2.0 ALTERNATIVES

2.1 INTRODUCTION

The MRG Habitat Restoration Plan (Tetra Tech 2004) and the Restoration Analysis and Recommendations for the Isleta Reach of the Middle Rio Grande (Parametrix 2008) contain a toolbox of habitat restoration treatments that may be selectively applied to site-specific restoration plans. Conditions at a specific site, combined with the ever-evolving understanding of silvery minnow, require the restoration practitioner to be creative and adapt techniques appropriate to the goals of the project. Table 2.1 summarizes the specific restoration treatments, which were derived from TetraTech (2004) and Parametrix (2008) that will be applied to restoring silvery minnow habitat in the Isleta Reach.

The project aims to implement river restoration activities that will create, enhance, and maintain egg retention, larval and young-of-year rearing habitat, low-flow habitat, and over-wintering habitat for the silvery minnow. Approximately 44 acres (18 hectares) of islands and riverbank would be modified to create slackwater mesohabitat features to increase potential spawning, larval fish habitats, and refugial pools within the Peralta and LP1DR subreaches of the Isleta Reach. Additionally, the creation of the bosque inundation channel within the LP1DR Subreach will be designed to increase the frequency of inundation of historic floodplains. The project will implement active bosque inundation on approximately 12 acres (5 hectares) within the floodplain of the LP1DR subreach. In addition, expected benefits to native riverine vegetation would potentially increase habitat for the flycatcher.

2.2 ALTERNATIVES CONSIDERED BUT ELIMINATED

Five restoration treatments—island/bar destabilization, arroyo connectivity, gradient control structures, sediment management, and fish passage (Table 2.2)—were eliminated from consideration during the evaluation process. Although these techniques may have positive habitat implications, they have been eliminated from the Proposed Action Alternative because of lack of feasibility or because these techniques would not meet the desired project objectives.

Table 2.1. Restoration Treatments and Potential Benefits of Proposed Treatment

Treatment	Description	Benefits of Treatment
Creation of backwaters and embayments	Areas cut into banks and bars to allow water to enter to create slackwater habitat, primarily during mid- to high-flow events, including spring runoff and floods.	Increases habitat diversity by increasing backwaters, pools, eddies at various depths and velocities. Intended to retain drifting silvery minnow eggs and to provide rearing habitat and enhance food supplies for developing silvery minnow larvae.
Creation of bankline benches	Removal of vegetation and excavation of soils adjacent to the main channel to create benches that would be inundated at a range of discharges.	Provides shallow water habitat at a range of discharges that could provide spawning habitat and increased retention of silvery minnow eggs and larvae. Increased inundation would benefit native vegetation, potentially increasing habitat for the flycatcher.
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 silvery minnow egg and larval development during medium and high-flow events.
Island/Bar modification	Creation of shelves on islands and bars to increase inundation frequency. This technique is targeted for islands and bars that have an overtopping discharge greater than 3,500 cfs and exceedance days per year less than 21 days.	Increases habitat availability by increasing the inundated area at lower flows. May also destabilize bars and islands, slowing the rate of vegetation stabilization and/or armoring.
Large woody debris (LWD)	Placement of trees, root wads, stumps, or branches in the main river channel or along its banks to create pools.	Creates low-flow refugial habitat (pools and slow-water habitats), provides shelter from predators and winter habitat, and provides structure for periphyton growth to improve food availability for silvery minnow.
Removal of lateral confinements	Elimination or reduction of structural features and maintenance practices that decrease bank erosion potential	Could increase floodplain width with more diverse channel and floodplain features, resulting in increased net-zero and low-velocity habitat for silvery minnow
Floodplain vegetation management	Managing vegetation within the floodplain through actively planting desired native vegetation and controlling non-native vegetation to restore riparian habitat.	Increases habitat availability and diversifies habitat structure for the flycatcher in heavily disturbed sites. Combined with passive restoration techniques to promote natural revegetation, actively planting has the potential to increase flycatcher habitat availability.
Bosque inundation channels	Construction of ephemeral channels in the floodplain to carry flow from the main river channel during high-flow events.	Creates shallow, ephemeral, low-velocity aquatic habitats in the bosque during high-flow events. Provides silvery minnow egg retention and larval habitat associated with silvery minnow spawning. Enhances hydrologic connectivity with the floodplain. Could improve flycatcher habitat.
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.

Information adapted from Tetra Tech 2004.

Table 2.2. Treatments Eliminated from Further Study

Treatment	Description	Benefits of Treatment	Reason for Elimination
Island/Bar destabilization	Clearing vegetation on stabilized islands and bank-attached bars to encourage the redistribution of sediments.	Could encourage the redistribution of sediment and natural fluvial geomorphic processes.	Out of scope. The feasibility of accomplishing sediment mobilization in an environment with reduced flow regimes is unlikely. Given the budget, other techniques to provide habitat for the silvery minnow are favored.
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 silvery minnow eggs and larvae, and increase the supply of sediment to the river.	Out of scope. Technique does not meet project objectives. Based on an analysis of existing conditions, restoration treatments were selected to enhance critical habitat needs in the project reach.
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.	Out of scope. Technique does not meet project objectives. Technique is not appropriate in this reach as extensive channel incision has not yet occurred.
Sediment management	Increased sediment supply through mobilization behind dams, arroyo reconnection, or introduction of spoils.	Silvery minnow is most commonly observed in areas where the bed is predominantly silt and sand.	Out of scope. Technique does not meet project objectives. Managing accumulated sediment behind dams or diversion structures is not feasible as there are no such structures within the project area.
Fish passage	Installation of fish passage structures at impoundments to improve longitudinal connectivity of river.	Allows upstream movement of silvery minnow and reduces habitat fragmentation.	Out of scope. Fish passages are not feasible in the proposed locations, which are 20.3 miles (33.7 km) south of Isleta Diversion Dam and 33 miles (53.1 km) north of San Acacia Diversion Dam.

2.3 ACTION AND NO ACTION ALTERNATIVES

Two alternatives, an Action Alternative and a No Action Alternative, are analyzed in detail below.

2.3.1 ACTION ALTERNATIVE

Habitat restoration in the Isleta Reach will involve a combination of passive and active restoration practices. Passive restoration results when the key ecological and geomorphological processes are restored. Active restoration practices are engineered approaches to artificially replace some aspect of lost ecosystem structure or function. Active restoration techniques depend more on human intervention and less on natural riverine processes to repair habitat function (Tetra Tech 2004). Though active restoration strategies rely on mechanical means to achieve the desired habitat restoration results, most of these techniques will also incorporate components of passive restoration. Active restoration will be implemented both in the channel and along the river's banks.

Each active restoration method presented involves the physical manipulation of a predetermined portion of the surface area of selected features with an amphibious excavator or land-based equipment, such as a dozer, a belly scraper, an excavator, or a backhoe. Treatments may involve the removal of vegetation and jetty jacks, the excavation to desired cut-depths, and the distribution of sediment spoils. These treatments would generate woody debris and sediments that must be utilized on site or disposed of in accordance with the 404 permit. Deposition of sediment spoils within the riparian areas, but specifically on islands and bank-attached bars is not desirable because it would further disturb vegetation and raise the elevation of the island or bank-attached bar, which would reduce opportunities for saturation and inundation and create sites for non-native, weedy, herbaceous species establishment (such as Russian thistle [*Salsosa kali*], field bindweed [*Convolvulus arvensis*], Canada thistle [*Cirsium arvense*], etc). Therefore, new low-elevation habitat would be created adjacent to the islands and bank-attached bars within the active river channel using evenly distributed excess sediment and woody debris. Sediments and woody debris would be placed within silt barriers 2 feet (0.6 m) from the wetted perimeter of the bank to prevent any sediments from falling into the channel. Woody debris may be used for the creation of in-channel debris piles adjacent to the treatment area. Sediment spoils on bankline features will be spread evenly over the land surface to an uncompacted depth not to exceed 2 feet (0.6 m) and seeded with native grasses and forbs.

