Acknowledgments

The Boise Parks and Recreation Department invited representatives of interest groups, agencies, private property and water rights holders to participate in the steering committee for the Boise River Resource Management and Master Plan project. The steering committee reflects the broad interests of the public. Its members identified issues, examined management choices, made policy choices and recommendations which will affect the Greenbelt path, the Boise River environment and future recreational opportunities.

Steering committee members volunteered many hours to come to working meetings, to participate in a field trip along the Boise River, to participate at public meetings and to share their expertise of and feelings for the river and Greenbelt. The Board of Parks and Recreation Commissioners appointed Tom Governale to the steering committee as the Department staff person responsible for the plan.

Steering Committee Members

Charlie Tillinghast	Commissioner, Board of Parks and Recreation
Donna Griffin	Ada County Parks and Waterways
Paul Collins	Recreational boater - Kayaker
Jack McLeod	Flood District #10; Boise River 2000
Lee Sisco	Water District #63; Boise River 2000
Marti Bridges	Idaho Rivers United; Boise River 2000
Andy Brunelle	Trout Unlimited
Dale Allen	Idaho Department of Fish and Game
Todd Littlefield	Boise Police Department Bicycle Patrol
Lan Smith	Boise Fire Department
Steve Sweet	Quadrant Consulting
Tom Chelstrom	Manager, REI; Recreational Boater – Canoeist
Millie Davis	Harris Ranch Property Owner
Chuck Mickelson	Boise Public Works Department
Lori Graves	Idaho Department of Water Resources
Ellen Berggren, Succeeded by Dave Greegor	Idaho Department of Water Resources Board
Hal Simmons	Boise City Planning Department
Randy Deardon	Garden City Director of Public Works
Billy Ray Strite	BRS Architects, Developer

RESOLUTION 15743

BY THE COUNCIL: **BAKER, FORNEY, HAUSRATH, MAPP, TERTELING AND WETHERELL**

A RESOLUTION APPROVING AND ADOPTING THE BOISE RIVER RESOURCE MANAGEMENT AND MASTER PLAN AS PRESENTED BY THE BOISE CITY PARKS AND RECREATION DEPARTMENT AND CITIZEN STEERING COMMITTEE AND RECOMMENDED BY THE BOISE BOARD OF PARK AND RECREATION COMMISSIONERS ON BEHALF OF BOISE CITY AND PROVIDING AN EFFECTIVE DATE.

NOW THEREFORE, BE IT RESOLVED BY THE MAYOR AND COUNCIL OF THE CITY OF BOISE CITY, IDAHO:

Section 1. That the BOISE RIVER RESOURCE MANAGEMENT AND MASTER PLAN, a copy of which is attached hereto as Exhibit "A" and incorporated herein by reference, be, and the same is hereby, approved as to both form and content.

Section 2. That the BOISE RIVER RESOURCE MANAGEMENT AND MASTER PLAN is hereby adopted by Boise City.

Section 3. That this Resolution shall be in full force and effect immediately upon its adoption and approval.

ADOPTED by the Council of the City of Boise City, Idaho, this 14th day of December, 19 99.

APPROVED by the Mayor of the City of Boise City, this 14th day of December, 19 99.

ATTEST:

CITY CLERK

APPROVED:

MAYOR

H:\WP\PARKS\99~Resos\boise river resource mgnt & master plan. res.wp

interoffice MEMORANDUM

DATE: December 2, 1999

TO: Boise City Council & Mayor Coles

FROM: Tom Governale, Superintendent of Resources T.G.
Boise Parks & Recreation Department

SUBJ: Boise River Resource Management & Master Plan

ACTION REQUESTED

The Board of Park & Recreation Commissioners respectfully request the following actions of the City Council and Mayor:

1. Adopt by resolution the Boise River Resource Management & Master Plan.

2. That the following addendum be approved and added to the Boise River Management & Master Plan:

   "That a 12 (twelve) month user survey be funded and begun in December 1999 to determine the relationship and impact of recreational use, wintering bald eagles and other wildlife on each other and request that a broad based task force be created to review survey results to evaluate the impact of recreational use on bald eagles and other wildlife in appropriate sections of the greenbelt path system, and propose quarterly reports and final recommendations to the Board of Parks & Recreation Commissioners".

NOTE: The addendum was created by the Board of Park & Recreation Commissioners during their review and endorsement of the plan at their November 18, 1999 Commission meeting.

If Council approves the addendum, staff recommends that funding for the user survey be considered from year-end savings.

SUBJECT DATA

The Boise City Comprehensive Park & Recreation System Plan, adopted in 1993, recommends that a Boise river front plan be completed. On January 13, 1999 the Board of Boise City Parks &

Recreation Commissioners appointed 19 individuals representing various users organizations, interest groups, private citizens and related agencies to a steering committee to assist staff with developing a River Resource Management & Master Plan. In addition to a citizens steering committee, staff retained the services of a consultant, Spatial Dynamics, to assist with the plan development. The physical boundaries of the plan are the river and the river greenbelt setback that extends through Boise City and its Area of Impact - more specifically from Barber Dam downstream to 1/4 mile east of the Gleenwood St. bridge (approximately 10 miles). **The primary goal of the plan is to protect and enhance public safety, health and resource preservation associated with recreational use of the river and its riparian area. In addition, the plan provides policies and a master plan that promotes sustainable recreational use and enjoyment of the river. The major elements of the plan deal with public safety, recreation, wildlife & vegetation, river bank stabilization & hydrology, water quality and land mitigation. The plan was developed with respect to the continued use and economic viability of the river's resources and existing water uses and rights - i.e. water rights of irrigators, flood control districts, community values and protection of property rights.**

The Steering Committee met nine times to discuss and develop policy and technical issues and recommendations. Two public meetings were conducted during the plan development process - one early in the process to gain general input on public perception and values about the river and one after the final draft was developed for public reaction. The plan is divided into three major sections; Policy & Technical Recommendation (see pages 11- 37); Master Plan for the River Corridor (see pages38-59); and a River Channel Assessment Report(see page 73). In addition, a Policy Implementation Matrix (see page 60)and a Site Improvement Matrix (see page 63) outlining priorities based on specific criteria was developed.

