grimm, N.B., Boulton, A.J., & Sabo, J.L.	On the multiple ecological roles of water in river networks	2013	Ecosphere, 4(2)	114
Sponseller, R.A., Grimm, N.B., Boulton, A.J., & Sabo, J.L.	Responses of macroinvertebrate communities to long-term flow variability in a Sonoran Desert stream	2010	Global Change Biology 16, 2891–2900	240
Sprenger, M.D., Smith, L.M., Taylor, J.P.	Restoration of Riparian Habitat Using Experimental Flooding	2002	Wetlands,Vol. 22, No. 1	235
Springer, A.E., Wright, J.M., Shafroth, P.B., Stromberg, J.C., & Patten, D.T.	Coupling Groundwater and Riparian Vegetation Models to Assess Effects of Reservoir Releases	1999	Water Resources Research, 35(12).	73
Stefferud, J.A., Marsh, P.C., & Clarkson, R.W.	Fishes: Historical changes and an imperiled fauna	2009	Ecology and Conservation of the San Pedro River. Ed. by JC Stromberg and BJ Tellman. Tucson: University of Arizona Press.	74

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Stefferud, J.A., Propst, D.L.	Fish fauna of the Bavícora Basin, Chihuahua, Mexico	1996	The Southwestern Naturalist, Vol. 41, No. 4	233
Stevens, L.E., Ayers, T.J., Bennett, J.B., Christensen, K., Kearsley, M.J.C., Meretsky, V.J., Phillips III, A.M., Parnell, R.A., Spence, J., Sogge, M.K., Springer, A.E., Wegner, D.L.	Planned Flooding and Colorado River Riparian Trade-offs Downstream from Glen Canyon Dam, Arizona	2001	Ecological Applications,Vol. 11, No. 3	232
Stevens, L.E., Bailowitz, R.A.	Odonata of Ash Meadows National Wildlife Refuge, Southern Nevada, USA	2008	Journal of the Arizona-Nevada Academy of Science Vol. 40, No. 2	368
Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	1995	Ecological Applications, Vol. 5, No. 4, pp. 1025-1039	230
Stevens, L.E., Siemion, G.	Tamarisk Reproductive Phenology and Colorado River Hydrography, Southwestern USA	2012	Journal of the Arizona-Nevada Academy of Science, Vol. 44, No. 1, pp. 46-58	228
Stevens, L.E., Turner, D.S., & Supplee, V.	Wildlife and Flow Relationships in the Verde River Watershed	2008	Ecological Implications of Verde River Flows	75
Stoleson, S.H., Finch, D.M.	Microhabitat use by breeding southwestern willow flycatchers on the Gila River, New Mexico	2003	Studies in Avian Biology No. 26:91-95	226
Stoleson, S.H., Shook, R.S., Finch, D.M.	Breeding Biology of Lucy's Warbler in Southwestern New Mexico	2000	Western Birds, Vol. 44	227
Stromberg, J., Dixon, M.D., Scott, R.L., Maddock, T., Baird, K., & Tellman, B.	Status of the Upper San Pedro River (USA): Riparian Ecosystem	2009	Ecology and Conservation of the San Pedro River. Ed. by JC Stromberg and BJ Tellman. Tucson: University of Arizona Press	79
Stromberg, J., Lite, S.J., & Beauchamp, V.B.	Managing streamflow regimes for riparian ecosystem restoration	2003	Presented at the 2003 Tamarisk Symposium.	80
Stromberg, J.C.	Influence of streamflow regime and temperature on growth rate of the riparian tree, Platanus wrightii, in Arizona	2001	Freshwater Biology, 46(2), 227–239.	76
Stromberg, J.C.	Ecological Implications of Verde River Flows	2008	Ecological Implications of Verde River Flows	78
Stromberg, J.C.	Instream flow models for mixed deciduous riparian vegetation within a semiarid region	1993	Regulated Rivers: Research & Management, 8(3), 225–235.	81
Stromberg, J.C.	Biotic integrity of Platanus wrightii riparian forests in Arizona: first approximation	2001	Forest Ecology and Management, 142(1), 251–266.	82
Stromberg, J.C.	Fremont Cottonwood-Goodding Willow Riparian Forests: A Review of Their Ecology, Threats,and Recovery Potential	1993	Journal of the Arizona-Nevada Academy of Science, Vol. 27, No. 1	218
Stromberg, J.C.	Dynamics of Fremont cottonwood (Populus fremontii) and saltcedar (Tamarix Chinensis) populations along the San Pedro River, Arizona	1998	Journal of Arid Environments, Vol. 40: 133-155	223
Stromberg, J.C., & Boudell, J.A	Floods, drought, and seed mass of riparian plant species	2013	Journal of Arid Environments, 97, 99–107.	118
Stromberg, J.C., Bagstad, K.J., Leenhouts, J.M., Lite, S.J., & Makings, E.	Effects of streamflow intermittency on riparian vegetation of a semiarid region river (San Pedro River, Arizona)	2005	River Research and Applications, 21, 925–938.	77

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Stromberg, J.C., Beauchamp, V.B., Dixon, M.D., Lite, S.J., Paradzick, C.	Importance of low-flow and high-flow characteristics to restoration of riparian vegetation along rivers in arid south-western United States	2007	Freshwater Biology 52, 651–679	221
Stromberg, J.C., Butler, L., Hazelton, A.F., & Boudell, J.A.	Seed Size, Sediment, and Spatial Heterogeneity: Post-Flood Species Coexistence in Dryland Riparian Ecosystems	2011	Wetlands, 31(6), 1187–1197.	106
Stromberg, J.C., Lite, S.J., & Dixon, M.D.	Effects of streamflow patterns on riparian vegetation of a semiarid river: Implications for a changing climate	2009	River Research and Applications	84
Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	Altered streamflow regimes and invasive plant species: the Tamarix case	2007	Global Ecology and Biogeography, 16, 381– 393	217
Stromberg, J.C., McCluney, K.E., Dixon, M.D., Meixner, T.	Dryland Riparian Ecosystems In the American Southwest:Sensitivity and Resilience to Climatic Extremes	2013	Ecosystems 16: 411-415	219
Stromberg, J.C., Shafroth, P.B., & Hazelton, A.F.	Legacies of Flood Reduction on a Dryland River	2012	River Research and Applications, 28(2), 143–159.	105
Stromberg, J.C., Tiller, R., & Richter, B.	Effects of Groundwater Decline on Riparian Vegetation of Semiarid Regions: The San Pedro, Arizona	1996	Ecological Applications, 6(1), 113.	83
Stromberg, J.C., Wilkins, S.D., Tress, J.A.	Vegetation-Hydrology Models: Implications for Management of Prosopis Velutina (Velvet Mesquite) Riparian Ecosystems	1993	Ecological Applications, Vol. 3, No. 2	216
Stromberg, Lite, Dixon, & Tiller 2009b	Riparian Vegetation: Pattern and Process	2009	Ecology and Conservation of the San Pedro River	85
Strong, T.R., Bock, C.E.	Bird Species Distribution Patterns in Riparian Habitats in Southeastern Arizona	1990	The Condor, Vol. 92, No. 4	215
Szaro, R.C., Belfit, S.C.	Herpetofaunal Use of a Desert Riparian Island and its Adjacent Habitat	1986	Journal of Wildlife Management 50(4):752-761	211
Tallent-Halsell, N.G., & Walker, L.R.	Responses of Salix Gooddingii and Tamarix Ramosissima to Flooding	2002	Wetlands, 22(4), 776–785.	86
Taylor, J.P, McDaniel, K.C.	Restoration of Saltcedar (Tamarix sp.)-Infested Floodplains on the Bosque del Apache National Wildlife Refuge	1998	Weed Technology, Vol. 12, No. 2	208
Texas Parks & Wildlife	Desert Spring Fishes			205
Thibault, J.R., Moyer, D.L., Dahm, C.N., Valett, H.M., & Marshall, M.C.	Effects of Livestock Grazing on Morphology, Hydrology and Nutrient Retention in Four Riparian/Stream Ecosystems, New Mexico, USA	1999	USDA Forest Service Proceedings RMRS-P-7. 2000	396
Tidwell, V.C., Passell, H.D., Conrad, S.H., Thomas, R.P	System dynamics modeling for community-based water planning: Application to the Middle Rio Grande	2004	Aquatic Sciences 66 (357-372)	204
Titus, P.J., Titus, J.H.	Ecological monitoring of the endangered Huachuca water umbel (Lilaeopsis schaffneriana ssp. recurva: Apiaceae)	2008	The Southwestern Naturalist, Vol. 53, No. 4	203
Trungale Engineering & Science	Instream Flow-Habitat Relationships in the Upper Rio Grande River Basin	2012	Texas Water Development Board Contract Report Number 1248311376	202
Turner, D.S., & Haney, J.A.	Workshop Results: Steps Toward Understanding Ecological Response to Hydrologic Variation in the Verde River (Chapter 6)	2008	Ecological Implications of Verde River Flows.	87
Turner, P.R., Tafenelli, R.J.	Evaluation of the instream flow requirements of the native fishes of Aravaipa Creek by the IFIM	1983	U.S. Fish and Wildlife Service	201
Turner, T.F., Propst, D.L.	Chapter 10. Effects of Altered Flow Regimes and Habitat Fragmentation on Gila River Fishes	2014	Gila Flow Needs Assessment, The Nature Conservancy	404
U.S.Bureau of Reclamation	Final Environmental Assessment Experimental Releases from Glen Canyon Dam, Arizona 2008 through 2012	2008	Department of the Interior	16

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
U.S.Fish & Wildlife Service	Fish and Wildlife Coordination Act Substantiating Report: Central Arizona Project Verde and East Verde River Water Diversions, Yavapai and Gila Counties, Arizona	1989	U.S. Fish and Wildlife Service	88
U.S.Fish & Wildlife Service	Final Biological Opinion for the Operation of the Glen Canyon Dam	2008	U.S. Fish and Wildlife Service	89
Upper Rio Gr&e Basin & Bay Expert Science Team	Environmental Flows Recommendations Report	2012	Final Submission to the Environmental Flows Advisory Group, Rio Grande Basin and Bay Area Stakeholders Committee, and Texas Commission on Environmental Quality	391
Valdez, R.A., Shannon, J.P., & Blinn, D.W.	Biologic implications of the 1996 controlled food	1999	The Controlled Flood in the Grand Canyon (pp. 343–350). Washington, D.C.: American Geophysical Union.	91
Valett, H.M., Fisher, S.G., Grimm, N.B., Camill, P.	Vertical Hydrologic Exchange and Ecological Stability of a Desert Stream Ecosystem	1994	Ecology, Vol. 75, No. 2, pp. 548-560	199
Van Haverbeke, D.R.	The Humpback Chub of Grand Canyon	2010	Proceedings of the Colorado River Basin Science and Resource Management Symposium, November 18-20, 2008	356
Van Riper, C.J., & Paradzick, C.	Streamflow-Biota Relations: Riparian Vegetation	2006	Defining Ecosystem Flow Requirements for the Bill Williams River, Arizona. U.S. Geological Survey Open-File Report,	92
Vidales-Contreras, J.A., Pissani-Zuñiga, J.F., Rodríguez-Fuentes, H., Olivares-Sáenz, E., Ar&a-Ruiz, J., Luna-Maldonado, A.I.	Regimens of Ecological Flow Rates on the Pilón River	2014	Journal of Experimental Biology and Agricultural Sciences, Volume –2(4)	197
Villarreal, M.L.	Land Use and Disturbance Interactions in Dynamic Arid Systems: Multiscale Remote Sensing Approaches for Monitoring and Analyzing Riparian Vegetation Change	2009	Dissertation, University of Arizona	93
Vincent, K.R., Friedman, J.M., Griffin, E.R.	Erosional Consequence of Saltcedar Control	2009	Environmental Management 44:218–227	194
Waddle, T.J., & Bovee, K.D.	Environmental flows studies of the Fort Collins Science Center, U.S. Geological Survey—Cherry Creek, Arizona	2009	U.S. Geological Survey.	90
Walker, H.A.	Chapter 12. Gila River Avifauna: Streamflow Regimes and Ecological Relationships	2014	Gila Flow Needs Assessment, The Nature Conservancy	406
Wallace, C.S., Villarreal, M.L., van Riper III, C.	Influence of monsoon-related riparian phenology on yellow-billed cuckoo habitat selection in Arizona	2013	Journal of Biogeography, 40, 2094–2107	167
Ward, D.L.	Salinity of the Little Colorado River in Grand Canyon Confers Anti-Parasitic Properties on a Native Fish	2012	Western North American Naturalist, 72(3), 334–338.	108
Ward, F.A., Booker, J.F.	Economic Impacts of Instream Flow Protection for the Rio Grande Silvery Minnow in the Rio Grande Basin	2006	Reviews in Fisheries Science,14:1–16	158
Watts, D., Moore, G.	Ecohydrology and ecophysiology of Arundo donax (giant reed)		Report to the Pima County Board of Supervisors, Tucson, AZ	157
Webb, M.A., Ott, R.A., Bonds, C.C., Smart, R.M., Dick, G.O., Dodd, L.	Propagation and Establishment of Native Aquatic Plants in Reservoirs	2012	Texas Parks and Wildlife Department, Inland Fisheries Division	144

Authors	Article, Book, or Chapter Title	Date Published	Publication	Study Index
Webb, R., Leake, S.A.	Ground-water surface-water interactions and long-term change in riverine riparian vegetation in the southwestern United States	2006	Journal of Hydrology 320:302-323	142
Wenniger, E.J., Fagan, W.F.	Effect of River Flow Manipulation on Wolf Spider Assemblages at Three Desert Riparian Sites	2000	The Journal of Arachnology 28:115-122	141
West, P., Smith, D.H., & Auberle, W.	Valuing the Verde River Watershed - An Assessment	2009	Report	96
White, J.M., & Stromberg, J.C.	Resilience, Restoration, and Riparian Ecosystems: Case Study of a Dryland, Urban River	2011	Restoration Ecology, 19(1), 101–111.	109
Whitney, J.	Watershed/River Channel Linkages: the Upper Rio Grande Basin and the Middle Rio Grande Bosque	1999	USDA Forest Service Proceedings RMRS-P-7. 1999	394
Wilcox, A.C., Shafroth, P.B.	Coupled hydrogeomorphic and woody-seedling responses to controlled flood releases in a dryland river	2012	Water Resources Research, VOL. 49, 2843–2860	140
Williams, D.G., & Scott, R.L.	Vegetation-hydrology interactions: Dynamics of riparian plant water use	2009	In J.C. Stromberg & B. J. Tellman (Eds.), Ecology and Conservation of the San Pedro River	97
Williams, J.A., O'Farrell, M.J., Riddle, B.R.	Habitat use by bats in a riparian corridor of the Mojave Desert in southern Nevada	2006	Journal of Mammalogy, 87(6):1145-115	135
Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	1985	Journal of the Arizona-Nevada Academy of Science, Vol. 20, No. 1 pp. 1-61	137
Winemiller, K., Lujan, N.K., Wilkins, R.N., Snelgrove, R.T., Dube, A.M., Skow, K.L., Grones Snelgrove, A.	Status of Freshwater Mussels in Texas	2010	Texas A&M Institute of Renewable Natural Resources	134
Yong, W., Finch, D.M.	Population trends of migratory landbirds along the Middle Rio Grande	1997	THE SOUTHWESTERN NATURALIST 42(2):137-147	131
Yong, W., Finch, D.M.	Stopover ecology of landbirds migrating along the middle Rio Grande in spring and fall	2002	Gen. Tech. Rep. RMRS-GTR-99	132
Zamora-Arroyo, F., Nagler, P.L., Briggs, M., Radtke, D., Rodriquez, H., Garcia, J., Valdes, C., Huete, A., & Glenn, E.P.	Regeneration of native trees in response to flood releases from the United States into the delta of the Colorado River, Mexico	2001	Journal of Arid Environments 49:49-64	125
Zengel, S., Meretsky, V., Felger, R., & Ortiz, D.	Cienega de Santa Clara, a remnant wetland in the Rio Colorado delta (Mexico): vegetation distribution and the effects of water flow reduction	1995	Ecological Engineering Vol. 4	123

Appendix 5- Studies by River

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Agua Fria River	73	Coupling Groundwater and Riparian Vegetation Models to Assess Effects of Reservoir Releases	Springer, A.E., Wright, J.M., Shafroth, P.B., Stromberg, J.C., & Patten, D.T.	1999
	217	Altered streamflow regimes and invasive plant species: the Tamarix case	Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	2007
Aguja Creek	247	Ambrysus hungerfordi hungerfordi (Hemiptera: Naucoridae) Occurrence in the United States	Sites, R.W., Bowles, D.E.	1995
Alamito Creek	391	Environmental Flows Recommendations Report	Upper Rio Gr&e Basin & Bay Expert Science Team	2012
Amargosa River	389	Vegetation Response Following Invasive Tamarisk (Tamarix spp.) Removal and Implications for Riparian Restoration	Harms, R.S., Hiebert, R.D.	2006
Aravaca Creek	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	38	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	Kirkpatrick, C.	2007
	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
Aravaipa Creek	51	Differential Selection by Flooding	Minckley, W.L. & Meffe, G.K.	1987
	325	Physical habitat use by loach minnow Tiaroga cobitis (pisces: cyprinidae) in southwestern desert streams	Rinne, J.N.	1989
	38	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	Kirkpatrick, C.	2007
	137	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	1985
	19	Comparison of Upper Thermal Tolerances of Native and Nonnative Fish Species in Arizona	Carveth, C.J., Widmer, A.M., & Bonar, S.A	2006
	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Aravaipa Creek	201	Evaluation of the instream flow requirements of the native fishes of Aravaipa Creek by the IFIM	Turner, P.R., Tafenelli, R.J.	1983
	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
Arroyo la Becerra	173	Environmental impacts in Cuatro Ciénegas, Coahuila, Mexico: A commentary	Contreras-Balderas, S.	1984
Ash Creek	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
Ash Meadows Springs	299	The probable effects of groundwater use proposed by the Las Vegas Valley Water District on spring-dwelling animals in southern Nevada and southeastern California	Sada, D.W., Deacon, J.E.	1994
	368	Odonata of Ash Meadows National Wildlife Refuge, Southern Nevada, USA	Stevens, L.E., Bailowitz, R.A.	2008
Babocomari River	66	Multiyear riparian evapotranspiration and groundwater use for a semiarid watershed	Scott, R.L., Cable, W.L., Huxman, T.E., Nagler, P.L., Hernandez, M., & Goodrich, D.C.	2008
	43	Simulated effects of ground-water withdrawals and artificial recharge on discharge to streams, springs, and riparian vegetation in the Sierra Vista Subwatershed of the Upper San Pedro Basin, southeastern Arizona	Leake, S.A., Pool, D.R., & Leenhouts, J.M.	2008
	121	Babocomari River Riparian Protection Project	Robinett, D. & Kennedy, L.	2013
Big Casa Blanca	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
Big Sandy River	231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007
Bill Williams River	27	Shifting dominance of riparian Populus and Tamarix along gradients of flow alteration in western North American rivers	Merritt, D.M. & Poff, N.L.	2010
	30	How Much Water Do Stream-Dependent Species Need?	Hautzinger, A.B., Hickey, J., & Walker, D.	2008
	31	Summary of Unified Ecosystem Flow Requirements for the Bill Williams River Corridor	Hautzinger, A., Warner, A., Hickey, J., & Beauchamp, V.B.	2006