All treatment and control areas would be monitored for two years to determine the effectiveness of the methods implemented and identify any project-related hydrologic and geomorphic alterations. Long-term monitoring (up to 10 years) and adaptive management would be coordinated with the Collaborative Program and would incorporate interagency objectives. After monitoring and natural reshaping, any restoration areas that remain void of native vegetation may be replanted with appropriate native species to stabilize the contours to the extent possible. Following restoration, the treated features are expected to have a surface elevation suitable for inundation at a range of river flows, representing dry, moderate to high water years. Revegetation, whether natural or planted, would also provide suitable roughness to decrease flow velocities and increase egg and larvae retention.

2.3.2 RESTORATION TREATMENTS

Treatment 1: Backwater / Embayment

The creation of moderate- to high-flow backwater and embayment areas would involve the removal of riverbank and island vegetation and the excavation of soils to prescribed depths. Backwater areas (e.g., no upstream inlet) would be constructed on the downstream end of large point bars, which are already low-velocity areas, at a range of elevations. This allows for inundation at a range of river flows (Figure 2.1 and Figure 2.2). Backwater areas would be constructed such that at their target discharge, would be inundated at a depth of approximately 1 to 2 feet (0.30–0.61 m) and slope slightly, with the downstream end lower in elevation than the upstream end, increasing the amount of habitat opportunities at a range of river flows and avoiding possible silvery minnow entrapment. Backwaters can also be terraced to create a range of distinct target inundation discharges.

This treatment is being used to increase the amount of shallow, low-velocity habitat available during spring snow pack runoff events. The creation of backwaters and embayments are intended to support spawning, retain drifting silvery minnow eggs, and provide habitat for developing silvery minnow larvae.

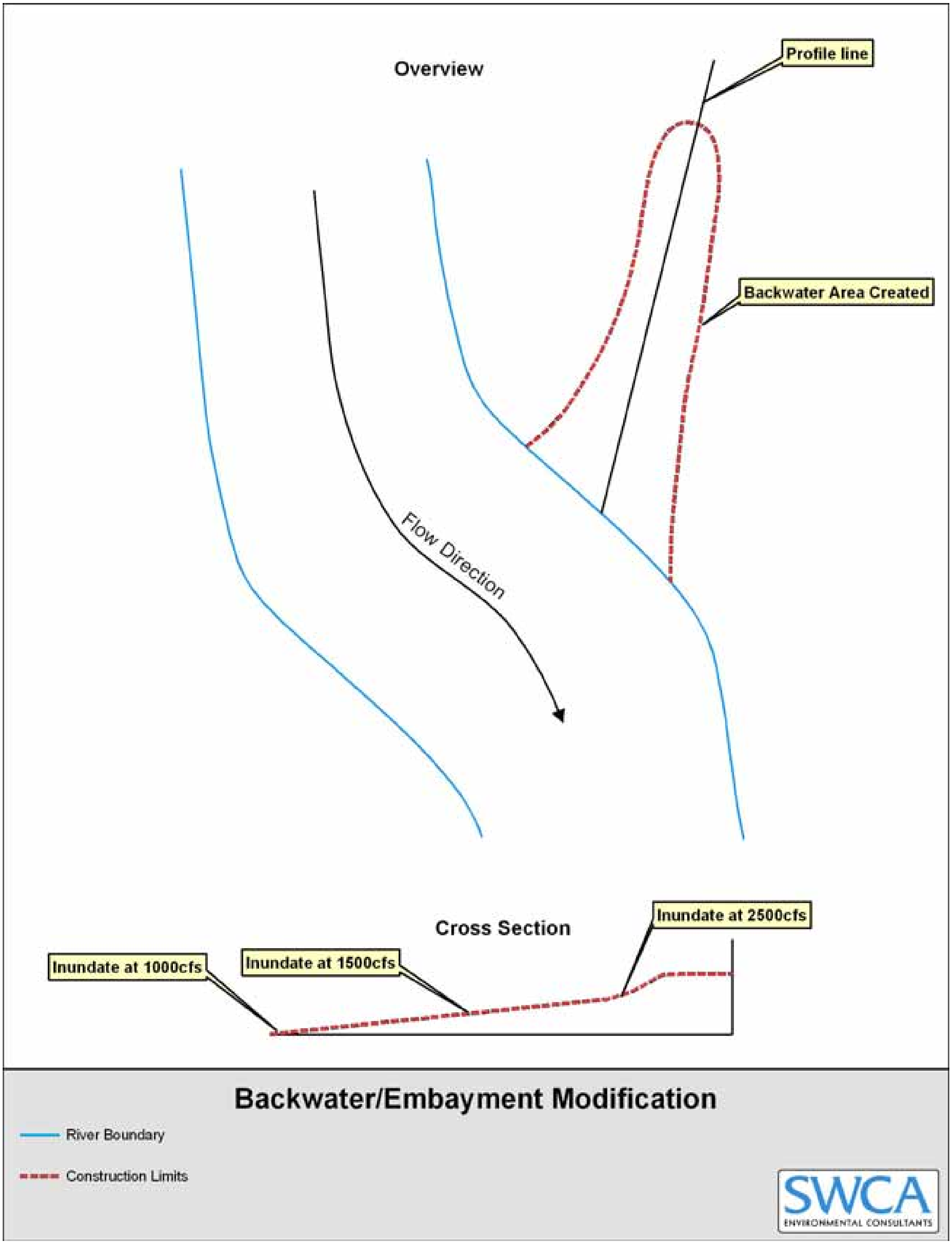

Figure 2.1. Backwater/Embayment schematic design.