PUBLIC COMMENTS

Attached is a summary of written public comments received from the Nov. 3 public comment meeting. Approximately 20 people attended the meeting. With the exception of land use and bald eagle comments, staff believe that all other comments are addressed in the plan. Comments regarding land use issues are addressed in the Boise River System Ordinance and through other Planning & Zoning regulations and are outside the scope of this plan. I believe that the one comment regarding bald eagle habitat is addressed through riparian enhancement recommendations. Also attached is a letter from the Golden Eagle Audubon Society commenting on the plan.

A matter that was not addressed in the plan that received verbal comment by two individuals during the public meeting and the attached Audubon letter, is that of bald eagles and trail closures. Specifically, should certain portions of the Greenbelt path known to host eagle perch trees be closed to use during the wintering bald eagle season of December 15 - February 15. A

Wintering Bald Eagle study was developed in 1994. The study addressed the needs of wintering bald eagles and the potential impacts of people and urbanization on the eagles. There is a policy statement in the City Comprehensive Plan encouraging the implementation of the study to ensure a population of wintering eagles in Boise. The Boise River Greenbelt & Pathways Committee evaluated and debated the matter of closing certain sections of the path during the wintering bald eagle season and recommended that the path not be closed. During their review of the River Resource Management & Master Plan on November 18, 1999, the Board of Parks & Recreation Commissioners heard public comment and discussed the relationship of the Bald Eagle study to the River Management Plan and recommended the afore noted addendum to the plan that includes additional study regarding the relationship of river and Greenblet use on wintering eagles and vice versa. More specifically, that a 12 month river and pathway use survey, consistent with the river plan recommendation, begin in December and be used to assist with determining the impact and relationship of users and bald eagles on one another; and that a broad based task force be created to review the survey results to evaluate the impact of recreational use on bald eagles and other wildlife in appropriate sections of the greenbelt path system.

In addition to the November 18th Commission hearing, staff met with a representative of the Audubon Society and reviewed each comment in their letter. The Audubon Society appears comfortable and is supportive of the plan after discussing their comments with staff and with the plan addendum recommended by the Parks & Recreation Commission.

I anticipate that several members of the Steering Committee, and possibly a representative of the Audubon Society will be present at the Pre-Council meeting on December 7 to express their support of the plan.

cc: James R. Hall, Director, Parks & Recreation
Boise River Resource Management & Master Plan Steering Committee
Board of Parks & Recreation Commissioners

TG\WP\

Table of Contents

Executive Summary

Introduction

The Boise River, a sparkling ribbon of water through the City of Boise, offers a multitude of values to city residents, people who live in the Treasure Valley and visitors from near and far. The Boise River Greenbelt has become a local and national symbol of Boise and its high quality of life and recreational opportunities. On hot summer weekends, the Boise River carries thousands of people on tubes and rafts from Ada County's Barber Park to Boise's Ann Morrison Park. Kayakers of varying abilities find play waves at different river flow levels. Canoeists are promoting a canoe trail from below Lucky Peak Dam to the Snake River. Fishermen can be found perched on the banks or wading the river much of the year.

The Boise River Greenbelt path, which is parallel to the river for many miles, offers active recreational opportunities including bicycling, jogging, in-line skating and walking. Quieter activities include observing birds and wildlife or sitting on a bench and reading a book. The Greenbelt path links current and future riverside parks which make the river corridor accessible to the public for most of its length through the City of Boise. The narrow band of riparian vegetation provides habitat for many birds and small animals. And, it provides a more natural environment in the middle of the city. Together, the river and the Greenbelt are the recreational centerpiece for the city and the entire valley.

The Boise River Greenbelt is a working river, providing seasonal flow regulation for flood control, reservoir recreation, municipal and industrial water. Also, stored irrigation water is delivered to thousands of acres of farmland throughout the valley from reservoirs higher in the watershed. River flows are regulated by the water demands of irrigators, some far from the river corridor through Boise.

Why is the plan needed?

Planning and implementation of the Boise River Greenbelt was begun 30 years ago. For its first three decades, adding to the Greenbelt was the primary focus. Now, most of the path through the City of Boise has been completed and the focus is shifting to future management and sustaining the resources which attract people to the river corridor.

In 1993, the Comprehensive Park and Recreation System Plan was adopted by the Boise City Council and it became part of the city's comprehensive plan. A survey, public workshops and contacts with various user groups revealed that the Boise Greenbelt is the most popular recreation area in Boise. The Comprehensive Plan recognized that "no one agency has assumed the recreation management, maintenance and program responsibility for uses in and along the river." (Comp. Plan VII-54)

Two major recommendations were made in the Comprehensive Plan regarding the Boise River through the city.

- The Boise Parks and Recreation Department should assume the leadership and coordinating role for the Boise riverfront and the adjoining riparian area.
- A Boise riverfront plan should be completed and should address issues including:
  - -Additional recreation uses along the shoreline
  - -Development setbacks from the river
  - -Management of the riparian areas along the river
  - -Safety and use in and along the river
  - -Access to the river (types and locations)
  - -Lighting and other design features
  - -Environmental issues
  - -Signage, educational and interpretive issues
  - -Future river crossings
  - -Vegetation setbacks along the Greenbelt

This planning effort addressed many of the issues outlined in the Comprehensive Plan and this process brought together a committee of various people from throughout the community to discuss and provide guidance on ways the Parks and Recreation Department should approach river corridor management in the future. The public has had opportunities to review information gathered in the process and to present other ideas or concerns which may not have been included in those addressed by the steering committee, Department staff or consultants working on the project.

What are the goals of the plan?