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Bill Williams River	32	Beaver dams, hydrological thresholds and controlled floods as a management tool in a desert riverine ecosystem, Bill Williams River, Arizona	Andersen, D.C., & Shafroth, P.B.	2010
	34	Physiological Response to Groundwater Depth Varies among Species and with River Flow Regulation	Horton, J.L., Kolb, T.E. & Hart, S.C.	2001
	2	Chapter 7: Ecosystem Functioning	Anderson	2006
	17	Mechanisms Associated With Decline of Woody Species in Riparian Ecosystems of the Southwestern U.S	Busch, D.E., & Smith, S.D.	1995
	277	Riparian vegetation response to altered disturbance and stress regimes	Shafroth, P.B., Stromberg, J., Patten, D.T.	2002
	67	Streamflow-Biota Relations: Riparian Vegetation	Shafroth, P.B. & Beauchamp, V.B.	2006
	122	Are Cicadas (Diceroprocta apache) Both a "Keystone" and a "Critical-Link" Species in Lower Colorado River Riparian Communities?	Andersenson, D.	1994
	18	Proposed Management Plan for Alamo Lake and the Bill Williams River	BWRC Technical Committee	1994
	3	Chapter 6: Streamflow Biota Relations	Anderson	2006
	47	Streamflow-Biota Relations: Fish and Aquatic Macroinvertebrates	Lytle, D.A.	2006
	283	Woody Riparian Vegetation Response to Different Alluvial Water Table Regimes	Shafroth, P.B., Stromberg, J.C., Patten, D.T	2000
	231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007
	69	Ecosystem effects of environmental flows: modelling and experimental floods in a dryland river	Shafroth, P.B., Wilcox, A.C., Lytle, D.A., Hickey, J.T., Andersensen, D.C., Beauchamp, V.B., … Warner, A.	2010
	92	Streamflow-Biota Relations: Riparian Vegetation	Van Riper, C.J., & Paradzick, C.	2006
	140	Coupled hydrogeomorphic and woody-seedling responses to controlled flood releases in a dryland river	Wilcox, A.C., Shafroth, P.B.	2012
	94	Managed Flood Effects on Beaver Pond Habitat in a Desert Riverine Ecosystem, Bill Williams River, Arizona USA	Andersensen, D.C., Shafroth, P.B., Pritekel, C.M., & O'Neill, M.W.	2011
	217	Altered streamflow regimes and invasive plant species: the Tamarix case	Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	2007

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Bill Williams River	70	Establishment of Woody Riparian Vegetation in Relation to Annual Patterns of Streamflow, Bill Williams River, Arizona	Shafroth, P.B., Auble, G.T., Stromberg, J.C., & Patten, D.T.	1998
	162	Water Uptake in Woody Riparian Phreatophytes of the Southwestern United States: A Stable Isotope Study	Busch, D.E., Ingraham, N.L., & Smith, S.D.	1992
	335	Abandoned floodplain plant communities along a regulated dryland river	Reynolds, L.V., Shafroth, P.B., House, P.K.	2014
	105	Legacies of Flood Reduction on a Dryland River	Stromberg, J.C., Shafroth, P.B., & Hazelton, A.F.	2012
	98	Evaluating Dam Re-Operation for Freshwater Conservation in the Sustainable Rivers Project	Konrad, C.P., Warner, A., & Higgins, J.V.	2012
Bitter Lake	389	Vegetation Response Following Invasive Tamarisk (Tamarix spp.) Removal and Implications for Riparian Restoration	Harms, R.S., Hiebert, R.D.	2006
Black Canyon Creek	352	Ecological condition of the East Fork of the Gila River and selected tributaries: Gila National Forest, New Mexico	Ohmart, R.D.	1995
Boggy Creek	323	Desired future condition: Fish habitat in southwestern riparian-stream habitats	Rinne, J.N.	1996
Bonita Creek	19	Comparison of Upper Thermal Tolerances of Native and Nonnative Fish Species in Arizona	Carveth, C.J., Widmer, A.M., & Bonar, S.A	2006
	51	Differential Selection by Flooding	Minckley, W.L. & Meffe, G.K.	1987
Bright Angel Creek	290	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	Oberlin, G.E., Shannon, J.P., Blinn, D.W.	1999
Brown Canyon	38	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	Kirkpatrick, C.	2007
	343	Habitat Selection by Riparian Songbirds Breeding in Southern Arizona	Powell, B.P., Steidl, R.J.	2002
	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
Brown Canyon	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Buehman Canyon	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	38	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	Kirkpatrick, C.	2007
	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
Buenos Aires National Wildlife Refuge Stock Tanks	19	Comparison of Upper Thermal Tolerances of Native and Nonnative Fish Species in Arizona	Carveth, C.J., Widmer, A.M., & Bonar, S.A	2006
Burro Creek	201	Evaluation of the instream flow requirements of the native fishes of Aravaipa Creek by the IFIM	Turner, P.R., Tafenelli, R.J.	1983
Cajon Bonito River	286	Habitat and Conservation Status of the Beaver in the Sierra San Luis Sonora, México	Pelz Serrano, K., Ponce Guevara, E., Lopez Gonzales, C.A.	2005
Canada del Oro	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
Canyon Creek	369	Fish and Other Aquatic Resource Trends in the United States	Loftus, A.J., & Flather, C.H.	2000
Canyon del Muerto	102	Ecosystem response to removal of exotic riparian shrubs and a transition to upland vegetation	Reynolds, L.V., & Cooper, D.J	2011
Cave Creek	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
	119	Invertebrate assemblages of pools in arid-land streams have high functional redundancy and are resistant to severe drying	Boersma, K.S., Bogan, M.T., Henrichs, B.A., & Lytle, D.A	2014
Centerfire Creek	323	Desired future condition: Fish habitat in southwestern riparian-stream habitats	Rinne, J.N.	1996

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Cherry Creek	50	Linking streamflow and groundwater to avian habitat in a desert riparian system	Merritt, D.M. & Bateman, H.L.	2012
	90	Environmental flows studies of the Fort Collins Science Center, U.S. Geological Survey—Cherry Creek, Arizona	Waddle, T.J., & Bovee, K.D.	2009
Chihuahueños Creek	396	Effects of Livestock Grazing on Morphology, Hydrology and Nutrient Retention in Four Riparian/Stream Ecosystems, New Mexico, USA	Thibault, J.R., Moyer, D.L., Dahm, C.N., Valett, H.M., & Marshall, M.C.	1999
Chinle Wash	118	Floods, drought, and seed mass of riparian plant species	Stromberg, J.C., & Boudell, J.A	2013
Chuar Creek	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
Cienega Creek	38	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	Kirkpatrick, C.	2007
	62	Final Report: Pantano Jungle Restoration, Cienega Creek Preserve	Scalero, D.	2009
	217	Altered streamflow regimes and invasive plant species: the Tamarix case	Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	2007
	9	State of the Las Cienegas National Conservation Area. Part 3. Condition and Trend of Riparian Target Species, Vegetation and Channel Geomorphology	Bodner, G.& K.Simms	2008
	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	8	State of the Las Cienegas National Conservation Area. Gila Topminnow population status and trends 1989-2005	Bodner, G., Simms, J., & Gori, D.	2007
	95	The Goldilocks effect: intermittent streams sustain more plant species than those with perennial or ephemeral flow	Katz, G.L., Denslow, M.W., & Stromberg, J.C.	2012
	118	Floods, drought, and seed mass of riparian plant species	Stromberg, J.C., & Boudell, J.A	2013
Ciénega de Santa Clara	123	Cienega de Santa Clara, a remnant wetland in the Rio Colorado delta (Mexico): vegetation distribution and the effects of water flow reduction	Zengel, S., Meretsky, V., Felger, R., & Ortiz, D.	1995

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Ciénega de Santa Clara	198	The Hydrobiid Snails (Gastropoda: Rissoacea) of the Cuatro Cienegas Basin: Systematic Relationships and Ecology of a Unique Fauna	Hershler, R.	1984
	209	Cienega de Santa Clara: Endangered Wetland in the Colorado River Delta, Sonora, Mexico	Glenn, E.P., Felger, R.S., Borquez, A., Turner, D.S.	1992
	193	Distribution and abundance of the Yuma clapper rail (Rallus longirostris yumanensis) in the Colorado River delta, México	Hinojosa-Huerta, O., DeStefano, S., & Shaw, W.W.	2001
	193	Distribution and abundance of the Yuma clapper rail (Rallus longirostris yumanensis) in the Colorado River delta, México	Hinojosa-Huerta, O., DeStefano, S., & Shaw, W.W.	2001
	182	Effects of Water Management on the Wetlands of the Colorado River Delta, Mexico	Glenn, E.P., Lee, C., Felger, R., & Zengel, S.	1996
	188	An integrated model for evaluating hydrology, hydrodynamics, salinity and vegetation cover in a coastal desert wetland	Huckelbridge, K.H., Stacey, M.T., Glenn, E.P., & Dracup, J.A.	2010
Colorado River	264	Chapter 9. Recreation Use Values and Nonuse Values	Loomis, J., Douglas, A.J., & Harpman D.A.	2005
	207	Restoration potential of the aquatic ecosystems of the Colorado River Delta, Mexico: Introduction to special issue on “Wetlands of the Colorado River Delta”	Glenn, E.P., Flessa, K.W., & Pitt, J.	2013
	356	The Humpback Chub of Grand Canyon	Van Haverbeke, D.R.	2010
	260	Chapter 2. Fishes of Grand Canyon	Gloss, S.P., & Coggins, L.G.	2005
	361	An Assessment of Riparian Environmental Quality by Using Butterflies and Disturbance Susceptibility Scores	Nelson, S.M., Andersensen, D.C.	1994
	261	Chapter 5. Aquatic Ecology: The role of organic matter.	Kennedy, T.A., & Gloss, S.P.	2005
	262	Chapter 6. Riparian vegetation and associated wildlife	Ralston, B.E.	2005
	16	Final Environmental Assessment Experimental Releases from Glen Canyon Dam, Arizona 2008 through 2012	U.S.Bureau of Reclamation	2008
	36	Riparian vegetation responses: snatching defeat from the jaws of victory, and vice versa	Kearsley, M.J. & Ayers, T.J.	1999
	365	Water Use by Riparian Plants on the Lower Colorado River	Nagler, P.L., & Glenn, E.P.	2010
	357	Evaluating Effects of a High-Flow Event on Rainbow Trout Movement in Glen and Marble Canyons, Arizona, by Using Acoustic Telemetry and Relative Abundance Measures	Hilwig, K.D., Makinster, A.S.	2010

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Colorado River	265	Chapter 12. Recreational values and campsites	Kaplinski, M., Behan, J., Hazel, J.E., Parnell, R.A., & Fairley, H.C.	2005
	210	Ecology and conservation biology of the Colorado River Delta, Mexico.	Glenn, E.P., Zamora-Arroyo, F., Nagler, P., Briggs, M., Shaw, W., & Flessa, K.	2001
	358	Water Velocity of the Colorado River: Implications for Native Fishes	Magirl, C.S., Andersensen, M.E.	2010
	266	Bats in the riparian-restoration sites along the Lower Colorado River, Arizona	Calvert, A.W., & Neiswenter, S.A.	2012
	351	Riparian vegetation dynamics and evapotranspiration in the riparian corridor in the delta of the Colorado River, Mexico	Nagler, P.L., Glenn, E.P., Hinojosa-Huerta, O., Zamora, F., Howard, K.	2007
	359	Economic Values for National Park System Resources Within the Colorado River Watershed	Duffield, J.W., Neher, C.J., Patterson, D.A.	2010
	263	Chapter 7. Birds of the Colorado River in Grand Canyon: a Synthesis of Status, Trends, and Dam Operation Effects	Holmes, J.A., Spence, J.R., & Sogge, M.K.	2005
	354	Water Supply Analysis for Restoring the Colorado River Delta, Mexico	Medellin-Azuara, J., Lund, J.R., Howitt, R.E.	2007
	163	Water budget for agricultural and aquatic ecosystems in the delta of the Colorado River, Mexico: Implications for obtaining water for the environment	Carrillo-Guerreo, Y., Glenn, E.P., & Hinojosa-Huerta, O.	2013
	17	Mechanisms Associated With Decline of Woody Species in Riparian Ecosystems of the Southwestern U.S	Busch, D.E., & Smith, S.D.	1995
	125	Regeneration of native trees in response to flood releases from the United States into the delta of the Colorado River, Mexico	Zamora-Arroyo, F., Nagler, P.L., Briggs, M., Radtke, D., Rodriquez, H., Garcia, J., Valdes, C., Huete, A., & Glenn, E.P.	2001
	210	Ecology and conservation biology of the Colorado River Delta, Mexico.	Glenn, E.P., Zamora-Arroyo, F., Nagler, P., Briggs, M., Shaw, W., & Flessa, K.	2001
	63	Science and Values in River Restoration Science and Values in River Restoration in the Grand Canyon	Schmidt, J.C., Webb, R.H., Valdez, R.A., Marzolf, G.R., & Stevens, L.E.	1998

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Colorado River	192	Status of marsh birds in the wetlands of the Colorado River delta, México	Hinojosa-Huerta, O., Guzmán-Olachea, R., Butrón-Méndez, J., Butrón-Rodríguez, J.J., & Calvo-Fonseca, A.	2013
	207	Restoration potential of the aquatic ecosystems of the Colorado River Delta, Mexico: Introduction to special issue on “Wetlands of the Colorado River Delta”	Glenn, E.P., Flessa, K.W., & Pitt, J.	2013
	207	Restoration potential of the aquatic ecosystems of the Colorado River Delta, Mexico: Introduction to special issue on “Wetlands of the Colorado River Delta”	Glenn, E.P., Flessa, K.W., & Pitt, J.	2013
	209	Cienega de Santa Clara: Endangered Wetland in the Colorado River Delta, Sonora, Mexico	Glenn, E.P., Felger, R.S., Borquez, A., Turner, D.S.	1992
	195	Community-based restoration of desert wetlands: the case of the Colorado River Delta	Hinojosa-Huerta, O., Briggs, M., Carrillo-Guerrero, Y., Glenn, E.P., Lara-Flores, M., & Román-Rodríguez, M.	2005
	162	Water Uptake in Woody Riparian Phreatophytes of the Southwestern United States: A Stable Isotope Study	Busch, D.E., Ingraham, N.L., & Smith, S.D.	1992
	228	Tamarisk Reproductive Phenology and Colorado River Hydrography, Southwestern USA	Stevens, L.E., Siemion, G.	2012
	210	Ecology and conservation biology of the Colorado River Delta, Mexico.	Glenn, E.P., Zamora-Arroyo, F., Nagler, P., Briggs, M., Shaw, W., & Flessa, K.	2001
	160	Nesting-Habitat Relationships of Riparian Birds along the Colorado River in Grand Canyon, Arizona	Brown, B.T., Trosset, M.W.	1989
	181	Growth rates, salt tolerance and water use characteristics of native and invasive riparian plants from the delta of the Colorado River, Mexico	Glenn, E., Tanner, R., Mendez, S., Kehret, T., Moore, D., Garcia, J., & Valdes, C.	1998
	351	Riparian vegetation dynamics and evapotranspiration in the riparian corridor in the delta of the Colorado River, Mexico	Nagler, P.L., Glenn, E.P., Hinojosa-Huerta, O., Zamora, F., Howard, K.	2007
	24	An Inventory, Assessment, And Development Of Recovery Priorities For Arizona Strip Springs, Seeps And Natural Ponds: A Synthesis Of Information	Gr& Canyon Wildl&s Council	2001