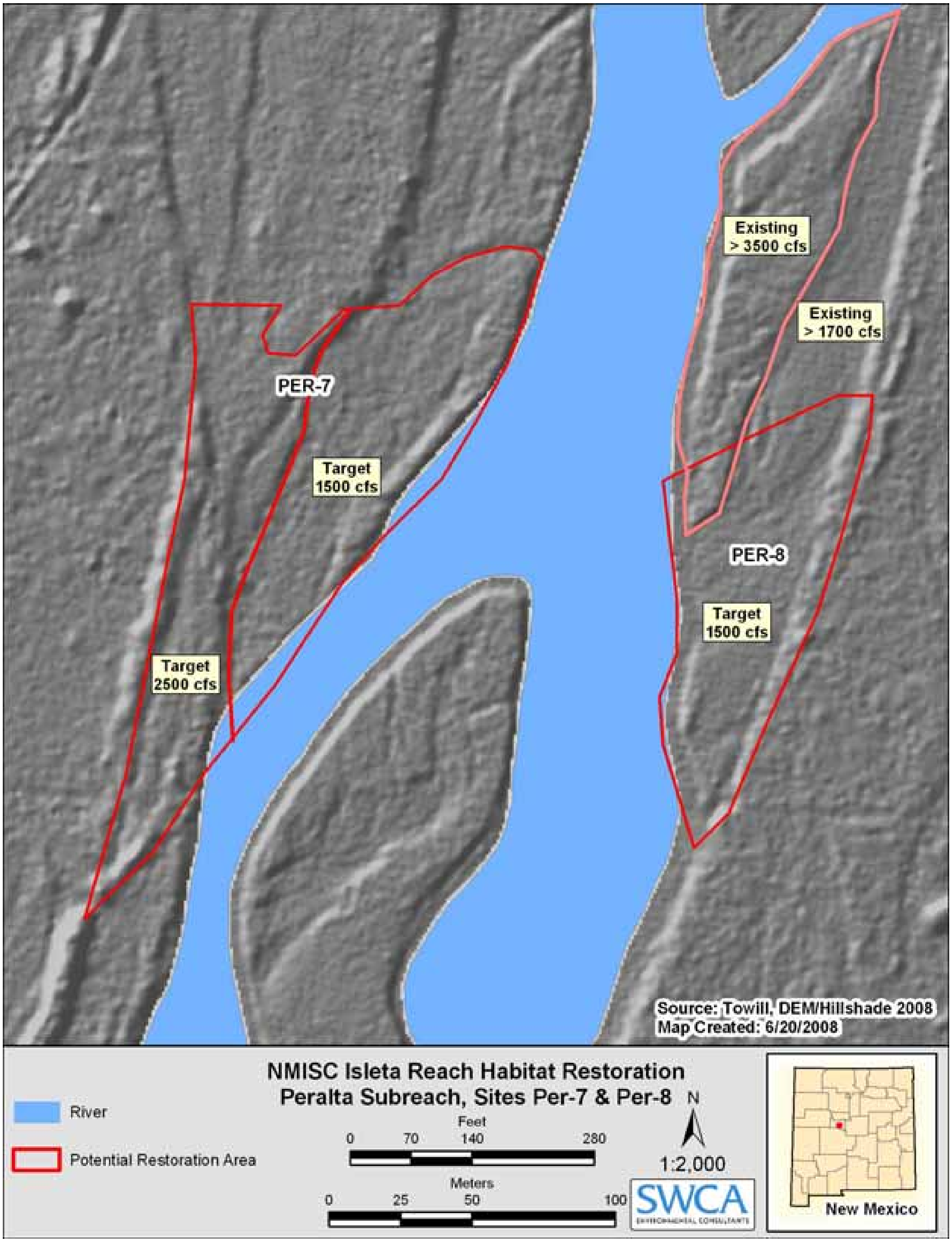

Figure 2.2. Example of backwater modification in sites PER-7 and PER-8. These sites will be modified to allow for additional backwater and overbank flooding during lower-flow periods, starting at target flows of 1,500 cfs.

Treatment 2: Bankline Benches

The creation of bankline benches involves lowering the bank through the removal of bankline vegetation and through the excavation of soils to increase the potential for overbank flooding (Figure 2.3 and Figure 2.4). The target elevation for excavated and terraced banks varies depending on the height of the bank, the bank-full level, and the target inundation discharge frequency and duration. Bankline benches would be created in areas where the removal of the naturally formed levees that often exist along the banks could increase inundation in the overbank areas.

Bankline benches would be inundated during different stages of moderate to high flows and would increase the frequency and duration of inundation. However, the overbank areas would not remain flooded for significant periods of time and would not be intended to provide mesohabitat for adult silvery minnow. Conversely, bankline benches are expected to provide additional low-velocity habitat, resulting in improved egg retention and larval fish development during periods of high river-flow.

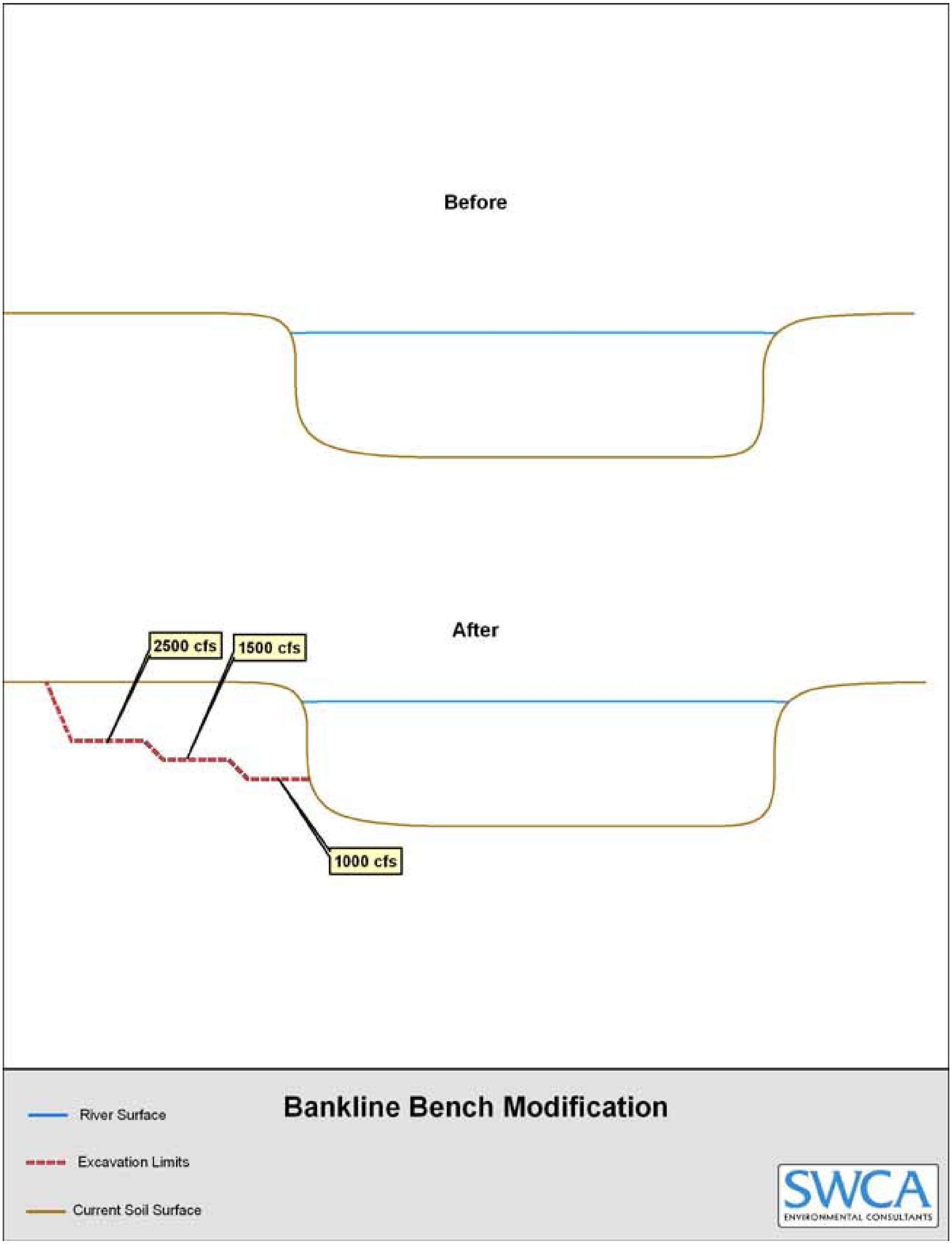

Figure 2.3. Bankline bench schematic design.