The Boise Parks and Recreation Department assumed leadership for the Boise riverfront and initiated a planning process early in 1999. The priority goal established for the plan is to protect and enhance public safety, health and resource preservation associated with recreational use of the river and its riparian area. The secondary goal of the plan is to provide policies which promote sustainable recreational use and enjoyment of the river.

This document includes the resource management and master plan and policy recommendations for the Boise River from Barber Park to the city limits near Glenwood Bridge. This part of the river flows through Ada County, Boise City and Garden City. The stretch of river and Greenbelt through Garden City was not excluded, but was studied in less depth. As with many planning processes, there was progress toward completing a management approach. However, in the process, many other information needs were identified and questions raised which may generate future specific studies, plans and designs.

Another goal is for the plan to provide guidance for daily operations and policy actions which will accomplish the goals listed earlier. The final plan will be presented to the Board of Parks and Recreation and then to the Boise City Council for adoption and

incorporation into the city's comprehensive plan. The recommendations and site-specific implementation actions will provide the basis for Department planning and budget requests. Some recommendations ask for actions from other City departments and agencies.

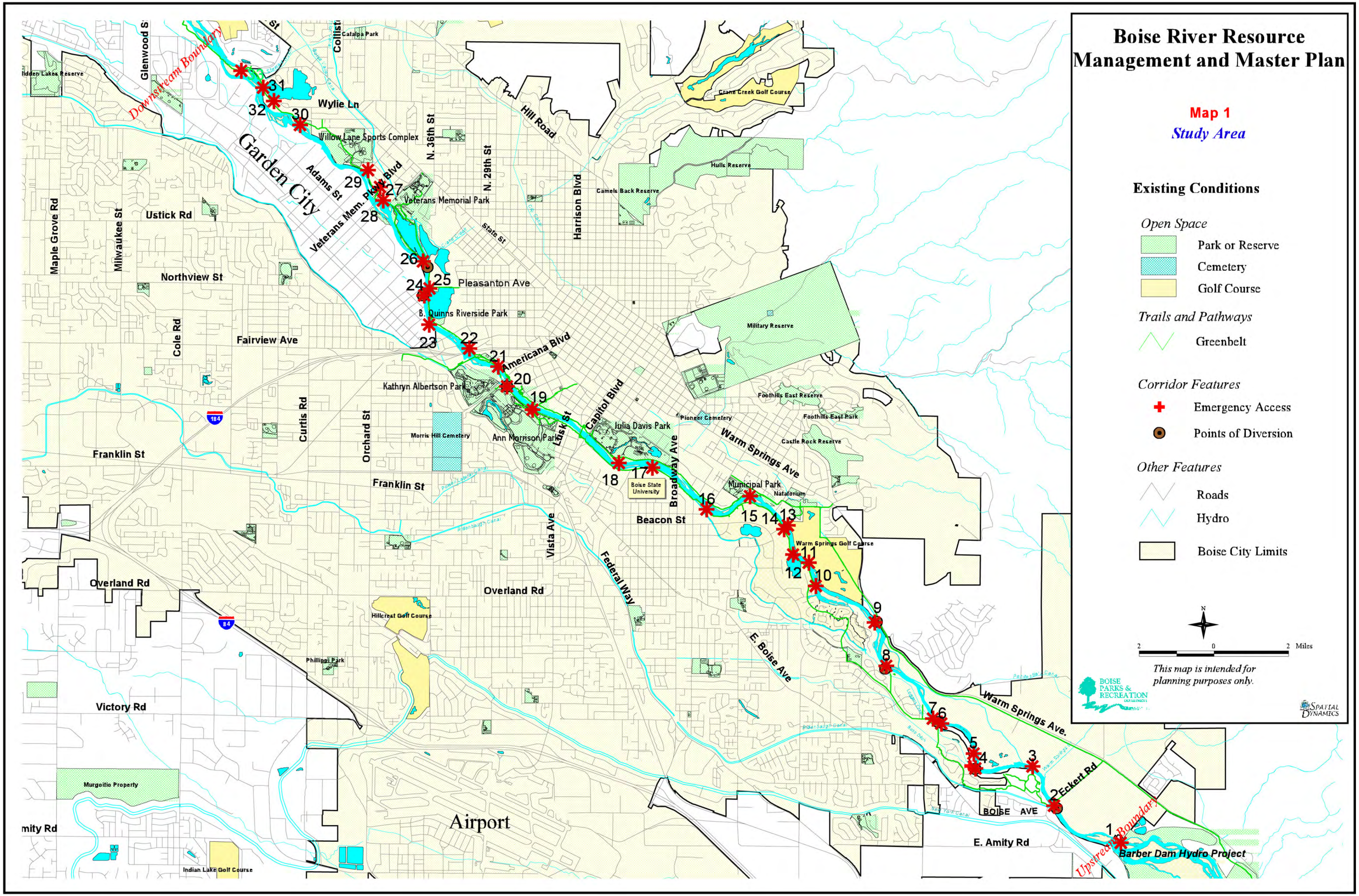
How was the plan developed?

Boise Parks and Recreation Department staff assembled the steering committee, identified the planning area, the river corridor through the City of Boise and its Area of Impact, and some of the initial management challenges to be addressed in the plan. The planning area (see Map 1) extends from Barber Dam to the city limits upstream of Glenwood Bridge, approximately 10 river miles. The planning area on either side of the river includes city parks, the Greenbelt and path and a 70-foot setback from the 6,500 cfs (cubic feet per second) line which may or may not include the entire Greenbelt. The 6,500 cfs measurement is taken from the gauge at Glenwood Bridge and is considered bank full for water management purposes.

Consultants gathered the physical and technical information required for the plan while the steering committee of volunteers tackled policy and management questions about the river front. The broad-based steering committee identified values of the Boise River and threats to those values. They raised questions about current and future management of the river, riparian area, Greenbelt and riverside parks. A number of experts presented information to the steering committee about management or policy topics. Presentations were made by the Boise Fire and Police Departments, an ecologist, a fisheries biologist, and a fluvial geomorphologist. The steering committee discussed options and consequences of making, or not making, some management choices. Their recommendations are incorporated into the plan.