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Colorado River	209	Cienega de Santa Clara: Endangered Wetland in the Colorado River Delta, Sonora, Mexico	Glenn, E.P., Felger, R.S., Borquez, A., Turner, D.S.	1992
	110	2008 High-Flow Experiment at Glen Canyon Dam—Morphologic Response of Eddy-Deposited Sandbars and Associated Aquatic Backwater Habitats along the Colorado River in Grand Canyon National Park	Grams, P.E., J.C.Schmidt, & M.E.Andersensen	2010
	112	Site-occupancy monitoring of an ecosystem indicator: Linking characteristics of riparian vegetation to beaver occurrence	Breck, S.W., Goldstein, M.I., & Pyare, S	2013
	58	Riparian vegetation response to the March 2008 short-duration, high-flow experiment; implications of timing and frequency of flood disturbance on nonnative plant establishment along the Colorado River below Glen Canyon Dam	Ralston, B.E.	2010
	48	Glen Canyon Dam Releases – Economic Considerations	Marcus, D.	2009
	232	Planned Flooding and Colorado River Riparian Trade-offs Downstream from Glen Canyon Dam, Arizona	Stevens, L.E., Ayers, T.J., Bennett, J.B., Christensen, K., Kearsley, M.J.C., Meretsky, V.J., Phillips III, A.M., Parnell, R.A., Spence, J., Sogge, M.K., Springer, A.E., Wegner, D.L.	2001
	337	Summary report of responses of key resources to the 2000 low steady summer flow experiment, along the Colorado River downstream from Glen Canyon Dam, Arizona	Ralston, B.E.	2011
	172	Experimental flooding in Grand Canyon	Collier, M.P., Webb, R.H., & &rews, E.D.	1998
	328	Estimating recruitment dynamics and movement of rainbow trout (Oncorhynchus mykiss) in the Colorado River in Grand Canyon using an integrated assessment model	Korman, J., Martell, S.J.D., Walters, C.J., Makinster, A.S., Coggins, L.G., Yard, M.D., & Persons, W.R.	2012
	49	2008 High-Flow Experiment at Glen Canyon Dam Benefits Colorado River Resources in Grand Canyon National Park	Melis, T.S., Topping, D.J., Grams, P.E., Rubin, D.M., Wright, S.A., Draut, A.E.& others	2010
	303	Life History and Ecology of the Humpback Chub in the Little Colorado and Colorado Rivers of the Grand Canyon	Kaeding, L.R., & Zimmerman, M.A.	1983
	304	The importance of Colorado River flow to nursery habitats of the Gulf corvina (Cynoscion othonopterus)	Rowell, K., Flessa, K.W., Dettman, D.L., Roman, M,	2005

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Colorado River	304	The importance of Colorado River flow to nursery habitats of the Gulf corvina (Cynoscion othonopterus)	Rowell, K., Flessa, K.W., Dettman, D.L., Roman, M,	2005
	346	Response of the Shrimp Population in the Upper Gulf of California to Fluctuations in Discharges of the Colorado River	Perez-Arvizu, E.M., Aragon-Noriega, E.A., Espinosa Carreon, L.	2009
	168	The Bullfrog, Rana catesbeiana Shaw, in the Lower Colorado River, Arizona-California	Clarkson, R.W., & deVos J.C.Jr.	2015
	100	The influence of floods and precipitation on Tamarix establishment in Grand Canyon, Arizona: consequences for flow regime restoration	Mortenson, S.G., Weisberg, P.J., & Stevens, L.E.	2012
	308	Penaeid shrimp landing in the upper Gulf of California in relation to Colorado River freshwater discharge	Galindo-Bect, M.S., Glenn, E.P., Page, H.M., Fitzsimmons K., Galindo-Bect, L.A., Hern&ez-Ayon, J.M., Petty, R.L., Garcia-Hern&ez, J., Moore, D.	2000
	308	Penaeid shrimp landing in the upper Gulf of California in relation to Colorado River freshwater discharge	Galindo-Bect, M.S., Glenn, E.P., Page, H.M., Fitzsimmons K., Galindo-Bect, L.A., Hern&ez-Ayon, J.M., Petty, R.L., Garcia-Hern&ez, J., Moore, D.	2000
	309	Dead delta’s former productivity: Two trillion shells at the mouth of the Colorado River	Kowalewski, M., Avila Serrano, G.E., Flessa, K.W., Goodfriend, G.A.	2000
	309	Dead delta’s former productivity: Two trillion shells at the mouth of the Colorado River	Kowalewski, M., Avila Serrano, G.E., Flessa, K.W., Goodfriend, G.A.	2000
	380	Management of natural resources in riparian corridors.	Debano, L.F., Rinne, J.N., & Baker, M.B.	2003
	312	Chapter 5: WIldlife and Biological Resources	Ch&ra, S., Abella, S.R., Albrecht, B.A.et al	2013
	116	Food-web dynamics in a large river discontinuum	Cross, W.F., Baxter, C.V., Rosi-Marshall, E.J., Hall Jr, R.O., Kennedy, T.A., Donner, K.C., … Yard, M.D.	2013
	51	Differential Selection by Flooding	Minckley, W.L. & Meffe, G.K.	1987
	111	Distribution and Abundance of Saltcedar and Russian Olive in the Western United States	Nagler, P.L., Glenn, E.P., Jarnevich, C.S., & Shafroth, P.B.	2011

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Colorado River	316	Regulation leads to increases in riparian vegetation, but not direct allochthonous inputs, along the Colorado River in Grand Canyon, Arizona	Kennedy, T.A., & Ralston, B.E.	2012
	317	Valuing recreation and environmental flows in the Colorado River Delta utilizing contingent valuation method	Kerna, A.	2012
	168	The Bullfrog, Rana catesbeiana Shaw, in the Lower Colorado River, Arizona-California	Clarkson, R.W., & deVos J.C.Jr.	2015
	125	Regeneration of native trees in response to flood releases from the United States into the delta of the Colorado River, Mexico	Zamora-Arroyo, F., Nagler, P.L., Briggs, M., Radtke, D., Rodriquez, H., Garcia, J., Valdes, C., Huete, A., & Glenn, E.P.	2001
	86	Responses of Salix Gooddingii and Tamarix Ramosissima to Flooding	Tallent-Halsell, N.G., & Walker, L.R.	2002
	192	Status of marsh birds in the wetlands of the Colorado River delta, México	Hinojosa-Huerta, O., Guzmán-Olachea, R., Butrón-Méndez, J., Butrón-Rodríguez, J.J., & Calvo-Fonseca, A.	2013
	60	Short-term Effects Short-term effects of the 2008 high-flow experiment on macroinvertebrates in the Colorado River below Glen Canyon Dam, Arizona	Rosi-Marshall, E.J., Kennedy, T.A., Kincaid, D.W., Cross, W.F., Kelly, H.A., Behn, K.A., … Baxter, C.V.	2010
	274	Tolerance values of stream caddisflies (Trichoptera) in the lower Colorado River Basin, USA	Blinn, D.W., & Ruiter, D.E.	2006
	190	Effects of drought on birds and riparian vegetation in the Colorado River Delta, Mexico	Hinojosa-Huerta, O., Nagler, P.L., Carrillo-Guererro, Y., Glenn, E.P.	2013
	128	Status changes of bird species using revegetated riparian habitats on the Lower Colorado River from 1977 to 1984	Andersenson, B.W., Hunter, W.C., & Ohmart, R.D.	1988
	89	Final Biological Opinion for the Operation of the Glen Canyon Dam	U.S.Fish & Wildlife Service	2008
	347	Comparative growth and consumption potential of rainbow through and humpback chub in the Colorado River, Grand Canyon, Arizona under different temperature scenarios	Paukert, C.P., Petersen, J.H.	2007
	346	Response of the Shrimp Population in the Upper Gulf of California to Fluctuations in Discharges of the Colorado River	Perez-Arvizu, E.M., Aragon-Noriega, E.A., Espinosa Carreon, L.	2009

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Colorado River	317	Valuing recreation and environmental flows in the Colorado River Delta utilizing contingent valuation method	Kerna, A.	2012
	125	Regeneration of native trees in response to flood releases from the United States into the delta of the Colorado River, Mexico	Zamora-Arroyo, F., Nagler, P.L., Briggs, M., Radtke, D., Rodriquez, H., Garcia, J., Valdes, C., Huete, A., & Glenn, E.P.	2001
	340	State-and-Transition Prototype Model of Riparian Vegetation Downstream of Glen Canyon Dam, Arizona	Ralston, B.E., Starfield, A.M., Black, R.S., Van Lonkhuyzen, R.A.	2014
	190	Effects of drought on birds and riparian vegetation in the Colorado River Delta, Mexico	Hinojosa-Huerta, O., Nagler, P.L., Carrillo-Guererro, Y., Glenn, E.P.	2013
	122	Are Cicadas (Diceroprocta apache) Both a "Keystone" and a "Critical-Link" Species in Lower Colorado River Riparian Communities?	Andersenson, D.	1994
	282	A sampling plan for riparian birds of the Lower Colorado River-Final Report	Bart, J., Dunn, L., & Leist, A.	2010
	389	Vegetation Response Following Invasive Tamarisk (Tamarix spp.) Removal and Implications for Riparian Restoration	Harms, R.S., Hiebert, R.D.	2006
	92	Streamflow-Biota Relations: Riparian Vegetation	Van Riper, C.J., & Paradzick, C.	2006
	41	Effects of high-flow experiments from Glen Canyon Dam on abundance, growth, and survival rates of early life stages of rainbow trout in the Lees Ferry reach of the Colorado River	Korman, J., Kaplinski, M., & Melis, T.S.	2010
	255	Resurrecting the dammed: a look at Colorado River restoration	Cohn, J.P.	2001
	174	Habitat relationships of subadult humpback chub in the Colorado River through Grand Canyon: spatial variability and implications of flow regulation	Converse, Y.K., Hawkins, C.P., & Valdez, R.A.	1998
	231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007
	387	Synthesis of ground and remote sensing data for monitoring ecosystem function in the Colorado River Delta, Mexico	Nagler, P.A., Glenn, E.P., Hinojosa-Huerta, O.	2009
	195	Community-based restoration of desert wetlands: the case of the Colorado River Delta	Hinojosa-Huerta, O., Briggs, M., Carrillo-Guerrero, Y., Glenn, E.P., Lara-Flores, M., & Román-Rodríguez, M.	2005

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Colorado River	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
	91	Biologic implications of the 1996 controlled food	Valdez, R.A., Shannon, J.P., & Blinn, D.W.	1999
Cooks Lake	216	Vegetation-Hydrology Models: Implications for Management of Prosopis Velutina (Velvet Mesquite) Riparian Ecosystems	Stromberg, J.C., Wilkins, S.D., Tress, J.A.	1993
Cooks Lake Tributary, Unnamed Wash	216	Vegetation-Hydrology Models: Implications for Management of Prosopis Velutina (Velvet Mesquite) Riparian Ecosystems	Stromberg, J.C., Wilkins, S.D., Tress, J.A.	1993
Coyote Spring Valley	314	Ecological Condition Assessments of California's Perennial Wadeable Streams: Highlights from the Surface Water Ambient Monitoring Program's Perennial Streams Assessment (PSA) (2000-2007).	Ode, P.R., Kincaid, T.M., Fleming, T., Rehn, A.C.	2011
Crystal Spring	287	Habitat Restoration as a Means of Controlling Non-Native Fish in a Mojave Desert Oasis	Scoppettone, G.G., Rissler, P.H., Gourley, C., Martinez, C.	2005
Cuatro Ciénegas	291	Cuatro Cienegas fishes: research review and a local test of diversity versus habitat size	Minckley, W.L.	1984
	137	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	1985
Dave Creek	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
Devil's Hole	332	Connectivity in Desert Aquatic Ecosystems: The Devils Hole Story	Riggs, A.C., Deacon, J.E.	2002
	336	Annual Ground-water Discharge by Evapotranspiration from Areas of Spring-fed Riparian Vegetation Along the Eastern Margin of Death Valley, 2000-02	Laczniak, R.J., Smith, J.L., & DeMeo, G.A.	2006
	206	Multi Scaled Habitat Selection by Elegant Trogons in Southeastern Arizona	Hall, L.S., & Mannan R.W.	1999
Devils River	134	Status of Freshwater Mussels in Texas	Winemiller, K., Lujan, N.K., Wilkins, R.N., Snelgrove, R.T., Dube, A.M., Skow, K.L., Grones Snelgrove, A.	2010

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Devils River	202	Instream Flow-Habitat Relationships in the Upper Rio Grande River Basin	Trungale Engineering & Science	2012
	391	Environmental Flows Recommendations Report	Upper Rio Gr&e Basin & Bay Expert Science Team	2012
	137	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	1985
Diamond Creek	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
	352	Ecological condition of the East Fork of the Gila River and selected tributaries: Gila National Forest, New Mexico	Ohmart, R.D.	1995
	290	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	Oberlin, G.E., Shannon, J.P., Blinn, D.W.	1999
Eagle Creek	51	Differential Selection by Flooding	Minckley, W.L. & Meffe, G.K.	1987
East Fork Gila River	352	Ecological condition of the East Fork of the Gila River and selected tributaries: Gila National Forest, New Mexico	Ohmart, R.D.	1995
	342	Natural flow regimes, nonnative fishes, and native fish persistence in arid-land river systems	Propst, D.L., Gido, K.B., Stefferud, J.A.	2008
East Turkey Creek	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
	119	Invertebrate assemblages of pools in arid-land streams have high functional redundancy and are resistant to severe drying	Boersma, K.S., Bogan, M.T., Henrichs, B.A., & Lytle, D.A	2014
East Verde River	88	Fish and Wildlife Coordination Act Substantiating Report: Central Arizona Project Verde and East Verde River Water Diversions, Yavapai and Gila Counties, Arizona	U.S.Fish & Wildlife Service	1989
Galloway Creek	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
Garden Canyon	82	Biotic integrity of Platanus wrightii riparian forests in Arizona: first approximation	Stromberg, J.C.	2001

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Gila River	111	Distribution and Abundance of Saltcedar and Russian Olive in the Western United States	Nagler, P.L., Glenn, E.P., Jarnevich, C.S., & Shafroth, P.B.	2011
	404	Chapter 10. Effects of Altered Flow Regimes and Habitat Fragmentation on Gila River Fishes	Turner, T.F., Propst, D.L.	2014
	325	Physical habitat use by loach minnow Tiaroga cobitis (pisces: cyprinidae) in southwestern desert streams	Rinne, J.N.	1989
	217	Altered streamflow regimes and invasive plant species: the Tamarix case	Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	2007
	342	Natural flow regimes, nonnative fishes, and native fish persistence in arid-land river systems	Propst, D.L., Gido, K.B., Stefferud, J.A.	2008
	403	Chapter 9. Aquatic Invertebrates of the Cliff-Gila Valley, NM: Effects of Flow Regime on Invertebrate Community Structure	Bogan, M.T.	2014
	42	Variation in Streamflow Influences Abundance and Productivity of an Endangered Songbird, the Southwestern Willow Flycatcher	Koronkiewicz, T.J., Graber, A.E., & McLeod, M.A.	2010
	402	Chapter 8. Riparian Vegetation of the Upper Gila River and Southwestern Streams	Kindscher, K.	2014
	401	Chapter 7: Groundwater and Surface Water Interactions in the Cliff-Gila Valley, NM	Soles, E.S., Cooper, M.S.	2014
	405	Chapter 11. Gila River Herpetofauna: Streamflow Regimes and Ecological Relationships	Gori, D.	2014
	226	Microhabitat use by breeding southwestern willow flycatchers on the Gila River, New Mexico	Stoleson, S.H., Finch, D.M.	2003
	406	Chapter 12. Gila River Avifauna: Streamflow Regimes and Ecological Relationships	Walker, H.A.	2014
	407	Chapter 13. Riparian Mammals of the Gila River, New Mexico: Impacts of Flow	Frey, J.K.	2014
	381	Status of federal and state listed warmwater fishes of the Gila River basin, with recommendations for management	Desert Fishes Team	2003
	201	Evaluation of the instream flow requirements of the native fishes of Aravaipa Creek by the IFIM	Turner, P.R., Tafenelli, R.J.	1983
	51	Differential Selection by Flooding	Minckley, W.L. & Meffe, G.K.	1987
	231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Gila River	383	Analysis of recovery plan implementation for threatened and endangered warmwater fishes of the Gila River basin	Desert Fishes Team	2006
	383	Analysis of recovery plan implementation for threatened and endangered warmwater fishes of the Gila River basin	Desert Fishes Team	2006
	382	Status of unlisted native fishes of the Gila River basin, with recommendations for management	Desert Fishes Team	2004
	382	Status of unlisted native fishes of the Gila River basin, with recommendations for management	Desert Fishes Team	2004
	381	Status of federal and state listed warmwater fishes of the Gila River basin, with recommendations for management	Desert Fishes Team	2003
	380	Management of natural resources in riparian corridors.	Debano, L.F., Rinne, J.N., & Baker, M.B.	2003
	408	Chapter 14. Workshop Outcomes: Ecological Response to Hydrologic Variability in the Gila River, Cliff-Gila Valley	Gori, D., Cooper, M.S., Lyons, D.	2014
	214	Nesting ecology and nest success of the Blue Grosbeak along two rivers in New Mexico	Cartron, J.E., Finch, D.M., Hawksworth, D.L., Stoleson, S.H.	2013
	276	Distribution, Status, and Notes on the Ecology of Gila robusta (Cyprinidae) in the Gila River Drainage, New Mexico	Bestgen, K.R., & Propst, D.L.	1989
	27	Shifting dominance of riparian Populus and Tamarix along gradients of flow alteration in western North American rivers	Merritt, D.M. & Poff, N.L.	2010
	280	Floristic composition, beta diversity, and nestedness of reference sites for restoration of xeroriparian areas	Beauchamp, V.B., & Shafroth, P.B.	2011
	137	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	1985
	227	Breeding Biology of Lucy's Warbler in Southwestern New Mexico	Stoleson, S.H., Shook, R.S., Finch, D.M.	2000
Grapevine Springs	299	The probable effects of groundwater use proposed by the Las Vegas Valley Water District on spring-dwelling animals in southern Nevada and southeastern California	Sada, D.W., Deacon, J.E.	1994
Hassayampa River	34	Physiological Response to Groundwater Depth Varies among Species and with River Flow Regulation	Horton, J.L., Kolb, T.E. & Hart, S.C.	2001
	33	Responses of riparian trees to interannual variation in groundwater depth in a semi-arid river basin	Horton, J.L., Kolb, T.E. & Hart, S.C.	2001