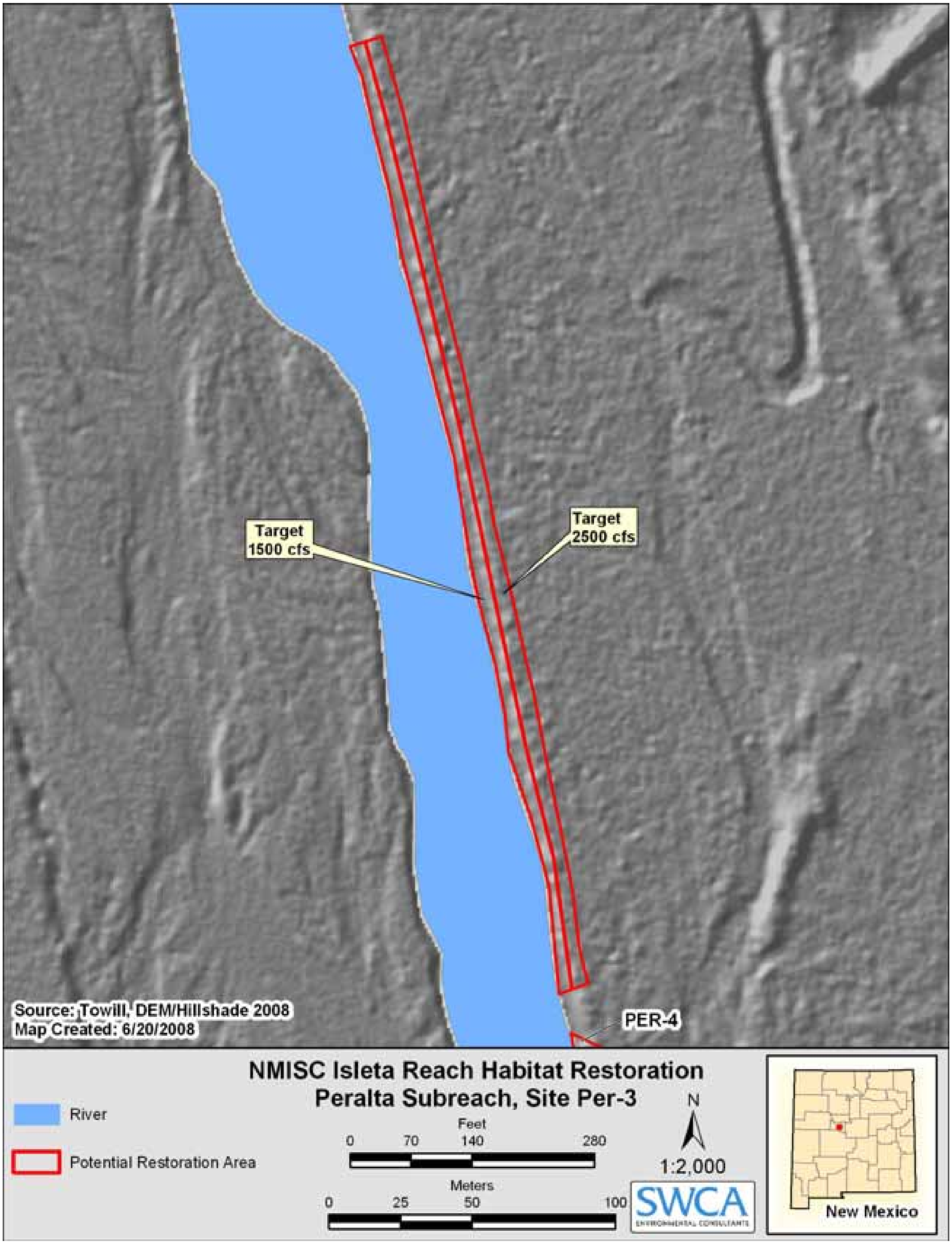

Figure 2.4. Example of bankline benches.

Treatment 3: Ephemeral Channels

Ephemeral channels are low-velocity, flow-through channels that are connected to the main river channel across bars and islands. These channels are normally dry but carry high-discharge flow from the main channel 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 to no flow. Ephemeral channels are not intended to provide for overbank flooding. Construction of an ephemeral channel requires removal of existing vegetation and would cause the disturbance of some sediment or soil. The channels would be cut through islands, banks, and bars to a depth that would allow water to flow at moderate to high river flows (Figure 2.5 and Figure 2.6). The design of the ephemeral channels would consider the river channel geometry, resulting velocity profiles and distribution, and subsequent water retention times.

Ephemeral channels create aquatic habitat beneficial to the silvery minnow. The target inundation elevations and duration would accommodate flows to encourage silvery minnow recruitment each year. Ephemeral channels could provide sufficient periods of inundation for larval development and refugia for young silvery minnow depending on target elevations and individual runoff characteristics. These channels would dry during lower flows and would not be designed to provide habitat for adult silvery minnow. While channels of this kind are proposed primarily to enhance silvery minnow habitat, they also promote riparian functionality and interconnectedness.

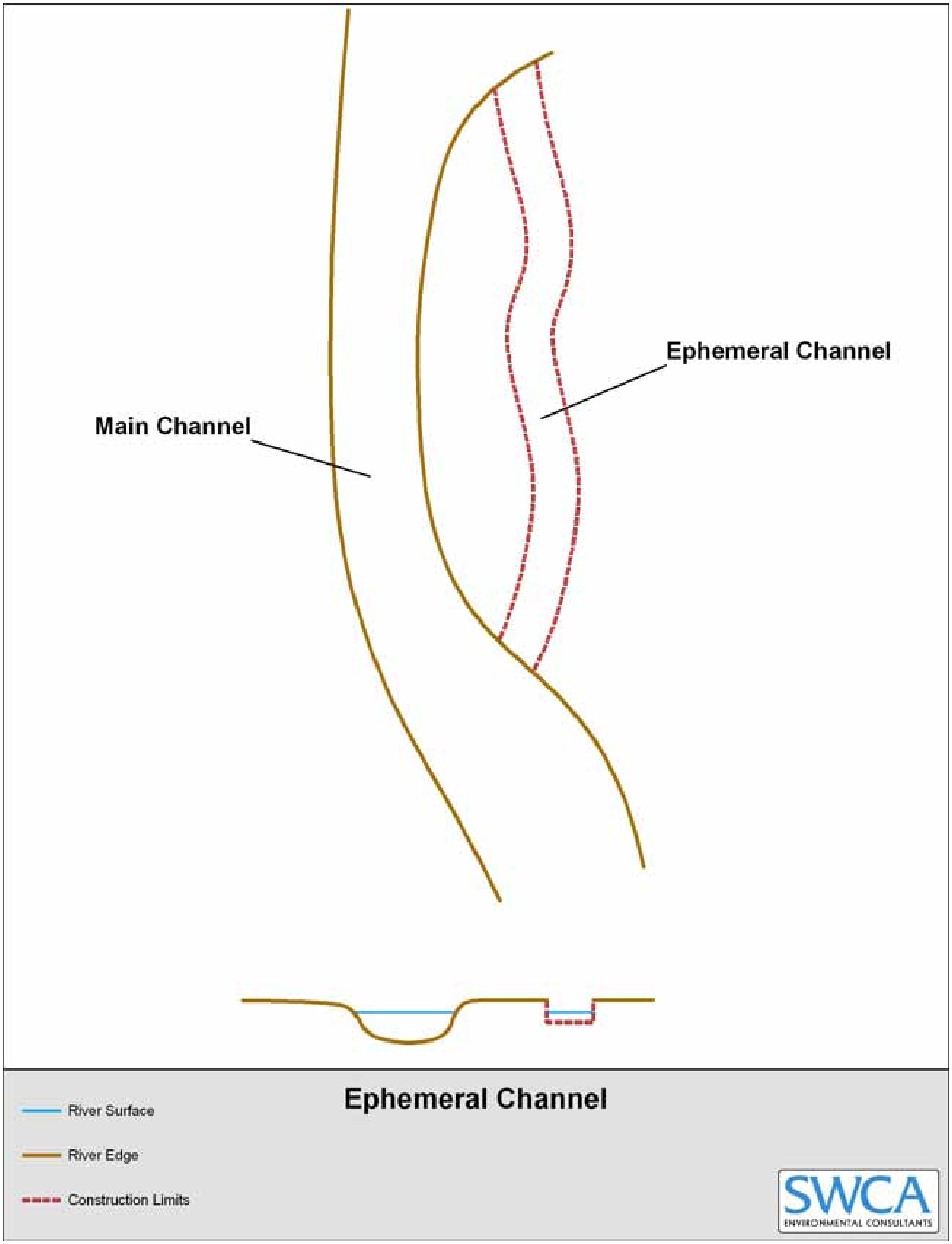

Figure 2.5. Ephemeral channel schematic design.