The public had an opportunity to help identify issues at the beginning of the planning process and to review the draft plan. News releases and a display at the Boise Public Library before each public meeting gave information on when and how to participate.

Information about the river and its physical and social environments, was collected by consultants mainly from existing sources such as other city departments, other agencies, existing plans and reports. Some information was collected in the field by Spatial Dynamics employees who toured the study area on bicycles and recorded the location of physical features with a global positioning system (GPS). The locations for many items were collected, some of which are duck nest boxes, volunteer trails along the river, litter hot spots and debris piles in the river. The Boise Parks and Recreation Department staff provided locational information on trash cans and other park features. The complete inventory of information is not presented in the plan. It is contained in data files in the geographic information system maintained by the Parks and Recreation Department.


Boise River Resource Management and Master Plan
Map 1
Study Area
Existing Conditions
Open Space
Park or Reserve
Cemetery
Golf Course
Trails and Pathways
Greenbelt
Corridor Features
Emergency Access
Points of Diversion
Other Features
Roads
Hydro
Boise City Limits
2
0
2 Miles
This map is intended for planning purposes only.
BOISE PARKS & RECREATION
SPATIAL DYNAMICS
Downstream Boundary
Upstream Boundary
Garden City
Airport
Wylie Ln
Willow Lane Sports Complex
Veterans Memorial Park
Veterans Mem. Pkwy
Adams St
Glenwood St
Collister
Catalpa Park
Hidden Lakes Reserve
Hill Road
Crane Creek Golf Course
Hulls Reserve
Camels Back Reserve
Harrison Blvd
N. 36th St
N. 29th St
State St
Ustick Rd
Maple Grove Rd
Milwaukee St
Northview St
Cole Rd
Fairview Ave
Pleasanton Ave
B. Quinns Riverside Park
Americana Blvd
Kathryn Albertson Park
Ann Morrison Park
Morris Hill Cemetery
Military Reserve
Foothills East Reserve
Foothills East Park
Pioneer Cemetery
Castle Rock Reserve
Capitol Blvd
Julia Davis Park
Lusk St
Boise State University
Broadway Ave
Warm Springs Ave
Municipal Park
Natatorium
Warm Springs Golf Course
Curtis Rd
Orchard St
Franklin St
Vista Ave
Beacon St
Federal Way
Overland Rd
Hillcrest Golf Course
Phillippi Park
E. Boise Ave
Victory Rd
Murgoitio Property
Amity Rd
Indian Lake Golf Course
Eckert Rd
BOISE AVE
E. Amity Rd
Barber Dam Hydro Project
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84
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Map 1
Existing Conditions

Agua Tierra Environmental Consulting (ATEC) surveyed the river and Greenbelt both on foot and from the air. Maps, photographs and information prepared by ATEC document river hydrology, river bank conditions, potential problem areas, solutions for bank erosion and an evaluation of the priority of sites for repair.

All field work was completed in spring of 1999 during flows greater than 6,000 cfs. At this flow level, some of the river's characteristics are underwater and not visible. Average flows for April and May usually are about 3,000 cfs. The GPS data points and information from ATEC were entered into a computerized mapping system called a Geographic Information System (GIS). The GIS gives planners the ability to put various types of data together or to call out specific information such as the location of trails through the riparian vegetation. Mary McGown conducted the public open houses, many of the steering committee meetings and wrote the plan.

The information developed during the resource inventory process went to the steering committee and was considered in the recommendations. The information and management issues break down into two major areas of consideration: providing additional public access and recreational opportunities and protecting and enhancing the natural river environment.

The plan, at this scale, does not include recommendations or designs for every foot of the river. It is a general road map or guideline for future management decisions and policies.

What are the major management challenges in the Boise River corridor?

Management challenges fall into two basic categories – institutional and operational. The institutional challenges have to do with land ownership patterns, involvement of numerous jurisdictions and control of the flow levels of the Boise River. Although the Boise Parks and Recreation Department assumes leadership for management of the river corridor in the defined planning area, it does not own or control all the river front land. Ada County and Garden City own portions of the river corridor in the study area. There is private land in the corridor. Within the City of Boise, the Department owns river side parks, the Greenbelt, and has management responsibility for a 70 foot setback from the 6,500 cfs flow line. The patchwork of land ownership and governmental policies and management actions are a challenge in a number of issues which cross property boundaries.

The importance of the 6,500 cfs line emphasizes that the Boise River is a controlled river, with flows regulated by how much water is released from the irrigation storage and flood control dams higher in the watershed. The 6,500 cfs, as measured at the Glenwood Bridge, is considered bank full and localized flooding occurs at higher flows. The U.S. Bureau of Reclamation controls the flows at the dams, with support of the U.S. Corps of Engineers during the flood control period. A flow of 16,600 cfs measured at the Glenwood Bridge is considered a 100 year flood event.

Reservoir regulations are based on forecasts of runoff from snow melt. If above average water is forecasted, storage water from the three reservoirs is released to run the river at channel capacity (6,500 cfs). Releasing this much water provides maximum space in the reservoirs to capture the peak runoff. Forecasts for average and low runoff means water will be released from the reservoirs differently. The storage capabilities of the reservoirs means water can be held over from year to year to supplement what is needed by irrigators and others in drier years.

Water in the storage reservoirs is called for by numerous irrigation districts during the agricultural growing season. The irrigation companies have diversion structures and headgates along the Boise River to divert water from the river into canals, which carry water to fields far from the City. The Bureau of Reclamation operates the dams. The agency strategy is to store water during the winter and spring run off and consequently the Boise River flows are sometimes low enough in the winter to threaten survival of fish and aquatic organisms. The Boise Parks and Recreation Department is responsible for managing the river banks and narrow recreational corridor through the City of Boise, but it does not manage the water in the river.

