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March 2005

Middle Rio Grande Riverine Habitat Restoration Project

Submitted to:

New Mexico Interstate Stream Commission

U.S. Bureau of Reclamation

ENVIRONMENTAL ASSESSMENT

FINAL DRAFT

U.S. Department of the Interior

BUREAU OF RECLAMATION
Albuquerque Area Office
Albuquerque, New Mexico

Finding of No Significant Impact

Middle Rio Grande
Riverine Habitat Restoration Project

_____	_____
Manager, Environment Division	Date
_____	_____
Area Manager, Albuquerque Area Office	Date
_____	_____
New Mexico Interstate Stream Commission, Rio Grande Bureau	Date

AAO-05-004
FONSI Number

BACKGROUND

The U.S. Bureau of Reclamation (Reclamation) and the State of New Mexico Interstate Stream Commission (ISC) are proposing to implement part of the Reasonable and Prudent Alternative (RPA) in the March 2003 U.S. Fish and Wildlife Service (USFWS) Biological Opinion for Reclamation's Water and River Maintenance Operations, the U.S. Army Corps of Engineers' (USACE) Flood Control Operations, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico, 2003 (U.S. Fish and Wildlife Service [USFWS] 2003). The requirement of Element S of the RPA is to address priority habitat restoration goals of the Middle Rio Grande Endangered Species Act (ESA) Collaborative Program (Collaborative Program).

This project, termed the Middle Rio Grande Riverine Habitat Restoration Project (project), will apply several habitat restoration techniques in three subreach locations of the river in the Albuquerque Reach to create and improve riverine habitat suitable for the endangered Rio Grande silvery minnow (RGSM). Changes in riverine ecosystem processes and habitats have been linked to declines in RGSM, the last remaining member of a guild of small, pelagic spawning minnows native to the Rio Grande. The Environmental Assessment (EA) evaluates the impacts of these riverine habitat restoration techniques and projects on environmental resources and their relationship to other projects and undertakings in compliance with the National Environmental Policy Act (42 U.S.C 4321 et seq.).

SUMMARY OF THE PROPOSED ACTION

The Proposed Action involves the design and implementation of six techniques to restore aquatic habitat for the benefit of the RGSM within the river in the Middle Rio Grande (MRG), Albuquerque Reach. Techniques would be implemented on islands, bars and banks to evaluate the river's ability to naturally mobilize sediments and create RGSM habitat under a variety of flow conditions. Work would take place over a four-year period, from March 2005 through 2009, with Phase I occurring during 2005 and 2006. Approximately 70 acres would be treated within the river channel on islands and bars during Phase I. As the project progresses, implementation would continue on selected islands, bars, and banks, with the potential of increasing treated acres to approximately 350. Total funding for the Phase I of the project from both federal and state sources is anticipated to be $1,062,000. Federal funding for Phase I from the Collaborative Program is $174,000; federal funding from Reclamation is $98,000; and funding from the State of New Mexico is approximately $790,000.

No significant adverse impacts to environmental resources and the human environment are anticipated as a result of the planned phased approach. No Indian Trust Assets have been identified and no impacts are anticipated due to the project. Continual evaluation of both adverse and beneficial effects will be performed over the duration of the project. The initial project design is expected to produce beneficial effects on aquatic habitats and aquatic resources. Implementation will be followed by monitoring and evaluation of the success of each technique to restore habitat without any undue short-term effects.

ENVIRONMENTAL IMPACTS RELATED TO THE RESOURCES OF CONCERN

Resources of primary concern for the project include the three federally threatened or endangered species and their associated habitat that occur within the project area, water quality in the Rio Grande, and the visual and aesthetic quality of the project area, which lies within Rio Grande Valley State Park (RGVSP).

Short-term environmental impacts are anticipated during the construction phase of the project, resulting from temporary construction disturbance and noise. Direct environmental impacts may include temporary and localized increases in the level of suspended sediments in the river, clearing or trampling of vegetation, and direct impacts to fish caught under mechanized equipment operating in the river. These short-term direct effects will be minimized by following best management practices, monitoring normal water quality parameters twice daily when operating equipment in the channel, using previously cleared access and staging areas. Indirect effects may result from construction noise above the ambient noise level normally experienced by recreational users of RGVSP or residents of areas near the project. Visual and aesthetic effects may occur during construction.

Indirect long-term effects, including beneficial effects to riverine habitats suitable for Rio Grande silvery minnow and other fish and wildlife resources, will be evaluated during the course of the project. Long-term effects on the visual and aesthetic quality of the RGVSP are not anticipated, since the restoration design will restore natural riverine processes to create or improve the function of the RGVSP riverine ecosystem.

OTHER AFFECTED RESOURCES

The Rio Grande Compact limits the amount of water that can be depleted in the MRG (Rio Grande Compact 1939). Any increase in net depletions will jeopardize the ability of the State of New Mexico to meet its downstream delivery obligations. Therefore, the ISC requires that new projects demonstrate that they will not result in any increases in net water depletions, or that any increases are offset by purchased or leased water rights. This project will evaluate changes in water depletions (water losses) and develop methods to ensure that depletions are not increased as a result of the action.

ENVIRONMENTAL COMMITMENTS

All applicable permits will be obtained prior to implementation of the project, including but not limited to:

- Landowner access permissions
- Clean Water Act (CWA), Section 404
- State Water Quality Certification under CWA, Section 401
- Temporary Construction Noise Permit, City of Albuquerque Environmental Health Department
- National Pollutant Discharge Elimination System (NPDES) Permit

- Storm Water Pollution Prevention Plans

In addition to obtaining these permits, the Joint Lead agencies make the following environmental commitments:

- Monitoring standard water quality parameters, including suspended sediment and pH, twice daily when operating amphibious equipment within the river channel.
- Avoiding construction or location of staging areas in jurisdictional wetlands.
- Avoiding impacts to birds protected by the Migratory Bird Treaty Act by scheduling construction outside of the normal bird breeding and nesting season (April 15 through August 15) for most avian species or conducting pre-construction breeding bird surveys and monitoring if construction were to occur during the breeding and nesting season and consultation with USFWS if affected species are observed.
- Avoiding or minimizing potential visual and aesthetic impacts at the Central to I-40 subreach by replanting native vegetation.
- Implementing specific mitigation measures to avoid impacts to threatened or endangered species and their habitats identified in the project area, as determined in consultation with USFWS.
- Avoiding any Traditional Cultural Properties identified in the project area during consultation with the State Historic Preservation Officer and tribal entities.
- Implementing measures to stop work and notify the Reclamation Area Archaeologist in the event that prehistoric or historic remains, human burials, or other archaeological resources are discovered during construction or monitoring.
- Consultation will take place to identify any Indian Trust Assets impacted by the Project.

COORDINATION

Agencies and other entities contacted formally or informally to coordinate efforts in preparation of this EA include:

Bernalillo County
City of Albuquerque
City of Albuquerque Open Space Division
Corrales Bosque Commission
Middle Rio Grande Conservancy District
New Mexico Department of Game and Fish
New Mexico State Historic Preservation Division
New Mexico State Historic Preservation Officer
Pueblo of Isleta
Sandia Pueblo
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
Village of Corrales

CONCLUSION

The project, proposed by Reclamation and ISC, will apply six habitat restoration techniques in three subreach locations of the river in the Albuquerque Reach to create and improve habitat for the endangered Rio Grande silvery minnow. The project will treat 70 acres in 2005 and 2006 and up to 350 acres over a period of four years, and monitor the riverine environment to determine if the techniques applied restore or improve riverine ecosystem processes and habitats suitable for life stages of the RGSM. This need is identified as part of the Reasonable and Prudent Alternative (RPA) in the March 2003 USFWS Biological Opinion for Reclamation's Water and River Maintenance Operations, the U.S. Army Corps of Engineers' Flood Control Operations, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico, 2003 (USFWS 2003).

Short-term impacts may occur to visual and aesthetic resources, noise, water quality, and threatened or endangered species, including RGSM. Potential short-term construction effects of the project will be minimized with best management practices and impact-avoidance measures to assure that effects do not rise to the level of significance. Long-term effects may be beneficial to riverine ecosystem processes and will be monitored by the Joint Lead Agencies to determine if they meet the objectives of the project.

Based on the analysis performed in the environmental assessment, no significant adverse impacts to the natural or human environment will result from implementation of the project. This Finding of No Significant Impact (FONSI) has been determined pursuant to the National Environmental Policy Act (42 U.S.C. 4321et seq.) It has been determined that the proposed action does not constitute a major federal action that would significantly affect the human environment. Therefore, an environmental impact statement will not be prepared for this project.

MIDDLE RIO GRANDE
RIVERINE HABITAT RESTORATION PROJECT
ENVIRONMENTAL ASSESSMENT
FINAL DRAFT

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TABLE OF CONTENTS

Table of Contents, continued

LIST OF FIGURES

LIST OF TABLES

1.0 PURPOSE AND NEED FOR ACTION

1.1 INTRODUCTION

The U.S. Bureau of Reclamation (Reclamation) and the New Mexico Interstate Stream Commission (ISC) seek to implement part of the Reasonable and Prudent Alternative (RPA) in the March 2003 U.S. Fish and Wildlife Service Biological Opinion for Reclamation's Water and River Maintenance Operations, the U.S. Army Corps of Engineers' (USACE) Flood Control Operations, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico, 2003 (U.S. Fish and Wildlife Service [USFWS] 2003) and to address priority habitat restoration goals of the Middle Rio Grande Endangered Species Act (ESA) Collaborative Program (Collaborative Program). Reclamation and the ISC are proposing to implement river restoration activities for the benefit of the federally listed Rio Grande silvery minnow (RGSM), specifically activities to improve adult and juvenile over-wintering habitat and RGSM egg retention and rearing habitat within the Albuquerque Reach of the Rio Grande. Restoring the riverine habitats that support the RGSM is considered to be an essential element for recovering the species (Federal Register [FR] 1993).

Changes in riverine ecosystem processes and habitats have been linked to declines in RGSM, the last remaining member of a guild of small, pelagic spawning minnows native to the Rio Grande (Sublette et al. 1990; Bestgen and Platania 1991). Restoring specific riverine habitats that support the RGSM in river reaches where flow is more assured is a priority for the Program (Collaborative Program Request for Proposals, October 2004).

This project, termed the Middle Rio Grande Riverine Habitat Restoration Project (Project), is jointly led by Reclamation and ISC and proposes to apply several habitat restoration techniques in three subreach locations of the river in the Albuquerque Reach to create and improve habitat for RGSM. The Project is primarily funded by the State of New Mexico with partial funding by the Collaborative Program, with additional funding from other federal and non-federal sources. This Environmental Assessment (EA) has been conducted to evaluate the impacts of these riverine habitat restoration techniques and projects on other resources and their relationship to other projects and undertakings in compliance with the National Environmental Policy Act (NEPA) (42 U.S.C. 4331-4335).

1.2 PROPOSED ACTION

The Proposed Action involves the design and implementation of various habitat restoration/rehabilitation techniques to restore aquatic habitat for the benefit of the RGSM within the river in the Middle Rio Grande (MRG), Albuquerque Reach (Figure 1.1). The proposed rehabilitation and restoration would occur within the river floodway at three locations each approximately 1.5 miles long: the North Diversion Channel, the Interstate 40 to Central Avenue– area, and the South Diversion Channel (Figure 1.2). Projects at specific sites on vegetated islands, bars, and riverbanks would be implemented to test the efficacy of specific techniques (Figures 1.3 – 1.5) (Table 1.1). Techniques would be implemented on islands to evaluate the river's ability to naturally mobilize sediments and create RGSM habitat under a variety of flow conditions.

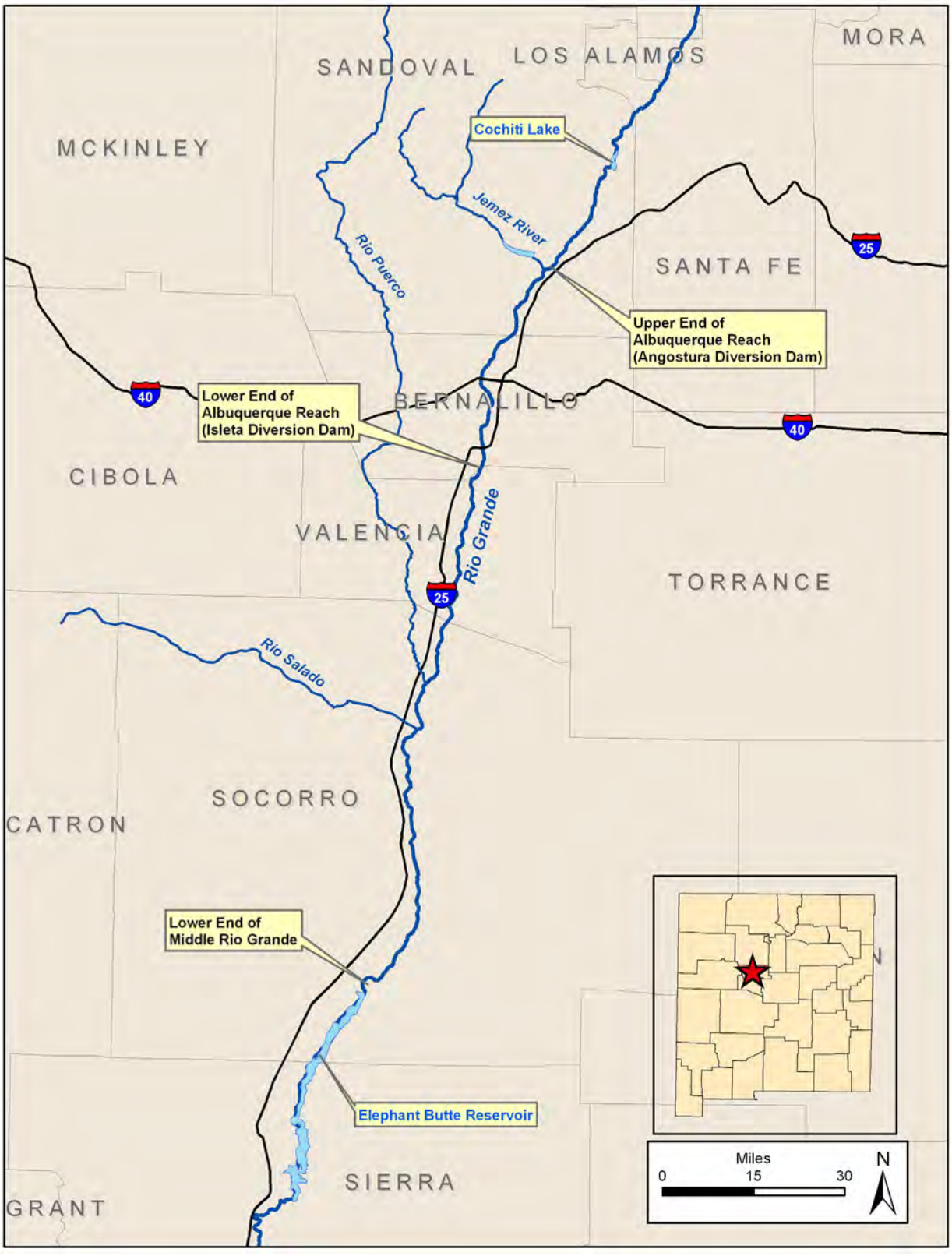

Figure 1.1. Project location map.

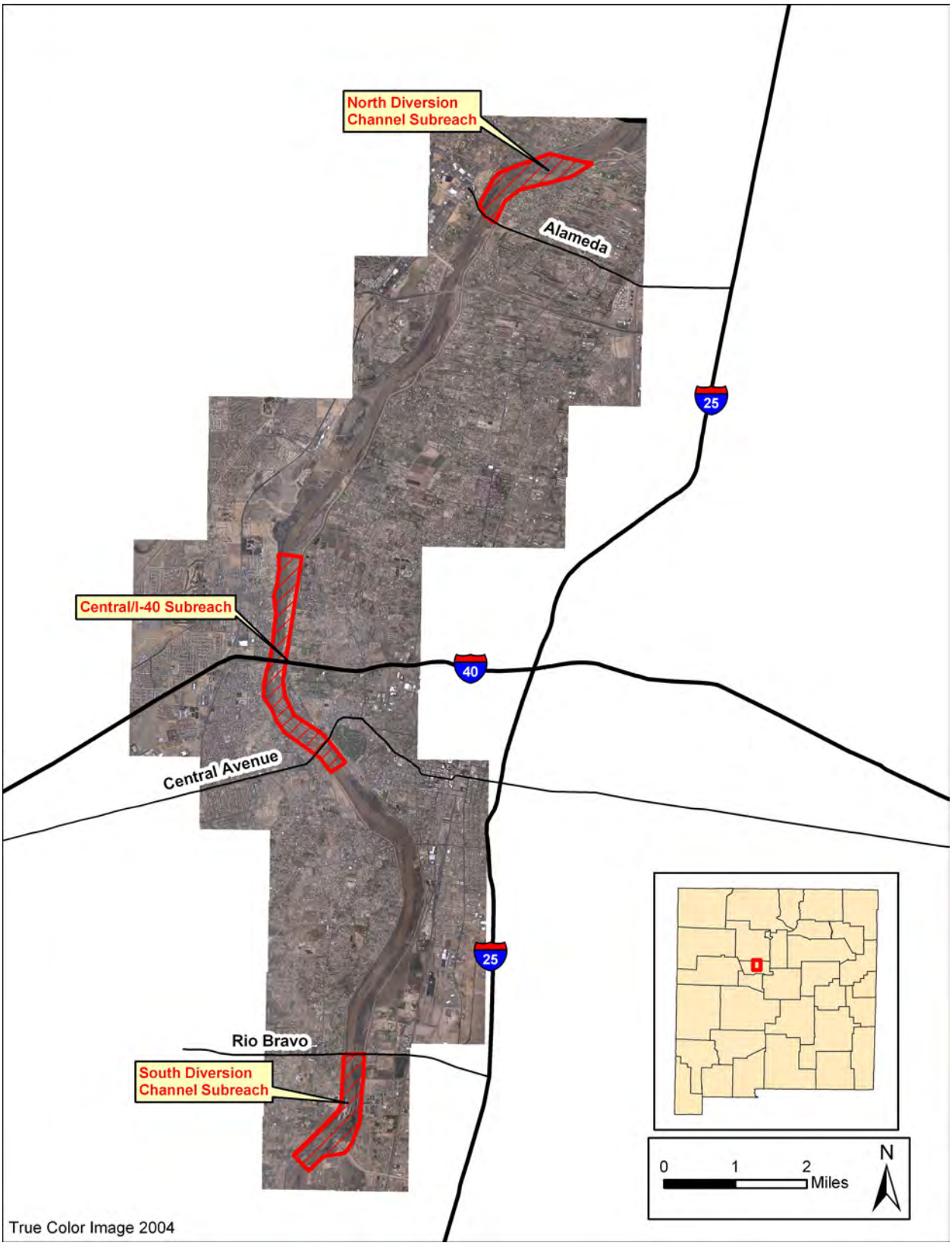

Figure 1.2. Proposed riverine habitat restoration subreaches.