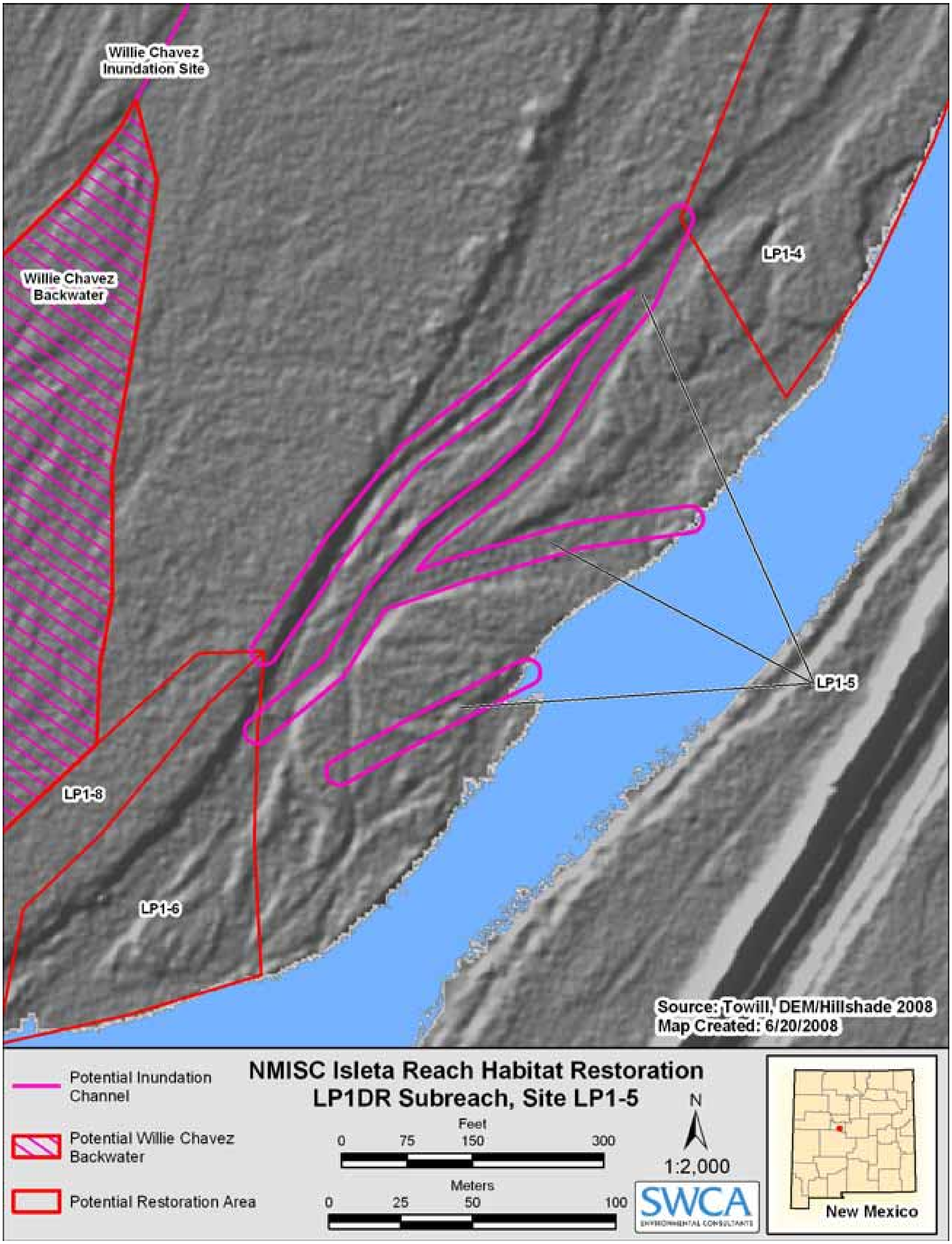

Figure 2.6. Ephemeral channel.

Treatment 4: Island Modification

The island modification technique would be targeted to those features that are infrequently inundated, stabilized by vegetation, or otherwise are armoring and thus are resistant to sediment mobilization. These bank-attached bars and islands have the potential to become or have become permanent channel features. Modifying these features would assist in alleviating adverse changes to silvery minnow critical habitat and improving the quality and quantity of available habitat (USFWS 2003). Islands can be modified by planned physical disturbance, such as removing vegetation and destabilizing soil and sediment, mowing vegetation, root-plowing vegetation and sediment, and raking vegetation and surface sediment (Tetra Tech 2004), or through creating shelves that are inundated at a lower discharge. Island modification should result in re-establishing channel function, through increasing the frequency and duration of inundation and increasing the redeposition of sediment, all of which should result in enhanced silvery minnow habitat. Treated islands would be allowed to naturally expand or contract in response to flows and available sediment load. Island modification would also increase the potential for redeposition of sediment in downstream subreaches of the Rio Grande. Sediment removed as a result of the modification would be placed in the river behind silt fences (Figure 2.7 and Figure 2.8). The NMISC would collaborate with the USACE for island modifications to ensure all 401 and 404 permits are obtained and the proposed actions comply with all elements of the CWA.

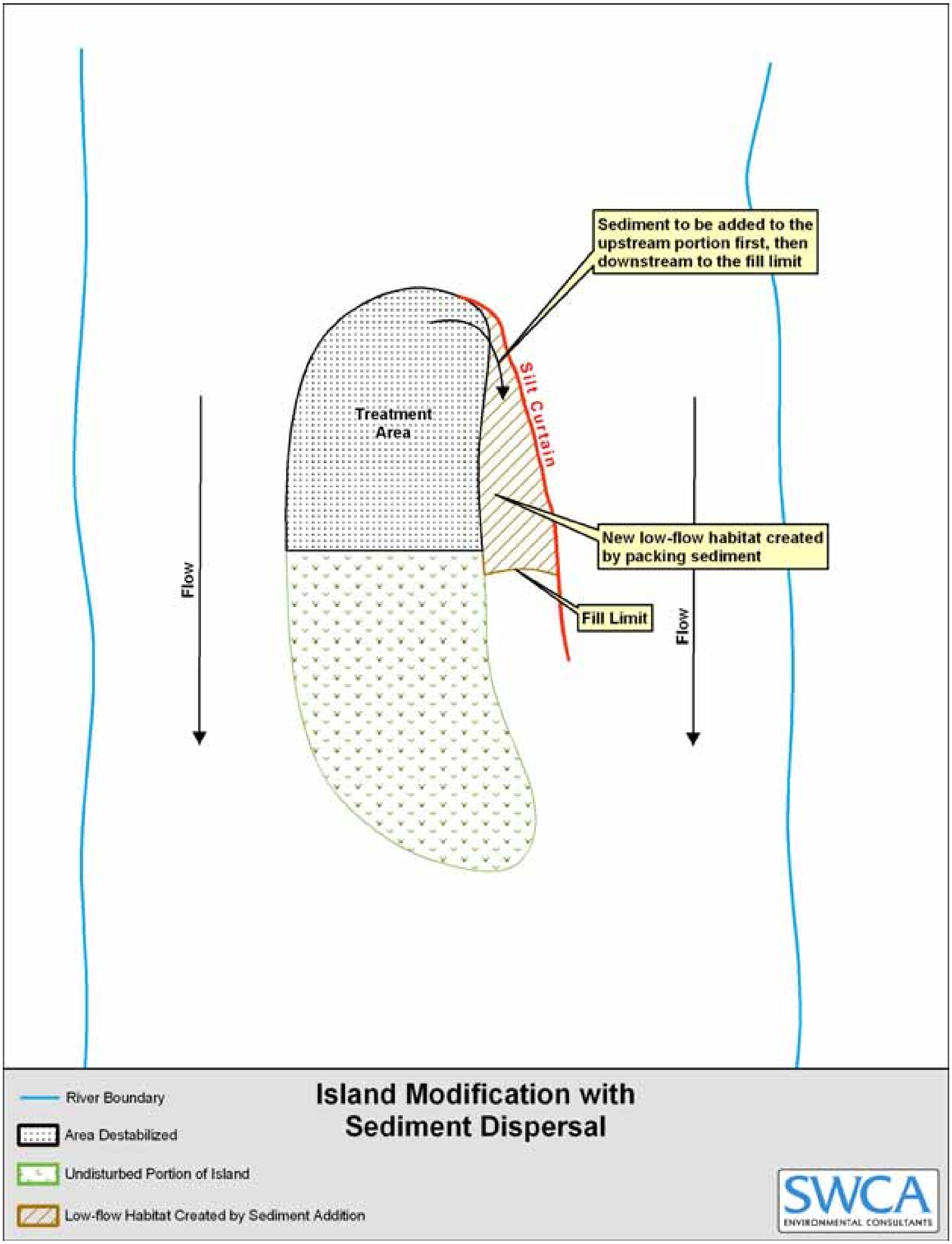

Figure 2.7. Island/Bar modification illustrating sediment dispersal through the creation of low-flow shelves.