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Hassayampa River	118	Floods, drought, and seed mass of riparian plant species	Stromberg, J.C., & Boudell, J.A	2013
	153	Flood pulsing and metacommunity dynamics in a desert riparian ecosystem	Boudell, J.A., & Stromberg, J.C.	2008
	216	Vegetation-Hydrology Models: Implications for Management of Prosopis Velutina (Velvet Mesquite) Riparian Ecosystems	Stromberg, J.C., Wilkins, S.D., Tress, J.A.	1993
	217	Altered streamflow regimes and invasive plant species: the Tamarix case	Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	2007
	95	The Goldilocks effect: intermittent streams sustain more plant species than those with perennial or ephemeral flow	Katz, G.L., Denslow, M.W., & Stromberg, J.C.	2012
Hassayampa River Tributary, Unnamed Wash	216	Vegetation-Hydrology Models: Implications for Management of Prosopis Velutina (Velvet Mesquite) Riparian Ecosystems	Stromberg, J.C., Wilkins, S.D., Tress, J.A.	1993
Havasu Creek	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
	290	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	Oberlin, G.E., Shannon, J.P., Blinn, D.W.	1999
Hot Springs Canyon	46	Riparian plant species richness along lateral and longitudinal gradients of water stress and flood disturbance, San Pedro River, Arizona, USA	Lite, S.J., Bagstad, K.J., & Stromberg, J.C.	2005
	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
Independence Creek	391	Environmental Flows Recommendations Report	Upper Rio Gr&e Basin & Bay Expert Science Team	2012
	202	Instream Flow-Habitat Relationships in the Upper Rio Grande River Basin	Trungale Engineering & Science	2012

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Jackrabbit Spring	287	Habitat Restoration as a Means of Controlling Non-Native Fish in a Mojave Desert Oasis	Scoppettone, G.G., Rissler, P.H., Gourley, C., Martinez, C.	2005
	315	Eradication of invasive Tamarix ramosissima along a desert stream increases native fish density	Kennedy, T.A., Finlay, J.C., & Hobbie, S.E.	2005
Jemez River	271	A preliminary riparian wetland vegetation community classification of the Upper and Middle Rio Grande Watersheds in New Mexico	Durkin, P., Muldavin, E., Bradley, M., Carr, S.E.	1996
Kanab Creek	290	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	Oberlin, G.E., Shannon, J.P., Blinn, D.W.	1999
Kanab Creek	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
Kings Pool Spring	287	Habitat Restoration as a Means of Controlling Non-Native Fish in a Mojave Desert Oasis	Scoppettone, G.G., Rissler, P.H., Gourley, C., Martinez, C.	2005
Las Moras Creek	137	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	1985
	134	Status of Freshwater Mussels in Texas	Winemiller, K., Lujan, N.K., Wilkins, R.N., Snelgrove, R.T., Dube, A.M., Skow, K.L., Grones Snelgrove, A.	2010
Little Colorado River	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
	50	Linking streamflow and groundwater to avian habitat in a desert riparian system	Merritt, D.M. & Bateman, H.L.	2012
	228	Tamarisk Reproductive Phenology and Colorado River Hydrography, Southwestern USA	Stevens, L.E., Siemion, G.	2012
	108	Salinity of the Little Colorado River in Grand Canyon Confers Anti-Parasitic Properties on a Native Fish	Ward, D.L.	2012
	290	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	Oberlin, G.E., Shannon, J.P., Blinn, D.W.	1999
Lyle Creek	151	Importance of sycamores to riparian birds in southeastern Arizona	Bock, C.E., & Bock, J.H.	1984

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Madera Canyon	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
Matkatamiba Creek	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
Meadow Valley Wash	294	Big Spring spinedace and associated fish populations and habitat conditions in Condor Canyon, Meadow Valley Wash, Nevada	Jezorek, I.G., Connolly, P.J., Munz, C.S., & Dixon, C.	2011
Middle Fork Gila River	342	Natural flow regimes, nonnative fishes, and native fish persistence in arid-land river systems	Propst, D.L., Gido, K.B., Stefferud, J.A.	2008
Moapa (Muddy) River	137	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	1985
	135	Habitat use by bats in a riparian corridor of the Mojave Desert in southern Nevada	Williams, J.A., O'Farrell, M.J., Riddle, B.R.	2006
	250	Quantifying Groundwater and Surface-Water Discharge from Evapotranspiration Processes in 12 Hydrographic Areas of the Colorado Regional Ground-Water Flow System, Nevada, Utah, and Arizona	DeMeo, G.A., Smith, Jl., Damar, N.A., & Darnell, J.	2008
	250	Quantifying Groundwater and Surface-Water Discharge from Evapotranspiration Processes in 12 Hydrographic Areas of the Colorado Regional Ground-Water Flow System, Nevada, Utah, and Arizona	DeMeo, G.A., Smith, Jl., Damar, N.A., & Darnell, J.	2008
Mohawk Creek	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
Mojave River	331	Mojave River Vole	Laabs, D.	1998
	389	Vegetation Response Following Invasive Tamarisk (Tamarix spp.) Removal and Implications for Riparian Restoration	Harms, R.S., Hiebert, R.D.	2006
	269	Fishes, Amphibians, and Reptiles of the Lower Mojave River System	Brown, T.	1978
Nankoweap Creek	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
	290	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	Oberlin, G.E., Shannon, J.P., Blinn, D.W.	1999

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
North Fork Cave Creek	119	Invertebrate assemblages of pools in arid-land streams have high functional redundancy and are resistant to severe drying	Boersma, K.S., Bogan, M.T., Henrichs, B.A., & Lytle, D.A	2014
Oak Creek	76	Influence of streamflow regime and temperature on growth rate of the riparian tree, Platanus wrightii, in Arizona	Stromberg, J.C.	2001
O'Donnell Creek	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
Pahranagat River	231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007
Paige Creek	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	293	Associations between Riparian Ecosystem Parameters in Happy Valley, Arizona	Jemison, R.L.	1999
Palomas Creek	271	A preliminary riparian wetland vegetation community classification of the Upper and Middle Rio Grande Watersheds in New Mexico	Durkin, P., Muldavin, E., Bradley, M., Carr, S.E.	1996
Paria River	290	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	Oberlin, G.E., Shannon, J.P., Blinn, D.W.	1999
	228	Tamarisk Reproductive Phenology and Colorado River Hydrography, Southwestern USA	Stevens, L.E., Siemion, G.	2012
	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
Parker Canyon	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
Pecos River	27	Shifting dominance of riparian Populus and Tamarix along gradients of flow alteration in western North American rivers	Merritt, D.M. & Poff, N.L.	2010
	137	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	1985
	273	Summer bird/vegetation associations in Tamarisk and native habitat along the Pecos River, southeastern New Mexico	Livingston, M.F.	1996

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Pecos River	391	Environmental Flows Recommendations Report	Upper Rio Gr&e Basin & Bay Expert Science Team	2012
	202	Instream Flow-Habitat Relationships in the Upper Rio Grande River Basin	Trungale Engineering & Science	2012
	134	Status of Freshwater Mussels in Texas	Winemiller, K., Lujan, N.K., Wilkins, R.N., Snelgrove, R.T., Dube, A.M., Skow, K.L., Grones Snelgrove, A.	2010
	280	Floristic composition, beta diversity, and nestedness of reference sites for restoration of xeroriparian areas	Beauchamp, V.B., & Shafroth, P.B.	2011
	389	Vegetation Response Following Invasive Tamarisk (Tamarix spp.) Removal and Implications for Riparian Restoration	Harms, R.S., Hiebert, R.D.	2006
	278	Dispersal and Life History Traits of Notropis girardi (Cypriniformes: Cyprinidae), Introduced into the Pecos River, New Mexico	Bestgen, K.R., Platania, S.P., Brooks, J.E., & Propst, D.L.	1989
	236	Flow regulation and fragmentation imperil pelagic-spawning riverine fishes	Dudley, R.K., & Platania, S.P.	2007
	27	Shifting dominance of riparian Populus and Tamarix along gradients of flow alteration in western North American rivers	Merritt, D.M. & Poff, N.L.	2010
Pinto Creek	82	Biotic integrity of Platanus wrightii riparian forests in Arizona: first approximation	Stromberg, J.C.	2001
Point of Rocks Springs	299	The probable effects of groundwater use proposed by the Las Vegas Valley Water District on spring-dwelling animals in southern Nevada and southeastern California	Sada, D.W., Deacon, J.E.	1994
Puerco River	389	Vegetation Response Following Invasive Tamarisk (Tamarix spp.) Removal and Implications for Riparian Restoration	Harms, R.S., Hiebert, R.D.	2006

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Queen Creek	211	Herpetofaunal Use of a Desert Riparian Island and its Adjacent Habitat	Szaro, R.C., Belfit, S.C.	1986
Ramsey Canyon	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
Redfield Canyon	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
Redrock Canyon	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
Rincon Creek	15	Hydrologic Function and Channel Morphologic Analysis of the Santa Cruz River at the North Simpson Site	Briggs, M.K., Magirl, C., & Hess, S	2007
	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	270	Monitoring Riparian Ecosystems: An Inventory of Riparian Habitat Along Rincon Creek Near Tucson, Arizona	Briggs, M., Schmid, M.K., & Halvorson, W.L.	1997
	14	Water Requirements for Bottomland Vegetation of Middle Rincon Creek and Potential Threats to Water Availability	Briggs, M.K.	2008
	38	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	Kirkpatrick, C.	2007
	375	Evaluation of hydrologic and riparian resources in Saguaro National Park, Tucson, Arizona	Baird, K., MacNish, R., Guertin, D.P.	2000
	52	Assessment Report Water-Right Application No. 33-96733 Middle Reach of Rincon Creek	National Park Service 2008	2008
Rio Bavispe	180	Status of Beavers (Castor canadensis frondator) in Rio Bavispe, Sonora, Mexico	Gallo-Reynoso, J.P., Suárez-Gracida, G., Cabrera-Santiago, H., Coria-Galindo, E., Egido-Villarreal, J., Ortiz, L.C.	2002
Rio Casas Grandes	341	Distribution and Status of the Chihuahua Chub (Teleostei: Cyprinidae: Gila nigrescens), with Notes on Its Ecology and Associated Species	Propst, D.L., Stefferud, J.A.	1994
	233	Fish fauna of the Bavícora Basin, Chihuahua, Mexico	Stefferud, J.A., Propst, D.L.	1996

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Rio Chama	271	A preliminary riparian wetland vegetation community classification of the Upper and Middle Rio Grande Watersheds in New Mexico	Durkin, P., Muldavin, E., Bradley, M., Carr, S.E.	1996
Rio Conchos	175	Ecological Characterization of a Riparian Corridor Along the Río Conchos, Chihuahua, Mexico	Cornell, J.E., Gutierrez, M., Wait, D.A., & Rubio-Arias, H.O.	2008
	220	Integrated river basin management in the Conchos River basin, Mexico: A case study of freshwater climate change adaptation	Barrios, E.J., Rodríguez-Pineda, J.A., & De la Maza Benignos, M.	2011
	288	Hydrological Feasibility of Environmental Flows in the Rio Grande/Bravo Basin	S&oval-Solis, S., McKinney D.C.	2009
	376	Recent records of Cycleptus in the Río Conchos, Chihuahua, Mexico	Lozano-Vilano, M.de L.	2010
	248	Environmental flows for rivers and economic compensation for irrigators	Sisto, N.P	2009
Rio de Don Fernando	396	Effects of Livestock Grazing on Morphology, Hydrology and Nutrient Retention in Four Riparian/Stream Ecosystems, New Mexico, USA	Thibault, J.R., Moyer, D.L., Dahm, C.N., Valett, H.M., & Marshall, M.C.	1999
Rio de las Vacas	396	Effects of Livestock Grazing on Morphology, Hydrology and Nutrient Retention in Four Riparian/Stream Ecosystems, New Mexico, USA	Thibault, J.R., Moyer, D.L., Dahm, C.N., Valett, H.M., & Marshall, M.C.	1999
Rio del Oso	392	Dynamic Human Landscapes of the Rio del Oso: Restoration and the Simulation of Past Ecological Conditions in The Upper Rio Grande Basin	Periman, R.D.	1999
Rio Grande	124	Environmental Flows in a Human-Dominated System: Integrated Water Management Strategies for the Rio Grande/Bravo Basin	Albin Lane, B.A.	2014
	139	Abundance and species richness of snakes along the Middle Rio Grande Riparian Forest in New Mexico	Bateman, H.L., MacCoubrey, A.C., Snell, H.L.& Finch, D.M.	2009
	138	Abundance and reproduction of toads (Bufo) along a regulated river in the southwestern United States: Importance of flooding in riparian ecosystems	Bateman, H.L., Harner, M.J., & MacCoubrey, A.C.	2008
	136	Impact of Non-Native Plant Removal on Lizards in Riparian Habitats in the Southwestern United States	Bateman, H.L., Chung-MacCoubrey, A., & Snell, H.L.	2008
	146	Notes on the ecology of a population of Eumeces obsoletus (scincidae) in New Mexico	Belfit, S.C., & Belfit V.F.	1985

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Rio Grande	133	Minimal genetic structure in the Rio Grande Cooter (Pseudemys Gorzugj)	Bailey, I.A., Dixon, J.R., Hudson, R., & Forstner, M.R.J	2008
	133	Minimal genetic structure in the Rio Grande Cooter (Pseudemys Gorzugj)	Bailey, I.A., Dixon, J.R., Hudson, R., & Forstner, M.R.J	2008
	132	Stopover ecology of landbirds migrating along the middle Rio Grande in spring and fall	Yong, W., Finch, D.M.	2002
	126	Facilitating Sustainable Use of the Rio Grande: A Social-Ecological Perspective	AlexAndersen, K.A.	2012
	152	Instream Flows and Endangered Species in an International River Basin: The Upper Rio Grande	Booker, J.F., & Ward, F.A.	1999
	124	Environmental Flows in a Human-Dominated System: Integrated Water Management Strategies for the Rio Grande/Bravo Basin	Albin Lane, B.A.	2014
	103	Evaluating Hydrologic Effects of Water Acquisitions on the Middle Rio Grande	Harding, B.L., McCord, J.T.	2005
	127	Texas freshwater fish assemblages following decades of environmental change	Andersenson, A.A., Hubbs, C., Winemiller K.O., & Edwards R.J.	1995
	159	Legal & Institutional Framework for Restoring Instream Flows in the Rio Grande: Fort Quitman to Amistad	Brock, L., Kelly, M.E., & Chapman.K.	2001
	179	Distribution and Habitat of the Arizona Gray Squirrel (Sciurus arizonensis) in New Mexico	Frey, J.K., Hill, M.T., Christman, B.L., Truett, J.C., & MacDonald, S.O.	2008
	178	Rodent Communities in Native and Exotic Riparian Vegetation in the Middle Rio Grande Valley of Central New Mexico	Ellis, L.M., Crawford, C.S., & Molles Jr., M.C.	1997
	177	Strategies for Ecological Restoration of the Middle Rio Grande in New Mexico and Recovery of the Endangered Rio Grande Silvery Minnow	Cowley, D.E.	2006
	177	Strategies for Ecological Restoration of the Middle Rio Grande in New Mexico and Recovery of the Endangered Rio Grande Silvery Minnow	Cowley, D.E.	2006
	177	Strategies for Ecological Restoration of the Middle Rio Grande in New Mexico and Recovery of the Endangered Rio Grande Silvery Minnow	Cowley, D.E.	2006
	177	Strategies for Ecological Restoration of the Middle Rio Grande in New Mexico and Recovery of the Endangered Rio Grande Silvery Minnow	Cowley, D.E.	2006

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Rio Grande	176	Impacts of Non-native Plant Removal on Vertebrates along the Middle Rio Grande (New Mexico)	Bateman, H.L., Chung-MacCoubrey, A., Finch, D.M., Snell, H.L.& Hawksworth, D.L.	2008
	170	Groundwater, vegetation, and atmosphere: Comparative riparian evapotranspiration, restoration, and water salvage	Cleverly, J.R., Dahm, C.N., Thibault, J.R., Donnell, D.E., & Coonrod, J.E.	2006
	169	Riparian ecohydrology: Regulation of water flux from the ground to the atmosphere in the Middle Rio Grande, New Mexico	Cleverly, J.R., Dahm, C.N., Thibault, J.R., Donnell, D.E., & Coonrod, J.E.	2006
	166	Herpetological Communities of the Middle Rio Grande Bosque: What Do We Know, What Should We Know, and Why?	Chung-MacCoubrey, A.L., & Bateman, H.L.	2006
	164	Colonization of the eastern bluebird along the Rio Grande in New Mexico	Carton, J.L., Means, M.D., Hawksworth, D.L & Finch, D.M.	2007
	191	Changing Fish Faunas in Two Reaches of the Rio Grande in the Albuquerque Basin	Hoagstrom, C.W., Remshardt, W.J., Smith, J.R., Brooks, J.E.	2010
	185	Avian Species Richness in Different-Aged Stands of Riparian Forest Along the Middle Rio Grande, New Mexico	Farley, G.H., Ellis, L.M., Stuart, J.N., Scott, N.K.Jr.	1994
	149	Contingent values for New Mexico instream flows: With tests of scope, group-size reminder and temporal reliability	Berrens, R.P., Bohara, A.K., Silva, C.L., Brookshire, D., & McKee, M.	2000
	186	On the Imminent Decline of Rio Grande Cottonwoods in Central New Mexico	Howe, W.H., & Knopf, F.L.	1991
	159	Legal & Institutional Framework for Restoring Instream Flows in the Rio Grande: Fort Quitman to Amistad	Brock, L., Kelly, M.E., & Chapman.K.	2001
	159	Legal & Institutional Framework for Restoring Instream Flows in the Rio Grande: Fort Quitman to Amistad	Brock, L., Kelly, M.E., & Chapman.K.	2001
	158	Economic Impacts of Instream Flow Protection for the Rio Grande Silvery Minnow in the Rio Grande Basin	Ward, F.A., Booker, J.F.	2006
	158	Economic Impacts of Instream Flow Protection for the Rio Grande Silvery Minnow in the Rio Grande Basin	Ward, F.A., Booker, J.F.	2006
	157	Ecohydrology and ecophysiology of Arundo donax (giant reed)	Watts, D., Moore, G.	
	152	Instream Flows and Endangered Species in an International River Basin: The Upper Rio Grande	Booker, J.F., & Ward, F.A.	1999
	152	Instream Flows and Endangered Species in an International River Basin: The Upper Rio Grande	Booker, J.F., & Ward, F.A.	1999
	152	Instream Flows and Endangered Species in an International River Basin: The Upper Rio Grande	Booker, J.F., & Ward, F.A.	1999