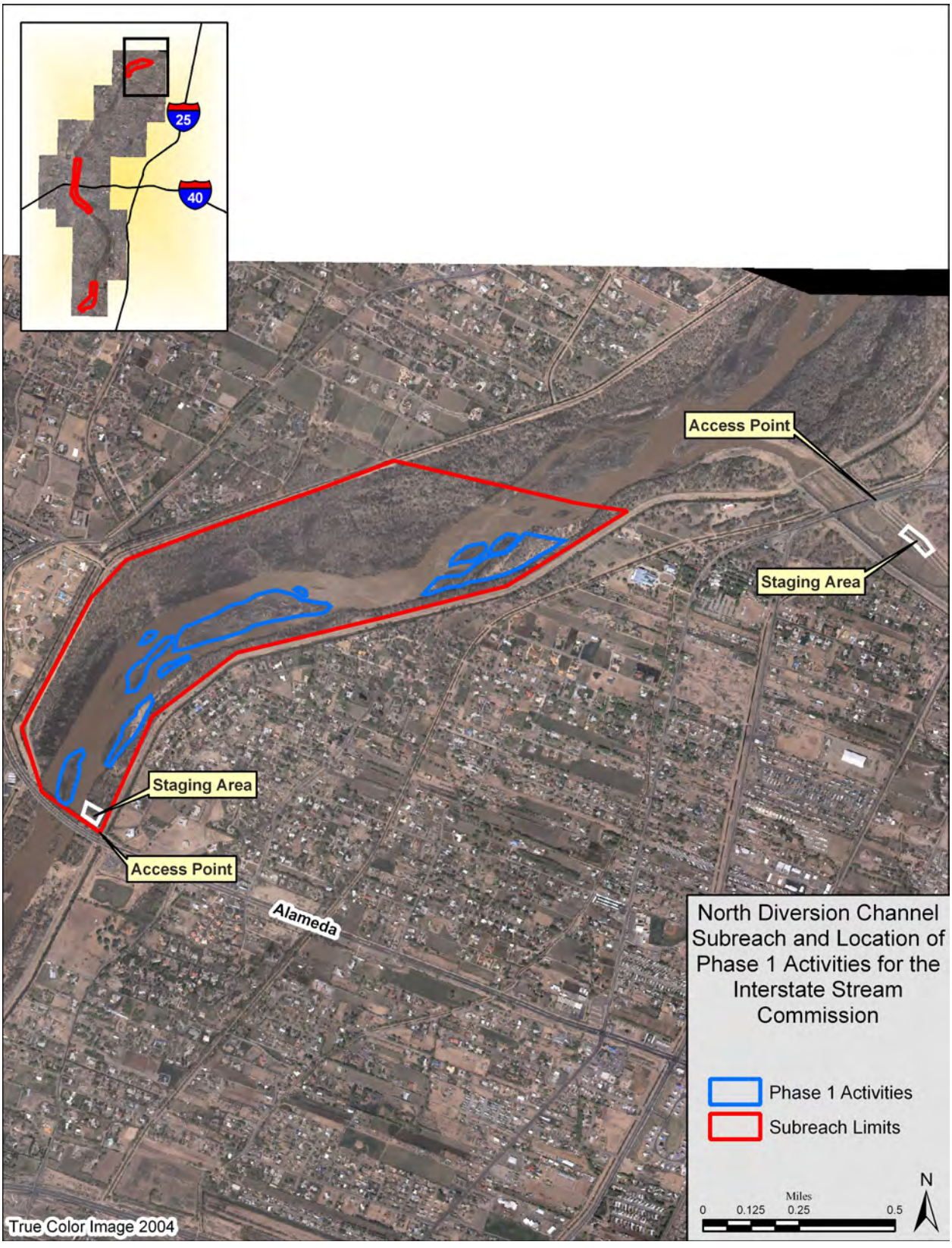

Figure 1.3 Alameda to NDC subreach restoration locations.

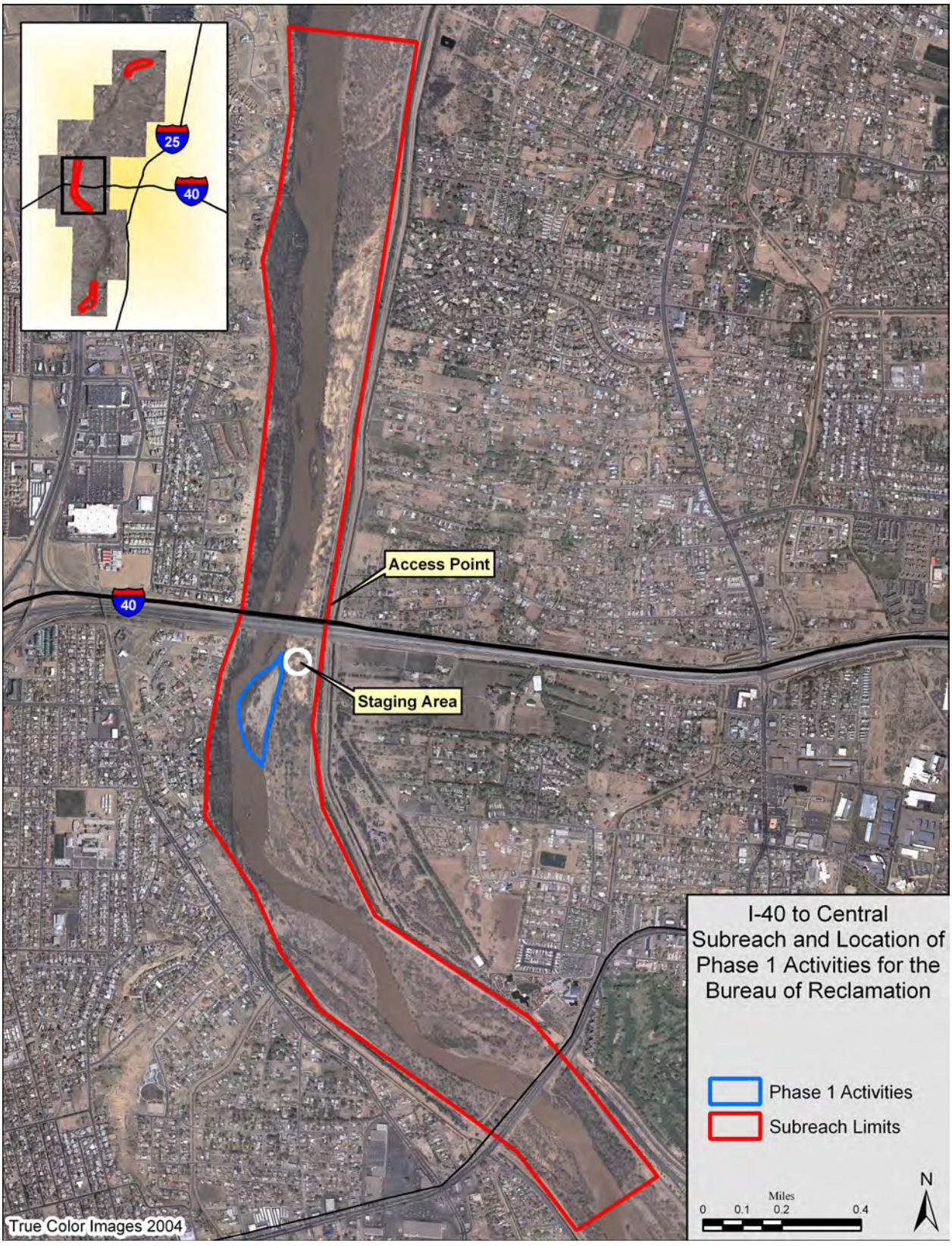

Figure 1.4. I-40 to Central subreach restoration locations.

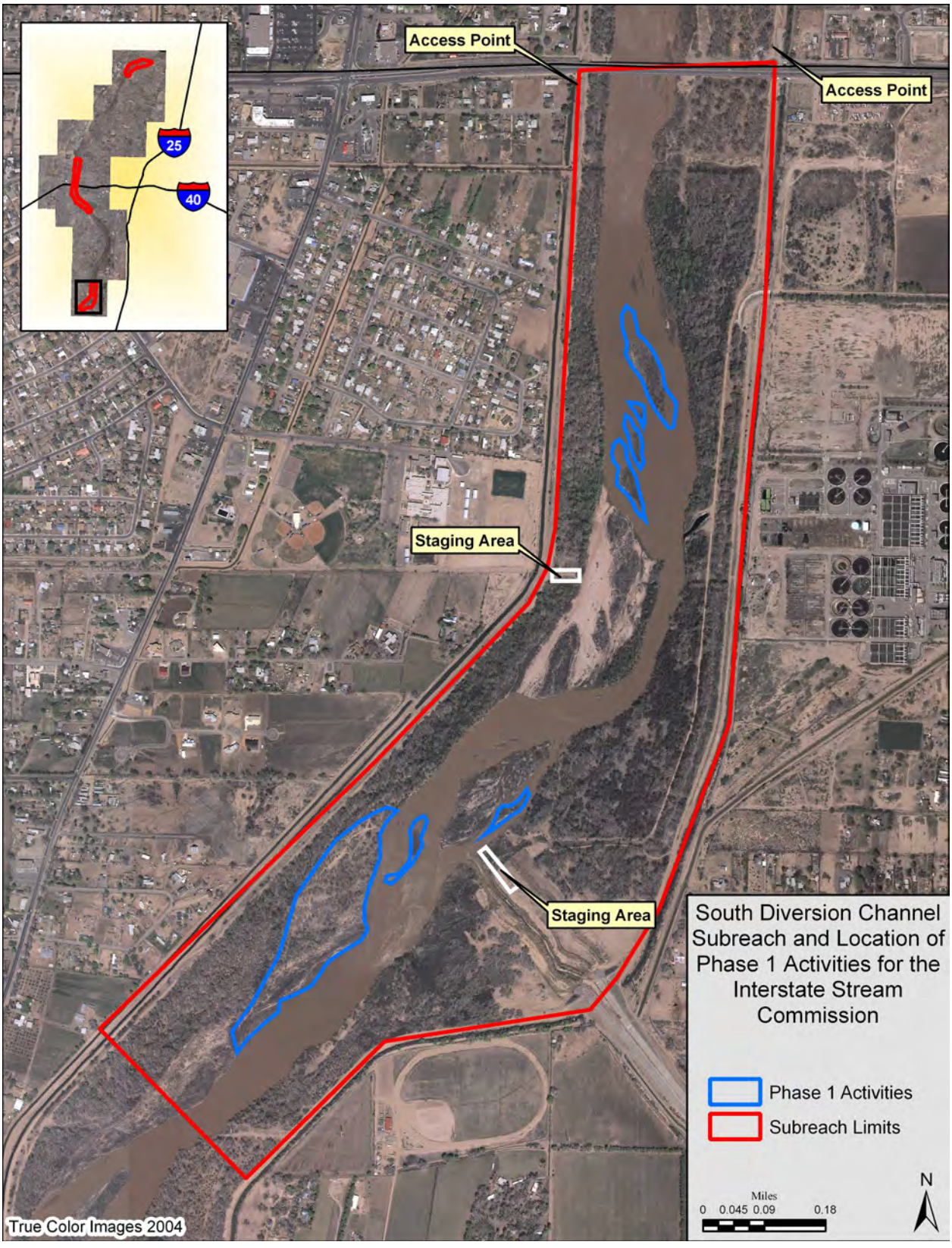

Figure 1.5. Rio Bravo to SDC subreach restoration locations.

Table 1.1 Proposed Restoration Techniques, Estimated Costs, and Number of Actions

Restoration Technique	Proposed Initial Number of Actions (2005-2006)	Funding Source for Phase I	Phase I Acres Treated	Maximum Acres Treated	Phase I Locations and Costs		
					North Diversion Channel	I-40/ Central	South Diversion Channel
Vegetated Island Modification and Evaluation	6-8 islands	State of NM and Collaborative Program	50	250	Yes	No	Yes
Bar Habitat Modification	1 bar	Bureau of Reclamation	12	64	No	Yes	No
Large Woody Debris	Multiple sites	N/A	N/A	N/A	Yes	Yes	Yes
Island Bank Scouring and Scalloping	5 sites	State of NM	1	6	Yes	No	Yes
Bank Lowering	4 sites	State of NM	5	15	Yes	No	Yes
Ephemeral Channels on Islands	5 sites	State of NM	2	20	Yes	Yes	Yes
State of NM Component:					$474,000	None	$316,000
Reclamation Component:					None	$98,000	None
MRG ESA Collaborative Program Component:					$104,000	None	$70,000
TOTAL PHASE I ESTIMATED COSTS:					$578,000	$98,000	$386,000

Bar modification is intended to create low-velocity habitat for RGSM. A number of bank rehabilitation techniques are also proposed, designed to accelerate natural bank erosion processes.

Work would take place over a four-year period, from March 2005 through March 2009 with Phase I occurring during 2005 and 2006. Approximately 70 acres would be treated during Phase I. Phase I implementation would occur on islands and bars, while future phases may be applied to banks as well as island and bar locations. As the project progresses, implementation would continue on selected islands, bars, and banks with the number of treated acres increasing to 180 to 350 acres. Currently, federal funding for Phase I from the Collaborative Program is $174,000; federal funding from Reclamation is $98,000, and funding from the State of New Mexico is approximately $790,000.

1.3 Purpose and Need

The purpose of the proposed action is to develop, construct, and evaluate egg retention, larval rearing, young of year, and over-wintering habitat for the RGSM utilizing various techniques at several locations within the Albuquerque Reach of the river, and to determine if these techniques can improve habitat suitability for the four critical life stages of the RGSM: egg, larvae, juvenile, and adult. The Project will also evaluate the benefit of each technique in contributing to the large-scale goals for suitable habitat development for the RGSM in the Albuquerque Reach of the Middle Rio Grande.

The Proposed Action is needed to satisfy federal requirements under the Biological Opinion (2003 MRG BO) for Reclamation's Water and River Maintenance Operations, the USACE's Flood Control Operations, and Related Non-Federal Actions on the Middle Rio Grande, New Mexico, 2003 (U.S. Fish and Wildlife Service [USFWS] 2003). The 2003 MRG BO requires the funding and collaborative execution of habitat restoration projects on the Middle Rio Grande that will improve survival of all life stages of the endangered RGSM, as specified in RPA element S:

> In consultation with the [U.S. Fish and Wildlife] Service and appropriate Pueblos and in coordination with parties to the consultation, action agencies shall conduct habitat/ecosystem restoration projects in the Middle Rio Grande to increase backwaters and oxbows, widen the river channel, and/or lower river banks to produce shallow water habitats, overbank flooding, and regeneration stands of willows and cottonwood to benefit the silvery minnow, the flycatcher, or their habitats. Projects should be examined for depletions. It is the Service's understanding that the objective of the action agencies and parties to the consultation is to develop projects that are depletion neutral. By 2013, additional restoration totaling 1,600 acres (648 hectares) will be completed in the action area. In the short term (5 years or less), the emphasis for silvery minnow habitat restoration projects shall be placed on river reaches north of the San Acacia Diversion Dam. Projects should result in the restoration/creation of blocks of habitat 24 hectares (60 acres) or larger [USFWS 2003:95–96].

1.4 ISSUES

Ecological Values

The Rio Grande floodplain, including the riparian corridor (Bosque) and river channel, is highly valued by the residents of Albuquerque and New Mexico for its opportunities for natural beauty, the recreational value of the natural trails, the importance of the area as a refuge for birds and other wildlife, and the presence of rare and protected species. The Project area is part of the Rio Grande Valley State Park (RGVSP), which is managed cooperatively by the City of Albuquerque Open Space Division and the Middle Rio Grande Conservancy District (MRGCD). The 4,300-acre park extends from Sandia Pueblo in the north through Albuquerque and south to Isleta Pueblo. Conservation of the Park's aesthetic, recreational, and ecological values is a high priority for the community of Albuquerque. As a result, actions within the Rio Grande and its floodplain can be controversial.

Economic Commitments for Endangered Species Recovery

The Project or elements of the project would be funded partially by the signatories of the Collaborative Program, a multi-agency body of signatories working to meet the terms of a comprehensive BO covering the RGSM and other federally endangered species in the Middle Rio Grande (USFWS 2003). Additional funding will be provided by the State of New Mexico as part of the local match to the Program. Since the inception of the Collaborative Program, the federal government, through Reclamation, has been the source of funding for numerous projects. The 2003 MRG BO requires the funding and collaborative execution of habitat restoration projects to improve survival of all life stages of the RGSM and other endangered species and aid in their recovery. The execution of the BO involves commitments of substantial economic resources by the signatories of the MRG Collaborative Program Memorandum of Agreement (MOA). NEPA disclosure and public comment on these commitments has not yet taken place. A Notice of Intent to file a Draft Environmental Impact Statement appeared in June 2003 (FR 2003a). In the absence of this NEPA document or a Record of Decision to tier from, this EA will not be able to fully evaluate economic consequences of the Project within the context of the entire economic commitment proposed for endangered species recovery. However, the funding spent toward habitat restoration would assist in avoiding jeopardy for the existence of the RGSM and contribute to the recovery of this endangered species.

Net Water Depletion

Water quantity and water quality are of great concern for all river systems in the arid Southwest, where surface water availability is limited and its downstream delivery is vital to other communities. The Rio Grande Compact limits the amount of water that can be depleted in the Middle Rio Grande (Rio Grande Compact 1939). Any increase in net depletions will jeopardize the ability of the State of New Mexico to meet its downstream delivery obligations. Therefore, the ISC requires that new projects demonstrate that they will not result in any increases in net water depletions, or that any increases are offset by purchased or leased water rights. This project will evaluate changes in water depletions (water losses) and develop methods to ensure that depletions are not increased as a result of the action.

2.0 ALTERNATIVES

2.1 INTRODUCTION

The Joint-Lead Agencies have considered several techniques for improving aquatic habitats at an intermediate scale (mesohabitats) for the RGSM within the Middle Rio Grande (MRG). The MRG is defined as the Rio Grande and its tributaries from the New Mexico-Colorado state line downstream to the inflow of Elephant Butte Reservoir, equaling the elevation at Elephant Butte Dam spillway crest (4,450 feet above mean sea level). The aquatic habitat restoration techniques discussed in the Habitat Restoration Plan for the Middle Rio Grande (Tetra Tech 2004) were developed specifically for compliance with the 2003 MRG BO and were used as the preliminary set of techniques that are proposed to be implemented and evaluated in this EA, as summarized in Tables 2.1 and 2.2. The objective of these activities varies, with most serving to improve multiple processes and functions of the riverine and riparian system. All techniques can potentially be used to improve RGSM habitat (Tetra Tech 2004). Each of the restoration techniques considered incorporates both passive and active restoration elements, an approach which works with the river instead of against it. The adoption of passive restoration techniques provides the best opportunity for long-term success and should be considered whenever possible (Tetra Tech 2004). Several subreach alternatives were initially considered including the Pueblo of Sandia, the North Diversion Channel, the Interstate 40 (I-40)/Central Avenue, and the South Diversion Channel river segments.

2.2 ALTERNATIVES CONSIDERED

Two alternatives, the No Action and one Action alternative are analyzed in detail in this environmental assessment.

The Action Alternative includes the following habitat restoration techniques: terrace and bank lowering, creation of high-flow ephemeral channels, high-flow bank-line embayments, main-channel widening, removal of lateral confinements, river bar and island enhancement, modification of islands and bars, and addition of woody debris (Tetra Tech 2004) (Table 2.1). However, in the evaluation process the selected techniques have been developed further and, in some cases, have been combined with other selected techniques. All techniques will utilize the benefits of passive restoration. Detailed descriptions are provided in Sections 2.5.1 and 2.5.2. Bank lowering and large woody debris techniques remain as described. The high-flow ephemeral channel technique is designated herein as ephemeral channel construction and would be constructed only within mid-channel islands or attached bars. High-flow bank-like embayments are referred to as bank scouring. Main-channel widening and removal of lateral confinements will be achieved as part of scouring and bank lowering activities. River bar and island enhancement will effectively be combined with the modification of islands and bars. Vegetated island modification and evaluation is one proposed technique, and bar habitat modification is presented as a separate technique. Subreaches selected for implementation are the North Diversion Channel, I-40/Central, and the South Diversion Channel.

Table 2.1. Proposed Habitat Restoration Techniques

Technique	Description	Benefits of Technique
Passive restoration	Allows for higher-magnitude peak flows to accelerate natural channel-forming process and improve floodplain habitat.	Increases sinuosity and allows for development of complex and diverse habitat, including bars, islands, side channels, sloughs, and braided channels.
Terrace and bank lowering	Removal of vegetation and excavation of soils adjacent to the main channel to create potential for overbank flooding.	Could provide for increased retention of RGSM eggs and larvae.
High-flow ephemeral channels	Construction of ephemeral channels on islands to carry flow from the main river channel during high-flow events.	Normally dry but creates shallow, ephemeral, low-velocity aquatic habitats important for RGSM egg and larval development during high flow time periods.
High-flow bank-line embayments	Areas cut into banks where water enters, primarily during high-flow events including spring runoff and floods.	Intended to retain drifting RGSM eggs and to provide rearing habitat and enhance food supplies for developing RGSM larvae.
Main channel widening	Excavation of banks and lateral expansion of active channel.	Intended to reduce average flow velocities and increase total area of lower-velocity, shallow habitat for young-of-year and adult RGSM.
Removal of lateral confinements	Reduction or elimination of structural features and maintenance practices that decrease bank erosion potential.	Creates wider floodplain with more diverse channel and floodplain features, resulting in increased net-zero and low-velocity habitat for RGSM.
River bar and island enhancement	Elimination of channel maintenance and provisions to encourage island and bar formation.	Improves aquatic habitat heterogeneity by creating backwaters, eddy zones, and shear zones to increase habitat for all life stages of RGSM.
Modification of islands and bars	Involves the physical disturbance (discing, mowing, root-plowing, raking) of islands or bars to remove vegetation and mobilize the features during high flows.	Creates more complex habitat for RGSM by reducing average channel depth, widening the channel, and increasing backwaters, pools, eddies, and runs of various depths and velocities.
Woody debris	Placement of trees, root wads, stumps, or branches in the main river channel or along its banks.	Creates slow-water habitats for all life stages of RGSM, provides shelter from predators and winter habitat, and provides structure for periphyton growth to improve food availability for RGSM.