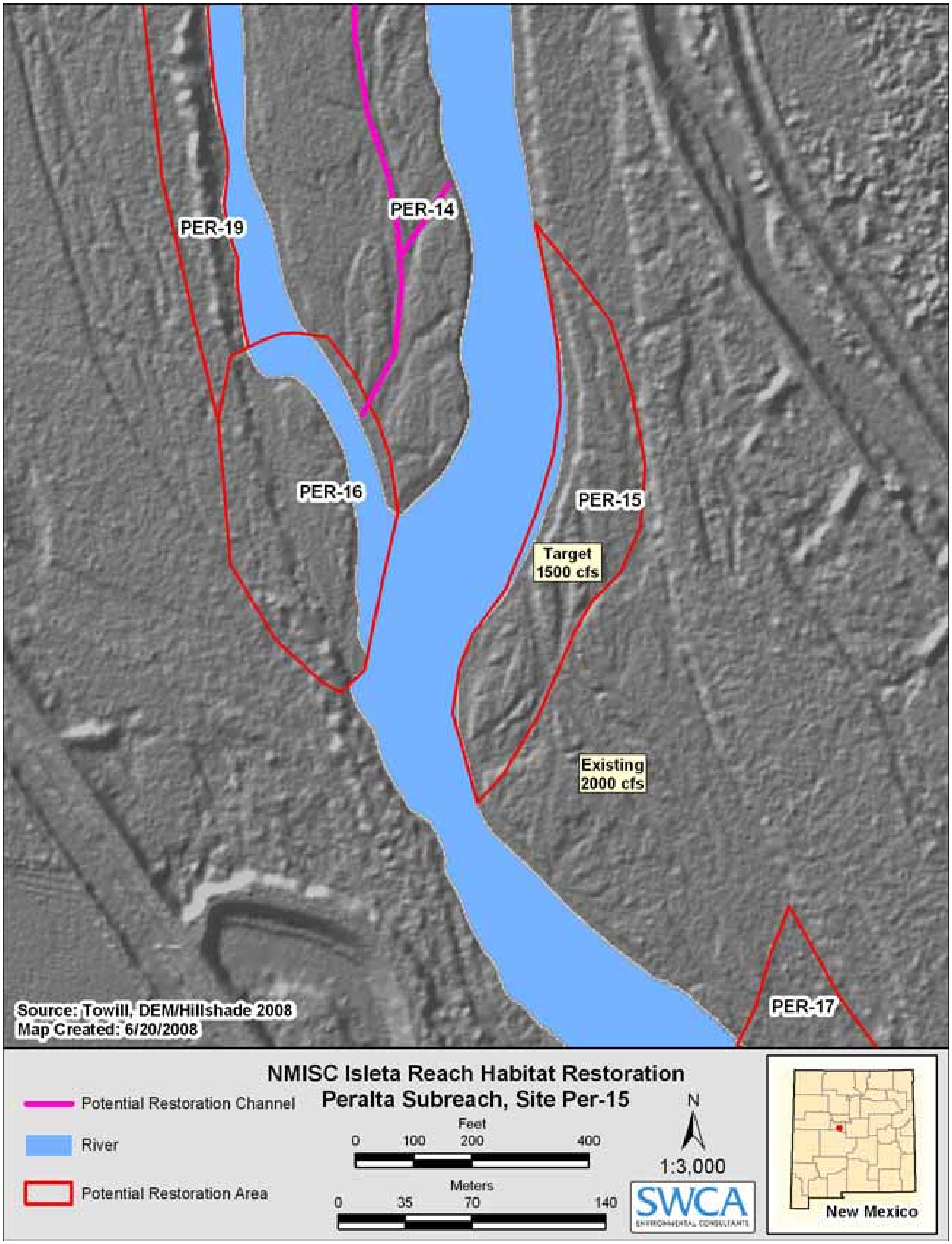

Figure 2.8. Island/Bar modification example.

Treatment 5: Large Woody Debris

Large woody debris (LWD) has been identified as suitable habitat for the silvery minnow (USFWS 2003). Prior to the 1930s, conditions in the MRG naturally provided large quantities of LWD to the channel as stream banks eroded and the river routinely migrated laterally across the floodplain, removing and transporting LWD from the riparian zone. River channel stabilization and the reduction in overbank flow have effectively reduced the amount of LWD available in the river channel.

The placement of LWD is a technique that involves setting root wads, trees, and large branches in the main river channel or near the banks to create diverse aquatic habitats (Figure 2.9). LWD will be unanchored and placed on or near the riverbank or on islands and bars likely to be transported as flows increase. LWD may be placed in high-density, location-specific areas associated with backwaters and embayments to create scour flows, which could help prevent sedimentation on these features and increase project longevity. The NMISC is coordinating with the MRGCD to obtain large cottonwoods that were killed as a result of the Belen fire.

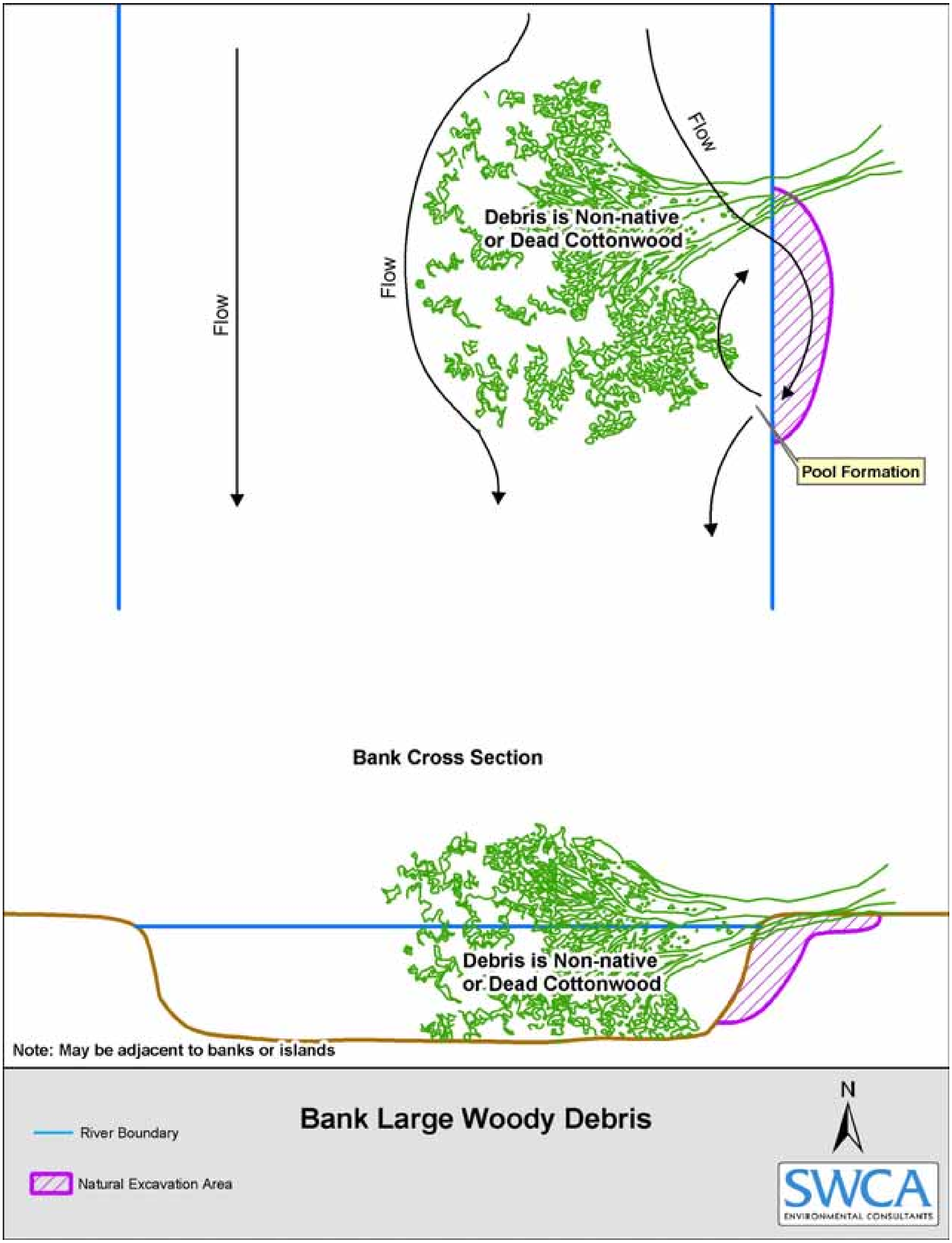

Figure 2.9. Large woody debris schematic.