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Rio Grande	152	Instream Flows and Endangered Species in an International River Basin: The Upper Rio Grande	Booker, J.F., & Ward, F.A.	1999
	150	Controlled flooding and staged drawdown for restoration of native cottonwoods in the middle Rio Grande Valley, New Mexico, USA	Bhattacharjee, J., Taylor, J.P., & Smith, L.M.	2006
	131	Population trends of migratory landbirds along the Middle Rio Grande	Yong, W., Finch, D.M.	1997
	159	Legal & Institutional Framework for Restoring Instream Flows in the Rio Grande: Fort Quitman to Amistad	Brock, L., Kelly, M.E., & Chapman.K.	2001
	350	Quantifying ichthyofaunal zonation and species richness along a 2800-km reach of the Rio Chama and Rio Grande (USA)	McGarvey, D.J.	2011
	326	Vulnerability of species to climate change in the Southwest: terrestrial species of the Middle Rio Grande	Friggens, M.M., Finch, D.M., Bagne, K.E., Coe, S.J., Hawksworth, D.L.	2013
	334	Dam Impacts on and restoration of an alluvial river - Rio Grande, New Mexico	Richard, G.Julien, P.	2003
	338	The" forgotten river" of the Rio Grande/Rio Bravo: Investigation into the reclamation of an arid riparian ecosystem	L&is, M.E.	2001
	338	The" forgotten river" of the Rio Grande/Rio Bravo: Investigation into the reclamation of an arid riparian ecosystem	L&is, M.E.	2001
	344	Habitat fragmentation and modifications affecting distribution of the Rio Grande silvery minnow	Porter, M.D., Massong, T.M.	2004
	345	Integrating Environmental Flows into Multi-Objective Reservoir Management for a Transboundary,Water-Scarce River Basin: Rio Grande/Bravo	Porse, E.C., S&oval-Solis, S., Lane, B.A.	2015
	348	Habitat use of the Rio Grande silvery minnow (Hybognathus Amarus) during a long-term flood pulse in the Middle Rio Grande, New Mexico	Magana, H.A.	2012
	253	Restoration and Monitoring in the Middle Rio Grande Bosque: Current Status of Flood Pulse Related Efforts	Crawford, C.S., & Umbreit, N.E.	1999
	237	Social, Political, and Institutional Setting: Water Management Problems of the Rio Grande	Douglas, A.J.	2009
	350	Quantifying ichthyofaunal zonation and species richness along a 2800-km reach of the Rio Chama and Rio Grande (USA)	McGarvey, D.J.	2011
	393	Simulation of Rio Grande Floodplain Inundation Using FLO-2D	O'Brien, J.S., & Fullerton, W.T.	1999

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Rio Grande	246	Post-Wildfire Recovery of Riparian Vegetation During a Period of Water Scarcity in the Southwestern USA	Smith, D.M., Finch, D.M., Gunning, C., Jemison, R., Kelly, J.	2009
	275	Seedling competition between native cottonwood and exotic saltcedar: implications for restoration	Bhattacharjee, J., Taylor, J.P., Smith, L.M., & Haukos, D.A.	2009
	243	Influences of Disturbance and Vegetation on Abundance of Native and Exotic Detritivores in a Southwestern Riparian Forest	Smith, D.M., Kelly, J.F., Finch, D.M.	2006
	350	Quantifying ichthyofaunal zonation and species richness along a 2800-km reach of the Rio Chama and Rio Grande (USA)	McGarvey, D.J.	2011
	238	Abundance of wind scorpions Solifugae: Eremobatidae) in riparian forests disturbed by grazing, fire, and flood in Central New Mexico, USA	Smith, D.M., & Finch, D.M.	2011
	237	Social, Political, and Institutional Setting: Water Management Problems of the Rio Grande	Douglas, A.J.	2009
	237	Social, Political, and Institutional Setting: Water Management Problems of the Rio Grande	Douglas, A.J.	2009
	237	Social, Political, and Institutional Setting: Water Management Problems of the Rio Grande	Douglas, A.J.	2009
	350	Quantifying ichthyofaunal zonation and species richness along a 2800-km reach of the Rio Chama and Rio Grande (USA)	McGarvey, D.J.	2011
	391	Environmental Flows Recommendations Report	Upper Rio Gr&e Basin & Bay Expert Science Team	2012
	280	Floristic composition, beta diversity, and nestedness of reference sites for restoration of xeroriparian areas	Beauchamp, V.B., & Shafroth, P.B.	2011
	292	Integrated Water Management for Environmental Flows in the Rio Grande	S&oval-Solis, S., McKinney D.C.	2014
	272	Terrestrial Vegetation Inventory of Water Delivery Systems Between San Acacia Diversion and the Bosque Del Apache National Wildlife Refuge	Boren, J.C., Terrell, T., Cowley, D., Mason, G., Eaton, S., & Hurd, B.	2005
	271	A preliminary riparian wetland vegetation community classification of the Upper and Middle Rio Grande Watersheds in New Mexico	Durkin, P., Muldavin, E., Bradley, M., Carr, S.E.	1996
	259	Ground arthropods as potential indicators of flooding regime in the riparian forest of the middle Rio Grande, New Mexico	Cartron, J.E., Molles, M.C., Schuetz, J.F., Crawford, C.S., & Dahm, C.N.	2003

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Rio Grande	292	Integrated Water Management for Environmental Flows in the Rio Grande	S&oval-Solis, S., McKinney D.C.	2014
	390	Texas Riparian Areas	Hardy, T.B., Davis, N.	2013
	389	Vegetation Response Following Invasive Tamarisk (Tamarix spp.) Removal and Implications for Riparian Restoration	Harms, R.S., Hiebert, R.D.	2006
	395	How Great a Thirst? Assembling a River Restoration Toolkit	Harris, S.	1999
	313	Water Management in the Binational Texas/Mexico Rio Grande/Rio Bravo Basin	Kelly, M.	2001
	394	Watershed/River Channel Linkages: the Upper Rio Grande Basin and the Middle Rio Grande Bosque	Whitney, J.	1999
	313	Water Management in the Binational Texas/Mexico Rio Grande/Rio Bravo Basin	Kelly, M.	2001
	313	Water Management in the Binational Texas/Mexico Rio Grande/Rio Bravo Basin	Kelly, M.	2001
	313	Water Management in the Binational Texas/Mexico Rio Grande/Rio Bravo Basin	Kelly, M.	2001
	27	Shifting dominance of riparian Populus and Tamarix along gradients of flow alteration in western North American rivers	Merritt, D.M. & Poff, N.L.	2010
	319	Middle Rio Grande ecosystem : bosque biological management plan - The first decade: a review and update	Robert, L.	2005
	320	Middle RIo Grande Ecosystem: Bosque Biological Management Plan	Crawford, C.S., Cully, A.C., Leutheuser, R., Sifuentes, M.S., White, L.H., Wilber, J.P.	1993
	322	Bendway weirs: Could they create habitat for the endangered Rio Grande silvery minnow	Kinzli, K.-D., & Myrick, C.A.	2010
	324	Predicting velocity in bendway weir eddy fields	Kinzli, K.-D., & Thornton, C.I.	2010
	245	Cicada Emergence in Southwestern Riparian Forest: Influences of Wildfire and Vegetation Composition	Smith, D.M., Kelly, J.F., Finch, D.M.	2006
	313	Water Management in the Binational Texas/Mexico Rio Grande/Rio Bravo Basin	Kelly, M.	2001
	371	Restoration of the Rio Grande/Rio Bravo in the Juarez Valley: An analysis	Muniz, I., Salas Plata, J., Turner, C.	2005

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Rio Grande	200	Intra-Annual Variation in Fish Communities and Habitat Associations in a Chihuahua Desert Reach of the Rio Grande/Rio Bravo Del Norte	Heard, T.C., Perkin, J.S., & Bonner, T.H.	2012
	229	Conservation and status of the fish communities inhabiting the Rio Conchos basin and middle Rio Grande, Mexico and USA	Edwards, R.J., Garrett, G.P., & Marsh-Matthews, E.	2003
	229	Conservation and status of the fish communities inhabiting the Rio Conchos basin and middle Rio Grande, Mexico and USA	Edwards, R.J., Garrett, G.P., & Marsh-Matthews, E.	2003
	225	Influence of Experimental Flooding on Litter Dynamics in a Rio Grande Riparian Forest, New Mexico	Ellis, L.M., Molles Jr., M., & Crawford, C.S.,	1999
	224	Comparison of litter dynamics in native and exotic riparian vegetation along the Middle Rio Grande of central New Mexico, USA	Ellis, L.M., Crawford, C.S., & Molles Jr., M.	1998
	236	Flow regulation and fragmentation imperil pelagic-spawning riverine fishes	Dudley, R.K., & Platania, S.P.	2007
	249	Establishment Patterns of Native Populus and Salix in the Presence of Invasive Nonnative Tamarix	Sher, A.A., Marshall, D.L., Taylor, J.P.	2002
	370	Riparian Vegetation of the Lower Rio Grande	Lonard, R.I., & Judd, F.W.	2002
	229	Conservation and status of the fish communities inhabiting the Rio Conchos basin and middle Rio Grande, Mexico and USA	Edwards, R.J., Garrett, G.P., & Marsh-Matthews, E.	2003
	204	System dynamics modeling for community-based water planning: Application to the Middle Rio Grande	Tidwell, V.C., Passell, H.D., Conrad, S.H., Thomas, R.P	2004
	229	Conservation and status of the fish communities inhabiting the Rio Conchos basin and middle Rio Grande, Mexico and USA	Edwards, R.J., Garrett, G.P., & Marsh-Matthews, E.	2003
	379	A River Transformed: Historic Geomorphic Changes of the Lower Rio Grande in the Big Bend Region of Texas, Chihuahua, and Coahuila	Dean, D.J.	2009
	378	The Middle Rio Grande Bosque: An Endangered Ecosystem	Crawford, C.S., Ellis, L.M., & Molles, M.C.	1996
	379	A River Transformed: Historic Geomorphic Changes of the Lower Rio Grande in the Big Bend Region of Texas, Chihuahua, and Coahuila	Dean, D.J.	2009
	379	A River Transformed: Historic Geomorphic Changes of the Lower Rio Grande in the Big Bend Region of Texas, Chihuahua, and Coahuila	Dean, D.J.	2009

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Rio Grande	214	Nesting ecology and nest success of the Blue Grosbeak along two rivers in New Mexico	Cartron, J.E., Finch, D.M., Hawksworth, D.L., Stoleson, S.H.	2013
	213	Sparrow migration along a river corridor in desert grassland	Finch, D.M., & Yong, W.	1996
	212	Flood Regime and Leaf Fall Determine Soil Inorganic Nitrogen Dynamics in Semiarid Riparian Forests	Follstad, J.J., & Dahm, C.N.	2008
	208	Restoration of Saltcedar (Tamarix sp.)-Infested Floodplains on the Bosque del Apache National Wildlife Refuge	Taylor, J.P, McDaniel, K.C.	1998
	371	Restoration of the Rio Grande/Rio Bravo in the Juarez Valley: An analysis	Muniz, I., Salas Plata, J., Turner, C.	2005
	235	Restoration of Riparian Habitat Using Experimental Flooding	Sprenger, M.D., Smith, L.M., Taylor, J.P.	2002
	366	Does river regulation increase the dominance of invasive woody species in riparian landscapes?	Mortenson, S.G., Weisberg, P.J.	2010
	234	Riparian Groundwater Models for the Middle Rio Grande: ESA Collaborative Program FY04	S.S.Papadopulos & Associates, Inc., New Mexico Interstate Stream Commission	2006
	355	Importance of groundwater depth, soil texture and rooting depth on arid riparian evapotranspiration	Moayyad, B.	2001
	364	Managed Flooding for Riparian Ecosystem Restoration	Molles, M.C., Crawford, C.S., Ellis, L.M., Valett, H.M., Dahm, C.N.	1998
	231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007
	398	River Bar Vegetation Mowing Response in the Middle Rio Grande	Muldavin, E., Milford, E., & Chauvin, Y.	1999
	397	Restoration Efforts in the Rio Grande Valley State Park	Linderoth, O.C.	1999
	363	Assemblages of Rodents in Riparian Forests Along the Rio Grande in Big Bend National Park, Texas: Current and Historic Insights on the Effects of Invasion by Saltcedar	Leavitt, D.J	2012
	345	Integrating Environmental Flows into Multi-Objective Reservoir Management for a Transboundary,Water-Scarce River Basin: Rio Grande/Bravo	Porse, E.C., S&oval-Solis, S., Lane, B.A.	2015
Rio Papigochic	233	Fish fauna of the Bavícora Basin, Chihuahua, Mexico	Stefferud, J.A., Propst, D.L.	1996

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Rio Peñasco	396	Effects of Livestock Grazing on Morphology, Hydrology and Nutrient Retention in Four Riparian/Stream Ecosystems, New Mexico, USA	Thibault, J.R., Moyer, D.L., Dahm, C.N., Valett, H.M., & Marshall, M.C.	1999
Rio Pilón	197	Regimens of Ecological Flow Rates on the Pilón River	Vidales-Contreras, J.A., Pissani-Zuñiga, J.F., Rodríguez-Fuentes, H., Olivares-Sáenz, E., Ar&a-Ruiz, J., Luna-Maldonado, A.I.	2014
Rio Puerco	194	Erosional Consequence of Saltcedar Control	Vincent, K.R., Friedman, J.M., Griffin, E.R.	2009
	280	Floristic composition, beta diversity, and nestedness of reference sites for restoration of xeroriparian areas	Beauchamp, V.B., & Shafroth, P.B.	2011
Rio Ruidoso	306	Restoration of Rio Grande cutthroat trout Oncorhynchus clarkii virginalis to the Mescalero Apache Reservation.	Kalb, B.W., & Caldwell, C.	2014
Rio Salado	280	Floristic composition, beta diversity, and nestedness of reference sites for restoration of xeroriparian areas	Beauchamp, V.B., & Shafroth, P.B.	2011
Rio San Carlos	137	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	1985
Rio San Miguel	239	Water transfer effects on peri-urban land use/land cover: A case study in a semi-arid region of Mexico	Díaz-Caravantes, R.E., & Sánchez-Flores, E.	2011
Rio San Pedro	288	Hydrological Feasibility of Environmental Flows in the Rio Grande/Bravo Basin	S&oval-Solis, S., McKinney D.C.	2009
Rio Santa Clara	341	Distribution and Status of the Chihuahua Chub (Teleostei: Cyprinidae: Gila nigrescens), with Notes on Its Ecology and Associated Species	Propst, D.L., Stefferud, J.A.	1994
Rio Santa Maria	341	Distribution and Status of the Chihuahua Chub (Teleostei: Cyprinidae: Gila nigrescens), with Notes on Its Ecology and Associated Species	Propst, D.L., Stefferud, J.A.	1994
	233	Fish fauna of the Bavícora Basin, Chihuahua, Mexico	Stefferud, J.A., Propst, D.L.	1996
Rio Sirupa	233	Fish fauna of the Bavícora Basin, Chihuahua, Mexico	Stefferud, J.A., Propst, D.L.	1996
Rio Sonora	239	Water transfer effects on peri-urban land use/land cover: A case study in a semi-arid region of Mexico	Díaz-Caravantes, R.E., & Sánchez-Flores, E.	2011

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Rio Yaqui	372	Integrated Hydrologic-Economic-Institutional Model of Environmental Flow Strategies for Rio Yaqui Basin, Sonora, Mexico	Munoz-Hern&ez, A., Mayer, A.S., Watkins Jr., D.W.	2011
	268	A Record of the Southern River Otter, Lutra longicaudis, from the Rio Yaqui, Sonora, Mexico	Brown, B.T., Warren, P.L., Andersenson, L.S., & Gori, D.F.	1982
	385	Economic valuation of environmental services sustained by water flows in the Yaqui River Delta	Ilija Ojeda, M., Mayer, A.S., Solomon, B.D.	2008
Rio Zanjon	239	Water transfer effects on peri-urban land use/land cover: A case study in a semi-arid region of Mexico	Díaz-Caravantes, R.E., & Sánchez-Flores, E.	2011
Sabino Creek	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	38	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	Kirkpatrick, C.	2007
	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
Salt River	366	Does river regulation increase the dominance of invasive woody species in riparian landscapes?	Mortenson, S.G., Weisberg, P.J.	2010
	51	Differential Selection by Flooding	Minckley, W.L. & Meffe, G.K.	1987
	217	Altered streamflow regimes and invasive plant species: the Tamarix case	Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	2007
	111	Distribution and Abundance of Saltcedar and Russian Olive in the Western United States	Nagler, P.L., Glenn, E.P., Jarnevich, C.S., & Shafroth, P.B.	2011
	141	Effect of River Flow Manipulation on Wolf Spider Assemblages at Three Desert Riparian Sites	Wenniger, E.J., Fagan, W.F.	2000
	109	Resilience, Restoration, and Riparian Ecosystems: Case Study of a Dryland, Urban River	White, J.M., & Stromberg, J.C.	2011
	231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007
	380	Management of natural resources in riparian corridors.	Debano, L.F., Rinne, J.N., & Baker, M.B.	2003