Many operational management challenges result from the number of people who are attracted to the river corridor to recreate and to build their homes and businesses. The popularity of the Greenbelt and river recreation and the tremendous population growth of Boise and southwest Idaho, which translates into more recreationists, resulted in management challenges for the river and its corridor. The Boise Parks and Recreation Department is beginning a mature management phase of the river corridor and its values and opportunities. Little area remains to be developed along the river, the challenges now are how to maintain the natural values, yet provide the desired closeness to the river and recreational opportunities desired by the public.

Human uses have negatively affected the river and its riparian area. Houses have been built close to the river. Trails have been made through riparian areas, damaging vegetation and river banks. The river banks show effects of trampling and changed hydrology due to channelization. And, litter accumulates along and in the river and at each diversion. Human impacts are inevitable. The plan addresses how impacts may be reduced or managed to prevent continued destruction of the river banks and vegetation and to promote sustainable recreational use and enjoyment of the river.

The management challenges addressed in the plan are categorized into six major topic areas:

1. Public safety
2. Recreation
3. Wildlife and vegetation
4. River bank stabilization, treatment and hydrology
5. Water quality
6. Mitigation program

Some management challenges over lap more than one area. For example, the management of riparian vegetation has safety implications when tall vegetation grows along the Greenbelt path. Extensive discussions of each category and its parts are in the Policy and Technical Recommendations section where background information is included for each management challenge.

What are some recommendations of the plan?

The recommendations range from major policy and fiscal considerations, such as suggesting the Department create a naturalist or ecologist position with stable funding, to daily management actions, such as continuing and expanding the use of "no mow" zones to improve the quality of water which runs off parks and into the river.

The following are a sample of recommendations. All policy decisions are given in the *Policy and Technical Recommendations* section.

Public Safety

- Identify at least one emergency access point between each diversion structure which crosses the river.
- Develop a jointly funded river ranger program to educate people about river safety, to offer first aid, to perform some river rescues and to enforce laws.
- Work with irrigators and recreationists to improve safety at diversions and materials used at diversions.
- Provide lighting along the Greenbelt path from Municipal Park to Americana Boulevard.
- Provide telephones along the Greenbelt path at tuber ports, parks and potentially at bridge crossings.
- Develop a consistent alcohol use policy for the entire river corridor.

Recreation

- Conduct a comprehensive study to identify the types and numbers of users of the Greenbelt path and river corridor.
- Create more restrooms accessible to recreationists on the river.
- Develop one or more tuber ports between Barber and Ann Morrison Parks. A tuber port, which would also serve Greenbelt users, at a minimum will have emergency access, a restroom, telephone and water fountain.
- Work with kayakers to develop a recreational kayak course at the Settler's Canal Diversion at the west end of Ann Morrison Park if this is feasible.
- Create safe portages for boaters and floaters around all diversions between Barber Dam and Glenwood Bridge.
- Close and revegetate volunteer trails where resource damage is occurring. Educate people about the need to let the area heal. Develop some of the trails to provide safe access to the river and to prevent further resource damage.
- Stencil the bike path on the roadway where bicycles are prohibited from the unpaved path.

- Seek cooperative agreements for after hours parking with businesses near the Greenbelt.
- Limit or spread out tubing use.

Wildlife, Fisheries and Riparian Zone

- Create an ecologist or naturalist position within the Parks and Recreation Department.
- Develop a riparian management plan, including an inventory of the riparian area, a native vegetation and wildlife habitat enhancement program, and control of invasive non native plants and noxious weeds.
- Work with other agencies and private organizations to improve fish habitat in the City.
- Establish a working relationship with the U.S. Bureau of Reclamation to influence flow regimes for fish and wildlife and to support minimum flows for fish and wildlife.
- Explore interest in, and potential partners for, an interpretive program along the Boise River.
- Develop some overlooks or surface hardened observation places to direct foot traffic out of riparian areas to places where resource damage will be minimized.

River Bank Stabilization, Treatment and Hydrology

- Protect and restore river banks to meet multiple objectives – bank stability, safety, wildlife habitat.
- Encourage the City of Boise to undertake a comprehensive flood protection study to include the river meander channel.

Water Quality

- The Parks and Recreation Department should continue and improve its programs which contribute to water quality improvements, such as no mow zones, mutt mitts, integrated pest management and storm water management.

Mitigation Program

- The City of Boise should establish a wetlands mitigation program to be administered by the Parks and Recreation Department.

Overview of the Plan

The draft plan reflects several general priorities as well as a number of site specific recommendations and proposed actions. The general priorities, or management philosophies, are tied to certain sections of the river corridor. In several areas, natural values are emphasized. In another area, recreational opportunities receive priority.

From Barber Dam to approximately the west end of the Warm Springs Golf Course, the emphasis is on protecting and enhancing natural values. This emphasis applies to the area from Veterans' Park downstream to the planning area boundary near Glenwood Bridge. The general management emphasis is on enhancing natural values by preventing further resource damage and revegetating riparian areas and river banks with native plant species.

The middle part of the planning area provides the most recreational opportunities and services. From the future Warm Springs Park to the Broadway Avenue Bridge, and from Americana Bridge to Veterans Park there is emphasis on providing and managing access to the river and services for river users and Greenbelt users. One or more developed tuber ports, which would also provide emergency vehicle access, restrooms, and telephones, are recommended between Barber and Ann Morrison Parks. The tuber port services would be convenient to Greenbelt path users too.

The area between Broadway Avenue and Americana Boulevard is referred to as the "core" area. The recreation emphasis is continued here, but in an urban context. The core area is accessible from riverside parks, Boise State University, cultural sites like the Boise Art Museum and Boise Public Library. It is near downtown and is probably the most heavily used section of the Greenbelt path and river.

In the plan, 32 sites are identified where some action is recommended. Many of the 32 sites are analyzed in the *Channel Assessment Report*, which discusses the technical hydrological and rehabilitation attributes of each site. The sites are potential emergency access places, where bank erosion is occurring and should be stemmed, where riparian enhancement and recreational opportunities exist and areas where specific management challenges are identified.