Table 2.2. Techniques Eliminated from Further Study

Technique	Description	Benefits of Technique
Arroyo connectivity	Clearing of vegetation and/or excavation of pilot channels to bring stranded arroyos to grade with the mainstem Rio Grande.	Could re-establish eddies associated with the mouths of arroyos, which may help to retain RGSM eggs and larvae, and increases the supply of sediment to the river.
Gradient-control structures	Low head weirs constructed perpendicular to the channel with aprons to simulate natural riffles.	Creates aquatic habitat diversity by producing variable flow velocities and depths.
Sediment management	Increased sediment supply through mobilization behind dams, arroyo reconnection, or introduction of spoils.	Supports the observation that RGSM is most commonly found in areas where the bed is predominantly silt and sand.
Fish passage	Installation of fish passage structures at impoundments to improve longitudinal connectivity of river.	Allows upstream movement of RGSM and reduces habitat fragmentation.

2.3 Other Alternatives Considered but Eliminated

An alternative consisting of arroyo connectivity, gradient-control structures, sediment management, and fish passage was eliminated from consideration during the evaluation process (Table 2.2). Although these techniques may have positive habitat implications, they have been eliminated for the three sites of this project due to cost, construction of structures in the channel, and increased sedimentation to the river.

2.4 No Action Alternative

The No Action Alternative assumes that no anthropogenic changes would occur to islands, bars, and shoreline environments and the riverine habitats available to the RGSM in the Albuquerque Reach at the proposed project locations. Current river operations, and trends in riverine habitat quality and quantity will remain dominant under the No Action Alternative.

2.5 Preferred Alternative

The Preferred Alternative consists of the implementation of six restoration techniques, incorporating active and passive methods, to be applied initially at numerous sites within three subreaches between River Mile 194 (near the Alameda Bridge) and River Mile 176 on the southern end (0.5 mile south of the South Diversion Channel). Photographs of the three selected subreaches are in Appendix B. Figures 2.1–2.13 show the detailed locations of the Project elements within each subreach. The initial number of acres treated over the early phase of the project would be 70 acres, with the potential for 180-360 treated acres over the duration of the project.

The Rio Grande is a dynamic system, constantly changing both spatially and temporally. An integrative and passive approach would allow, to the extent possible, the development of natural river and floodplain features, including temporary bars and islands, ephemeral secondary channels, and lateral migration of the river across modified bars and islands. The application of each of the specific modification techniques will be used within the dynamic floodplain or channel to work synergistically with these natural hydrological processes. The initial modifications would create conditions under which the Rio Grande could shape the features within the river. The ultimate outcome would be greater mesohabitat diversity with a variety of flow velocity habitats.

The use of multiple techniques implemented in several locations also provides an economy of implementation and comparative monitoring of the effectiveness of each technique, alone and in combination with the others. Therefore, all components described below will be used to meet the overall purpose, objectives, and need of the project. Table 1.1 summarizes the action sites and their proposed locations. Three instream feature modification techniques and three bank modification techniques are included in the Preferred Alternative, as discussed in detail in Sections 2.5.1 and 2.5.2.

2.5.1 INSTREAM FEATURE MODIFICATION

Islands and bars are common features in braided river systems with significant supplies of sediment such as the Middle Rio Grande. Vegetated islands and bars contract and expand in response to flow and sediment changes within the river. The vegetated islands within the MRG have historically been transient, temporary features. They were commonly displaced or moved during high seasonal flows or were removed naturally during low flow periods or physically by Reclamation and other entities to maintain the river channel capacity. Bars are transient, unvegetated features of the river that may form into vegetated islands or become part of the riverbank over time. Under current river and climate conditions, where high sustained seasonal flows have been absent for the most part, many more of the islands have become vegetated features that restrict channel width and river migration through subreaches of the Albuquerque Reach.

Technique 1: Vegetated Island Modification and Evaluation

The Rio Grande naturally forms islands in some reaches and subreaches. The size, shape, amount of vegetation, and in-channel location of islands are related to flow conditions and sediment loads. Today, islands have become much more of a feature of the river. The amount of established vegetation increases the likelihood that islands would become permanent, as they become more difficult to move once vegetation is established and mature (Fluder 2004). These vegetated islands also serve as exposed substrate for the diffusion of invasive deciduous species.

Island modification, particularly on islands that may become permanent, may assist in alleviating adverse changes to RGSM critical habitat and improving the quality and quantity of available habitat (USFWS 2003). Islands can be modified by planned physical disturbance. Existing techniques for removing vegetation and destabilizing soil and sediment include mowing vegetation, root-plowing vegetation and sediment, and raking vegetation and surface sediment (Tetra Tech 2004). Under the Proposed Action, a number of techniques would be evaluated for their utility in addressing narrowing of the river channel and island attachment within the channel.

Islands would be selected for evaluating different methods of restoring them to a condition in which they would be seasonally inundated at moderate to high seasonal flows, similar to what occurs during overbank flooding on the floodplain. The islands may expand or contract in response to flows and sediment load and would be allowed to redeposit sediment in downstream subreaches of the Rio Grande.

The selected treatment would be applied to four to six islands; another island in each selected subreach would serve as a control point. The conceptual design for vegetated island modification and evaluation (Figures 2.1 and 2.2) would take into account potential increased sediment retention in the modified sections of the river, as well as potential flow-through velocities and depths. Fringe vegetation would be left at the head of some of the islands to reduce flow velocities for selected islands. Methods for reducing the time and cost necessary to complete evaluation of each restoration site, as well as potential reconstruction or modification of the island, would be considered.

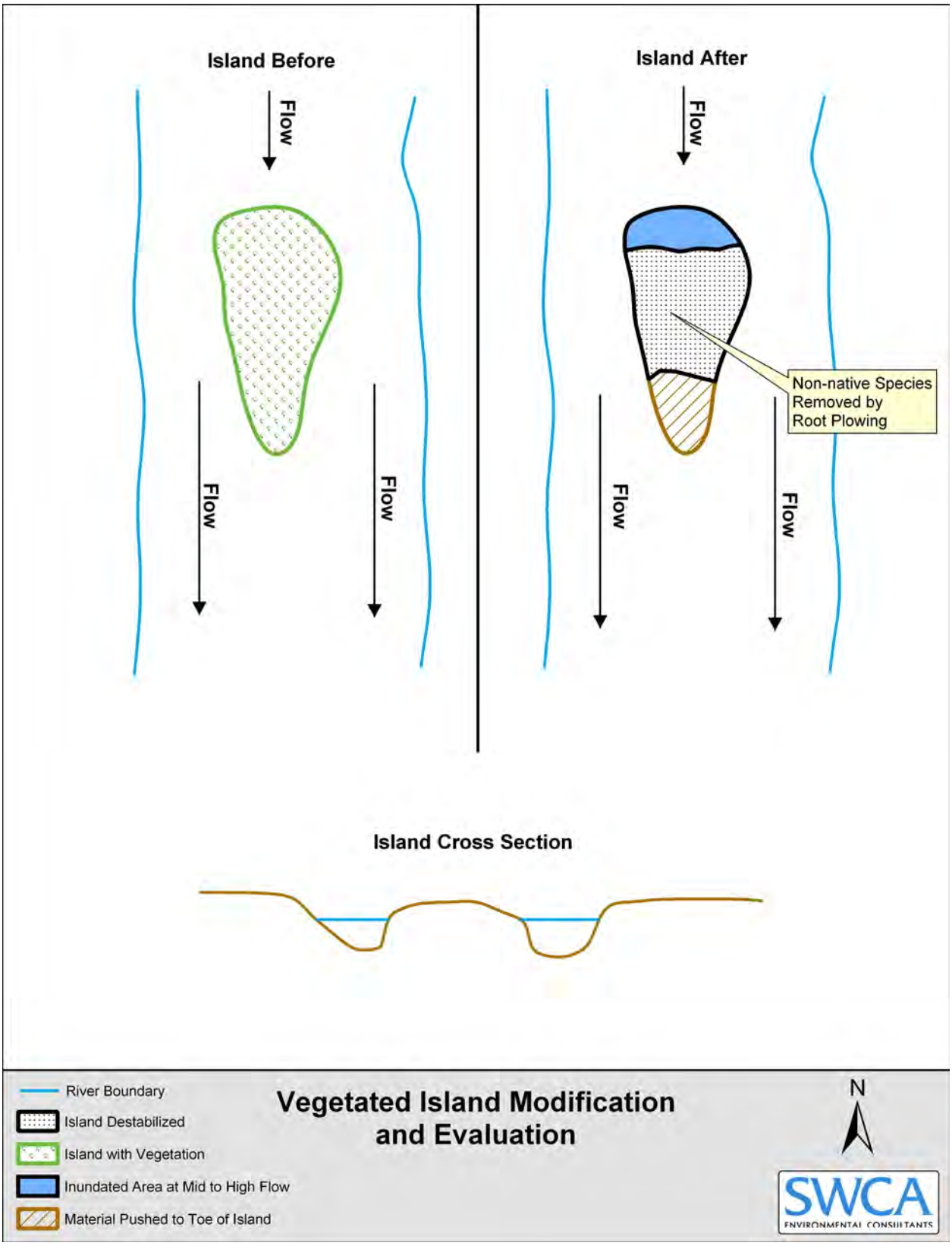

Figure 2.1. Schematic of the vegetated island modification and evaluation technique.

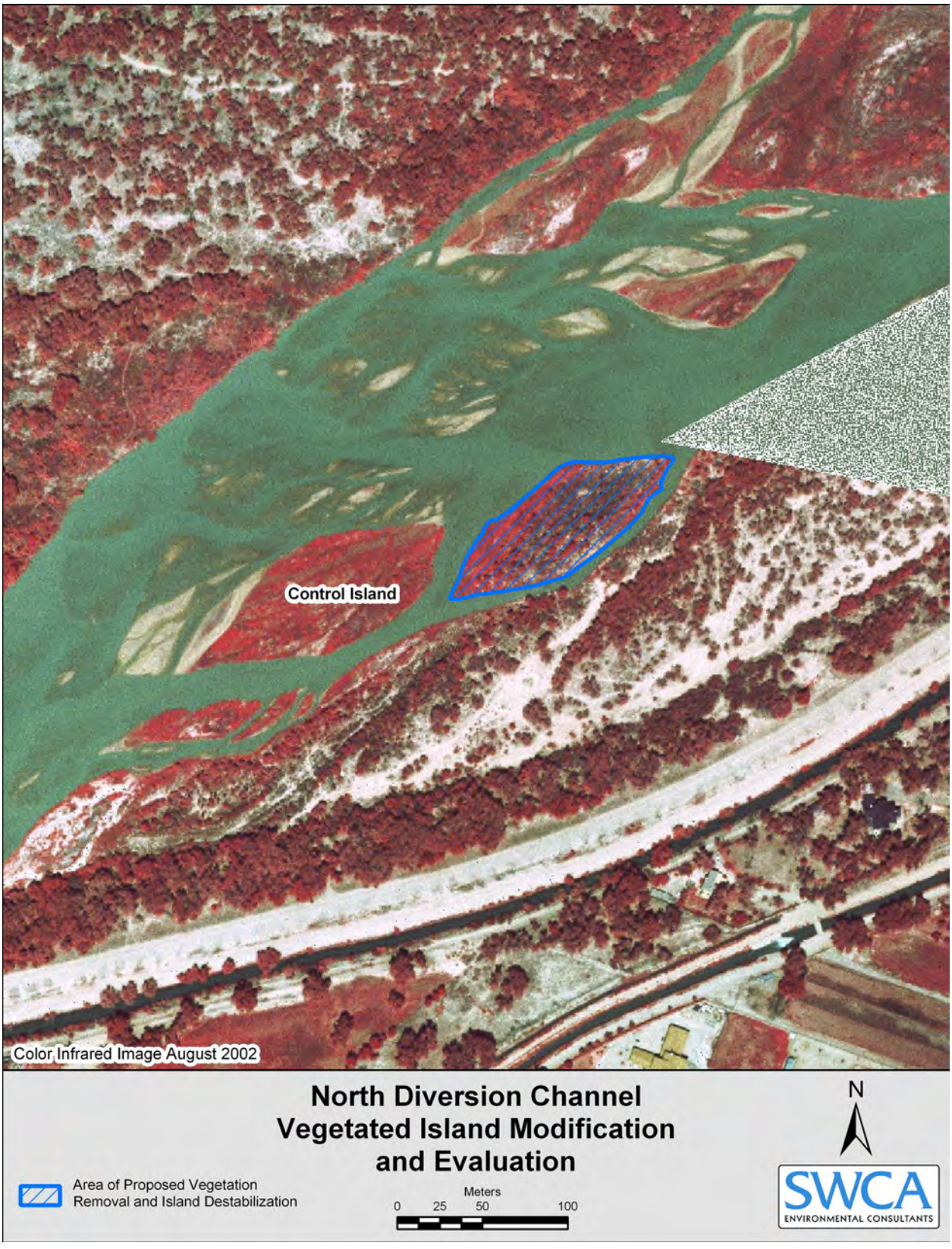

Figure 2.2. Example of the vegetated island modification and evaluation technique.

The treatment to be applied would be cutting non-native vegetation on these islands and plowing the roots to a depth suitable to eradicate invasive species. No other modifications would be made. The river would then be allowed to naturally shape the island during high flow events. After reshaping, the remaining island area may be replanted with selected appropriate native species to stabilize the island contours to the extent possible. Following restoration, the island would be expected to have a surface elevation suitable for inundation at moderate and high river flows.

Technique 2: Bar Habitat Modification

Bar habitat modification is similar to island habitat modification. Bars are transient, generally unvegetated features that typically form after a flood and are later removed during high flow events. Bars may be attached to the riverbank or isolated within the river's flow. Periods of sustained low flow increase the stability of river bars, with the potential for vegetation to become established. River maintenance efforts up until the mid-1980's focused on eliminating bars from the channel to maintain a consistent floodway for water delivery and reduce flood threat.

However, river bars increase the variety of available aquatic habitat by creating backwaters, eddy zones, and complex channel configuration (Tetra Tech 2004). The presence of these features and mesohabitats may provide habitat for the RGSM by providing interaction between the river and attached bars at high flows, emulating the floodplain functions within the range of river operations.

In their current configuration, most bars in the Albuquerque Reach of the MRG do not appear to have the correct surface topography to function as RGSM nursery habitat at low flows. However, the surfaces of these in-channel features could be modified to provide important nursery habitat identified by previous studies (Porter and Massong 2004). Techniques to be applied include: (1) lowering surfaces along the active river's edge to simulate connected shelf areas; (2) creating shelf areas within the point bar connected to the river via side channels; (3) constructing inlets connected to the river, either directly or via a side channel; and (4) constructing inlets that are connected to the river but also convey surface water runoff to the Rio Grande (Figures 2.3 and 2.4). The key process for the constructed areas is periodic flow of water through the entire inlet that would wash away fine sediments that have accumulated over time.

Technique 3: Ephemeral Channels on Bars and Islands

Ephemeral channels are low-velocity, flow-through channels that are connected to the main river channel across the bars and islands. These channels are normally dry but carry high-discharge flow from the main channel, characteristically during spring snowmelt and summer monsoon events. The channels carry water at lower velocities than the main channel and may include mesohabitats such as pools and backwaters with little or no flow. These ephemeral channels create aquatic habitat that would be beneficial to RGSM. Ephemeral channels are not intended to provide for overbank flooding.

Construction of an ephemeral channel requires removal of existing vegetation, most likely along the edges of vegetated islands that are not connected with the bank, and the disturbance of some sediment or soil. The channels would be cut through islands to a depth that would allow water to flow at moderate to high river flows (Figures 2.5 and 2.6). Channels may also be cut through

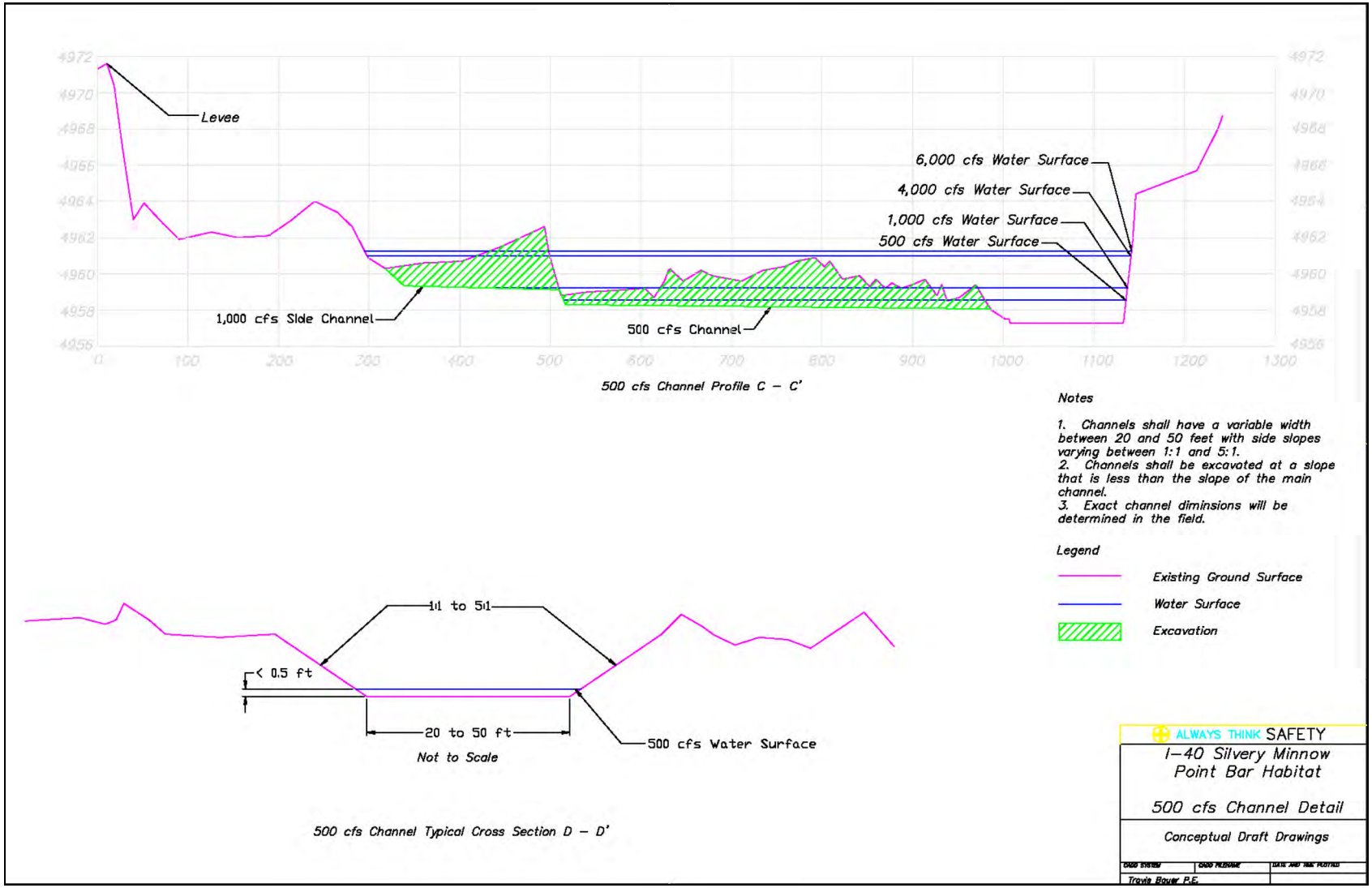

Figure 2.3. Schematic of the bar modification technique.