Treatment 6: Remove Lateral Constraints

Lateral constraints, such as jetty jacks and the densely vegetated natural levees that form around them, decrease the potential for lateral migration of the channel and natural bank erosion processes, ultimately creating a narrower, more linear, and deeper river channel. Removal of jetty jacks would allow for the subsequent removal of the associated natural levees, thus increasing the connectivity between the river channel and floodplain. This, in turn, may allow for natural river processes to create wider and more diverse channel and floodplain features, yielding increased low-velocity habitat for all life stages of the silvery minnow.

Removal of bankline jetty jacks running parallel to the channel are proposed in select locations associated with the creation of bankline benches and embayments cut into the bank and adjacent floodplain. Jetty jack removal is proposed only in areas where levees would not be put at risk or where river control activities would not be affected. Tie-back jetty jacks or those that run perpendicular to the river channel are not proposed for removal as part of the project.

The bankline jetty jacks would be removed by an amphibious excavator and placed on the adjacent floodplain or bosque, then appropriately removed from the bosque shortly thereafter via designated access routes. Remaining jetty jacks would be tied together with cable looped through the end jetty jacks and secured with cable clamps. Approval from the USACE, Reclamation, and the MRGCD would be obtained prior to removal of jetty jacks. The NMISC has initiated a conversation with the three action agencies concerning jetty jack removal as part of the project, and a consensus agreement would be reached before any action is taken concerning this treatment.

Treatment 7: Floodplain Vegetation Management

The MRGCD has developed a site restoration design for the post-burn riparian site of approximately 100 acres (40 hectares) that would incorporate ecologically based passive and active restoration techniques to create a more resilient, sustainable, and fire-resistant landscape. The goal is for native trees, shrubs, and herbaceous vegetation to cover 80% of the site in a patchwork mosaic of differing ages and sizes to increase overall habitat diversity and availability for wildlife, including endangered and sensitive species, such as the flycatcher**.** Proposed activities include active revegetation, management and control of non-native species, preservation of mature native trees and dead snags, and the creation and maintenance of fuel breaks. All vegetative treatments and plantings would be performed in the dry. Active revegetation involves planting species representative of riparian gallery forests in the MRG. Dominant species include cottonwood, Goodding's willow (*Salix gooddingii*), and coyote willow (*Salix exigua*). A number of riparian shrubs, such as New Mexico olive (*Forestiera pubescens*), skunkbush sumac (*Rhus trilobata*), false indigobush (*Amorpha fruticosa*), and seepwillow (*Baccharis salicifolia*) may be planted to increase diversity. Ground layer plantings may be focused on restoring and enhancing existing wetlands. Control of non-native species (e.g., saltcedar, Russian olive) would be accomplished through herbicide treatments. All herbicides would be applied according to the label and would be mixed within contained system to minimize spills and flows onto the ground. Application of herbicides would be conducted in such a manner to minimize runoff from the stem and flows onto the ground. Herbicides would not be applied when winds exceed 15 miles per hour or when rain is forecasted for the local area within 12 hours of application.

Mature cottonwood and tree willow species would be preserved as well as a number of dead snags to create structural diversity and wildlife habitat. Finally, open areas with native grasses and yerba mansa (*Anemopsis californica*) would be maintained as open areas to create and maintain fuel breaks. Existing depressions would be enhanced (5–10 acres [2–4 hectares]) to support the natural regeneration of cottonwoods, willow species, and herbaceous wetlands. A minimum of 5 of the 10 acres (2 of the 4 hectares) would be planted as willow swales. Swales would be excavated with rows approximately 8 feet (2.4 m) apart with one willow stem planted every 4 feet (1.2 m). Swales would have roughly 1,000 willow stems per acre and would be located in areas with a maximum depth to groundwater of less than 4 feet (1.2 m) and located in proximity to the river channel. All floodplain vegetation management activities would be scheduled between September 1 and April 15 to avoid impacts to nesting birds. A summary of proposed treatments follows:

1. Plant approximately 15 acres (6 hectares) of native trees and shrubs per the restoration plan. Ten acres (4 hectares) would be planted at a density of 50 shrubs/trees per acre, and 5 acres (2 hectares) would be planted at 100 shrubs/trees per acre.
2. Remove and control non-native plants to achieve goals for native plant cover, leaving selected non-native trees and shrubs for habitat until native trees provide adequate structure for wildlife (100 acres [40 hectares]). The proposed treatment is a continuation of a program implemented by the MRGCD to control non-native phreatophytes following the Belen fire. The MRGCD would use tryclopyr (Garlon 4) applied as basal bark or cut stump treatments. Treatment involves treating cut stems (3–8 inches [8–20 cm] in height) with an herbicide solution consisting of 35% Garlon 4 and 65% vegetable oil with a blue marker dye. Herbicide application would not take place when winds exceed 15 miles per hour or when rain is forecasted for the local area within 12 hours of application. Care would be taken when mixing or applying to avoid runoff onto the ground; careful application is required due to the high toxicity to fish.

   The herbicide application protocols were developed in collaboration with the New Mexico non-native phreatophyte control program and are based on the MRGCD's and others' experience and research within the MRG. The recommendations are consistent with New Mexico State University (NMSU) Saltcedar Information recommendations (NMSU 2008). These recommendations include a 50:50 volume/volume (v/v) ratio for basal bark treatments and ratios from 33:67 v/v to 50:50 v/v ratios for cut stump treatments using Garlon 4.

   Cut stump and basal bark application treatments are applied at low pressures and typically close to the ground. The low pressure applications result in larger droplet sizes that are less likely to present safety concerns for applicators and are less susceptible to drift to non-target species. Therefore, applications at the recommended wind speeds are warranted to enable completion of the project within the time frames allowed.

3. Preserve mature native trees, remove dead trees and excess dead-and-downed wood, and retain at least three snags and dead-and-downed logs >12 inches (30.5 cm) in diameter per acre for wildlife (100 acres [40 hectares]).
4. Create and maintain fuel breaks with more open and sparse canopies in existing stands of native grasses and forbs (currently dominated by yerba mansa and saltgrass [*distichlis spicata*]) on the site per the restoration plan (25–30 acres [10–12 hectares]).

Treatment 8: Bosque Inundation

The goals of the bosque inundation technique are to maintain or restore the hydrologic connectivity of the floodplain to the river and provide additional low-flow habitat for the silvery minnow during peak runoff events associated with the spring runoff pulse. Based on the 25-day exceedance goal, the target discharge is 3,000 to 3,500 cfs.

Inundation would be achieved through creating an inlet channel. The inlet channel would be cut through the natural bankline levee, directing water into the floodplain. Abandoned flow channels and other paths of least resistance located in the floodplain would be utilized in bringing the water to the desired location. The inundation channel would be graded to direct the flow of water away from the levee and to minimize the entrapment of silvery minnow. A backwater in the Willie Chavez site would be graded from the river channel to the inundation channel and serve as the desired location for bosque inundation. The backwater is intended to drain the area and minimize silvery minnow entrapment, while serving as slackwater habitat.

Treatment 9: Passive Restoration

Passive restoration can include both curtailing human actions that have a negative impact on the river and removing installations that were part of earlier efforts to stabilize the channel and that have interfered with the river’s natural flow. It is anticipated that passive restoration would be accomplished throughout the entire project area. Passive restoration encourages the river to shape itself through natural riverine processes, such as the transport of sediment during flood events or the scouring of riverbanks, without human intervention. The passive restoration techniques considered herein would not cause a major shift in present river management practices, but would instead utilize current management trends to help restore natural riverine processes within the MRG.

2.3.3 NO ACTION ALTERNATIVE

The No Action Alternative assumes that no anthropogenic changes would be made to islands, bars, riparian environments, or the riverine habitats available to the silvery minnow in the Isleta Reach at the proposed project locations. Current river operations, as well as trends in riverine habitat quality and quantity, with the exception of other habitat restoration projects in the reach, would remain dominant under the No Action Alternative.