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Salton Sea	389	Vegetation Response Following Invasive Tamarisk (Tamarix spp.) Removal and Implications for Riparian Restoration	Harms, R.S., Hiebert, R.D.	2006
	360	Diversity of terrestrial avifauna in response to distance from the shoreline of the Salton Sea	Mendelsohn, M.B., Boarman, W.I., Fisher, R.N., Hathaway, S.A.	2007
San Felipe Creek	389	Vegetation Response Following Invasive Tamarisk (Tamarix spp.) Removal and Implications for Riparian Restoration	Harms, R.S., Hiebert, R.D.	2006
San Felipe River	137	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	1985
San Francisco Hot Springs	196	Ecology of a population of the narrow-headed garter snake (thamnophis rufipunctatus) in New Mexico: catastrophic decline of a river specialist	Hibbitts, T.J., Painter, C.W., & Holycross, A.T.	2009
San Francisco River	325	Physical habitat use by loach minnow Tiaroga cobitis (pisces: cyprinidae) in southwestern desert streams	Rinne, J.N.	1989
	342	Natural flow regimes, nonnative fishes, and native fish persistence in arid-land river systems	Propst, D.L., Gido, K.B., Stefferud, J.A.	2008
	51	Differential Selection by Flooding	Minckley, W.L. & Meffe, G.K.	1987
	276	Distribution, Status, and Notes on the Ecology of Gila robusta (Cyprinidae) in the Gila River Drainage, New Mexico	Bestgen, K.R., & Propst, D.L.	1989
San Juan River	400	Determinación de caudales ambientales para ríos de la cuenca del Río San Juan mediante la aplicación de métodos hidrológicos.	Martínez Zepeda, L.M.	2012
	400	Determinación de caudales ambientales para ríos de la cuenca del Río San Juan mediante la aplicación de métodos hidrológicos.	Martínez Zepeda, L.M.	2012
	400	Determinación de caudales ambientales para ríos de la cuenca del Río San Juan mediante la aplicación de métodos hidrológicos.	Martínez Zepeda, L.M.	2012
San Pedro River	79	Status of the Upper San Pedro River (USA): Riparian Ecosystem	Stromberg, J., Dixon, M.D., Scott, R.L., Maddock, T., Baird, K., & Tellman, B.	2009
	80	Managing streamflow regimes for riparian ecosystem restoration	Stromberg, J., Lite, S.J., & Beauchamp, V.B.	2003
	46	Riparian plant species richness along lateral and longitudinal gradients of water stress and flood disturbance, San Pedro River, Arizona, USA	Lite, S.J., Bagstad, K.J., & Stromberg, J.C.	2005
	45	Surface water and ground-water thresholds for maintaining Populus–Salix forests, San Pedro River, Arizona	Lite, S.J. & Stromberg, J.C.	2005

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
San Pedro River	83	Effects of Groundwater Decline on Riparian Vegetation of Semiarid Regions: The San Pedro, Arizona	Stromberg, J.C., Tiller, R., & Richter, B.	1996
	84	Effects of streamflow patterns on riparian vegetation of a semiarid river: Implications for a changing climate	Stromberg, J.C., Lite, S.J., & Dixon, M.D.	2009
	85	Riparian Vegetation: Pattern and Process	Stromberg, Lite, Dixon, & Tiller 2009b	2009
	253	Restoration and Monitoring in the Middle Rio Grande Bosque: Current Status of Flood Pulse Related Efforts	Crawford, C.S., & Umbreit, N.E.	1999
	388	Long-term decrease in satellite vegetation indices in response to environmental variables in an iconic desert riparian ecosystem:the Upper San Pedro, Arizona, United States	Nguyen, U., Glenn, E.P., Nagler, P.L., Scott, R.L.	2014
	154	Seasonal Fecundity and Source-Sink Status of Shrub-Nesting Birds in a Southwestern Riparian Corridor	Brand, L.A., & Noon, B.R.	2011
	74	Fishes: Historical changes and an imperiled fauna	Stefferud, J.A., Marsh, P.C., & Clarkson, R.W.	2009
	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	95	The Goldilocks effect: intermittent streams sustain more plant species than those with perennial or ephemeral flow	Katz, G.L., Denslow, M.W., & Stromberg, J.C.	2012
	1	Groundwater AMA Review Report	Arizona Department of Water Resources	2005
	4	Response of Herbaceous Riparian Plants to Rain and Flooding on the San Pedro River, Arizona, USA	Bagstad, K.J., Stromberg, J.C., & Lite, S.J.	2005
	353	Evaluation of Simulations to Understand Effects of Groundwater Development and Artificial Recharge on Surface Water and Riparian Vegetation, Sierra Vista Subwatershed, Upper San Pedro Basin, Arizona	Leake, S.A., & Gungle, B.	2005
	101	Hydrological impacts of mesquite encroachment in the upper San Pedro watershed	Nie, W.; Y.Yuan, W.Kepner, C.Erickson, M.Jackson	2012
	43	Simulated effects of ground-water withdrawals and artificial recharge on discharge to streams, springs, and riparian vegetation in the Sierra Vista Subwatershed of the Upper San Pedro Basin, southeastern Arizona	Leake, S.A., Pool, D.R., & Leenhouts, J.M.	2008

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
San Pedro River	155	Avian Density and Nest Survival on the San Pedro River: Importance of Vegetation Type and Hydrologic Regime	Brand, L.A., Stromberg, J.C., & Noon, B.R.	2010
	65	The water use of two dominant vegetation communities in a semiarid riparian ecosystem	Scott, R.L., Shuttleworth, W.J., Goodrich, D.C., & Maddock III, T.	2000
	203	Ecological monitoring of the endangered Huachuca water umbel (Lilaeopsis schaffneriana ssp. recurva: Apiaceae)	Titus, P.J., Titus, J.H.	2008
	216	Vegetation-Hydrology Models: Implications for Management of Prosopis Velutina (Velvet Mesquite) Riparian Ecosystems	Stromberg, J.C., Wilkins, S.D., Tress, J.A.	1993
	54	Nature-Oriented Visitors and Their Expenditures: Upper San Pedro River Basin	Orr, P. & Colby, B.	2002
	217	Altered streamflow regimes and invasive plant species: the Tamarix case	Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	2007
	59	Chapter 9: Reptiles and Amphibians	Rosen, P.C.	2009
	61	Greenfall Links Groundwater to Aboveground Food Webs in Desert River Floodplains	Sabo, J.L., McCluney, K.E., Marusenko, Y., Keller, A., & Soykan, C.U.	2008
	77	Effects of streamflow intermittency on riparian vegetation of a semiarid region river (San Pedro River, Arizona)	Stromberg, J.C., Bagstad, K.J., Leenhouts, J.M., Lite, S.J., & Makings, E.	2005
	64	A GIS-based Management Tool to Quantify Riparian Vegetation Groundwater Use	Scott, R.L., Goodrich, D.C. & Levick, L.R.	2003
	97	Vegetation-hydrology interactions: Dynamics of riparian plant water use	Williams, D.G., & Scott, R.L.	2009
	66	Multiyear riparian evapotranspiration and groundwater use for a semiarid watershed	Scott, R.L., Cable, W.L., Huxman, T.E., Nagler, P.L., Hernandez, M., & Goodrich, D.C.	2008
	223	Dynamics of Fremont cottonwood (Populus fremontii) and saltcedar (Tamarix Chinensis) populations along the San Pedro River, Arizona	Stromberg, J.C.	1998
	68	Modeling climate change impacts – and uncertainty –on the hydrology of a riparian system: The San Pedro Basin (Arizona/Sonora)	Serrat-Cepdevila, A., Valdes, J.B., Gonzales Perez, J., Baird, K., Mata, L.J., & Maddock III, T.	2007

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
San Pedro River	366	Does river regulation increase the dominance of invasive woody species in riparian landscapes?	Mortenson, S.G., Weisberg, P.J.	2010
	384	Estimating Riparian and Agricultural Actual Evapotranspiration by Reference Evapotranspiration and MODIS Enhanced Vegetation Index	Nagler, P.L., Glenn, E.P., Nguyen, U., Scott, R.S., Doody, T.	2013
	156	Factors influencing species richness and community composition of breeding birds in a desert riparian corridor	Brand, L.A., White, G.C., & Noon, B.R.	2008
	231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007
	307	Tree production in desert regions using effluent and water harvesting	Karpiscak, M.M., & Gottfried, G.J.	2000
	380	Management of natural resources in riparian corridors.	Debano, L.F., Rinne, J.N., & Baker, M.B.	2003
	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	28	Interbasin Groundwater Flow at the Benson Narrows, Arizona	Haney, J.	2005
	27	Shifting dominance of riparian Populus and Tamarix along gradients of flow alteration in western North American rivers	Merritt, D.M. & Poff, N.L.	2010
	35	Streamside herbaceous vegetation response to hydrologic restoration on the San Pedro River, Arizona	Katz, G.L., Stromberg, J.C., & Denslow, M.W.	2009
	25	Seasonal estimates of riparian evapotranspiration using remote sensing and in situ measurements	Goodrich, D.C., Scott, R., Qi, J., Goff, B., Unkrich, C.L., Moran, M.S., Ni, W., Cooper, W.E., Eichinger, W.J., Shuttleworth, Y.Kerr, R.& Marsett, W.N.	2000
	44	Hydrologic requirements of and consumptive ground-water use by riparian vegetation along the San Pedro River, Arizona	Leenhouts, J.M., Stromberg, J.C., & Scott, R.L	2006
	25	Seasonal estimates of riparian evapotranspiration using remote sensing and in situ measurements	Goodrich, D.C., Scott, R., Qi, J., Goff, B., Unkrich, C.L., Moran, M.S., Ni, W., Cooper, W.E., Eichinger, W.J., Shuttleworth, Y.Kerr, R.& Marsett, W.N.	2000
	23	Controls on transpiration in a semiarid riparian cottonwood forest	Gazal, R.M., Scott, R.L., Goodrich, D.C., & Williams, D.G.	2006

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
San Pedro River	38	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	Kirkpatrick, C.	2007
	29	Terrestrial arthropod communities along the San Pedro: Three Case Studies (Chapter 7)	Hannon, L.E., Ries, L.& Williams, K.S.	2009
	242	Water sources used by riparian trees varies among stream types on the San Pedro River, Arizona	Snyder, K.A., Williams, D.G.	2000
	115	Crayfish impact desert river ecosystem function and litter-dwelling invertebrate communities through association with novel detrital resources	Moody, E.K. & J.L.Sabo	2013
	258	Habitat Selection by Sympatric Brood Parasites in Southeastern Arizona: The Influence of Landscape, Vegetation, and Species Richness	Chace, J.F.	2004
	99	River drying lowers the diversity and alters the composition of an assemblage of desert riparian arthropods	Mccluney, K.E.& Sabo, J.L.	2012
	118	Floods, drought, and seed mass of riparian plant species	Stromberg, J.C., & Boudell, J.A	2013
	12	Breeding and Migratory Birds: Patterns and Processes	Brand, L.A., Cerasale, D.J., & Rick, T.D.	2009
	298	Chapter 3. Southwestern Willow Flycatcher Nest Records and Potential for Future Breeding along the Upper San Pedro River, Arizona	Johnson, G.E., & Van Riper, C.	2014
	333	Development of a Shared Vision for Groundwater Management to Protect and Sustain Baseflows of the Upper San Pedro River, Arizona, USA	Richter, H.E., Gungle, B., Lacher, L.J., Turner, D.S., Bushman, B.M.	2014
	13	Projecting avian response to linked changes in groundwater and riparian floodplain vegetation along a dryland river: a scenario analysis	Brand, L.A., Stromberg, J., Goodrich, D.C., Dixon, M.D., Lansey, K., Kang, D., & Cerasale, D.J.	2010
	43	Simulated effects of ground-water withdrawals and artificial recharge on discharge to streams, springs, and riparian vegetation in the Sierra Vista Subwatershed of the Upper San Pedro Basin, southeastern Arizona	Leake, S.A., Pool, D.R., & Leenhouts, J.M.	2008
	19	Comparison of Upper Thermal Tolerances of Native and Nonnative Fish Species in Arizona	Carveth, C.J., Widmer, A.M., & Bonar, S.A	2006

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Santa Cruz River	71	A Living River - Charting the Health of the Upper Santa Cruz River	Sonoran Institute	2009
	380	Management of natural resources in riparian corridors.	Debano, L.F., Rinne, J.N., & Baker, M.B.	2003
	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	5	Habitat preservation and restoration: Do homebuyers have preferences for quality habitat?	Bark, R.H., Osgood, D.E., Colby, B.G., Katz, G., & Stromberg, J.	2009
	217	Altered streamflow regimes and invasive plant species: the Tamarix case	Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	2007
	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	38	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	Kirkpatrick, C.	2007
	93	Land Use and Disturbance Interactions in Dynamic Arid Systems: Multiscale Remote Sensing Approaches for Monitoring and Analyzing Riparian Vegetation Change	Villarreal, M.L.	2009
	6	Remotely sensed proxies for environmental amenities in hedonic analysis: What does green mean?	Bark-Hodgins, R.H., Osgood, D.E., & Colby, B.G.	2006
	10	The effect of the Santa Cruz River riparian corridor on single family home prices using the hedonic pricing method	Bourne, K.L.	2007
	11	Natural and anthropogenic factors affecting the structure of the benthic macroinvertebrate community in an effluent-dominated reach of the Santa Cruz River, AZ	Boyle, T.P., & Fraleigh, H.D.	2003
	72	Causes and consequences of mammal species richness (Chapter 6)	Soykan, C.U., Brand, L.A. & Sabo, J.L.	2009
	22	Aquifer Monitoring for Groundwater-Dependent Ecosystems, Pima County, Arizona	Fonseca, J.	2004
	53	Developing an Ecosystem Services Online Decision Support Tool to Assess the Impacts of Climate Change and Urban Growth in the Santa Cruz Watershed; Where We Live, Work, and Play	Norman, L., Tallent-Halsell, N., Labiosa, W., Weber, M., McCoy, A., Hirschboeck, K., … Gray, F.	2010

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Santa Cruz River	55	Preliminary Riparian Protection, Management, and Restoration Element	Pima County	2000
Santa Maria River	217	Altered streamflow regimes and invasive plant species: the Tamarix case	Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	2007
	277	Riparian vegetation response to altered disturbance and stress regimes	Shafroth, P.B., Stromberg, J., Patten, D.T.	2002
Shinumo Creek	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
Soldier Creek	373	Restoration of Soldier Spring: an isolated habitat for native Apache trout	Long, J.W., Burnett, B.M., Medina, A.L., & Parker, J.L.	2004
Sonoita Creek	38	Quantifying impacts of groundwater withdrawal on avian communities in desert riparian woodlands of the southwestern U.S	Kirkpatrick, C.	2007
	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
South Diamond Creek	352	Ecological condition of the East Fork of the Gila River and selected tributaries: Gila National Forest, New Mexico	Ohmart, R.D.	1995
Spring Canyon	290	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	Oberlin, G.E., Shannon, J.P., Blinn, D.W.	1999
Sycamore Creek	82	Biotic integrity of Platanus wrightii riparian forests in Arizona: first approximation	Stromberg, J.C.	2001
	51	Differential Selection by Flooding	Minckley, W.L. & Meffe, G.K.	1987
	76	Influence of streamflow regime and temperature on growth rate of the riparian tree, Platanus wrightii, in Arizona	Stromberg, J.C.	2001
	114	On the multiple ecological roles of water in river networks	Sponseller, R.A., Grimm, N.B., Boulton, A.J., & Sabo, J.L.	2013
	199	Vertical Hydrologic Exchange and Ecological Stability of a Desert Stream Ecosystem	Valett, H.M., Fisher, S.G., Grimm, N.B., Camill, P.	1994

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Sycamore Creek	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
	240	Responses of macroinvertebrate communities to long-term flow variability in a Sonoran Desert stream	Sponseller, R.A., Grimm, N.B., Boulton, A.J., & Sabo, J.L.	2010
Tanque Verde Wash	39	Surface Water Depletion and Riparian Birds	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	40	Quantifying impacts of groundwater withdrawal on avian abundance, species richness, and reproductive success in Sonoran Desert parks	Kirkpatrick, C., Conway, C.J., & LaRoche, D.	2009
	216	Vegetation-Hydrology Models: Implications for Management of Prosopis Velutina (Velvet Mesquite) Riparian Ecosystems	Stromberg, J.C., Wilkins, S.D., Tress, J.A.	1993
	216	Vegetation-Hydrology Models: Implications for Management of Prosopis Velutina (Velvet Mesquite) Riparian Ecosystems	Stromberg, J.C., Wilkins, S.D., Tress, J.A.	1993
	375	Evaluation of hydrologic and riparian resources in Saguaro National Park, Tucson, Arizona	Baird, K., MacNish, R., Guertin, D.P.	2000
	20	Riparian Areas Generate Property Value Premium for Landowners	Colby, B.G., & Wishart, S.	2002
Tapeats Creek	290	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	Oberlin, G.E., Shannon, J.P., Blinn, D.W.	1999
	230	Flow Regulation, Geomorphology, and Colorado River Marsh Development in the Grand Canyon, Arizona	Stevens, L.E., Schmidt, J.C., Ayers, T.J., Brown, B.T.	1995
Terlingua Creek	391	Environmental Flows Recommendations Report	Upper Rio Gr&e Basin & Bay Expert Science Team	2012
Tonto Creek	231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007
Tularosa River	325	Physical habitat use by loach minnow Tiaroga cobitis (pisces: cyprinidae) in southwestern desert streams	Rinne, J.N.	1989
	342	Natural flow regimes, nonnative fishes, and native fish persistence in arid-land river systems	Propst, D.L., Gido, K.B., Stefferud, J.A.	2008
Tule Creek	171	Impact of Flooding in a Sonoran Desert Stream, including Elimination of an Endangered Fish Population (Poeciliopsis o. occidentalis, Poeciliidae)	Collins, J.P., Young, C., Howell, J., & Minckley, W.L.	1981
Unnamed Poza	173	Environmental impacts in Cuatro Ciénegas, Coahuila, Mexico: A commentary	Contreras-Balderas, S.	1984