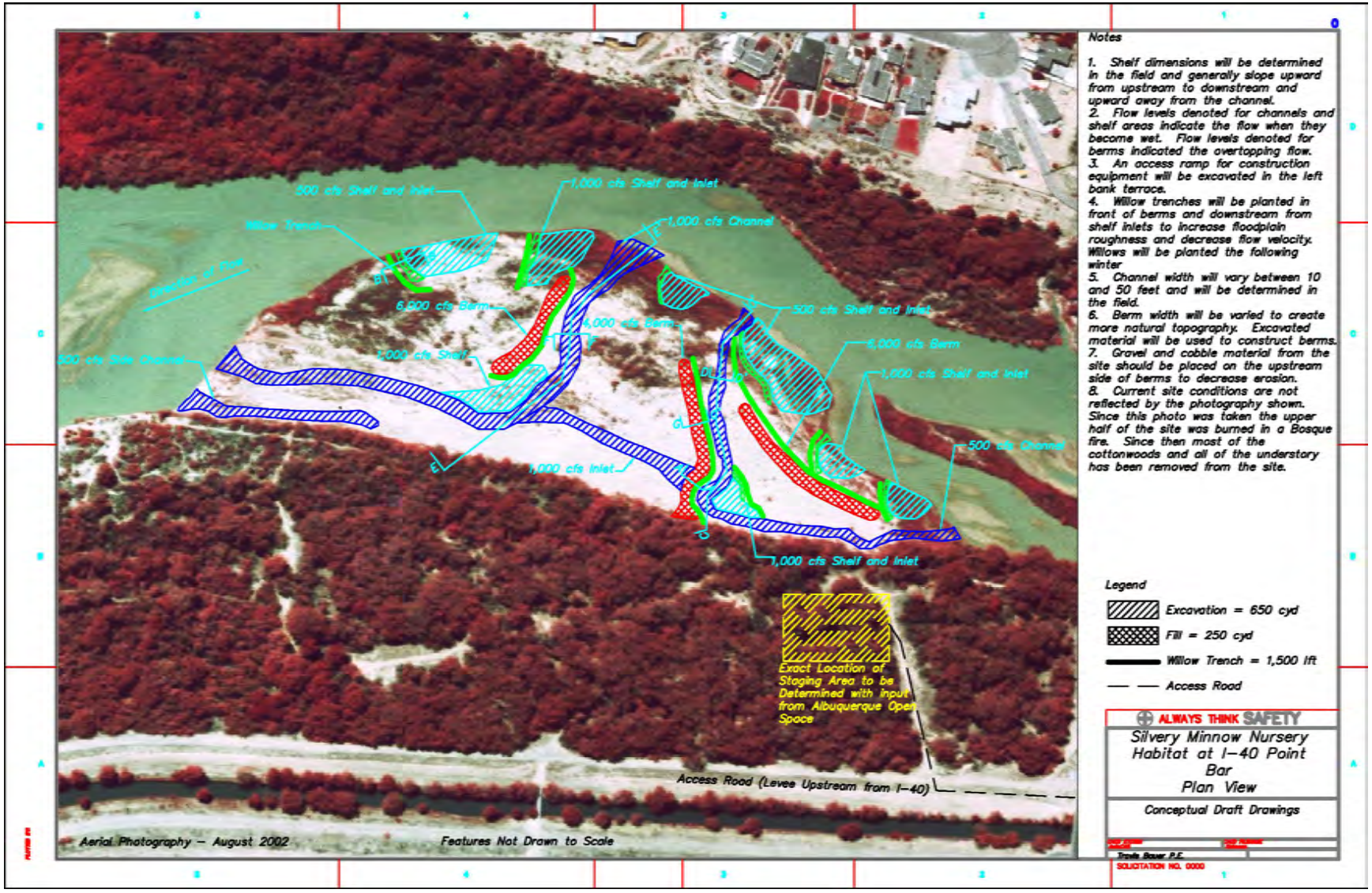

Figure 2.4. Example of the bar modification technique.

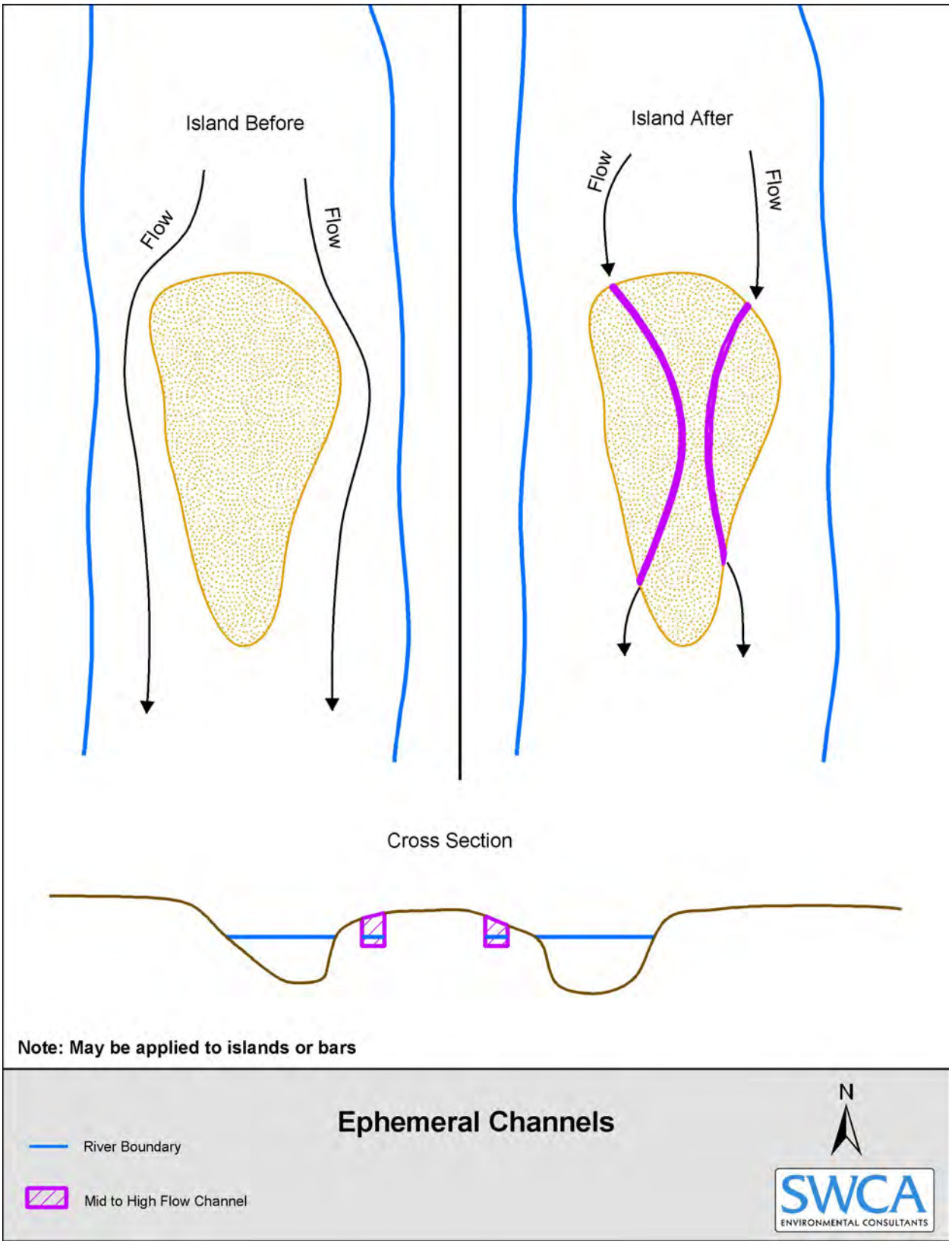

Figure 2.5. Schematic of the ephemeral channels technique.

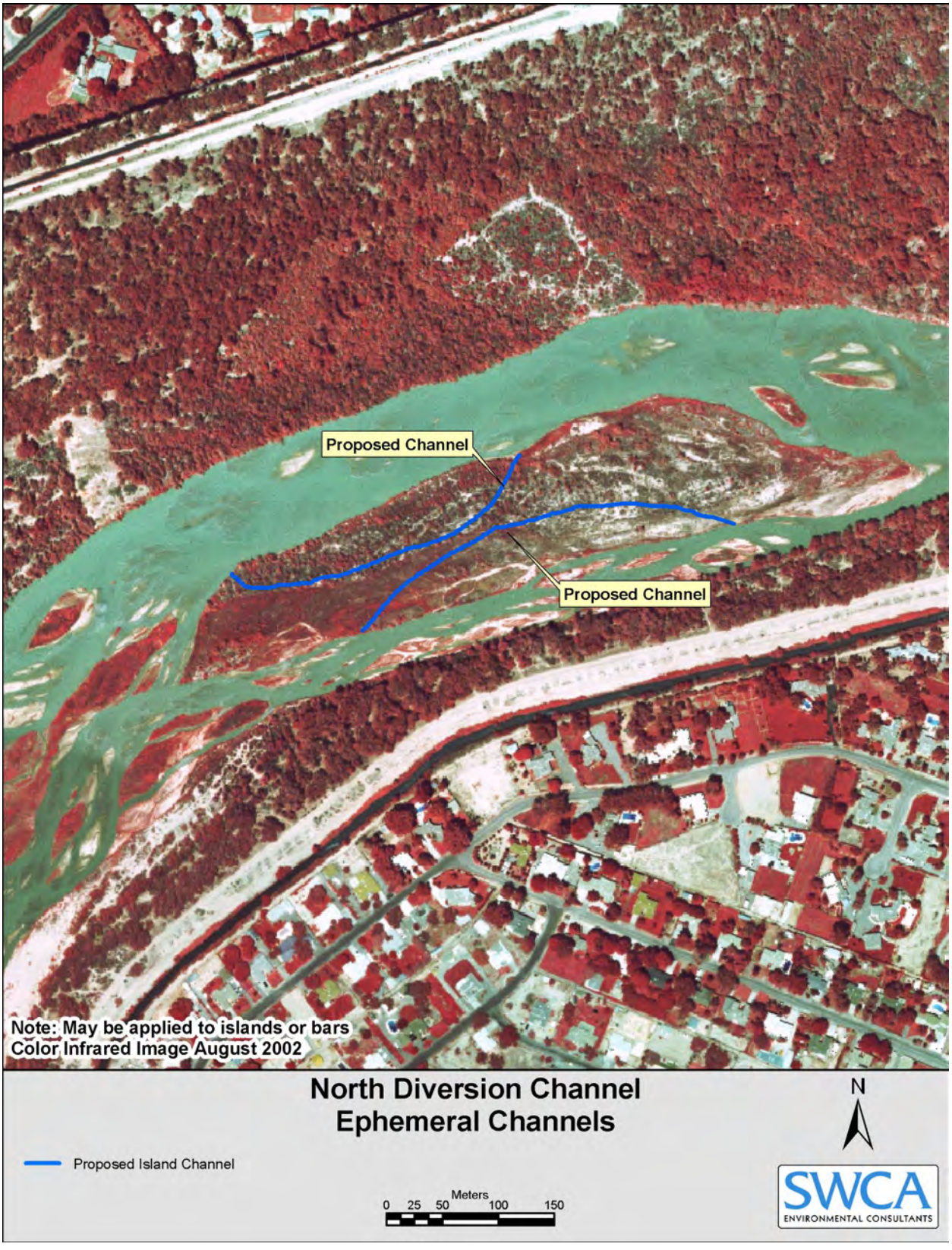

Figure 2.6. Example of the ephemeral channel technique.

sediment bars that are now connected to the banks. The design of the ephemeral channels would consider the river flow at which water enters the channel, water retention times, and velocity relationships. The ephemeral channels would be able to accommodate flows to encourage RGSM recruitment each year, especially using integrative passive techniques.

Ephemeral channels could provide sufficient periods of inundation for larval development and young silvery minnows. These side channels would dry during lower flows and would not be designed to provide habitat for adult RGSM. While channels of this kind are proposed primarily to enhance RGSM habitat, they also promote riparian functionality and interconnectedness.

2.5.2 BANK MODIFICATION TECHNIQUES

In the MRG, and especially in the Albuquerque Reach, the historic floodplain is disconnected from the channel and, given the current channel conditions, seldom experiences overbank flooding. The riverbanks tend to be composed of sandy-silt sediments that form vertical surfaces outlining the active Rio Grande channel. As a consequence, the bank line boundaries can be easily modified to include the construction of RGSM habitat. These techniques include, but are not limited to, placement of large woody debris, inlet scours and scallops, bank lowering, and altering attached bars or shelves. The bank modification techniques described below would be evaluated on selected large islands and may be implemented on the shoreline of the river or the bank line over the duration of the project. These techniques would only be applied in areas where such action would not increase flood risk.

Technique 4: Large Woody Debris

The large woody debris (LWD) technique involves the placement of root wads, trees, and branches in the main channel or near the bank to create aquatic habitats. LWD may be placed in the channel or anchored to the river bottom or bank. Anchored LWD tends to remain in place until decomposition sets in. LWD may be placed in high densities or dispersed throughout subreaches. Introducing LWD would promote increased habitat diversity and food availability.

Although LWD has been identified as suitable habitat for RGSM (USFWS 2003), no studies have been completed on the MRG to document the effects of significant increases in the amount of this habitat type. Prior to the 1930s, conditions in the MRG provided diverse quantities of LWD to the channel, as stream banks eroded and the river routinely migrated laterally across the floodplain, removing and transporting significant quantities of LWD from the riparian zone. While modification of the river channel and construction of dams for flood control and water delivery purposes are largely responsible for stabilizing the river and floodplain, creating the monotypic cottonwood gallery in the middle valley and significantly reducing flood threat, channel incision has essentially eliminated overbank flow in the Albuquerque Reach, reducing the amount of LWD in the river channel. For this technique, LWD would be placed in selected locations (Figures 2.7–2.9). The objective of this technique is to increase the amount of large woody debris present in the described subreaches of the MRG to enhance food availability and the mesohabitats utilized by RGSM.

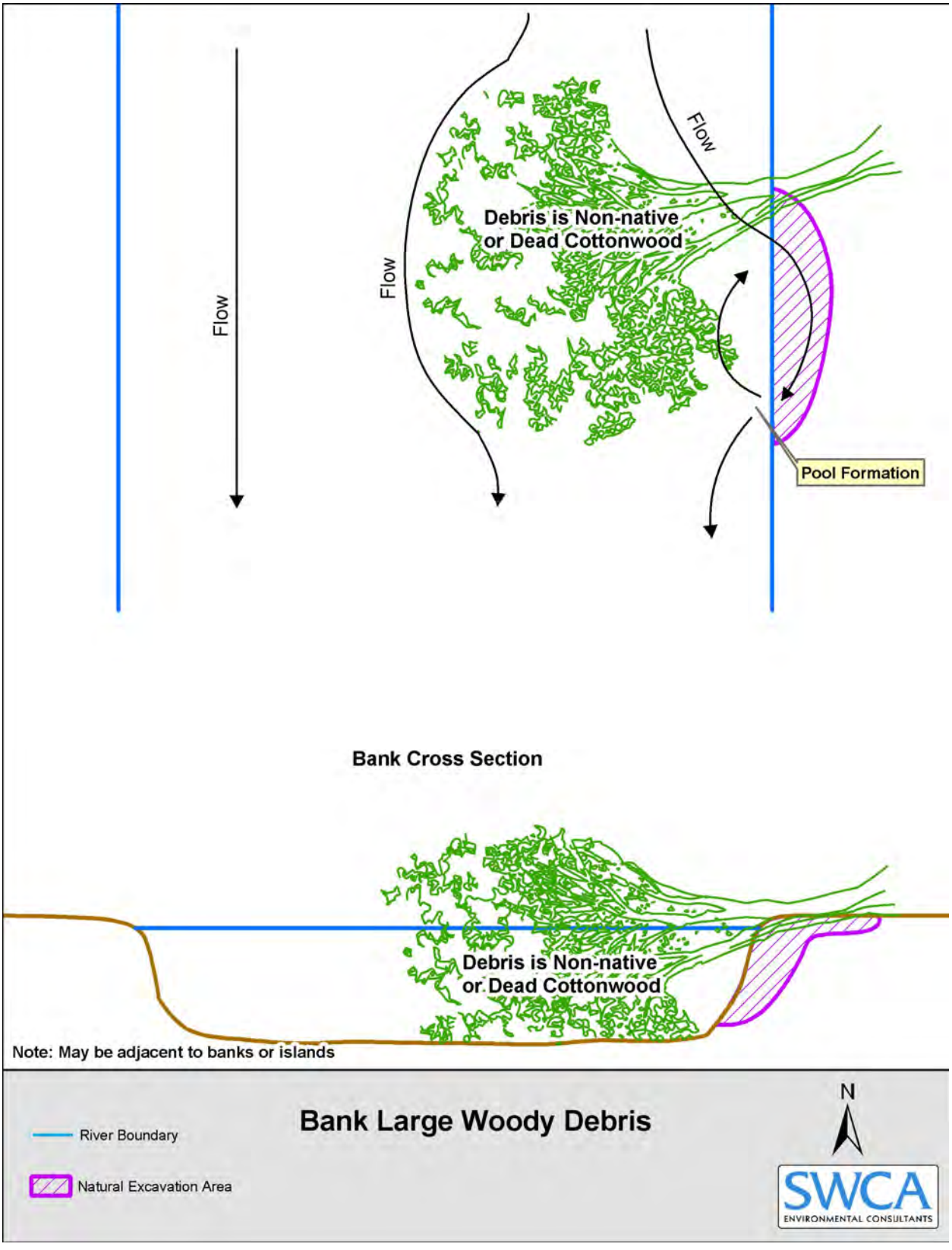

Figure 2.7. Schematic of the large woody debris technique used along bank line.

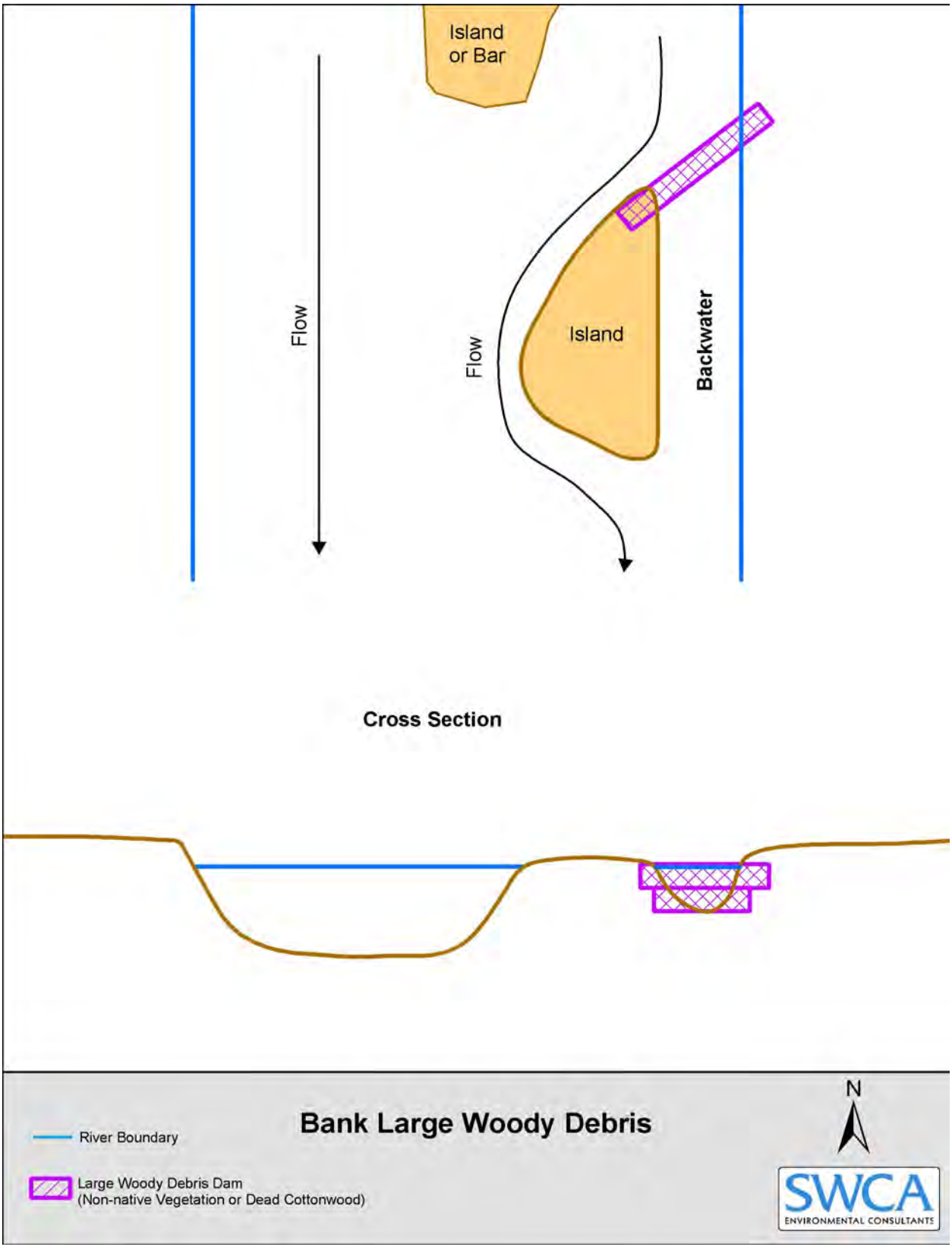

Figure 2.8. Schematic of using large woody debris as a debris dam.

Figure 2.9. Example of the large woody debris technique.

Technique 5: Artificial Bank Scours

Bank-line scours and scallops are areas cut into banks or islands where flow from the river channel enters, predominantly during high-flow events. Using this technique, scours would be created at areas where the thalweg comes into contact with the bank (Figures 2.10 and 2.11).

Scours are different from ephemeral channels in that they exchange water with the main channel within a small area instead of along a linear bank line. Scours may also be called inlets or embayments, although the function of embayments, which typically are constructed to create habitat for the RGSM, is slightly different. The purpose of scours or scallops is to create lateral migration of the river and to restore natural meandering of the system (William Lettis & Associates 2003; Tetra Tech 2004). Created scours would also provide low-velocity habitat for RGSM larvae and drifting eggs, rearing habitat, and increased food availability (Porter and Massong 2003).