The sites are numbered from upstream to downstream. The site numbers are shown on the three maps which cover the planning area. Each site is discussed in the plan text. An Implementation Guide at the end of the plan summarizes, in two parts, the recommended actions at each site and the recommended policies and sets relative priorities for them. One part, the Implementation Guide, indicates the priorities at each site. The priorities are important for the Department in setting goals and budgets. The other part, the Policy Guide, indicates the priority for enactment and the relative importance of each policy and its feasibility.

Policy and Technical Recommendations

The steering committee and Department staff made recommendations based on information which was mapped, given in presentations and after discussions among steering committee members about the potential effects of management choices and recommendations. The policy and technical recommendations are grouped into the six major management challenge categories.

1. Public Safety
2. Recreation
3. Wildlife and Vegetation
4. River Bank Stabilization, Treatment and Hydrology
5. Water Quality
6. Mitigation Program

Public Safety

Emergency Access Points

The Boise Fire Department would like at least one emergency access point between each diversion structure in the planning area. The Boise Fire Department contracts with the Ada County Sheriff to perform rescues throughout the county. Ideally, the Fire Department would like room to turn around a vehicle pulling a boat at an emergency access place. Currently there are few access points for the Fire Department Dive Team. On the river, the boat is limited in its range by diversion structures which span the river. In recent years, there are more river rescues than any other type of Boise Fire Department rescue.

Public access to the river is not limited, but is not encouraged until flows drop to 1,500 to 1,800 cfs or below. When the river flow approaches that level, Ada County and Boise City parks and safety staff survey the river for hazards to tubers and boaters. When the worst hazards are cleared, and officials agree, the river is declared "open," but never safe for tubing and floating. Ada County and the Idaho Department of Fish and Game are cooperating to install a boat ramp at Barber Park which would provide access for emergency personnel as well as access for stocking fish in the river.

Motorized craft are prohibited from most of the planning area by city and county ordinances. The exceptions are for motorized craft used in performance of their duties by safety and rescue crews and other agencies.

Recommendations

- Identify at least one potential emergency access point between each diversion structure.
- Every tuber port should include river access for emergency vehicles.

- Develop access points for multiple purposes.
- Develop a jointly funded river ranger program to educate people about river safety, offer first aid, perform some river rescues and enforce laws.
- Tie recreational skill levels to flow levels through education and a flow hotline.
- Law enforcement on the river should be done with non motorized craft. Motorized craft should be restricted to rescue and safety operations and other official duties.

Irrigation Diversions and Weirs

From Barber Dam to Glenwood Street Bridge there are eight structures which divert water from the Boise River. Some, such as the Settlers Irrigation District diversion, extend across the river and are hazardous to recreationists on the river. While hazardous to some, the diversions provide a recreational opportunity to experienced kayakers at certain flows. The irrigation structures are privately owned and most still function to deliver water to areas beyond the river. There are a number of issues which would need to be addressed in order to modify any structures. Permission of the owners would need to be granted. There are hazards associated with some of the diversions, including broken concrete, exposed rebar and bank treatments which are hazardous to recreationists. Engineering studies and plans would be required before modification of an irrigation structure. Money would need to be raised for structural changes. Liability questions would need to be answered.

It is recommended that portages be developed as an alternative to structural modifications to diversions. Potential portage routes have been identified by Tom Chelstrom in his guide, *Canoeing the Boise River*. There are potential portage routes around the river obstructions in the planning area. The portage routes are informal. Questions regarding easements or land ownership, signs marking the portages and construction all need to be addressed for Boise Parks and Recreation Department to adopt and manage portages.

Recommendations

- Provide designated portages around all diversions in the study area.
- In partnership with irrigators, recreationists and other agencies, identify and remove hazards associated with diversions, including unsafe materials.
- Investigate liability questions associated with portages on diversions.
- Remove diversion structures which no longer are in use.
- Develop safety guidelines for materials used in the river or on the banks.
- Meet with irrigators on an annual basis to discuss the diversions, and opportunities for maintenance and enhancement which also improve safety and recreational opportunities.

River Debris and Snags

Snags and river debris may be hazardous to recreationists in the river. They also provide fish, wildlife and some aesthetic benefits. The stretch of river where snags need to be

removed for floater safety is the same stretch where snags are needed for fish habitat. Each spring the Boise Fire and Parks and Recreation Departments and Ada County Parks and Ada County Sheriff's Office survey the Boise River between Barber and Ann Morrison Parks to identify the debris piles and snags most dangerous to floaters. Garden City does a similar reconnaissance each spring. Some debris piles and snags are difficult and dangerous to remove.

Recommendations

- Continue to identify dangerous debris and snags to be removed for safety reasons.
- Evaluate snags on a case-by-case basis. Remove the most hazardous snags and debris from the main channel used by tubers between Barber and Ann Morrison Parks.
- Seek a cost-sharing agreement with Ada County for snag removal. Cost sharing may be through use of equipment and personnel.
- Participate with the Idaho Department of Fish and Game and conservation organizations in habitat improvement projects along the river to mitigate for removal of debris and snags, i.e., connecting and rehabilitating side channels, constructing fish habitat.

Lighting and Emergency Phones

The Greenbelt path is used increasingly for transportation and at night by people walking to events at Boise State University or downtown. Several restaurants near the path attract pedestrians in the evening. There have been citizen requests for better lighting of the path in the downtown core area. Lighting increases visibility and safety and it also is a design element. Boise has an ordinance establishing a Downtown Historical Lighting District in which historical light standards are specified. The Greenbelt path between Americana and Capitol Boulevards is in the lighting district. The historical light standards are used in Julia Davis Park. They should be used along the Greenbelt path to the Broadway Bridge to continue the historical theme, though this section of path is not in the Historical Lighting District. Outside the core area, lighting should be chosen which increases visibility and safety, but which limits light pollution.