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Vasey's Paradise	290	Watershed influence on the macroinvertebrate fauna of ten major tributaries of the Colorado River through Grand Canyon, Arizona	Oberlin, G.E., Shannon, J.P., Blinn, D.W.	1999
Verde River	50	Linking streamflow and groundwater to avian habitat in a desert riparian system	Merritt, D.M. & Bateman, H.L.	2012
	231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007
	145	Arbuscular mycorrhizal fungi associated with Populus- Salix stands in a semiarid riparian ecosystem	Beauchamp, V.B., Stromberg J.C., & Stutz J.C.	2006
	21	Upper Verde River: Review of Stream-Riparian Monitoring Efforts Conducted by the U.S. Forest Service Rocky Mountain Research Station	Dwire, K., Buffington, J., Merritt, D., Rieman, B.E., & Tait, C.	2008
	26	Ecological Implications of Verde River Flows	Haney, J.A., & Turner, D.S.	2008
	137	Endangered Aquatic Ecosystems in North American Deserts with a List of Vanishing Fishes of the Region	Williams, J.E.,Bowman, D.B., Brooks, J.E., Echelle, A.A., Edwards, R.J., Hendrickson, D.A., L&ye, J.J.	1985
	7	Flow Regulation of the Verde River, Arizona, Encourages Tamarix recruitment but has minimal effect on Populus and Salix stand density	Beauchamp, V.B., & Stromberg, J.C.	2007
	301	Do riparian plant community characteristics differ between Tamarix (L.) invaded and uninvaded sites on the upper Verde River, Arizona?	Johnson, T.D., Kolb, T.E., & Medina, A.L.	2010
	51	Differential Selection by Flooding	Minckley, W.L. & Meffe, G.K.	1987
	118	Floods, drought, and seed mass of riparian plant species	Stromberg, J.C., & Boudell, J.A	2013
	311	Linkages between primary seed dispersal, hydrochory and flood timing in a semi-arid region river	Kehr, J.M., Merritt, D.M., & Stromberg, J.C.	2001
	19	Comparison of Upper Thermal Tolerances of Native and Nonnative Fish Species in Arizona	Carveth, C.J., Widmer, A.M., & Bonar, S.A	2006
	96	Valuing the Verde River Watershed - An Assessment	West, P., Smith, D.H., & Auberle, W.	2009
	88	Fish and Wildlife Coordination Act Substantiating Report: Central Arizona Project Verde and East Verde River Water Diversions, Yavapai and Gila Counties, Arizona	U.S.Fish & Wildlife Service	1989
	81	Instream flow models for mixed deciduous riparian vegetation within a semiarid region	Stromberg, J.C.	1993

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Verde River	80	Managing streamflow regimes for riparian ecosystem restoration	Stromberg, J., Lite, S.J., & Beauchamp, V.B.	2003
	78	Ecological Implications of Verde River Flows	Stromberg, J.C.	2008
	244	Water Relations of Riparian Plants from Warm Desert Regions	Smith, S.D., Devitt, D.A., Sala, A., Cleverly, J.R., Busch, D.E.	1998
	75	Wildlife and Flow Relationships in the Verde River Watershed	Stevens, L.E., Turner, D.S., & Supplee, V.	2008
	362	Simulated effects of groundwater pumping and artificial recharge on surface-water resources and riparian vegetation in the Verde valley sub-basin, central Arizona	Leake, S A., & Pool, D.R.	2012
	366	Does river regulation increase the dominance of invasive woody species in riparian landscapes?	Mortenson, S.G., Weisberg, P.J.	2010
	217	Altered streamflow regimes and invasive plant species: the Tamarix case	Stromberg, J.C., Lite, S.J., Marler, R., Paradzick, C., Shafroth, P.B., Shorrock, D., White, J.M., White, M.S.	2007
	380	Management of natural resources in riparian corridors.	Debano, L.F., Rinne, J.N., & Baker, M.B.	2003
	106	Seed Size, Sediment, and Spatial Heterogeneity: Post-Flood Species Coexistence in Dryland Riparian Ecosystems	Stromberg, J.C., Butler, L., Hazelton, A.F., & Boudell, J.A.	2011
	87	Workshop Results: Steps Toward Understanding Ecological Response to Hydrologic Variation in the Verde River (Chapter 6)	Turner, D.S., & Haney, J.A.	2008
Virgin River	295	Water Use by Tamarix Ramosissima and Associated Phreatophytes in a Mojave Desert Floodplain	Sala, A., Smith, S.D., Devitt, D.A.	1996
	254	Invasive capacity of Tamarix ramosissima in a Mojave Desert floodplain: the role of drought	Cleverly, J.R., Smith, S.D., Sala, A., & Devitt, D.A.	1997
	231	Southwestern Willow Flycatcher Breeding Site and Territory Summary—2007	Durst, S.L., Sogge, M.K., Stump, S.D., Walker.H.A., Kus, B,E., & Sferra, S.J.	2007
	281	Indirect effects of biocontrol of an invasive riparian plant (Tamarix) alters habitat and reduces herpetofauna abundance	Bateman, H.L., Merritt, D.M., Glenn, E.P., & Nagler, P.L.	2015
	281	Indirect effects of biocontrol of an invasive riparian plant (Tamarix) alters habitat and reduces herpetofauna abundance	Bateman, H.L., Merritt, D.M., Glenn, E.P., & Nagler, P.L.	2015
	366	Does river regulation increase the dominance of invasive woody species in riparian landscapes?	Mortenson, S.G., Weisberg, P.J.	2010

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Virgin River	366	Does river regulation increase the dominance of invasive woody species in riparian landscapes?	Mortenson, S.G., Weisberg, P.J.	2010
	318	Site Preferences and Community Characteristics of Cupressus arizonica Greene (Cupressaceae) in Southeastern Arizona	Parker, A.J.	1980
Warm Springs	299	The probable effects of groundwater use proposed by the Las Vegas Valley Water District on spring-dwelling animals in southern Nevada and southeastern California	Sada, D.W., Deacon, J.E.	1994
Waterman Wash	216	Vegetation-Hydrology Models: Implications for Management of Prosopis Velutina (Velvet Mesquite) Riparian Ecosystems	Stromberg, J.C., Wilkins, S.D., Tress, J.A.	1993
West Fork Gila River	342	Natural flow regimes, nonnative fishes, and native fish persistence in arid-land river systems	Propst, D.L., Gido, K.B., Stefferud, J.A.	2008
West Texas Springs	205	Desert Spring Fishes	Texas Parks & Wildlife	
West Turkey Creek	251	Riparian Plant Communities in the Mountains of Southeastern Arizona	Danzer, S.J., Jemison, R., & Guertin, D.P.	2001
Wupatki National Monument ephemeral pools	184	Survey of aquatic macroinvertebrates and amphibians at Wupatki National Monument, Arizona, USA: An evaluation of selected factors affecting species richness in ephemeral pools	Graham, T.B.	2002
Studies not linked to specific rivers				
Other Studies Mutli-State or Broadly Applicable	250	Quantifying Groundwater and Surface-Water Discharge from Evapotranspiration Processes in 12 Hydrographic Areas of the Colorado Regional Ground-Water Flow System, Nevada, Utah, and Arizona	DeMeo, G.A., Smith, Jl., Damar, N.A., & Darnell, J.	2008
	113	The relevance of wetland conservation in arid regions: A re-examination of vanishing communities in the American Southwest	Minckley, T.A., Turner, D.S., & Weinstein, S.R.	2013
	310	Biology, Ecology, and Management of Russian Olive in Western North America	Katz, G.L., & Shafroth, P.B.	2003
	104	Elevated CO2 does not offset greater water stress predicted under climate change for native and exotic riparian plants	Perry, L.G., Shafroth, P.B., Blumenthal, D.M., Morgan, J.A., & LeCain, D.R.	2012

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Other Studies Mutli-State or Broadly Applicable	349	Streamflow requirements for cottonwood seedling recruitment - an integrative model	Mahoney, J.M., Rood, S.B.	1998
	339	Hydrologic, abiotic and biotic interactions: plant density, wind speed, leaf size and groundwater all affect oak water use efficiency	Law, D.J., & Finch, D.M.	2011
	187	Population Structure, Physiology and Ecohydrological Impacts of Dioecious Riparian Tree Species of Western North America	Hultine, K.R., Bush, S.E., West, A.G., & Ehleringer, J.T.	2007
	107	Environment tolerance of an invasive riparian tree and its potential for continued spread in the southwestern US	Reynolds, L.V., & Cooper, D.J.	2010
	130	Climate Change and Ecosystems of the Southwestern United States	Archer, S.R., & Predick K.I.	2008
	289	Speciation and Geographic Variation in Black-Tailed Gnatcatchers	Atwood, J.L.	1988
	377	What we know and don't know about amphibian declines in the West	Corn, P.S.	1994
	374	The riparianness of a desert herpetofauna	Lowe, C.H.	1989
	183	Comparative ecophysiology of Tamarix ramosissima and native trees in western U.S. riparian zones	Glenn, E.P., & Nagler, P.L.	2005
	221	Importance of low-flow and high-flow characteristics to restoration of riparian vegetation along rivers in arid south-western United States	Stromberg, J.C., Beauchamp, V.B., Dixon, M.D., Lite, S.J., Paradzick, C.	2007
	219	Dryland Riparian Ecosystems In the American Southwest:Sensitivity and Resilience to Climatic Extremes	Stromberg, J.C., McCluney, K.E., Dixon, M.D., Meixner, T.	2013
	218	Fremont Cottonwood-Goodding Willow Riparian Forests: A Review of Their Ecology, Threats,and Recovery Potential	Stromberg, J.C.	1993
	367	Effects of flooding on native and exotic plant seedlings: implications for restoring south-western riparian forests by manipulating water and sediment flows	Levine, C.M., & Stromberg, J.C.	2001
	165	Natural flow regime, temperature and the composition and richness of invertebrate assemblages in streams of the western United States	Chinnayakanahalli, K.J., Hawkins, C.P., Tarboton D.G., & Hill, R.A.	2011

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Other Studies Mutli-State or Broadly Applicable	399	A Guide to managing, Restoring, and Conserving Springs in the Western United States.	Sada, D.W., Williams, J.E., Silvery, J.C., Anne, H., Ramakka, J., Summers, P., & Lewis, L.	2001
	129	Impact, Biology, and Ecology of Saltcedar (Tamarix spp.) in the Southwestern United States	Di Tomaso, J.M.	1998
Other studies - Arizona	206	Multi Scaled Habitat Selection by Elegant Trogons in Southeastern Arizona	Hall, L.S., & Mannan R.W.	1999
	241	Saltcedar and Southwestern Willow Flycatchers: Lessons From Long-term Studies in Central Arizona	Sogge, M.K., Paxton, E.H., Tudor, A.A.	2006
	215	Bird Species Distribution Patterns in Riparian Habitats in Southeastern Arizona	Strong, T.R., Bock, C.E.	1990
	37	Predictive Models of the Hydrological Regime of Unregulated Streams in Arizona	Anning, D.W., & Parker, J.T.C.	2009
	267	Rain and Rodents: Complex Dynamics of Desert Consumers	Brown, J.H., & Ernest, S.M.	2002
	321	Nutrient resorption in shrubs growing by design, and by default in Chihuahuan Desert arroyos	Killingbeck, K., & Whitford, W.	2001
	120	Distribution of Riparian Vegetation in Relation to Streamflow in Pima County, Arizona	Fonseca, J.E.& M.List	2013
	189	Environmental Correlates to the Abundance of Spring-Adapted versus Stream-Adapted Fishes	Hubbs, C.	2001
	56	City of Tucson and Pima County Riparian Protection Technical Paper	Pima County	2009
	57	City of Tucson and Pima County Water for the Environment Technical Paper	Pima County	2009
	386	Functions and values of riparian habitat to wildlife in Arizona : a literature review	Ohmart, R.D., Zisner, C.	1993
	167	Influence of monsoon-related riparian phenology on yellow-billed cuckoo habitat selection in Arizona	Wallace, C.S., Villarreal, M.L., van Riper III, C.	2013

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Other Studies - California	297	Associations among spring-dependent aquatic assemblages and environmental and land use gradients in a Mojave Desert mountain range	Sada, D.W., Fleishman, E., Murphy, D.D.	2005
	222	Regional patterns of plant community response to changes in water: Owens Valley, California	Elmore, A.J., Mustard, J.F., Manning, S.J.	2003
Other Studies - New Mexico	330	Breeding bird communities and nest plant selection in Chihuahuan Desert habitats in south-central New Mexico	Kozma, J.M., & Matthews, N.E.	1997
	329	Associations of small migratory and resident birds with two scrub habitats during late winter and spring in the northern Chihuahuan Desert, New Mexico	Kozma, J.M., Burkett, L.M., & Matthews, N.E.	2012
	327	Ecological flows in New Mexico -- It has been done	Oglesby, A.	2009
	148	Valuing the Protection of Minimum Instream Flows in New Mexico	Berrens, R.P., Andersenton P., & Silva, C.L.	1996
	147	A joint investigation of public support and public values: case of instream flows in New Mexico	Berrens, R.P., Bohara, A.K., Jenkins-Smith, H., Silva, C.L., GAndersenton.P., & Brookshire, D.	1998
Other Studies - Nevada	257	The Southern Nevada Agency Partnership Science and Research Synthesis: Science to Support Land Management in Southern Nevada	Chambers, J.C., Brooks, M.L., Pendleton, B.K., & Raish, C.B.	2013
	296	Anthropogenic Changes in Biogeography of Great Basin Aquatic Biota	Sada, D.W., Vinyard, G.L.	2002
	143	Phenological events and their environmental triggers in Mojave Desert ecosystems	Beatley, J.C.	1974
	142	Ground-water surface-water interactions and long-term change in riverine riparian vegetation in the southwestern United States	Webb, R., Leake, S.A.	2006
	252	Influence of Livestock Grazing Strategies on Riparian Response to Wildfire in Northern Nevada	Dalldorf, K.N., Swanson, S.R., Kozlowski, D.F., Schmidt, K.M., Shane, R.S., & Fern&ez, G.	2013
	256	An Overview of the Southern Nevada Agency Partnership Science and Research Synthesis	Chambers, J.C., Brooks, M.L., Turner, K., Raish, C.B., & Ostoja, S.M.	2013
	285	Control of Tamarix in the Western United States:Implications for Water Salvage, Wildlife Use, and Riparian Restoration	Shafroth, P.B., Cleverly, J.R., Dudley, T.L., Taylor, J.P., Van Riper III, C., Weeks, E.P., Stuart, J.N.	2005

River	Study Index	Article, Book, or Chapter Title	Authors	Date Published
Other Studies - Texas	302	Herpetofauna associated with arroyos and uplands in foothills of the Chihuahuan Desert	Jorgensen, E.E., & Demarais, S.	1998
	300	Understanding the habitat needs of the declining western yellow-billed cuckoo	Johnson, M.J.	2009
	279	A natural resource survey for proposed reservoir sites and selected stream segments in Texas	Bauer, J., Frye, R., & Spain, B.	1991
	144	Propagation and Establishment of Native Aquatic Plants in Reservoirs	Webb, M.A., Ott, R.A., Bonds, C.C., Smart, R.M., Dick, G.O., Dodd, L.	2012

Appendix E - Species with flow need or flow response data

Scientific Name	Common Name	Region	Study Index
Abies concolor	White fir	1, 3, 6	251
Acer negundo	Box elder	1, 2, 5	78, 187, 390
Actitis macularius	Spotted sandpiper	1	75
Agosia chrysogaster	Longfin dace	1, 3, 6	19, 75, 90
Aix sponsa	Wood Duck	1	75
Allenrolfea occidentalis	Iodine bush	6	181
Alnus oblongifolia/Baccharis salicifolia Forest	Arizona alder/Seep willow Forest	1, 2	271
Ambrosia psilostochya	Cumin ragweed	3	83
Ambrosia dumosa	Bur sage	4	143
Ambrysus h. hungerfordi		2	247
Ameiurus Natalis	Yellow bullhead	1, 2	90, 191
Anas platyrhynchos	Mallard	1	75
Archilochus alexandri	Black-chinned Hummingbird	3	13, 155
Ardea herodias	Great blue heron	1	75, 406
Armadillidium vulagare	Pill bug	1	243, 259
Arbuscular micorrhizal fungi		1	145
Arthropod		3, 6	29, 38, 52
Arundo donax	Giant Reed	2	157
Astyanax mexicanus	Mexican tetra	2	173, 202, 229
Atriplex canescens	Fourwing saltbush	2, 3, 4	85, 143, 208
Atriplex genus		6	55, 73
Baccharis emoryi	Emory's baccharis	3	83
Baccharis glutinosa	Saltmarsh baccharis	1, 3, 6	251
Baccharis salicifolia	Seep willow	3, 6	44, 70, 73, 83, 85, 97, 181
Baccharis sarothroides	Seep willow	1	103
Birds		1, 2, 3, 6	39, 329, 330, 360, 406
Benthic macroinvertebrates		6	11
Bufo microscaphus	Southwestern toad	6	31
Brachinus genus		3	99
Brickellia laciniata	Cutleaf brickellia	2	321
Bromus genus		1	272
Bufo alvarius	Sonoran desert toad	6	52
Bufo cognatus	Great plains toad	1	138, 405
Bufo woodhousii	Woodhouse's Toad	1	138, 405
Carpiodes carpio	River carpsucker	2	191
Carduelis psaltria	Lesser goldfinch	3, 6	13, 40
Castor canadensis	Beaver	1, 2, 6	32, 69, 87, 180, 407
Catostomus clarkii	Desert sucker	1, 4, 6	19, 90, 201, 294, 369, 404
Catostomus commersonii	White sucker	2	191
Catostomus discobolus	Bluehead sucker	1	63
Catostomus insignis	Sonora sucker	1, 6	90, 116
Catostomus latipinnis	Flannelmouth sucker	1	63, 110, 116
Campostoma ornatum	Mexican stoneroller	2	229, 233
Ceratopogonids		1	240
Ceryle alcyon	Belted kingfisher	1	75, 232