Bank-line scours would allow the river to erode banks on one bank and deposit material along the adjacent bank, inducing lateral migration of the river. Lateral migration is essential to the functionality of the river and contributes to the overall health not only of the RGSM but also of all species that use the Rio Grande riparian and floodplain areas. The artificial bank scour technique would be evaluated initially on selected islands and may be implemented on the shoreline of the river or the bank line over the duration of the project. This technique would only be applied in areas where such action would not increase flood risk.

Technique 6: Artificial Bank Lowering

Bank lowering involves the removal of bank-line vegetation and excavation of soils to enhance the potential for lateral movement of the river and overbank flooding (Figures 2.12 and 2.13). The target elevation for excavated banks and islands varies, depending on the height of the bank and the bank full level. Bank lowering is needed in areas where the channel has incised or where overbank flooding is limited by the absence of sustained high flows. Areas where banks are lowered are anticipated to be inundated during periods of above-average discharge (not annual events). By lowering the bank, the frequency of inundation will be increased. The overbank areas would not remain flooded for significant periods of time and are not intended to provide mesohabitat for adult RGSM, but to provide the necessary conditions for other processes that would result in habitat improvements.

This technique is being evaluated to determine if it results in lateral migration of the channel within confined lateral extents. The artificial bank lowering technique would be evaluated on selected large islands and may be implemented on the shoreline of the river or the bank line over the duration of the project. This technique would only be applied in areas where such action would not increase flood risk. Such lateral migration would remove dense bank-line vegetation on islands or shorelines and increase deposition of fresh sediment. Lateral migration and overbank flooding would allow the river to create ephemeral nursery habitat for retention of RGSM larvae and eggs.

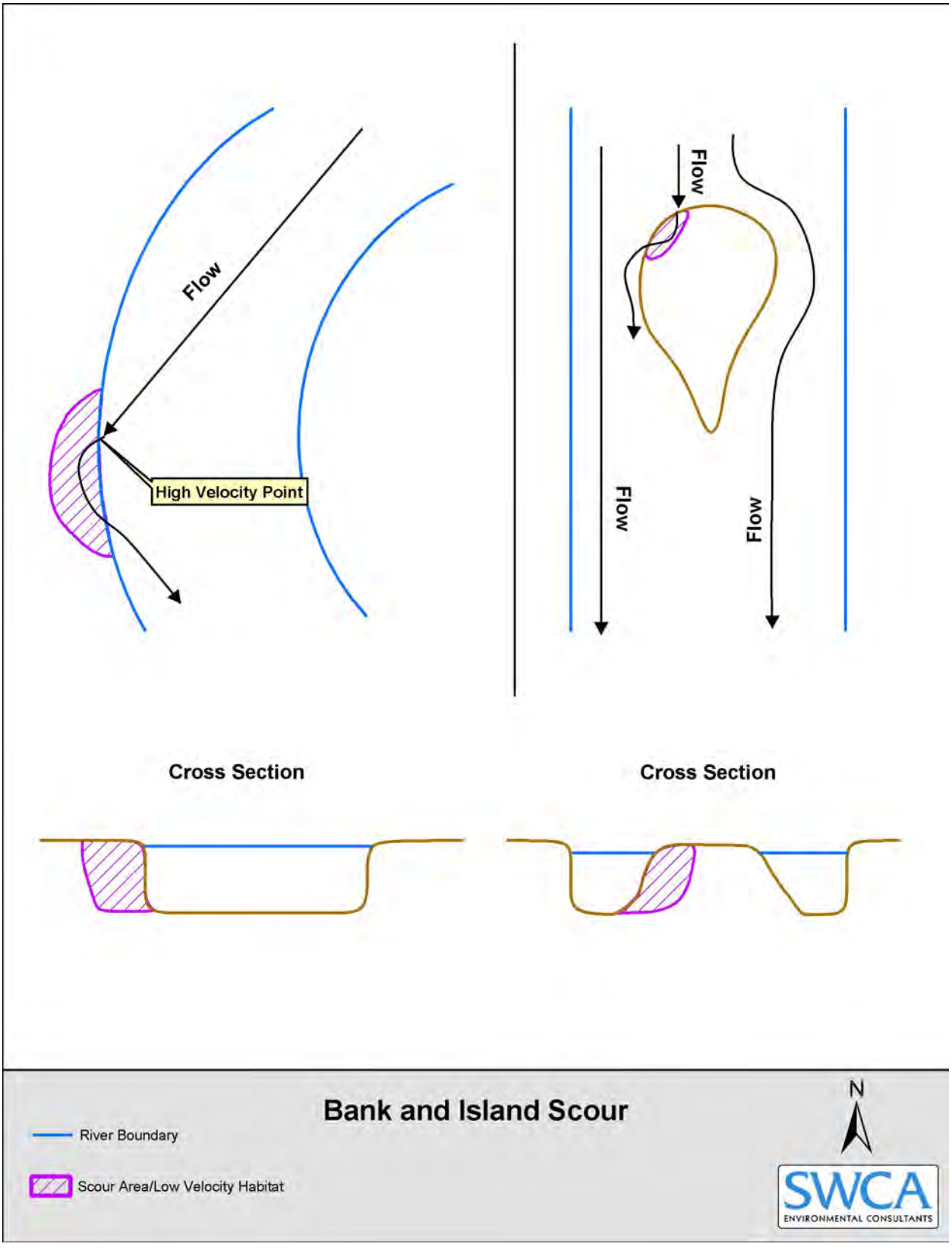

Figure 2.10. Schematic of the bank and island scour technique.

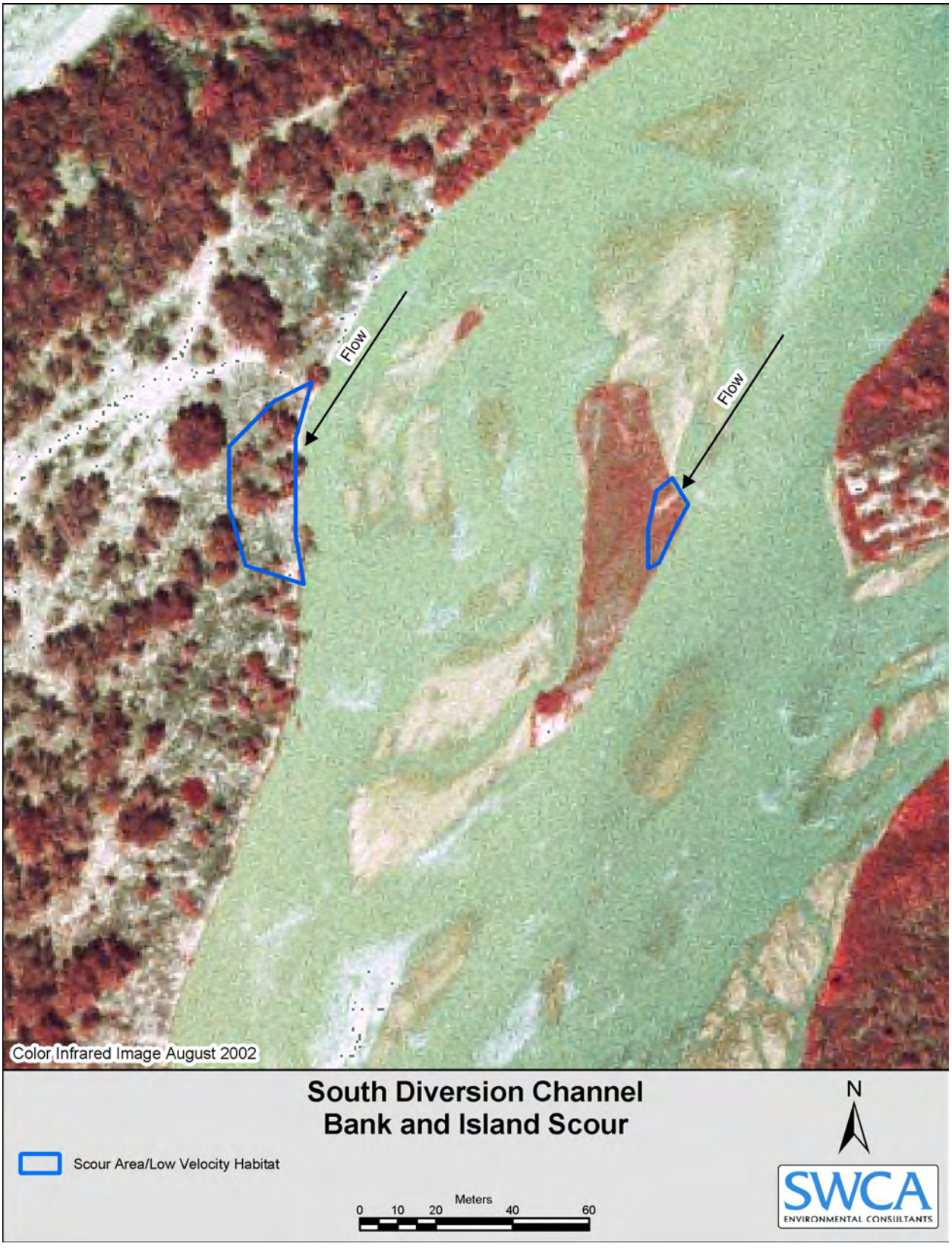

Figure 2.11. Example of the bank and island scour technique.

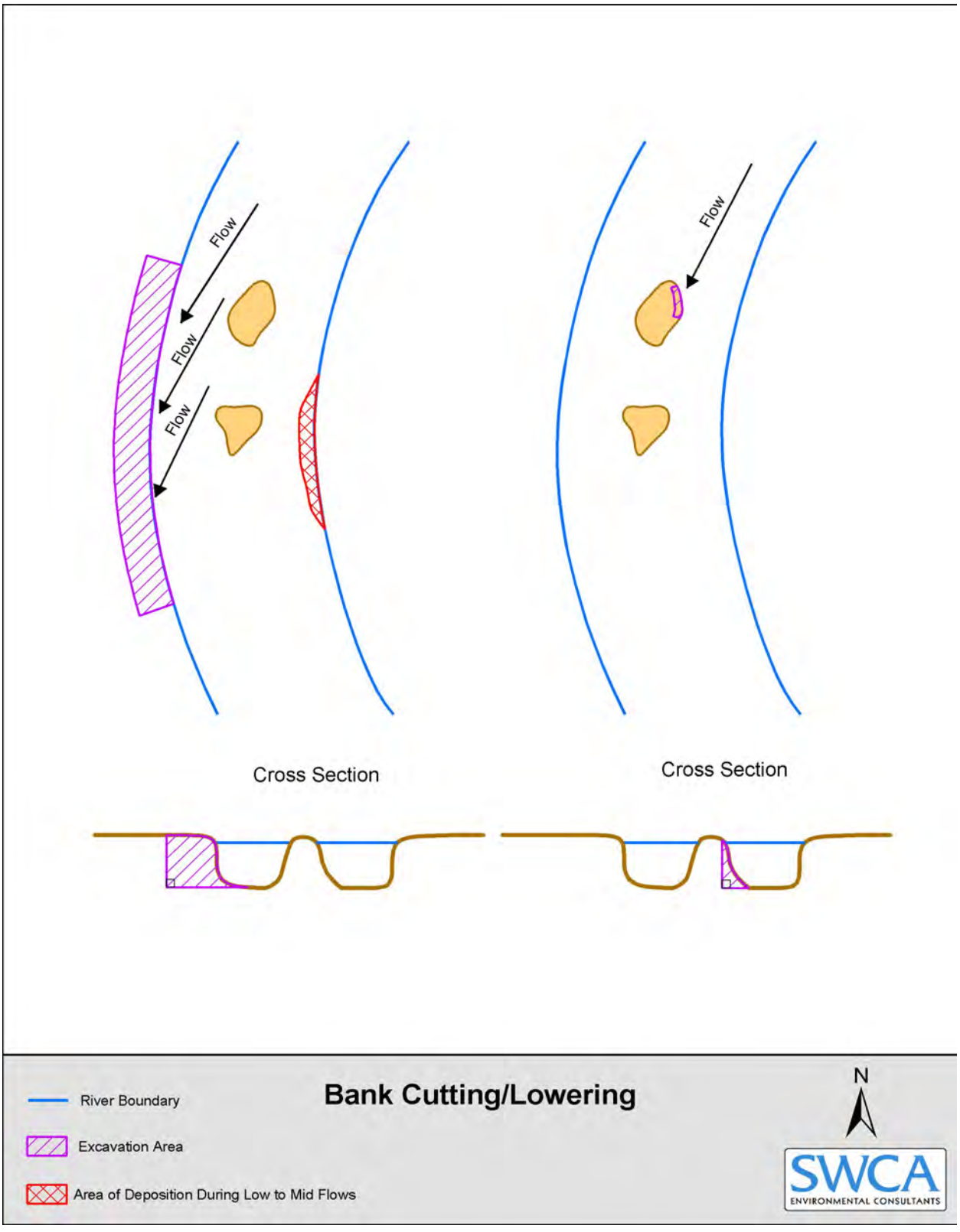

Figure 2.12. Schematic of the bank cutting/lowering technique.

Figure 2.13. Example of the bank cutting/lowering technique.

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This section describes the current condition of resources in the study area that may be affected by the Proposed Action. Resources and related topics presented include geomorphology and soils, hydrology and hydraulics, water quality, cultural resources, air quality and noise, fish and wildlife, vegetation and wetlands, threatened and endangered species, socioeconomics, visual and aesthetic resources, net water depletions, environmental justice, and Indian trust assets.

The Albuquerque Reach of the Rio Grande extends from the Angostura Diversion Dam to the Isleta Diversion Dam (Figure 1.1). This area has been identified by Reclamation and the ISC, as well as the Collaborative Program, as being a reach of the Rio Grande where habitat/ecosystem restoration projects would be highly beneficial to all life stages of the RGSM.

3.2 GEOMORPHOLOGY AND SOILS

The MRG lies in an asymmetric, elongated valley along the Rio Grande Rift (Chapin 1988; Hawley 1978). The Rio Grande rift valley is dominated by connected alluvial-filled sub-basins defined by normal faulted mountain ranges. The land flanking the Rio Grande Basin on the east is predominantly mountainous, with merging colluvial-alluvial fans and stream terraces sloping down and westward toward the Rio Grande. The geologic surface west of the river is ancestral Rio Grande alluvial deposits with isolated mountains and volcanoes. Near Albuquerque the land surface generally slopes up to a rolling divide to the Rio Puerco (this surface is known as the Llano de Albuquerque) (Bartolino and Cole 2002). The river channel flows in a wide valley with a fertile but narrow (2-3 mile wide) floodplain that has been cultivated for centuries.

Historically, the shape and pattern of the Rio Grande channel have continuously redefined the spatial distribution of sediments throughout the floodplain. However, in the twentieth and twenty-first centuries, floodway constriction and channel stabilization projects have altered the natural course of the river. For example, flow regulation by dams, levees, and jetty jacks have been used to control the location of the channel, preventing flow from reaching the historic floodplain and causing sediment to accumulate in some areas and scoured in others (MEI 2003).

Sedimentology and fluvial geomorphology play an important role in describing the evolution of the Rio Grande and in influencing the spatial extent and species diversity of vegetation in riparian areas. The present-day channel is composed of clay, silt, sand, and gravel, similar to the composition of ancestral river deposits. In addition to the erosion and transportation of sediment through the main-stem channel, tributary streams can contribute large volumes of sediment to the system. The historic floodplain in other reaches, such as the Albuquerque Reach, has become disconnected from the river (MEI 2003).

The soils of the Rio Grande Valley floor are generally derived from recent alluvial deposits. The two soil mapping units that occur within the proposed project area are the Vinton and Brazito Soils, occasionally flooded, and the frequently flooded Torrifluvents (U.S. Department of Agriculture [USDA] 1977). There is a wide range of soil textures but they are mostly

characterized by sand, loamy sand, or sandy loam. Also, these soils range from slightly saline to strongly saline and are moderately alkali affected.

3.3 HYDROLOGY AND HYDRAULICS

The MRG is the portion of the Rio Grande from the Colorado/New Mexico state line southward to the headwaters of Elephant Butte Reservoir, and includes the Rio Chama watershed. Most of the annual flow and discharge of the Rio Grande that reaches the MRG is generated in the headwaters of the river basin in Colorado and in the Rio Chama in northern New Mexico.

Most of the discharge volume of the Rio Grande is late spring snowmelt. Late summer monsoon events produce runoff and briefly alter the hydrograph of the river. These summer flows typically carry high sediment loads; however, the operations of Cochiti Dam since 1973 have greatly reduced the total supply of sediment throughout the Albuquerque Reach (SSPA 2004). Human activities have produced significant changes in the hydrology of the Rio Grande during the past century. The operation of upstream dams (Heron, El Vado, and Abiquiu Reservoirs on the Rio Chama, Jemez Dam on the Jemez River, and Cochiti Dam on the Rio Grande) affects flows in the river by storing and releasing water in a manner that generally decreases the spring flood peaks and alters the timing of the annual hydrograph. Of the 100 greatest daily discharges since 1942 at the Central Gage (8330000), all have occurred prior to the construction of Abiquiu and Cochiti dams (USGS 2003). However, these operations do not cause significant changes in the annual flow volume. According to USGS gage data, average daily flow for the Central Gage from 1942-1974 was 1042.70 cubic feet per second (cfs), while average daily flow from 1975-2002 was 1395.75 cfs.

3.4 WATER QUALITY

Current information for the water quality of the river system in the MRG is available from the U.S. Geological Survey, the USACE, Reclamation, the University of New Mexico (UNM), the New Mexico Environment Department, USFWS and other sources. Water quality constituents that are typically monitored include surface water temperature, pH, turbidity, dissolved oxygen (DO), suspended sediments (SSED), conductivity/total dissolved solids (TDS), and fecal coliform. These data may be collected in the Rio Grande, in adjacent canals, or within reservoirs. Typically, the data are collected with automatic data logging devices at stream gaging locations, or by personnel at specific riverine, canal, or reservoir locations

The available data for the Albuquerque Reach is characterized by a high degree of seasonal variability for several water quality measures, as shown in Table 3.1.

Table 3.1. Average Water Quality Data by Constituent for the Central Avenue Gage (1975-2001) (USGS 2003)

Season	Turbidity (NTU)	DO (mg/L)	pH	Conductivity (mg/L)	Water Temp (°C)	TDS (mg/L)	Fecal coliform (col/100mL)	SSED (mg/L)
Nov-Feb	9.12	10.19	8.08	391.86	6.66	255.08	N/A	539.01
Mar-June	45.57	8.66	7.97	359.11	15.90	209.74	82.50	1167.12
July-Oct	25.67	8.03	8.13	387.95	18.89	273.17	8.00	2114.67

New Mexico Environment Department water quality standards exist for reaches and subreaches throughout the State of New Mexico including the Albuquerque reach. The water quality standards listed below are from the New Mexico Water Quality Control Commission as amended through October 11, 2002, and are for the Albuquerque Reach between Sandia and Isleta pueblos.

NEW MEXICO WATER QUALITY STANDARDS (20.6.4.105):

A. Designated Uses: irrigation, limited warm water fishery, livestock watering, wildlife habitat, and secondary contact.

B. Standards:

(1) In any single sample: pH shall be within the range of 6.6 to 9.0, and temperature shall not exceed 32.2°C (90°F). The use-specific numeric standards set forth in 20.6.4.900 New Mexico Administrative Code (NMAC) are applicable to the designated uses listed above in Subsection A of this section.

(2) The monthly geometric mean of fecal coliform bacteria shall not exceed 1,000/100 mL; no single sample shall exceed 2,000/100 mL (see Subsection B of 20.6.4.13 NMAC)

(3) At mean monthly flows above 100 cubic feet per second (cfs), the mean monthly average concentration for: TDS shall not exceed 1,500 mg/L, sulfate shall not exceed 500 mg/L, and chloride shall not exceed 250 mg/L

(4) Narrative standards are those set forth in section 20.6.4.12 of the State of New Mexico Standards for Interstate and Intrastate Surface Waters. These include, but are not limited to:

i. Bottom Deposits – Surface waters of the State shall be free of water contaminants from other than natural causes that will settle and damage or impair the normal growth, function, or reproduction of aquatic life or significantly alter the physical or chemical properties of the bottom.

ii. Plant Nutrients – Plant nutrients from other than natural causes shall not be present in concentrations which will produce undesirable aquatic life or result in a dominance of nuisance species in surface waters of the state.

iii. Turbidity – Turbidity attributable to other than natural causes shall not reduce light transmission to the point that the normal growth, function, or reproduction of aquatic life is impaired or that will cause substantial visible contrast with the natural appearance of the water.

3.5 CULTURAL RESOURCES AND TRADITIONAL CULTURAL PROPERTIES

Cultural History

Cultural resources include archaeological sites, sites eligible for the State Register of Cultural Properties (SRCP) and/or the National Register of Historic Places (NRHP), and properties of traditional religious or cultural importance (traditional cultural properties [TCPs]).