The director of Parking and Security Services at Boise State University, Robert Seibolt, says there are both positive and negative aspects of providing emergency telephones. BSU has 22 emergency telephones on campus, some along the Greenbelt. Mr. Seibolt reports there are a fair number of prank calls, but the phones have suffered little vandalism. To provide the security, which the phones promise, they must be kept in working order. Every phone on campus is checked twice nightly to assure it is in working order. Sometimes the phones will not work during wet weather. The emergency phones require a tremendous investment of time to assure that they remain in working order.

The Boise Police Department indicated the types of incidents to which police are called vary by location along the Greenbelt, time of year, and other variables.

Recommendations

- Provide lighting along the Greenbelt path from Municipal Park to Americana Boulevard.
- Provide telephones along the Greenbelt path at tuber ports, parks and potentially at bridges. New pay telephones will call 911 without charge.
- Continue to evaluate installing emergency phones as new technology becomes available.

Existing Warning Signs; Reference Point Signs

Persons who recreate on or along the Boise River or who use the Greenbelt path for transportation do so at their own risk. Warning signs on the river may be appropriate for major hazards such as diversions. The Boise Fire Department often has difficulty locating the site of a river emergency because of lack of designated points to which a caller can refer. The fire department recommends having at least one location reference sign per mile.

Recommendations

- Limit the number of warning signs to major hazards and the presence of emergency phones.
- Use river crossings for signs such as location, bridge name.
- Simplify the existing path mileage signs. Replace over time with mileage beginning at the upstream path terminus at Sandy Point and moving downstream.
- There should be a map at each telephone.
- Identify bridges with signs visible from the water.
- Separate sign systems for river and Greenbelt users.

Alcohol use on the Boise River

The Boise Police and Fire Departments report that alcohol is a factor in many incidents to which they respond along the Boise River and Greenbelt path. A subcommittee of the Board of Parks and Recreation Board is studying alcohol use along the Greenbelt and in riverside parks. The Board is starting a process to solicit ideas from the public about alcohol use.

It is difficult to enforce laws regarding alcohol use when people are in the Boise River. Many recreationists enter the river at Barber Park, an Ada County park, which does not restrict the use of alcohol by adult floaters. County park staff and the Ada County Sheriff's Office do not permit glass containers on the river.

Recommendations

- Investigate policies to prohibit alcohol use on the Boise River or allow it by permit only.

- Work with Ada County to devise a policy for alcohol use that will serve both the City's and County's interests.
- Develop a jointly funded river ranger program with Ada County to educate people about river safety, offer first aid, perform some rescues and enforce laws.
- There should be a consistent alcohol use policy for the entire river corridor.

Structures

The deck just downstream of the Americana Bridge was constructed more than 15 years ago in anticipation of the path being completed on the south side of the river. Private property blocks extension of the path. The deck is isolated from the Greenbelt path and parks. The issue is whether the Department should maintain the inaccessible deck or renew efforts to connect the Greenbelt path on the south side of the river between Americana Boulevard and the Charthouse restaurant near the Main Street Bridge.

Recommendations

- Renew efforts to connect the Greenbelt on the south side of the river from Americana Boulevard to the Main Street Bridge.
- Remove the deck and rehabilitate the river bank if the Greenbelt extension does not occur.

Design of Bridges

Two new road bridges are proposed between Eckert Road and Broadway Avenue. The bridge pilings and abutments may be hazardous to river users if not designed appropriately. For example, pilings at an angle to the current, such as Glenwood Bridge, are hazardous to boaters at high flows and cause gravel to settle out of the current. Pilings can capture debris and snags and become flood hazards at high flows.

Greenbelt path users go under the road bridges. Some of the existing underpasses present dangerous conditions to path users due to narrowing of the path or poor sight lines. Different types of users, such as cyclists and pedestrians, can have conflicts because of the different speeds at which they travel through the underpasses and their approaches. Boise Parks and Recreation should monitor these areas and redesign them as opportunities arise for relocation or reconstruction of the path.

The Idaho Department of Transportation worked with the Idaho Department of Fish and Game to provide fish stocking access at Glenwood Bridge. There may be access opportunities for fish stocking, emergency vehicles and the recreating public at new bridges.

Recommendations

- Urge the Ada County Highway District and Idaho Department of Transportation to design bridge pilings and abutments to be safe for river users.
- Request that bridges be used for informational signs for river users.

- Use the construction of bridges as opportunities to provide access points for emergency and recreational uses.
- Examine existing bridge Greenbelt underpasses and approaches for safety problems and identify ways to upgrade safety.
- Create a marker system on the bridge structure which will illustrate river flow levels.

Greenbelt Path

The Greenbelt path is used by recreationists as well as commuters. The Boise Parks and Recreation Department does not irrigate along the Greenbelt path between 6:30 and 9 a.m. and between 4 and 9 p.m. in deference to commuters. The current standards are for a paved path of 12 feet wide and the natural path 6 feet wide. In many places the path is less than the 12 foot standard width. In some places, such as through Ann Morrison Park, there is an unpaved path, often used by joggers, parallel to the paved Greenbelt. The paved path has a center stripe for safety reasons. There are no statistics on the numbers and types of Greenbelt users.

Department staff have discovered there is confusion about ownership in places along the Greenbelt and easements. Sometimes this is discovered when a park or Greenbelt improvement project is begun.

Recommendations

- Conduct a scientific study to identify the types and numbers of users of the Greenbelt path throughout the year.
- The standard width of the path should be 12 feet wherever possible.
- Maintain the minimum six-foot-wide path standard for the existing and future unpaved paths.
- It would be difficult to enforce a speed limit. Encourage education of users to ride at speeds for the conditions, to keep right, etc.
- Maintain or create a dual path system, i.e., paved and unpaved, where appropriate, to separate users.
- Continue safety education programs, such as “Stay to the Right.”
- Continue to stripe the paved Greenbelt path.
- Continue to require that dogs be on leashes
- Conduct a property survey to verify all boundaries set by ownership, easements, license agreements or other agreements.