AZ/NM Mts Plateau = 1 Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Scientific Name	Common Name	Region	Study Index
Celtis laevigata	Sugarberry	2	390
Celtis reticulata	Netleaf hackberry	3	83
Chilopsis linearis	Desert willow	1, 2	106, 321
Chironomidae genus		1	240
Cichlasoma cyanoguttatum	Rio Grande cichlid	2	202
Cichlasoma minckleyi	Minckley's cichlid	2	173
Cnemidophorus exsanguis	Chihuahuan spotted whiptail	1	146
Cnemidophorus inornatus	Little striped whiptail	1	146
Cnemidophorus tesselatus	Common checkered whiptail	1	146
Cnemidophorus uniparens	Desert grassland whiptail	1	146
Coccyzus americanus	Yellow-billed cuckcoo	6	92
Coleogyne ramosissim	Blackbush	4	143
Conyza canadensis	Horseweed	1	106
Columbina passerina	Ground dove	3	155
Cupressus arizonica	Aruziba cuoress	1	318
Cycleptus genus		2	376
Cyprinodon atrorus	Cuatro Cienegas pupfish	6	137
Cyprinus carpio	Common carp	2	191, 200
Cyprinodon diabolis	Devil's Hole pupfish	4	332
Cyprinodon elegans	Comanche spring pupfish	2	205
Cyprinodon eximius	Conchos pupfish	2	229
Cyprinella formosa	Beautiful shiner	2	233
Cyprinella lutrensis	Red shiner	1, 2	90, 191, 200, 229
Cynodon dactylon	Bermuda grass	3, 5	85, 129
Cyprinodon macularius	Desert pupfish	1, 3, 6	19, 51
Cyprinodon nevadensis	Amargosa pupfish	4	287
Cyprinella proserpinus	Proserpine shiner	2	137, 202, 391
Cynoscion othonopterus		6	304
Dendroica coronata	Yellow rumped warbler	3, 6	40
Dendroica petechia	Yellow warbler	3, 6	13, 52
Diceroprocta apache	Apache cicada	6	122
Dionda argentosa	Manatial roundnose minnow	2	202, 391
Dionda diaboli	Devils River minnow	2	137, 202
Dionda episcopa	Roundnose minnow	2, 3	137, 229
Distichlis spicata	Salt grass	1, 5	129, 272, 285
Durangonella coahuilae	Freshwater snail	6	198
Echinochloa crus-galli	Barnyard grass	1	106
Egretta thula	Snowy egret	6	190
Elaeagnus angustifolia	Russian olive	1	107, 234
Eleocharis montevidensis	Spikerush	3	83
Eleocharis palustris	Flatstem spikerush	5	144
Elymus canadensis	Canadian wildrye	1, 3	83, 272
Empidonax traillii	Southwestern willow flycatcher	1, 6	42, 92, 226, 232, 255, 263
Ephemeroptera genus		6	11, 69
Equisetaceae genus		6	56
Equisetum laevigatum	Smooth horsetail	3, 6	11, 83
Ericameria nauseosa	Rubber rabbitbush	3	83, 85
Etheostoma grahami	Rio Grande darter	2	202, 391
Eragrostis cilianensis	Gray lovegrass	1	106
Eremobates pallipes	Wind scorpion	1	238
Eucalyptus camaldulensis	River red gum	5	307
Eumeces obsoletus	Great plains skink	1	146
Fallugia paradoxa	Apache plume and ponil	2	321

AZ/NM Mts Plateau = 1   Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Scientific Name	Common Name	Region	Study Index
Fallceon genus		1	240
Falco peregrinus	Periguin falcon	1	232, 263
Flourensia cernua	American tarwort	2	321
Forested broadleaf		3	1
Forestiera neomexican	New Mexico olive	2	208
Fraxinus velutin	Velvet ash	1, 3, 6	83, 251, 307
Franseria dumosa	Burro bush	4	143
Gambusia affinis	Mosquito fish	2, 4	191, 287
Galerita janus	Beetle	1	259
Gammarus lacustris	Scud	1	261
Gambusia nobilis	Pecos gambusia	2	137
Gambusia senilis	Blotche gambusia	2	229
Gastropod		1	240
Gerris lacustris	Common water strider	1	60
Geothlypis trichas	Common yellow throat	3, 6	13, 38, 190
Gila cypha	Humpback chub	1, 6	63, 89, 108, 174, 303, 337, 347
Gila elegans	Bonytail chub	1	19, 63, 25
Gila robusta jordani	Phranagat roundtail chub	4	299
Gila nigresces	Chihuaha chub	2	341
Gila robusta	Roundtail chub	1, 3, 6	19, 63, 75, 90, 108, 201, 276
Gila sp.	Undescribed chub	2	233
Gomphidae genus		6	69
Gryllus alogus	Feild cricket	1, 3	61, 243
Grassland		3, 6	66, 57
Grayia spinosa	Hop sage	4	143
Gryllidae genus		3	99
Gymnogyps californianus	California condor	1	263
Haliaeetus leucocephalus	Bald eagle	1	75, 232
Helicopsyche genus		1	240
Heteranthera dubia	Water stargrass	5	144
Himantopus mexicanus	Black-necked stilt	6	190
Homoptera genus		3	29
Hybognathus amarus	Silvery minnow	1, 2	152, 158, 177, 191, 236, 322, 324, 348
Hydroprogne caspia	Caspian tern	6	190
Hyla arenicolor	Canyon tree frog	1, 6	52, 171
Hydropsychida genus		3	44, 77
Hydrochores genus		1	311
Hymenoclea genus		6	153
Ictalurus lupus	Headwater catfish	2	200, 202, 391
Icteria virens	Yellow-breasted chat	3	13, 155
Ictalurus punctatus	Channel catfish	2	191, 200
Invertebrates		1, 3, 6	11, 51, 87, 99, 116, 119, 403
Isocoma tenuisecta	Burroweed	1	106
Ixobrychus exilis	Least bitterin	2	191
Juglans major	Arizona walnut	3	83
Juncus balticus	Baltic rush	3	83
Juncus torreyi	Torry's rush	3	83
Kinosternon sonoriense	6 mud turtle	1	52, 405
Lachnophorus genus		3	99
Lasiurus cinereus	Hoary bat	6	31

AZ/NM Mts Plateau = 1   Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Scientific Name	Common Name	Region	Study Index
Laterallus jamaicensis coturniculus	Black rail	2, 6	190, 191
Larrea divaricata	Chaparrel	4	143
Larrea tridenta	Creosote-bush	2, 4	143, 321
Lepomis cyanellus	Green sunfish	1, 2	90, 191, 229
Leiothlypis luciae	Lucy's warbler	1, 3	13, 227
Lepomis megalotis	Longear sunfish	2	202
Lepomis macrochirus	Bluegill	2	191
Lepidomeda mollispinis pratensis	Big Spring spinedace	4	294
Limenitis archippus	Viceroy butterfly	3, 6	29, 31
Lilaeopsis schaffneriana	Cienega falshrush	3	203
Lithobates pipiens	North American leopard frog	1	232
Litopenaeus stylirostris	Shrimp	6	308, 346
Lontra canadensis	North American river otter	1	407
Lutra longicaudis	Southern river otter	6	268
Lycium andersonii	Desert-thorn/wolfberry	2, 4	143, 208
Lycosidae genus		1, 3	99, 141
Macroinvertebrates		1, 4, 6	52, 166, 177, 297
Macrhybopsis aestivalis	Speckled chub	2	236
Marrubium vulgare	Horehound	1	106
Mexipyrgus churinceanus	Freshwater snail	6	198
Meda fulgida	Spikedace	1, 6	19, 75, 137, 201, 404
Mergus merganser	Common merganser	1	75, 406
Melospiza melodia		3, 6	13, 38, 155, 190
Melilotus officinalis	Sweet clover	1, 3	85, 106
Mexithauma quadripaludium	Freshwater snail	6	198
Melanerpes uropygialis	Gila woodpecker	3	155
Mexipyrgus churinceanu	Snail	2	173
Mesquite Bosque		1, 5, 6	57, 183, 316, 255
Mexithauma quadripaludiu	Snail	2	173
Micropterus salmoides	Largemouth bass	2	202
Molothrus ater	Brown-headed cowbird	3	13
Moapa coriace	Moapa dace	4	137
Moxostoma congestum	Gray redhorse	2	202
Mulinia coloradoensis	Colorado delta clam	6	210, 309
Muhlenbergia rigens	Deer grass	6	56
Myiarchus cinerascens	Ash-throated flycatcher	6	190
Myotis yumanensis	Yuma mytosis	4	135
Notropis amabilis	Texas shiner	2	202
Notropis braytoni	Tamaulipas shiner	2	200, 202, 391
Notropis chihuahua	Chihuahua shiner	2, 5	161, 229
Notropis girardi	Arkansas River shiner	2	278
Notropis jemezanus	Rio Grande shiner	2	236
Notiosorex crawfordi	Desert shrew	6	31
Notropis simus pecosensis	Pecos bluntnose shiner	2	137, 236
Notropis stramineus	Sand shiner	2	202
Notropis xanthicara	Shiner	2	173
Nymphophilus minckleyi	Freshwater snail	5, 6	144, 198
Oncorhynchus clarkii virginalis	Rio Grande cutthroat trout	2	306
Oncorhynchus gilae	Gila trout	1	352
Oncorhynchus mykiss	Rainbow trout	1, 4	41, 49, 294, 328, 357
Oenothera rosea	Pink evening primrose	1	106
Oligochaeta genus		1	240

AZ/NM Mts Plateau = 1   Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Scientific Name	Common Name	Region	Study Index
Ondonata genus		4	368
Ondatra zibethicus	Muskrat	1	407
Ostracoda genus		6	69
Oxyloma haydeni haydeni	Niobrara ambersnail	1	232
Oxyloma kanabensis	Kanab ambersnail	1	232
Oreochromis aureus	Blue tilapia	2	229
Pandion haliaetus	Osprey	6	190
Paludiscala caramba	Paludiscala de oro snail	6	198
Palaemonetes suttkusi	Shrimp	2	173
Pelecanus erythrorhynchos	American White Pelican	6	190
Peromyscus leucopus	White-footed mouse	1	364
Phragmites australis	Rivercane	1	58, 340
Pipilo aberti	Albert's towhee	3	13, 155
Pimephales promelas	Fathead minnow	1, 2	90, 191, 229
Piranga rubra	Summer tannager	3	13
Platygobio gracilis	Flathead chub	2	191
Platanus wrightii	Arizona sycamore	1, 3, 6	76, 82, 251, 307
Pluchea sericea	Arrowweed	1, 4, 6	58, 181,190, 210, 254, 340
Potamopyrgus antipodarum	New Zealand mudsnalis	1	60
Pomoxis annularis	White crappie	2	191
Poecilus chalcites	Ground beetle	1	259
Porcellio laevis	Woodlouse	1	243, 259
Poecilus lucublandus	Ground beetle	1	259
Poecilia latipinna	Sailfin molly	4	287
Poeciliopsis occidentalis		1, 6	8, 19, 171
Polypogon monspeliensis	Rabbit's foot grass	1	106
Populus angustifolia	Narrowleaf cottonwood	1	352
Populus angustifolia/Alnus incana Forest	Narrowleaf cottonwood/Thinleaf alder forest	1, 2	271
Populus angustifolia/Salix exigua Forest	Narrowleaf cottonwood/Coyote willow forest	1, 2	271
Populus deltoides	Eastern cottonwood	1, 2	104, 169, 170, 212, 246, 271, 390
Populus fremontii	Freemont cottonwood	1, 2, 3, 5, 6	1, 17, 18, 23, 27, 31, 33, 34, 44, 45, 50, 52, 55, 56, 67, 70, 73, 83, 87, 97, 103, 107, 150, 181, 186, 187, 190, 208 210, 223, 234, 235, 242, 285, 307, 340, 349, 352, 366
Populus fremontii/Salix gooddingii forest	Fremont cottonwood/Gooding willow forest	1,2,3,6	7, 18, 45, 55, 57, 78, 79, 80, 83, 84, 120, 162, 271, 277, 283, 340, 351, 388, 401, 402
Populus genus		1, 5, 6	162, 183, 224, 255, 272, 351, 378
Potamogeton illinoensis	Illinois pondweed	5	144
Potamogeton nodosus	American pondweed	5	144
Predator arthropods		3	99
Prosopis glandulosa	Western honey mesquite	1, 2	190, 321, 340

AZ/NM Mts Plateau = 1 Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Scientific Name	Common Name	Region	Study Index
Prosopis pubescens	Screwbean mesquite	2, 4	208, 254
Prosopis velutina	Velvet mesquite	1, 3, 5, 6	1, 25, 43, 55, 56, 64, 65, 73, 83, 84, 85, 97, 106, 120, 216, 242, 285, 375
Ptychocheilus lucius	Colorado squawfish	1	63, 75
Pseudemys gorzugi	Rio grande cooter	2	133
Pseudemys scripta taylori	Cuatro cienegas slider	2	173
Pyrgulopsis carnifera	Moapa turban snail	4	299
Quercus genus		3	251
Rana catesbeiana	American Bullfrog	6	168
Rallus limicola	Virginia rail	2	191
Rallus longirostris yumanensis	Yuma clapper rail	2, 6	191, 193
Rana yavapaiensis	Lowland leopard frog	1, 6	52, 171
Rhinichthys cataractae	Longnose dace	2	191
Rhinichthys osculus nevadensis	Ash Meadows speckled dace	4	287, 369
Rhinichthys osculus	Speckled dace	1, 4, 6	19, 63, 75, 90, 110, 294, 299
Rhus microphylla	Littleleaf Sumac	2	321
Rumex crispus	Curly dock	1	106
Rhus trilobata	Skunkbush sumac	2	208
Sagittaria latifolia	Arrowhead	5	144
Saldidae genus	Shore bugs	3	99
Salix exigua	Coyote willow	1, 4	58, 254, 271, 352
Salix gooddingii	Goodding willow	1, 3, 6	17, 31, 33, 34, 44, 45, 50, 52, 70, 83, 85, 86, 87, 104, 181, 190, 210, 242
Salix genus		1, 3, 6	162, 251, 272, 351, 378
		1	255, 272, 351
Salix nigra	Black willow	2	208, 307, 390
Sayornis nigricans	Black phoebe	6	38, 190
Scaphiopodidae genus		3	59
Salmo trutta	Brown trout	1	369
Scaphiopus couchii	Couch's Spadefoot	2	302
Schoenoplectus acutus	Hardstem bulrush	3	85
Schedonorus phoenix	Tall fescue	1	106
Schoenoplectus tabernaemontani	Softstem bulrush	5	144
Scirpus acutus	Common tule	3	83
Scrub		3, 6	1, 57
Setaria genus		1	272
Shepherdia argentea	Silver buffaloberry	2	208
Shrubland		3, 6	66
Sisymbrium irio	London rocket	1	106
Sigmodon hispidus	Hispid cotton rat	6	31
Sorghum halepense	Johnsongrass	1	106, 272
Sonora semiannulata	Ground snake	6	31
Sporobolus airoides	Alkali sakaron	5	129
Sporobolus wrightii	Big sacaton	1, 3, 6	56, 65, 83, 97, 106
Staphylinidae genus		3	99
Sterna forsteri	Forster's tern	6	190
Syntomus genus		3	99
Stiobia genus		6	198

AZ/NM Mts Plateau = 1 Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Scientific Name	Common Name	Region	Study Index
Tamarix genus		1, 5, 6	100, 107, 129, 162, 183, 190, 224, 272, 315, 316
Tamarix chinensis	China tamarisk	1, 3, 6	33, 34, 83, 169, 170
Tamarix Ramossissima	Salt Cedar	1, 3, 6	1, 6, 7, 27, 44, 45, 50, 58, 70, 84, 85, 86, 104, 140, 150, 171, 181, 217, 228, 234, 254, 255, 285, 295, 340, 355, 387
Thamnophis eques	Mexican gartersnakes	1	405
Thamnophis cyrtopsis ocellatus	black-necked garter snake	6	52
Thamnophis rufipunctatus	narrow-headed gartersnake	3	196
Tiaroga cobitis	Loach minnow	1, 6	75, 201, 325, 404
Tipulidae genus		1	240
Terrapene Coahuila	Coahuilan box turtle	2	173
Typha genus		1, 6	55, 56, 73, 78
Typha domingensis		3, 6	83, 123
Toxostoma crissale	Crissal thrasher	6	190
Trionyx ater	Cuatro cienegas softshell	2	173
Tringa melanoleuca	Greater yellowlegs	6	190
Tringa semipalmata	Willet	6	190
Tubificidae genus	Slug worm	1	60
Unionidae genus		2	134
Urosaurus ornatus	Tree lizard	1	146
Vireo bellii	Bell's Vireo	3, 6	13, 52, 155
Veronica anagallis-aquatica	Water speedwell	1	190
Verbesina encelioides	Golden crownbeard	1	190
Viguiera dentata	Toothleaf goldeneye	1	106
Wilsonia pusilla	Wilson's warbler	3	13, 38
Wetland		6	57, 123
Xyrauchen texanus	Razorback sucker	1, 3, 6	19, 63, 75, 255
Zenaida macroura	Mourning dove	3	155
Zenaida asiatica	White-winged dove	3	155
Zapus hudsonius luteus	New Mexico meadow jumping mice	1	407
Ziziphus obtusifolia	Graythorn	3	85

Regions	
AZ-NM Mountains & Plateau	1
Chihuahuan	2
Madrean	3
Mojave	4
NA	5
Sonoran	6

Regions	
AZ-NM Mountains & Plateau	1
Chihuahuan	2
Madrean	3
Mojave	4
NA	5
Sonoran	6

AZ/NM Mts Plateau = 1   Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Regions

AZ/NM Mts Plateau = 1 Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Regions

AZ/NM Mts Plateau = 1   Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Regions

AZ/NM Mts Plateau = 1   Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Regions

AZ/NM Mts Plateau = 1   Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Regions

AZ/NM Mts Plateau = 1 Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6

Regions

AZ/NM Mts Plateau = 1   Chihuahuan = 2 Madrean = 3 Mojave = 4 NA = 5 Sonoran = 6