The indigenous population in the Rio Grande Valley of New Mexico dates back at least 12,000 years (Cordell 1997). The steady influx of people of European descent into the Rio Grande Valley of present-day New Mexico from the sixteenth century onward has given rise to a diverse cultural mosaic and has left a multitude of varied cultural resources that are more than 50 years old. The state was part of the Spanish Colonial Empire until Mexico won its independence in 1821. Twenty-five years later, in 1846, New Mexico was claimed by the United States. These successive cultures have left archaeological sites (habitation, mining, industrial, and other), standing structures, bridges, utilities, and a network of irrigation canals and acequias more than 50 years old (Arrowsmith 1963; Cordell 1997; Rivera 1998; Van Citters 2003).

Archaeological resources in the Albuquerque Reach of the Rio Grande floodplain are limited because of poor preservation, the result of a long history of agricultural use of the valley floor, and development of the metropolitan area (for the most part on private lands) prior to the existence of a preservation ethic. Historical records emphasize protohistoric and historic settlement in the North Valley between Albuquerque and Bernalillo (Sargeant 1985; Campbell 2001), and archaeological work on the West Mesa has contributed a great deal to our understanding of regional prehistory (Schmader 1991, 1994).

Archaeological resources that are listed on the National Register for Historic Places, or eligible for listing are protected under the National Historic Preservation Act (NHPA) of 1974 (16 U.S.C. 470). To determine if any cultural resources sites known to be listed on or eligible for the NRHP are within the project area, SWCA conducted a records search for the proposed project in the Archaeological Records Management Section (ARMS) database of the New Mexico Historic Preservation Division. Twelve archaeological sites are within one-half mile of the boundaries of the project area, and 24 are within one mile. Sites outside the project area are found on the edge of the floodplain (outside the artificial levees) or, more commonly, on benches or mesa surfaces just outside the floodplain. No known sites are located within the project area.

Traditional Cultural Properties

Reclamation is in the process of consulting with Native American Tribes and Pueblos that may have an interest in the Project and project area to determine if there are any Traditional Cultural Properties (TCPs) that must be considered in the decision-making process. The consultations are being conducted on a government-to-government basis. Because of the sensitive nature of the Rio Grande and its islands for Native Americans, no decision will be made regarding this proposed action prior to conclusion of the Tribal consultations.

3.6 VEGETATION AND WETLAND RESOURCES

The riverbank community along the MRG consists of open sand bars along the main channel. These areas are subject to frequent disturbance from erosion and flood events and typically have little or no vegetation. Sparse growth of young cottonwood (*Populus deltoides*), coyote willow (*Salix exigua*), tamarisk (*Tamarix* sp.), and a variety of annual forbs is occasionally found. Since these areas experience regular scouring during flood events, the vegetation typically does not mature. Like the riverbank riparian vegetation, characteristics of vegetated islands within the river channel have changed significantly. Perhaps due in part to the lack of flood peaks during the current drought, vegetated islands currently support upwards of 18 percent of the vegetation throughout the Albuquerque Reach (Milford et al. 2003).

An increase in non-native vegetation has been identified as the most significant indicator of failing ecological health in the riparian ecosystem. Species such as tamarisk, Russian olive (*Elaeagnus angustifolia*), and Siberian elm (*Ulmus pumila*) have more extensive reproductive cycles than native species, allowing them to out-compete native trees in many locations. The fact that flood peaks have been reduced and the river has incised through the Albuquerque Reach also factor in the transformation of riparian forests, since the non-native species are more tolerant of reduced floods and lower water tables.

Despite the considerable attention that has been devoted to the ecology and biodiversity of the neighboring riparian bosque (Hink and Ohmart 1984; Crawford et al. 1993), little is known about the in-channel bars, which are perhaps its most diverse and biologically active component. These dynamic environments support young wetland and riparian vegetation along with most of the natural regeneration of Rio Grande cottonwoods in the river corridor (Milford and Muldavin 2004).

A narrow band of herbaceous wetland plants dominated by inland saltgrass (*Distichlis spicata*) and Baltic rush (*Juncus balticus*) occurs on the banks of the Rio Grande. Other species that occur in the floodplain include isolated stands of rabbitbrush (*Ericameria nauseosa*), common mullein (*Verbascum thapsus*), coyote willow, Russian olive, and tamarisk. Dominant plant species found in the bosque are Rio Grande cottonwood (*P. deltoides wislizenii*) and oneseed juniper (*Juniperus monosperma*). Within the Rio Grande, most in-channel islands and bars are periodically inundated by high flow and support some marsh, meadow, or shrub wetland communities. However, the islands targeted for the Proposed Action are dominated by non-native vegetation and contain limited wildlife habitat.

3.7 FISH AND WILDLIFE

Changes in the river elevation relative to the floodplain and the hydrologic and sediment regime as well as the introduction of predatory species (game fish) have affected the fauna of the Rio Grande. Historically, the riparian corridor of the MRG supported a wide diversity of terrestrial species. Prior to increased anthropogenic control, the river system periodically contributed water and nutrients to the floodplain and supported a number of aquatic species that no longer inhabit the area.

The Rio Grande drainage in New Mexico historically supported at least 21 and perhaps 24 native fish species, representing nine or ten families (Propst 1999). Since the beginning of European settlement along the Rio Grande, this system has lost a larger proportion of its native fish fauna than any other major drainage in New Mexico. Shovelnose sturgeon (*Scaphirhynchus platorhynchus),* longnose gar (*Lepisosteus osseus*), American eel (*Anguilla rostrata*), speckled chub (*Machrybopsis aestivalis aestivalis*), and Rio Grande shiner (*Notropis jemezanus*) have been extirpated from the Rio Grande in New Mexico, and blue catfish (*Ictalurus furcatus*), if it persists, occurs only in Elephant Butte Reservoir. Rio Grande bluntnose shiner (*Notropis simus simus*) and phantom shiner (*Notropis orca*) are extinct. Rio Grande silvery minnow (*Hybognathus amarus*) is the only state and federally protected fish species currently inhabiting the Rio Grande, but Rio Grande sucker (*Catostomus plebeius*) and Rio Grande chub (*Gila pandora*) may warrant state protection (Propst 1999).

Common fish species of the MRG include river carpsucker (*Carpiodes carpio*), flathead chub (*Platygobio gracilis*), common carp (*Cyprinus carpio*), western mosquitofish (*Gambusia affinis*), and red shiner (*Cyprinella lutrensis*) (Platania 1993). Less common fish species present in the system are channel catfish (*Ictalurus punctatus*), fathead minnow (*Pimephales promelas*), longnose dace (*Rhinichthys cataractae*), white sucker (*Catostomus commersoni*), and the RGSM. Western mosquitofish, white sucker, and common carp are introduced species that are now common throughout the MRG.

In the most intensive biological survey of the MRG to date, Hink and Ohmart (1984) found 18 different species of reptiles and amphibians in the MRG. Eastern fence lizard (*Sceloporus undulatus*), New Mexican whiptail (*Aspidoscelis neomexicanus*), and Woodhouse toad (*Bufo woodhousii*) were common and widespread. Several common species in the Middle Rio Grande, such as bullfrogs (*Rana catesbeiana*), leopard frogs (*Rana pipiens*), and Woodhouse toads, are ubiquitous throughout the state. Others, like the chorus frog (*Pseudacris triseriata*) and the common gartersnake (*Thamnophis sirtalis*), are unique to the MRG (Hink and Ohmart 1984).

Throughout the year, riparian communities of the MRG provide important habitat during breeding and migration for many bird species. Hink and Ohmart (1984) recorded 277 species of birds within 163 miles of MRG bosque habitat. Stahlecker and Cox (1997) documented 126 species in the Rio Grande Nature Center State Park (RGNCSP). They estimate that 60–65 species of birds breed most years in the park (Stahlecker and Cox 1997). The 10 most common species during the winter of 1996–1997 were dark-eyed junco (*Junco hyemalis*), American crow (*Corvus brachyrhynchos*), American goldfinch (*Carduelis tristis*), white-crowned sparrow (*Zonotrichia leucophrys*), American robin (*Turdus migratorius*), Canada goose (*Branta canadensis*), red-winged blackbird (*Agelaius phoeniceus*), mallard (*Anas platyrhynchos*), European starling (*Sturnus vulgaris*), and house finch (*Carpodacus mexicanus*). The 10 most common species in the bosque during the summer of 1997 were black-chinned hummingbird (*Archilochus alexandri*), red-winged blackbird, black-headed grosbeak (*Pheucticus melanocephalus*), spotted towhee (*Pipilo maculatus*), brown-headed cowbird (*Molothrus ater*), mourning dove (*Zenaida macroura*), Bewick's wren (*Thryomanes bewickii*), black-capped chickadee (*Poecile atricapillus*), cliff swallow (*Petrochelidon pyrrhonota*), house finch, and European starling (Stahlecker and Cox 1997). The most abundant bird species found along the river in winter were mallard, Canada goose, and wood duck (*Aix sponsa*). Red-tailed hawk

(*Buteo jamaicensis*), Cooper's hawk (*Accipiter cooperii*), western screech-owl (*Otus kennicottii*), and great-horned owl (*Bubo virginianus*) also occur in the proposed project area (Stahlecker and Cox 1997).

Hink and Ohmart (1984) recorded 35 mammal species in their study of the MRG, and Campbell et al. (1997) observed 14 mammal species in their survey of the Albuquerque Reach. Based on both surveys, the most common small mammals in the proposed project area include white-footed mouse (*Peromyscus leucopus*), western harvest mouse (*Reithrodontomys megalotis*), and house mouse (*Mus musculus*) (Hink and Ohmart 1984; Campbell et al. 1997). Large mammals in the area include coyotes, raccoons, beavers, muskrats, pocket gophers, and rock squirrels. Several species of bats also utilize the MRG.

3.8 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

The agencies that have primary responsibility for the conservation of plant and animal species in New Mexico are the USFWS, under authority of the ESA; the New Mexico Department of Game and Fish (NMDGF), under authority of the New Mexico Wildlife Conservation Act of 1974; and the New Mexico Energy, Minerals and Natural Resources Department, under authority of the New Mexico Endangered Plant Species Act. These agencies maintain lists of plant and animal species that have been classified, or are potential candidates for classification, as Threatened or Endangered (Table 3.2).

Protection from harassment, harm, or destruction of habitat is granted to species protected under the Endangered Species Act. The New Mexico Wildlife Conservation Act and New Mexico Endangered Plant Species Act protects state-listed species by prohibiting taking without proper permits.

Table 3.2. Threatened (T), Endangered (E), Species of Concern (S), Candidate (C), and Proposed (P) Plant and Wildlife Species Known to Occur in Bernalillo and Sandoval Counties, New Mexico. *Note:* Animals and plants that could occur in the project area are shown in boldface.

Common Name (*Scientific name*)	**Status**		**General Habitat**
	FED	STATE	
Invertebrates			
William Lar's tiger beetle (*Cicindela fulgida williamlarsi*)	S	–	Montane alkali flats
San Ysidro tiger beetle (*Cicindela willistoni funaroi*)	S	–	Montane alkali flats
Slate millipede (*Comanchelus chihuanus*)	S	–	Plains mesa grassland
New Mexico silverspot butterfly (*Speyeria nokomis nitocris*)	S	–	Alpine and streamside meadows with significant violet crop
Wrinkled marshsnail (*Stagnicola caperatus*)	–	E	Ditches, streams, and marshes of the Jemez Mountains
Amphibians			
Jemez Mountains salamander (*Plethodon neomexicanus*)	S	T	Shady, wooded montane litter

Table 3.2. Threatened (T), Endangered (E), Species of Concern (S), Candidate (C), and Proposed (P) Plant and Wildlife Species Known to Occur in Bernalillo and Sandoval Counties, New Mexico, *continued*

Note: Animals and plants that could occur in the project area are shown in boldface.

Common Name (*Scientific name*)	**Status**		**General Habitat**
	FED	**STATE**	
Fish			
Rio Grande sucker (*Catostomus plebeius*)	S	–	Cool, mid-elevation streams with rocky substrates
Rio Grande silvery minnow (*Hybognathus amarus*)	**E**	**E**	**Silt and sand substrates with slow backwaters**
Rio Grande cutthroat trout (*Oncorhynchus clarki virginalis*)	S	–	Cool, high-gradient, high-elevation streams
BIRDS			
Northern goshawk (*Accipiter gentilis*)	S	–	Dense coniferous and mixed-woodland areas
Baird's sparrow (*Ammodramus bairdii*)	S	T	Winters in prairie areas
Western burrowing owl (*Athene cunicularia hypugea*)	S	–	Semi-arid grasslands and prairies, often associated with prairie dog towns
Common black-hawk (*Buteogallus anthracinus*)	**–**	**T**	**Woodlands along lowland streams**
Mountain plover (*Charadrius montanus*)	S	–	Semiarid grasslands and plains
Black tern (*Chlidonias niger*)	S	–	Vegetated marshes
Yellow-billed cuckoo (*Coccyzus americanus*)	**C**	**–**	**Dense riparian shrub**
Broad-billed hummingbird (*Cynanthus latirostris magicus*)	–	T	Low-elevation riparian woodlands
White-eared hummingbird (*Hylocharis leucotis borealis*)	–	T	Montane riparian areas
Southwestern willow flycatcher (*Empidonax traillii extimus*)	**E**	**E**	**Dense riparian groves of willow or salt cedar**
American peregrine falcon (*Falco peregrinus anatum)* Arctic peregrine falcon; listed for "similar appearance" (*F.p. tundrius*)	S	T	Montane species; prefers to perch in open areas, often near water.
Whooping crane (*Grus americana*)	–	E	Marshes and prairie potholes
Bald eagle (*Haliaeetus leucocephalus*)	**T**	**T**	**Winters along shores of rivers and lakes**
Neotropic cormorant (*Phalacrocorax brasilianus*)	-	T	Rivers, lakes, and reservoirs with adjacent wooded areas

Table 3.2. Threatened (T), Endangered (E), Species of Concern (S), Candidate (C), and Proposed (P) Plant and Wildlife Species Known to Occur in Bernalillo and Sandoval Counties, New Mexico, *continued*

Note: Animals and plants that could occur in the project area are shown in boldface.

Common Name (*Scientific name*)	**Status**		**General Habitat**
	FED	**STATE**	
Mexican spotted owl (*Strix occidentalis lucida*)	T	–	Mature mixed-conifer and pine-oak forests
Bell's vireo (*Vireo bellii*)	–	T	Riparian areas, piñon-juniper woodland, and Chihuahuan desert scrub
Gray vireo (*Vireo vicinior*)	–	T	Open woodlands with well-developed grasses
Mammals			
Townsend's big-eared bat (*Corynorhinus townsendii*)	S	–	Caves and rocky outcroppings in scrub deserts and piñon-juniper woodlands
Spotted bat (*Euderma maculatum*)	–	T	Rocky outcroppings, mature forests, caves
American marten (*Martes americana*)	–	T	Spruce-fir forests
Goat Peak pika (*Ochotona princeps nigrescens*)	S	–	Steep, rocky banks and hillsides above 8,000 feet
Black-footed ferret (*Mustela nigripes*)	E	–	Prairies; associated with prairie dogs
Pecos River muskrat (*Ondatra zibethicus ripensis*)	S	–	Riparian areas in Chihuahuan desert scrub and piñon-juniper woodlands
New Mexican jumping mouse (*Zapus hudsonius luteus*)	**S**	**T**	**Forb-grass communities in Jemez Mountains**
Plants			
Plank's catchfly (*Silene plankii*)	–	S	Rock outcrops
Santa Fe milkvetch (*Astragalus feensis*)	–	S	Sandy benches, gravelly hillsides, granitic and metamorphic rocks in juniper savanna or on barren areas
Knight's milkvetch (*Astragalus knightii*)	S	S	Dakota sandstone rimrock ledges in piñon-juniper woodlands
La Jolla prairie clover (*Dalea scariosa*)	–	S	Sandy clay banks and bluffs, often disturbed
Sapello Canyon larkspur (*Delphinium sapellonis*)	–	S	Montane areas in the Sandia Mountains
Sandia Mountain alumroot (*Heuchera pulchella*)	–	S	Rock outcrops in montane areas
Gypsum phacelia (*Phacelia* sp. nov.)	S	–	Gypsum outcrops
Parish's alkali grass (*Puccinellia parishii*)	S	E	Alkali springs, seeps, and drainages

Table 3.2. Threatened (T), Endangered (E), Species of Concern (S), Candidate (C), and Proposed (P) Plant and Wildlife Species Known to Occur in Bernalillo and Sandoval Counties, New Mexico, *continued*

Note: Animals and plants that could occur in the project area are shown in boldface.

Common Name (*Scientific name*)	**Status**		**General Habitat**
	FED	**STATE**	
Gypsum Townsend's aster (*Townsendia gypsophila*)	S	S	Weathered gypsum outcrops, gypsiferous soils

Information taken from NMDGF 2004a; NMRPTC 1999; Sublette et al. 1990; USFWS 2004.

FISH

Rio Grande Silvery Minnow *(Hybognathus amarus)*

The RGSM is a moderate-sized, stout minnow, reaching 3.5 inches in total length, that spawns in the late spring and early summer, coinciding with high spring snowmelt flows (Sublette et al. 1990). Spawning also may be triggered by other high-flow events such as spring and summer thunderstorms. The species is a pelagic spawner, producing neutrally buoyant eggs that drift downstream with the current (Platania 1995). The eggs hatch in 2 to 3 days, and the larvae may continue to drift or become retained in backwaters or embayments. The species normally lives about 2 to 3 years in the wild. Natural flow regimes, movement within their limited remaining range, and habitat diversity are important to completion of the life cycle.

In 1994, the RGSM was classified as Endangered by the USFWS (FR 1994a) and has been considered Endangered at the state level since 1979. Historically, the RGSM was one of the most widespread and abundant fishes in New Mexico. The species has declined as a result of impacts from dewatering, channelization and flow regulation for irrigation, diminished water quality, and competition/predation by non-native species. The species is endemic to New Mexico, where it historically occupied large rivers with shifting sand substrates. In the Rio Grande, the RGSM ranged from the confluence of the Rio Chama near Española to the Gulf of Mexico, and in the Pecos River from near Santa Rosa to its confluence with the Rio Grande (Propst 1999). The RGSM currently occupies less than 10 percent of its historic range and is found only in the Rio Grande from Cochiti Reservoir downstream to Elephant Butte Reservoir (Propst 1999).

Natural habitat for the Rio Grande silvery minnow includes stream margins, side channels, and off-channel pools where water velocities are lower than in the main channel. Areas with detritus and algal-covered substrates are preferred. The lee sides of islands and debris piles often serve as good habitat. Stream reaches dominated by straight, narrow, or incised channels with rapid flows would not typically be occupied by the RGSM (Sublette et al. 1990; Bestgen and Platania 1991). Critical habitat for the RGSM was designated by the USFWS from the Highway 22 Bridge downstream to the headwaters of Elephant Butte Reservoir, including the Albuquerque Reach. This designation became effective February 19, 2003 (FR 2003b). Constituent elements of critical habitat required to sustain the Rio Grande silvery minnow include, in brief: (1) A hydrologic regime that provides sufficient flowing water...capable of maintaining a diversity of aquatic habitats; (2) The presence of eddies...that provide a variation of habitats; (3) Substrates of predominantly sand or silt; and (4) Water of sufficient quality to maintain...variable water temperatures (USFWS 2003).

A Biological Opinion was released by the USFWS in 2003 covering Reclamation's water and river maintenance operations, the USACE's flood control operations, and Related Non-federal Actions on the MRG (USFWS 2003). The 2003 MRG BO requires habitat restoration projects on the MRG that will improve survival of all life stages of the endangered RGSM and other endangered species. The 2003 MRG BO identified the need for increased availability of low-velocity habitat and silt and sand substrates to provide food, shelter, and sites for reproduction for RGSM and thereby alleviate jeopardy to the continued existence of the species in the MRG.

RGSM populations within this reach have been monitored on an ongoing basis by UNM and the USFWS. Generally, the data collected indicate that RGSM are rare throughout the reach, with many of the individuals collected being adults (Dudley et al. 2003). This data set indicates that the population may benefit by retaining eggs, larvae, and juveniles in upstream areas like the Albuquerque Reach, where they can contribute to the population growth and aid in the recovery of the species.