2.4 PREFERRED ALTERNATIVE

The Preferred Alternative is the Action Alternative, which implements the restoration techniques summarized in Table 2.3 and Table 2.4 with the goal of enhancing, restoring, and/or creating riparian and riverine areas. These areas would provide aquatic habitat for the benefit of the silvery minnow in the Isleta Reach of the MRG. Approximately 44 acres (18 hectares) of islands and riverbank would be modified to create slackwater mesohabitat features to increase the spawning and larval fish habitat and refugial pools within the Peralta and LP1DR subreaches. Additionally, the creation of the bosque inundation channel within the LP1DR Subreach would be designed to increase the frequency of overbank inundation on 11.59 acres (4.7 hectares) of floodplain. While many of the proposed restoration treatments are designed primarily to enhance silvery minnow habitat, it is expected that the bosque inundation channels would also promote riparian functionality and interconnectedness and provide the conditions that would encourage the development of flycatcher habitat. The frequency of overbank inundation would occur during periods of above base-flow discharge. The overbank areas would not remain flooded for significant periods of time but would result in residual habitat improvements and nursery habitat. Maps indicating proposed restoration sites and the results of the HEC-RAS and FLO-2D modeling can be found in Appendix B. Photographs of some of the Proposed Action areas within the two selected subreaches are provided in Appendix C. The NMISC and MRGCD would conduct post-construction monitoring, including geomorphic, fisheries, bird, and vegetation monitoring as part of an adaptive management plan. As part of that plan, a course of action would be created for any site that is at risk of no longer meeting the project's objective. Monitoring results would also be used to inform future habitat restoration project in the Isleta Reach.

Floodplain vegetation management, implemented by the MRGCD, would enhance the habitat riparian communities, including flycatcher habitat within the floodplain in the LP1DR Subreach. Restored willow-dominated riparian communities would enhance existing wetlands and the proposed bosque inundation channel. Native riparian trees, such as cottonwood and Goodding's willow, would be planted to restore areas of the bosque that were damaged by the fire. Non-native phreatophytes, such as saltcedar and Russian olive, would be removed. Floodplain management restoration treatments (Table 2.5) would treat approximately 100 acres (40 hectares) of riparian habitat within the LP1DR Subreach. Table 2.3 through Table 2.6 summarize the proposed restoration treatments.

Table 2.3. Peralta Subreach Proposed Sites and Treatment

Restoration Site	Location	Existing Inundation Discharge (cfs)	Restoration Treatment	Target Inundation Discharge (cfs)	Area (acres)
Per-04		4000	Backwater / Embayment	1500 – 2500	1.16
Per-06	Peralta B2	5286	Backwater / Embayment	2500	0.94
Per-07	Peralta B3	2715	Backwater / Embayment	1500	3.29
Per-08	Peralta I5	3948	Backwater / Embayment	1500 – 2500	1.61
Per-10	Peralta I7	2694	Backwater / Embayment	1500	1.12
Per-12	Peralta B4	2231	Backwater / Embayment	1500	1.15
Per-16	Peralta I10	2456	Backwater / Embayment	1500	3.17
Per-17	Peralta B5	2084	Backwater / Embayment	1500	1.04
Per-13	Peralta I9	2517	Backwater / Embayment	1500	0.69
				Backwater / Embayment Total	**14.17**
Per-01	Peralta I2	4500	Bankline Benches	2500 – 3500	0.43
Per-03		4000	Bankline Benches	1500 – 2500	0.87
Per-09		4000 – 4500	Bankline Benches	2500 – 3500	0.73
Per-11		4500	Bankline Benches	1500 – 2500	0.31
Per-18		4000 – 4500	Bankline Benches	1500 – 2500	0.36
Per-19	Peralta I9	4500	Bankline Benches	1500 – 2500	6.03
				Bankline Benches Total	**8.73**
Per-14	Peralta I9	2517	Ephemeral Channels	1500	1.40
				Ephemeral Channels Total	**1.40**
Per-02	Peralta I2	3726	Island Modification	2500	0.82
Per-05	Peralta B2	5286	Island Modification	2500	1.30
Per-15	Peralta B5	2084	Island Modification	1500	2.87
				Island Modification Total	**4.99**
				PERALTA SUBREACH TOTAL	**29.29**

Table 2.4. LP1DR Subreach and Willie Chavez Proposed Sites and Treatment

Restoration Site	Location	Existing Inundation Discharge (cfs)	Restoration Treatment	Target Inundation Discharge (cfs)	Area (acres)
LP1-06	LP1 I7	3796	Backwater / Embayment	1500 – 2500	1.64
LP1-08	LP1 B5	2084 – 4500	Backwater / Embayment	2000 – 2500	2.69
LP1-04	LP1 I7	3796	Backwater / Embayment	1500 – 2500	2.99
LP1-07	LP1 B5	2084	Backwater / Embayment	1500	1.13
				Backwater / Embayment Total	**8.45**
LP1-01		4500	Bankline Benches	2500 – 3000	1.79
LP1-03	LP1 B2	3926	Bankline Benches	2500	1.82
LP1-09	LP1 B5	2084	Bankline Benches	2000	0.54
LP1-10		>5000	Bankline Benches	3500	0.55
				Bankline Benches Total	**4.70**
LP1-02	LP1 B2	3926	Ephemeral Channels	1500 – 2500	0.21
LP1-05	LP1 I7	3796	Ephemeral Channels	1500 – 2500	1.42
				Ephemeral Channels Total	**1.63**
Bosque Inundation	LP1DR Subreach	4500	Inundation Channel	3000 – 3500	4.41
Bosque Inundation	LP1DR Subreach	4000	Backwater	2500 – 3500	7.18
				Willie Chavez Total	**11.59**
				LP1DR SUBREACH TOTAL	**26.37**
				GRAND TOTAL – PERALTA AND LP1DR SUBREACHES	**55.66**

Table 2.5. Floodplain Vegetation Management Treatments

Restoration Site	Location	Restoration Treatment	Area (acres)	Description
Willie Chavez	LP1DR Subreach	Willow swales	5	Constructed in burned area, minimal native vegetation
Willie Chavez	LP1DR Subreach	Native shrub revegetation	15	Revegetate burned area
Willie Chavez	LP1DR Subreach	Cottonwood	15	Revegetate burned area
Willie Chavez	LP1DR Subreach	Non-native control	100	Ongoing, annual maintenance
Willie Chavez	LP1DR Subreach	Preserve mature trees/snags	50	Ongoing, annual maintenance
Willie Chavez	LP1DR Subreach	Fuel breaks	25–30	Maintain open areas with native grasses and yerba mansa through control of woody vegetation

Table 2.6. Isleta Restoration Technique Treatment Areas, by Subreach

Restoration Treatment	Isleta Reach Phase 1				Total Acres by Restoration Treatment
	Peralta		LP1DR		
	Area (acres)	# Sites	Area (acres)	# Sites	
Riverine Treatments					
Bankline Benches	8.72	6	4.70	4	13.42
Ephemeral Channels	1.40	1	1.63	2	3.03
Backwater/Embayments	14.18	9	8.44	4	22.62
Island/Bar Modification	5.00	3	0.00	0	5.00
Large Woody Debris	TBD	0	TBD	0	TBD
Removal of Lateral Confinements	TBD	0	TBD	0	TBD
Estimated Subtotal Riverine	**29.30**	**19**	**14.77**	**10**	**44.07**
Bosque Inundation					
Bosque Inundation Channels	0.00	0	4.41	1	4.41
Bosque Inundation Backwater	0.00	0	7.18	1	7.18
Estimated Subtotal Bosque Inundation	0.00	**0**	11.59	**2**	**11.59**
Estimated Total by Subreach	**29.30**	**19**	**26.36**	**12**	**55.66**
Floodplain Vegetation Management					
Willow Swales	NA	NA	5.00	TBD	5.00
Native Shrub Revegetation	NA	NA	15.00	TBD	5.00
Native Tree Replanting	NA	NA	15.00	TBD	15.00
Non-Native Species Control	NA	NA	100.00	Entire Area	100.00
Preserve Mature Trees/Snags	NA	NA	50.00	TBD	50.00
Maintain Fuel Breaks	NA	NA	25.00	TBD	25.00
Estimated Total Vegetation Mgmt			**100.00**		**100.00**