BIRDS

Common Black-hawk *(Buteogallus anthracinus)*
The common black-hawk is listed as Threatened by the State of New Mexico and may occur in the Albuquerque Reach (NMDGF 2004b). Though the common black-hawk is considered rare in Bernalillo County, nesting was observed in the Isleta Reach during the summer of 2003 (Williams 2003). The species primarily occupies riparian woodlands, particularly areas with well-developed cottonwood galleries, or a variety of woodland and marsh habitats along permanent lowland streams. Breeding black-hawks require mature riparian forest stands near permanent water. Most birds winter south of the U.S., although some records report occurrences within southern Arizona and the Gulf coast in Texas. The diet of this riparian-obligate species consists mainly of fish, insects, crayfish, amphibians, and reptiles, but occasionally they will take small mammals and birds. Loss of riparian habitat poses the greatest risk to the species. In 1996 the NMDGF estimated 60 to 80 breeding pairs in the state.

Yellow-billed Cuckoo *(Coccyzus americanus occidentalis)*
The yellow-billed cuckoo is a USFWS Candidate species that occurs locally along riparian corridors throughout New Mexico. Ideal habitat appears to be dominated by cottonwood canopy with a well-developed willow understory. Yellow-billed cuckoo diet consists mainly of caterpillars but may also include various insects, some fruit, and the occasional lizard or frog (NMDGF 2004c). The breeding range of yellow-billed cuckoo extends from California and northern Utah north and east to southwestern Quebec and south to Mexico. In New Mexico, historical accounts indicate that the yellow-billed cuckoo was locally very common along the Rio Grande, but rare statewide (NMDGF 2004c). Both Hink and Ohmart (1984) and Stahlecker and Cox (1997) reported yellow- billed cuckoo as a nesting bird in the bosque of the Middle Rio Grande.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)
The southwestern willow flycatcher is considered Endangered by both the USFWS and the State of New Mexico. The subspecies is restricted to dense riparian vegetation along select waterways in New Mexico, Arizona, western Texas, southern Utah, Nevada, and California. The decline of

the species has been attributed to loss of riparian habitat, brood parasitism, and lack of adequate protective regulations. The historic range of southwestern willow flycatchers included riparian areas throughout Arizona, California, Colorado, New Mexico, Texas, Utah, and Mexico. Critical habitat was designated for the flycatcher in 1997 (FR 1997) along 599 miles of streams and rivers in California, Arizona, and New Mexico, but was later withdrawn. In October 2004, the USFWS proposed a new designation of critical habitat for the flycatcher (FR 2004). The southwestern willow flycatcher prefers dense riparian thickets, typically willows with a scattered cottonwood overstory. Dense riparian woodlands are particularly important as breeding habitat.

In New Mexico, the flycatcher occupies riparian habitat along the Rio Grande, Rio Chama, Zuni River, San Francisco River, and Gila River drainages and is generally found within 150 feet of a water source. During spring and fall migration the species occurs statewide, although migration patterns are not well understood. On the Rio Grande, the subspecies occurs near Velarde, Isleta, the Sevilleta NWR, the Bosque del Apache NWR, San Marcial, and Fort Selden.

Bald Eagle (*Haliaeetus leucocephalus*)
This species is listed as Threatened by both the USFWS and the State of New Mexico. Bald eagles are associated with habitats near open water. In New Mexico, bald eagles commonly winter adjacent to rivers and lakes, or where carrion is available. The major food items of bald eagles in New Mexico are waterfowl, fish, and carrion (NMDGF 2004d). Bald eagles are uncommon during the summer and have limited breeding sites in New Mexico, though nests have been documented in the extreme northern and western portions of the state. The number of birds wintering in the state has been steadily increasing. Important wintering areas include the upper Rio Grande, but seldom the Middle Rio Grande. The bald eagle commonly winters along the Rio Grande between the Buckman diversion point and Cochiti Reservoir.

MAMMALS

New Mexican Jumping Mouse (*Zapus hudsonius luteus*)
The New Mexican jumping mouse (*Zapus hudsonius luteus*) is listed by the USFWS as a Species of Concern and is considered Threatened by the State of New Mexico. Also known as the New Mexico meadow jumping mouse, the species is endemic to New Mexico and Arizona. The New Mexican jumping mouse is restricted to mesic habitats, preferring permanent streams, moderate to high soil moisture, and dense and diverse streamside vegetation consisting of grasses, sedges, and forbs (NMDGF 2004e). In the Rio Grande Valley, the species occurs mainly along the edges of permanent ditches and cattail stands. The proposed project area does not contain any wetland areas with cattails or dense herbaceous vegetation. Recent surveys (Hink and Ohmart 1984) have failed to detect the New Mexican jumping mouse north of Isleta Marsh. It is therefore unlikely that the species occupies either the riparian floodplain or any in-channel islands of the Middle Rio Grande.

3.9 SOCIOECONOMICS

This analysis does not focus on all aspects of economics within the proposed project area, but considers only the projected economic costs of the Preferred Alternative and economic statistics at the state, county, and local levels to describe the economic context of the Project.

In 2000, Bernalillo County had a per capita personal income (PCPI) of $27,253 and Sandoval County had a PCPI of $22,247. The average PCPI for the State of New Mexico was $21,931, which was 75 percent of the national average, $29,469 (U.S. Census Bureau 2004a,b). Average annual growth in PCPI was 3.9 percent for the State of New Mexico and 4.2 percent nationwide.

The proposed project location encompasses Bernalillo and Sandoval Counties in the State of New Mexico. According to the 2000 Census, New Mexico had a population of 1,819,046, with 556,678 persons residing in Bernalillo County and 89,908 persons in Sandoval County. Bernalillo County is approximately 1,166 square miles in area, with an average of 477 persons per square mile, and is considered urban in character. Sandoval County is considered rural in character, with one minor urban center. The Town of Bernalillo (6,611) and the City of Rio Rancho (51,765) had a combined population of 58,376 in 2000.

Federal expenditures in the State of New Mexico accounted for $17,478 Billion in 2002 (U.S. Census Bureau 2002). State expenditures amounted to $63,611 Million in 2002 (New Mexico Department of Finance and Administration 2002). The estimated cost of the Proposed Action is $500,000 to $1,500,000 depending on funding availability.

3.10 Visual and Aesthetic Resources

The bosque area within Albuquerque is valued for the visual and aesthetic appeal of mature forest and flowing water in an arid landscape. The riparian areas are designated as the Rio Grande Valley State Park (RGVSP) through the Park Act of 1983, which is managed by the City of Albuquerque Open Space Division and the Middle Rio Grande Conservancy District (MRGCD). The 5,000-acre RGVSP extends through the City of Albuquerque, from Sandia Pueblo on the north to the Pueblo of Isleta on the south (RGVSP 2004). The bosque within Corrales is designated as the Corrales Bosque Preserve and is managed by the Village of Corrales and the Corrales Bosque Commission through an agreement with, and oversight from, the MRGCD. Sandia Pueblo lands are managed and controlled by the Pueblo.

The bosque and river are visible to the public from many bridge crossings, such as at the Alameda Bridge, Montaño Bridge, Central Avenue Bridge, César Chavez Bridge, and Rio Bravo Bridge. These bridge vistas of the river and bosque provide thousands of urban residents with a regular and important visual aesthetic experience. The bosque and river are also visible and enjoyed for the aesthetic value from many foot and horse trails. Trails within the Rio Grande Bosque exist on both sides of the river, with a 16-mile-long paved trail on the east side of the river. Recreation activities include, but are not limited to, walking, jogging, bicycling, roller-blading, horseback riding, fishing, and wildlife watching. No motorized vehicles except maintenance and emergency vehicles are allowed in the bosque, making the aesthetic experience of the recreating public one of a forest and riverside that is full of the sounds and sights of water and forest.

3.11 Air Quality and Noise

The proposed project area lies within New Mexico's Air Quality Control Region No. 152. This region includes Sandoval County and most of Valencia County, which are in attainment for all

criteria pollutants (carbon monoxide, lead, nitrogen dioxide, particulate matter, ozone, and sulfur oxides) of the National Ambient Air Quality Standards (New Mexico 2004). Bernalillo County also falls in Region No. 152 and is in attainment for all priority pollutants except carbon monoxide, which is presently in maintenance status (Macias, *personal communication* 2005). The closest Class I area (a national park or wilderness area) is Bandelier National Monument, 50 miles north of the proposed project area. Air quality in the project area is considered to be good. Due to inversions and an increase in the use of wood-burning stoves, carbon monoxide and airborne particulates are occasionally high in the Rio Grande Valley during winter months. All vehicles involved in project activities would have emission control equipment that has passed City of Albuquerque emissions tests. A fugitive dust permit would be obtained from the City of Albuquerque, and Best Management Practices (BMPs), such as wetting down disturbed areas to minimize dust, would be followed during project activities.

Noise levels are limited to 90 decibels A-weighted (dBA) averaged over an 8-hour day by the Occupational Safety and Health Administration (OSHA) (29 CFR 1910.95). No worker may be exposed to 115 dBA averaged over an 8-hour day without hearing protection. City of Albuquerque (COA) (1975) noise standards require that powered equipment be operated only between the hours of 7 am and 10 pm Monday through Saturday and 9 am to 10 pm on Sundays (City of Albuquerque 1975).

3.12. NET WATER DEPLETIONS

The Rio Grande Compact limits the amount of surface water that can be depleted (consumed) annually in the MRG based upon the natural flow of the river measured at the Otowi gage near Los Alamos (Rio Grande Compact 1939). In addition, the New Mexico State Engineer has determined the MRG is fully appropriated. Therefore, any increase in water use in one sector of use must be offset by a reduction in use in another sector such that senior water rights or New Mexico's ability to meet its downstream delivery obligations are not impaired. Therefore, the New Mexico State Water Plan (Office of the State Engineer/Interstate Stream Commission 2003) requires that habitat restoration projects either will not result in increases in net water depletions, or that any increases are offset by purchased or leased water rights. All the projects proposed for habitat restoration herein will be designed and constructed so as not to increase water depletions.

3.13 ENVIRONMENTAL JUSTICE

Executive Order 12898 (FR 1994b), Environmental Justice in Minority and Low-Income Populations, requires consideration of adverse impacts that would disproportionately affect minority and low-income populations. Compared to demographics on the national level, the population of Sandoval and Bernalillo Counties has proportionately more persons of Hispanic and Native American background and fewer persons of African-American or Asian background. Ethnic comparisons in the State of New Mexico are proportionately similar to Sandoval and Bernalillo counties. It should be recognized that persons of Hispanic background might also claim identification with another ethnic group as well.

3.14 INDIAN TRUST ASSETS

Indian Trust Assets (ITAs) are legal interest in assets held in trust by the United States Government for Indian tribes or for Indian individuals. Some examples of ITAs are lands, minerals, water rights, hunting and fishing rights, titles and money. ITAs cannot be sold leased, or alienated without the express approval of the United States government. Secretarial Order 3175 and Reclamation ITA policy require that Reclamation assess the impacts of its projects on ITAs. An inventory of all ITAs within the proposed project area is required. If any ITAs are impacted, the mitigation or compensation for adverse impacts to these assets must be accomplished.

4.0 ENVIRONMENTAL CONSEQUENCES

4.1 INTRODUCTION

The Joint-Lead Agencies have utilized a scientific and analytic evaluation with which to compare the No Action and the Proposed Action Alternatives. This chapter of the EA evaluates direct, indirect, and cumulative impacts for all resources described in Chapter 3, Affected Environment. Environmental commitments, which will provide ongoing guidance for the proposed project, are summarized.

4.2 GEOMORPHOLOGY AND SOILS

Under the No Action Alternative, should the drought continue, the geomorphology of the Rio Grande channel would either remain stable or continue to narrow and deepen into a single thalweg. In the absence of frequent high discharges, the river in this reach will continue to have high velocities and limited meandering between islands and bars. Islands and bars will become increasingly stable with increasingly mature vegetation, predominantly non-native species. The channel is expected to degrade, resulting in high banks that are rarely inundated under the No Action Alternative. Based on RGSM monitoring, the geomorphic trends produced under No Action are unfavorable for the species and do not promote egg retention or larval success.

Under the Proposed Action, the Project would undertake actions to alter the islands and bars within the channel as well as parts of the channel banks to create the desired habitat types. In doing so, the current geomorphology is anticipated to change slightly. Under the Proposed Action there would be minimal to moderate soil disturbance levels. The overall effects will be monitored and quantified, but are expected to be beneficial and completely within normal parameters for a sand-bed river system.

Before the initiation of construction activities, environmental protection measures would be reviewed at a pre-project meeting. All activities would be in compliance with local, state, and federal regulations. To mitigate negative effects from erosion, native herbaceous communities would be planted.

4.3 HYDROLOGY AND HYDRAULICS

Under both the No Action and the Proposed Action there would be no change in the amount or duration of flow in the river. The Proposed Action would work with the existing hydrologic conditions to develop the desired habitat types.

4.4 WATER QUALITY

The No Action Alternative will result in continued water quality that meets applicable standards for most physical constituents, such as surface water temperature, pH, turbidity, dissolved oxygen (DO), suspended sediments (SSED), conductivity/total dissolved solids (TDS), and fecal coliform.

Under the Proposed Action, no adverse impact to surface or ground water quality is anticipated. The Clean Water Act (CWA) provides protection for wetlands and waters of the United States from impacts associated with dredged or fill material in aquatic habitats, as defined under Section 404(b)(1). CWA compliance is required of all aspects of the Project, and since most work associated with the Proposed Action would be completed within jurisdictional areas, a 404 permit is required. Compliance with the CWA would ensure that the Proposed Action would have no adverse effect on the water quality of the MRG. Water quality would be monitored and evaluated for the duration of the project.

The Proposed Action would result in temporary changes in the measures for physical constituents, particularly for turbidity and total dissolved solids, because of the movement and dispersal of sediments within the river channel. Short-term and localized adverse effects to water quality may result, but are not expected to exceed applicable standards. The techniques to be tested will depend on high-flow events to release and redistribute sediments within the floodplain. The high-volume flows would be expected to dilute the effects of added sediment load on water quality standards.

4.5 CULTURAL RESOURCES AND TRADITIONAL CULTURAL PROPERTIES

Under the No Action there would be no change to cultural resources and traditional cultural properties.

No known archaeological resources were found inside the levees where the Proposed Action would take place. Should archeological resources be found during construction at staging areas, access locations, or proposed construction sites, work in that area would stop and the proper authorities informed. Because the Project area is contained completely within the active floodplain of the Rio Grande, no cultural resources survey is proposed as part of the Proposed Action. Project activities would be restricted to islands within the channel of the Rio Grande and to the banks of the river. Access to the channel would be wherever possible, but most likely along existing access routes. Therefore, no adverse impacts would occur to known archaeological resources from the Proposed Action.

Tribal Consultation is taking place to determine whether any TCPs occur within or near the proposed action areas. Should TCPs be identified with the potential for adverse impacts, these project areas will be avoided.

4.6 VEGETATION AND WETLAND RESOURCES

Increased over-island flooding and some overbank flooding are anticipated under the Proposed Action, compared to the No Action Alternative. Riparian vegetation is, by definition, subject to intermediate levels of disturbance from flooding. Reduced levels of annual maximum flows under the No Action Alternative have reduced these natural processes. Under the Proposed Action, some native and non-native vegetation would be disturbed by mechanical means during the implementation of the restoration techniques. The estimated acreage of impacts to riparian vegetation during implementation of initial actions is shown in Table 4.1

Table 4.1. Effects of Proposed Restoration Techniques on Vegetation

Restoration Technique	Initial Number of Acres Treated (2005-2006)	Maximum Number of Acres Treated	% Cover of Affected Vegetation *		
			Herbaceous/ Grasses	1-5m Woody Vegetation (Native)	1-5m Woody Vegetation (Non-Native)
Vegetated Island Evaluation	50	250	50	<10	40
Bar Habitat Modification	12	64	15	<5	<5
Large Woody Debris	None	None	None	None	None
Bank Scouring and Scalloping	1	6	20	<10	20
Bank Lowering	5	15	20	<10	30
Ephemeral Channels	2	20	75	<10	<10

*Any impacts to dense woody vegetation more than three meters in height will be avoided wherever possible during construction.

Each technique has somewhat different levels of potential impact on riparian vegetation. All vegetative communities, native and non-native, would be altered on selected vegetated islands under the Proposed Action. Dead and downed native deciduous species may be used for in-channel placement as large woody debris. Living native deciduous species would be avoided. Some herbaceous floodplain species may be trampled during construction, but impacts would be moderate.

The Rio Grande, including the proposed project locations, is a USACE jurisdictional waterway. Executive Order 11990 (Protection of Wetlands; FR 1977a) requires the avoidance of short- and long-term adverse impacts associated with the destruction, modification, or other disturbance of wetland habitats. Compliance with Section 404 of the CWA will prevent net loss of wetlands because of Project actions. As a result, the Proposed Action would not impact wetland communities in the project area. Executive Order 11988 (Floodplain Management; FR 1977b) provides federal guidance for activities within the floodplains of inland and coastal waters and requires federal agencies to "ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management." Proposed modification to riverbanks and islands will not result in significant changes in flooding patterns outside the existing floodplain.

4.7 FISH AND WILDLIFE

Short-term impacts to fish and wildlife resources would not occur under the No Action Alternative. Long-term adverse effects on breeding and foraging fish, avian species, and mammals, however, are gradual and difficult to quantify. They result from long-term reduction in riparian ecological processes, encroachment of non-native species, increased fire hazard, and increased depth to groundwater.

By comparison, the Proposed Action would produce short-term direct impacts on wildlife in the immediate area of disturbance, and long-term beneficial effects on fish and riparian wildlife from

improved ecological function and aquatic habitat. To avoid direct impact to migratory birds protected by the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703, ET seq.), clearing and grubbing of woody vegetation would be scheduled between August 15 and April 15, outside of the normal breeding season for many avian species. Should vegetation removal and construction take place between April 15 and August 15, preconstruction nesting bird surveys should be conducted to identify potential MBTA issues. Any positive preconstruction survey results or observations should be brought to the attention of U.S. Fish and Wildlife Service in order to determine methods of MBTA impact avoidance.

Other wildlife species inhabiting vegetated islands, such as reptiles, mammals, and amphibians, would be temporarily displaced and may experience mortality during the implementation of the Proposed Action. These short-term effects would be outweighed by the long-term benefits of a healthier riparian ecosystem. No adverse impacts on fish species are expected to occur under the Proposed Action. Long-term benefits from aquatic habitat creation and increased food abundance within mesohabitats are expected.

4.8 THREATENED, ENDANGERED, AND SPECIAL STATUS SPECIES

Rio Grande Silvery Minnow *(Hybognathus amarus)*

The No Action Alternative will continue the trends of population decline for the species in the Albuquerque Reach. The channel in the Albuquerque Reach is incised and degradation is expected to continue (Porter and Massong 2004). RGSM occurs in the project area, and fish obtained from recent salvage operations conducted during river intermittency have been stocked in the Albuquerque Reach (M. Hatch, personal communication 2004). Releases of rescued RGSM have been made near Alameda Bridge, which is in the project area. In-channel efforts will take place upstream of the release location. Increasing the amount and/or quality of suitable riverine habitat is essential for successful application of supplemental augmentation and rescue efforts for effective RGSM population management.

The Proposed Action may affect but is not likely to adversely affect designated RGSM critical habitat. The primary objective of the Proposed Action is to create mesohabitat for the RGSM. The Proposed Action may provide beneficial effects to RGSM and their critical habitat, including improved egg and larval retention in the Albuquerque Reach, increased recruitment rates and survival of young of year and adult RGSM.

RGSM critical habitat encompasses the entire project area (FR 2003b). Short-term effects to RGSM critical habitat immediately following habitat restoration activities, as discussed in the Biological Assessment. Work would take place in the river channel. Best Management Practices would be enforced to minimize erosional inputs into the river during periods of work.

Yellow-billed Cuckoo *(Coccyzus americanus occidentalis)*

The No Action Alternative will not make changes to the riparian habitats utilized by this species and no effects will occur.

The Proposed Action may affect but is not likely to adversely affect the yellow-billed cuckoo. To minimize impact on this and other riparian species, clearing and grubbing of woody vegetation

would be scheduled between September and April. Should vegetation removal and construction be implemented during the breeding season (April-August), pre-construction breeding bird surveys would be conducted and monitoring performed to assure avoidance of impacts. Any positive preconstruction survey results or observation of affected species during construction would be coordinated with USFWS to discuss nesting area avoidance.

Southwestern Willow Flycatcher (*Empidonax traillii extimus*)
The No Action Alternative would not disturb the riparian vegetation where this subspecies may occur, therefore this alternative would have no effect on the species.

The Proposed Action would take place outside of the breeding season for southwestern willow flycatcher and would not directly affect the species. The Proposed Action may affect but is not likely to adversely affect southwestern willow flycatcher breeding habitat. To minimize impact on this and other riparian species, clearing and grubbing of woody vegetation would be scheduled between September and April. Should vegetation removal and construction be implemented during the breeding season (April-August), pre-construction breeding bird surveys would be conducted and monitoring performed to assure avoidance of impacts. Any positive preconstruction survey results or observation of affected species during construction would be coordinated with USFWS to discuss nesting area avoidance.

Bald Eagle (*Haliaeetus leucocephalus*)
The No Action Alternative would not disturb the riparian vegetation where this species may occur, therefore this alternative would have no effect on the species.

The Proposed Action may have short-term potential effects to bald eagles during construction, related to temporary noise and other disruptions. Removal of woody vegetation and other construction activities may take place during the winter months when bald eagles may be in the proposed project area. Guidelines would be employed to minimize the potential for disturbing bald eagles. If a bald eagle is visible within 0.25 mile of the proposed project area in the morning when activity starts, or arrives during breaks in activity, the contractor would be required to suspend all construction activity until the bird leaves on its own volition, or the project biologist, in consultation with the Fish and Wildlife Service (USFWS), determines that the potential for harassment is minimal. However, if a bald eagle arrives during construction activities, or is observed 0.25 mile or more from the construction site, activity would not be interrupted. The Proposed Action may affect but is not likely to adversely affect the bald eagle.

Common Black-hawk *(Buteogallus anthracinus)*
The No Action Alternative would not make any changes to riparian vegetation used by this species, therefore no adverse impacts to this species and its habitats would occur.

The Proposed Action would include clearing of woody vegetation but not mature gallery trees. In addition, areas proposed for vegetation clearing and disturbance are not vegetated with mature forest habitats. Therefore, the Proposed Action should have no adverse impact on the common black-hawk. As a precautionary measure, the contractor or project biologist will follow the same protocol as that applied to bald eagles during construction activities.

New Mexican Jumping Mouse (*Zapus hudsonius luteus*)
Lack of suitable habitat in the project areas makes it unlikely that either the No Action Alternative or the Proposed Action would have an adverse effect on the New Mexican Jumping Mouse.

4.9 SOCIOECONOMICS

The long-term economic consequences of No Action are unknown at this time and difficult to assess. These impacts may be greater than the Proposed Action due to the significant costs of other RGSM habitat restoration options that have been proposed by the Middle Rio Grande Collaborative Program.

The Proposed Action would not adversely affect current economic and socioeconomic conditions within Bernalillo and Sandoval Counties. The cost of the Proposed Action would range from $500,000 to $1,500,000, depending on the funding available during 2005-2009. This amount is low in comparison with combined state and federal expenditures within Bernalillo and Sandoval Counties and will not adversely affect current economic conditions.

Both the No Action and the Proposed Action would see temporary increases in federal and state spending in Bernalillo and Sandoval Counties to provide habitat restoration for the RGSM. Regardless of this Proposed Action, the Biological Opinion of 2003 requires that aggressive measures be taken to improve and restore aquatic habitat for the RGSM, and that those measures should be conducted in all areas of critical habitat. The signatories to the MRG ESA Collaborative Program have identified the Albuquerque Reach as an area of high priority, since water quantity is more reliable than that in more southern reaches and the area is upstream of Elephant Butte Reservoir, and therefore able to support the duration of downstream egg drift required for successful breeding.

4.10 VISUAL AND AESTHETIC RESOURCES

The No Action Alternative will continue to provide long-term aesthetic value to RGVSP visitors and unimpeded vistas of the Rio Grande and the riparian forest from bridges. There would be no short-term changes in the visual and aesthetic experience. Long-term impacts to the river and bosque from changes in the channel configuration would be so slow as to be imperceptible to the public.

The Proposed Action would not produce any long-term changes in the visual and aesthetic experience of the public, either from the bridges, the trails, riverside areas, or adjacent homes. The Project would imitate natural processes of shifting channel configuration, islands, and bars and vegetation mosaic that is part of the aesthetic experience of a river.

The Project would create temporary channel and/or bank modifications that may be visible by pedestrians using the bridges, the trails, and river edge, or adjacent homeowners in the immediate time and place of construction. The short-term effects of equipment operation would disturb the aesthetic experience of individuals within the RGVSP within hearing distance of the construction. Of the bridge crossings, the proposed construction areas may be visible from

bridge crossings at Alameda, Rio Bravo, and Interstate 40 bridges. The Alameda Bridge crossing has a pedestrian bridge as well as a bridge for motorized vehicles. The Interstate 40 crossing has a number of adjacent homeowners within continuous view of the project. The visual and aesthetic impacts of the proposed Project would therefore be brief and limited to relatively few pedestrians using the trails near the project, but the intensity of this short-term impact may be experienced as high to those who regularly use these trails for their natural aesthetic value.

4.11 Air Quality and Noise

The project area is a natural area and a park with nature trails and other recreational uses in which a quiet atmosphere is expected. The No Action Alternative would hold ambient noise levels to this level.

The Proposed Action is not anticipated to generate ambient noise that exceeds the City of Albuquerque Noise Ordinance. Construction equipment to be used during the Proposed Action would create temporary variable noise levels that would likely exceed allowable ambient noise of 80 dBa in the immediate vicinity of the restoration site. All construction sites are anticipated to be greater than 500 feet from any sensitive noise receptors. The nearest noise receptors would include the recreating public on nearby trails and residents of nearby homes outside the levees. Under the Proposed Action, noise impacts during heavy equipment use would be short term and occur during normal business hours to minimize noise disturbance. The riparian vegetation and levee would abate some of the noise generated by the equipment. A Construction Noise Permit may be issued from the City of Albuquerque if sensitive noise receptors are identified within 500 feet of restoration construction sites.

Construction equipment would temporarily generate fumes and air emissions under the Proposed Action. The level of air emissions is anticipated to be low and in compliance with local and federal air emission standards.

4.12 Net Water Depletions

The No Action Alternative would continue current levels of water depletions in the Albuquerque Reach, as identified in previous studies (SSPA 2004). The goal of the Proposed Action is to neither increase nor decrease depletions. The majority of the proposed work will occur on islands and bars that are temporary in nature and located within the 660 foot wide river channel, where the river water-level elevation and river surface open area fluctuate significantly. Therefore, the work would not increase depletions to any measurable or calculable degree. Actions on the river channel banks that could potentially increase depletions, such as increasing surface water open areas, will be avoided. If necessary, a mulch (gravel mulch, tree mulch, etc., as appropriate) will be placed in areas where the riverbank height is lowered or ephemeral channels are constructed to offset any increase in water losses from those actions. Evaluation of the net depletion effects of each proposed technique will be performed over the course of the Project. Restoration techniques that are determined to add significant levels of depletion to the surface waters of the Rio Grande would be curtailed unless offset with other sources of water.

4.13. ENVIRONMENTAL JUSTICE

The Proposed Action is in compliance with Executive Order 12898 (FR 1994b), Environmental Justice in Minority and Low-Income Populations. The proposed project is located on the active flood plain of the Rio Grande, between the flood control levees and within the Albuquerque reach of the river. Outside of the levees, nearby land use along this reach of the river includes residential neighborhoods of all economic strata, agricultural land, and commercial and industrial uses.

Regardless of the level of impacts, they will be similar throughout the Albuquerque reach of the river and will affect a diverse group of communities and populations. There will be no disproportional high or adverse human health or environmental effects on minority or low-income populations.

4.14 INDIAN TRUST ASSETS

Consultation is ongoing to identify any Indian Trust Assets (ITAs) in the project areas and to assess potential impacts. Any issues identified in consultation will be addressed in accordance with Secretarial Order 3175 and Reclamation ITA policy. Should any ITAs be impacted by the project, mitigation or compensation for adverse impacts to these assets shall be accomplished.

4.15. IRRETRIEVABLE COMMITMENT OF RESOURCES

The implementation of the Project would result in the commitment of resources such as fossil fuels, construction materials, and labor. In addition, State and Federal public funds would be expended for the construction of the proposed project.

4.16. CUMULATIVE IMPACTS

The National Environmental Policy Act (NEPA) defines cumulative effects as "the impact on the environment which results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions" (42 U.S.C. 4331-4335). Cumulative environmental impacts associated with the Rio Grande, including islands and riparian areas, have been evaluated for the following projects relative to the Proposed Action.

Middle Rio Grande Endangered Species Act Collaborative Program

The Middle Rio Grande Endangered Species Act Collaborative Program has solicited and funded multiple habitat restoration projects, including the City of Albuquerque and USACE restoration projects nearby the Proposed Action. (Reclamation 2002). RGSM augmentation funded by the Collaborative Program should provide positive synergistic interactions with habitat that would be created by this project.

Upper Rio Grande Water Operations Environmental Impact Statement

Currently, the USACE, the ISC, and Reclamation are signatories of a MOA to develop integrated water operations rules for several dams on the Rio Grande upstream of the project area (URGWOPS 1999).

City of Albuquerque San Juan–Chama Drinking Water Project
The City of Albuquerque will begin construction of a diversion dam in the Rio Grande south of Alameda Bridge to divert San Juan–Chama water for the City's drinking water supply. The City is currently constructing water intakes and a crossing of the Rio Grande at Campbell Road for the same project. Several proposed habitat restoration projects are specified for the Albuquerque Reach as mitigation for adverse effects from this project (Reclamation 2004).

Middle Rio Grande Bosque Wildfire Project and Wetland Restoration Project
The USACE is involved in a Bosque Wildfire Project throughout the Albuquerque Reach of the Rio Grande, thinning riparian vegetation at selected locations adjacent to the river. The USACE is also involved in Ecosystem Restoration projects at the Albuquerque Biologic Park and the Wetland Restoration Project south of Central Avenue (USACE 2000).

New Mexico State RGSM Habitat Restoration Projects
Currently, the New Mexico Water Trust Board and the ISC are conducting projects to improve RGSM habitat. These projects include increasing scientific knowledge of available food for aquatic species within the Middle Rio Grande and incorporating large woody debris for improved mesohabitat (Tetra Tech 2004).

The cumulative effects of the Proposed Action plus the described related projects may produce short-term changes in several aspects of the existing hydrology, hydraulics, and fluvial geomorphology throughout the Albuquerque Reach. The Proposed Action may affect other specific downstream restoration projects by changing local fluvial geomorphology and hydrology. Other projects listed here may affect the Proposed Action by altering physical processes upon which the proposed techniques depend. Changes in upstream water operations may augment and improve the effectiveness of proposed projects or may decrease their effectiveness.

While all the parties to these various actions recognize the need for dramatic change in the riverine ecosystem to provide better support for the endangered RGSM, the complex cumulative outcome of multiple actions will be unpredictable and potentially adverse to water quality and various indicators of RGSM reproductive success. The only effective means of dealing with the complex cumulative effects in ESA critical habitat will be to coordinate efforts among all parties to obtain sound scientific measurement of the baseline parameters most closely associated with RGSM success, then develop and implement a detailed RGSM monitoring protocol. Further development and approval of an adaptive management strategy so that it is in place early in the implementation phase of the Proposed Action in 2005 would facilitate a rapid response to potentially adverse indicators.

4.17 Summary of Effects and Site Suitability

Different techniques considered for restoration would have short-term effects on some environmental resources but long-term beneficial effects on biological resources, including RGSM and RGSM critical habitat. The four subreaches considered for the different alternative techniques were not equally suitable. The overall effects of the proposed restoration techniques are summarized in Table 4.2.

Table 4.2. Environmental Consequences of Proposed Restoration Techniques and No Action Alternative

Environmental Resources	Proposed Action	No Action
Geomorphology and Soils	Short-term adverse impact on channel and bank geomorphology; long-term beneficial effects on channel geomorphology	The No Action Alternative would continue the geomorphic trends that are unfavorable for RGSM egg retention, and larval and adult success
Hydrology and Hydraulics	Short-term minimal adverse impact on hydrology; long-term positive effect	No change in the amount or duration of flows in the Albuquerque Reach
Water Quality	Short-term effects within applicable water quality standards; no long-term adverse effects	No change in levels of constituents such as pH, dissolved oxygen, temperature, and turbidity
Cultural Resources and TCPs	No adverse effects on archaeological resources; avoidance of any TCPs identified during Tribal Consultation recommended	No change to cultural resources and traditional cultural properties
Vegetation and Wetlands	Limited short-term effects on vegetation including some wetlands, no adverse effect on dense woody vegetation>3m tall	Continued trends in vegetation such as increases in non-native species and woody vegetation on islands
Fish and Wildlife	Short-term adverse impacts; long-term positive effect on fish and wildlife abundance and diversity from habitat improvements	Continued adverse trends toward decreased fish and wildlife abundance and diversity
Threatened, Endangered and Special Status Species	May affect but not likely to adversely affect Rio Grande silvery minnow, Yellow-billed cuckoo, Southwestern willow flycatcher, and bald eagle	Continued adverse trend toward decreased habitat for RGSM
Socioeconomics	No adverse effects. The costs of implementing the Project are within the annual range of variability for federal and state expenditures for Bernalillo and Sandoval County	Socioeconomic impact of No Action may result from higher costs of implementing other RGSM habitat restoration projects in the Albuquerque Reach
Visual and Aesthetic Resources	Short-term negative impacts; long-term positive effect	No long-term or short-term changes in the visual and aesthetic experience
Air Quality and Noise	Short-term adverse impact from increased ambient noise levels	No change in air quality or noise
Net Water Depletions	No adverse effects anticipated, further evaluation required	No change in net water depletions
Environmental Justice	No adverse effect	No change in environmental justice
Indian Trust Assets	Consultation to be conducted to identify any affected ITAs	No change in Indian Trust Assets

Much of the in-stream restoration activity would take place north of the Alameda Bridge and south of the southern boundary of the Pueblo of Sandia. Site assessments were completed to decide which vegetated islands in this subreach might be selected for modification and evaluation. Assessments were also completed to evaluate the potential for implementing other restoration techniques. Determination of proper treatments was based on multiple field visits involving numerous GPS data collection points and photographs. Proposed restoration techniques would include island, bar, and bank line modification. Access would use existing

levee roads or other access points in the vicinity of Alameda Bridge. Proposed staging and access will be coordinated with COA Open Space Division and MRGCD.

Bar enhancement and ephemeral channels would be utilized within the I-40/Central subreach. Multiple site assessments were completed, including the collection of photographs and GPS data, to evaluate this reach. Work at this location would create essential habitat for the early life stages of fish on the attached river bar. Restoration techniques would include bar modification and ephemeral channels, along with others. Access would be through the levee roads. Proposed staging and access will be coordinated with COA Open Space Division and MRGCD.

Island modification and evaluation, ephemeral channels, and bank line modification techniques would be implemented at the South Diversion Channel (SDC) site. Multiple site assessments were completed between the SDC and Rio Bravo Boulevard, including GPS data collection and photographs. A number of different rehabilitation techniques would be implemented within this subreach. Access would be from west levee road or the SDC. Proposed staging and access will be coordinated with COA Open Space Division, MRGCD, and AMAFCA.

4.18. ENVIRONMENTAL COMMITMENTS

Clean Water Act compliance is required of all aspects of the Project, and since most work associated with the Proposed Action will be completed within aquatic areas regulated by this law, a 404 permit is required. A state water quality certification permit under Section 401 of the CWA is also required.

Storm water discharges under the Proposed Action will be limited to ground-disturbing activities outside the mean high water mark. All such activities will be evaluated for compliance with National Pollutant Discharge Elimination System (NPDES) guidance, an NPDES permit, or a Storm Water Pollution Prevention Plan. The 404 and 401 permitting processes would be completed prior to commencement of the Proposed Action.

To avoid direct impact to migratory birds protected by the Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703, ET seq.), clearing of woody vegetation and construction would be scheduled between August 15 and April 15, outside of the normal breeding season for many avian species. Should vegetation removal and construction be implemented during the breeding season (April 15-August 15), pre-construction breeding bird surveys would be conducted and monitoring performed to assure avoidance of impact to migratory birds and associated avian species. Any positive preconstruction survey results or observation of affected species during construction would be coordinated with USFWS to discuss nesting area avoidance.

To avoid negative visual impacts at the I-40 to Central subreach, native vegetation would be planted after the removal of current vegetation during habitat restoration activities.

Any Indian Trust Assets identified in Consultation will be addressed in accordance with Secretarial Order 3175 and Reclamation ITA policy.

A Temporary Construction Noise Permit may be required by the Albuquerque Environmental Health Department prior to construction, as specified in the local Noise Ordinance, Article 9 Section 9-13.

Wetlands will be avoided in the location of staging areas and access routes to the construction areas.

Monitoring will be performed at each site to insure that project goals are met.

Cumulative impacts will be evaluated of adjacent habitat restoration projects as they come online, and adaptive management techniques will be utilized for elements of the project where appropriate.

Appropriate permits for the Rio Grande Bosque and river access and staging areas would be acquired prior to the commencement of the Proposed Action.

Endangered Species Act (ESA) compliance would be addressed with informal consultation with USFWS regarding potential impacts to threatened and endangered species. RGSM critical habitat encompasses the entire project area (FR 2003b) in the river channel. BMPs would be enforced to minimize potential impacts to RGSM from direct construction impacts and erosional inputs into the river during periods of work. Consultation with USFWS will determine the most effective BMPs.

Reclamation will coordinate with the State Historic Preservation Office for purposes of NHPA Section 106 compliance and will undertake any consultation with Tribal entities prior to beginning any construction. The Project is committed to avoidance of any TCPs in the project area. Should evidence of possible scientific, prehistorical, historical, or archeological data be discovered during the course of this action, work shall cease at that location and the Area archaeologist shall be notified by phone immediately, with the location and nature of the findings. Care shall be exercised so as not to disturb or damage artifacts or fossils uncovered during operations, and the proponents shall provide such cooperation and assistance as may be necessary to preserve the findings for removal or other disposition by the Government.

5.0 PREPARATION, CONSULTATION, AND COORDINATION

5.1 PREPARERS

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5.2 CONSULTATION AND COORDINATION

Agencies and other entities contacted formally or informally to coordinate efforts in preparation of this EA include:

Bernalillo County
City of Albuquerque
City of Albuquerque Open Space
Corrales Bosque Commission
Middle Rio Grande Conservancy District
New Mexico Department of Game and Fish
New Mexico State Historic Preservation Officer
Pueblo of Isleta
Sandia Pueblo
State Historic Preservation Division
U.S. Army Corps of Engineers
U.S. Fish and Wildlife Service
Village of Corrales

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APPENDIX A

SITE PHOTOS

ALAMEDA TO THE NORTH DIVERSION CHANNEL

Photo1: Looking WSW from Sandia Pueblo at the northern-most island. Note the vegetation density and the narrow channel of water between the two vegetated islands. September 2004.

Photo A.2: Looking SW from Sandia Pueblo at a smaller vegetated island just downstream of large vegetated island in photo 1. September 2004.

CENTRAL AVENUE TO JUST NORTH OF INTERSTATE 40 BRIDGE

Photo 3: Looking NE at semi-vegetated island (relatively young) just north of Central Ave. September 2004.

Photo 4: Looking ENE at vegetated island north of Central Ave. Island shows signs of being more mature with evidence of mature deciduous stands. September 2004.

SOUTH DIVERSION CHANNEL TO RIO BRAVO BLVD

Photo 5: Looking NE at river channel between two vegetated islands near the South Diversion Channel. December 2004.

Photo 6: An elevated bank along the Rio Grande near the South Diversion Channel. December 2004.

APPENDIX B

ACRONYMS

ACRONYMS

AMAFCA	Albuquerque Metropolitan Arroyo and Flood Control Authority
ARMS	Archaeological Records Management Section
BMPs	Best Management Practices
BO	Biological Opinion
CFR	Code of Federal Regulations
CFS	Cubic Feet per Second
COA	City of Albuquerque
CWA	Clean Water Act
DBA	Decibels A-weighted
DO	Dissolved Oxygen
EA	Environmental Assessment
EPA	Environmental Protection Agency
ESA	Endangered Species Act
FR	Federal Register
ISC	Interstate Stream Commission
ITA	Indian Trust Assets
LWD	Large Woody Debris
MBTA	Migratory Bird Treaty Act
MOA	Memorandum of Agreement
MRG	Middle Rio Grande
MRGCD	Middle Rio Grande Conservancy District
NDC	North Diversion Channel
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NMAC	New Mexico Administrative Code
NMDGF	New Mexico Department of Game & Fish
NMRPTC	New Mexico Rare Plant Technical Council
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
NTU	Nephalometric Turbidity Unit
NWR	National Wildlife Refuge
OSHA	Occupational Safety & Health Administration
PCPI	Per Capita Personal Income
RGNCSP	Rio Grande Nature Center State Park
RGSM	Rio Grande Silvery Minnow
RGVSP	Rio Grande Valley State Park
RPA	Reasonable and Prudent Alternatives
SDC	South Diversion Channel
SRCP	State Register of Cultural Properties
SSED	Suspended Sediments
TCPs	Traditional Cultural Properties
TDS	Total Dissolved Solids

UNM	University of New Mexico
USACE	U.S. Army Corps of Engineers
USDA	U.S. Department of Agriculture
USFWS	U.S. Fish and Wildlife Service
USGS	U.S. Geological Survey