Recreation

Restrooms

Restrooms provided by the Boise Parks and Recreation Department near the river and Greenbelt path are on the north side of the river with the exception of restrooms in Ann

Morrison Park. Restrooms which are open year round are at Warm Springs Golf Course, Municipal Park, Zoo Boise, Ann Morrison Park, the bike house at Wheels R Fun, and at the wastewater treatment plant on Lander Street. In the future, additional year round restrooms will become available at Warm Springs Park near Marden Street, at the east end of Julia Davis Park and at Bernardine Quinn Riverside Park. A vault style restroom at Boise Cascade Lake in Veterans Park will be closed due to water quality concerns. None of the existing or proposed restrooms are easily accessible to people floating the river. The Boise Police Department recommends that the restrooms be open during daylight and locked at night.

Recommendations

- Locate restrooms in new riverside parks to be more accessible from the river.
- Place restrooms at future tuber ports.
- Look for opportunities to build restrooms on the south side of the river.
- Create more accessible routes between restrooms and the river.
- Use portable restrooms in the warm months at strategic locations along the river and at Greenbelt access places.

Developed Access Points

The only developed tuber port is at Ada County's Barber Park. Undeveloped tuber ports are near CH2MHill and Kimberly One condominiums. The major tuber take out is an undeveloped area near the footbridge in Ann Morrison Park. The heavy use is causing severe erosion of the bank. There is difficult access in and out of the river for floaters along most of the river between Barber and Ann Morrison Parks. A shorter float may be desirable for families tubing with children. Automobile traffic generated by tubers is a concern for neighborhoods.

A tuber port schematic is depicted in Figure 1. A multiple access tuber port should have these elements:

- Easy access to and from the river
- A staging area for tubes, rafts and gear
- A restroom, water fountain and pay phone
- Trash cans
- Trees and grass to provide shade and lounging areas
- A low wall or barrier, such as a two rail fence, to restrict people from moving into the natural area.
- Access for emergency vehicles
- Access to parking and/or a tuber shuttle stop
- The tuber port should provide access to both the Greenbelt and the river.
- Lighting

Kayakers use a difficult access from Warm Springs Avenue to the wave at the Boise City Canal diversion above Warm Springs Golf Course. There are no developed boater access points. As discussed in relation to Public Safety, there are insufficient emergency access

places as well. If the traffic pattern on Warm Springs Avenue is altered with development of Harris Ranch, it may be possible to create an access place along that road where there are no houses and little traffic.

Recommendations

- Develop designated river access or tuber ports between Barber and Ann Morrison Parks. Potential sites include the East Park Center Bridge; Boise City Canal diversion; near the foot bridge at the future Warm Springs Park; near corporate buildings at Park Center; Municipal Park; Boise State University and the new bridges.
- Potential access places for non-motorized boaters include the fire training center and Willow Lane.
- A standard design for a pedestrian-accessed port should be developed for boater, tuber and emergency access. See Fig. 1.

Figure 1 - Tuber Port Schematic

Heavily Used Undeveloped Recreation Sites

There are several areas where volunteer trails to the river are becoming well-established and they occur in clusters. Visible resource damage includes trampled vegetation, soil compaction and erosion. Areas people use as tuber ports are becoming eroded and the banks are becoming incised. There are campsites, some made by homeless people and transients, and places where litter accumulates or trash has been dumped.

Recommendations

- Examine the areas with volunteer trails and block some with logs, rocks or plants, such as Woods rose.
- Develop certain volunteer trails to discourage people from walking randomly through riparian areas and to encourage trails where there will not be as much resource damage.
- Explore opportunities to create an overlook or bench at the end of river access trails.
- Revegetate where significant soil compaction and erosion are occurring.
- Erect temporary educational signs explaining the resource damage and repair and asking people to stay on the path.
- Continue the Adopt-A-River volunteer program.
- Create safe, accessible tuber ports with restrooms.
- Consistently enforce the no camping regulation along the Greenbelt path.

Trails

The Greenbelt path intersects with numerous streets through the city and some designated trails and paths. The plan for the Boise River should mesh with the Ridge to Rivers trails plan. There currently are three footbridges and crossings on all the road bridges, including Eckert Road. The East River footbridge is expected to be completed by the end of 1999. It will cross the river from Baybrook Court to the eastern boundary of the water purification plant. Both bridges planned by the Idaho Transportation Department and Ada County Highway District will have pedestrian lanes.

There are not many opportunities to develop more trails along the river. An unpaved path is proposed through part of the Harris Ranch development. An unpaved path has been proposed for the edge of Warm Springs Golf Course, along the Boise River. Across the river, from River Run to Barber Park, the unpaved path in the city limits is in a Greenbelt Wildland Reserve, and bicycles are prohibited by a deed restriction. That prohibition is difficult to enforce and many people ride bicycles through the area. Signs prohibiting bicycles are not visible at both ends of the path and the alternate bike route on the streets is not well-marked.

Recommendations

- No more footbridges are needed within the City of Boise. A footbridge in Garden City may be desirable.
- An unpaved path along the edge of the Warm Springs Golf Course should not be built for safety reasons. A net, like the one along the Greenbelt through the golf course, would not be aesthetically pleasing.
- Linking the Greenbelt path to neighborhoods and other trails should be encouraged.
- Sign and mark the bicycle route as an alternative to the natural path.
- Stencil the designated bike lane in the residential areas where the unpaved path restricts bicycles.
- Mark the entrance to the unpaved path with bollards or other obstacles to serve as a physical reminder that bicycles are prohibited. The path entrance must comply with accessibility standards.
- Seek opportunities to ensure parking for foot traffic users of existing and future natural paths.

Parking

The number of parking places available for river and Greenbelt users is not known. During evenings and weekends, Greenbelt and river users park in business lots. There is one formal agreement for five recreational parking places at a private business. Ada County has a 1999 agreement for people who use the tuber shuttle bus to Barber Park to park their cars at Timberline High School.

On summer afternoons, Ann Morrison Park often is over-full, with most of the vehicles belonging to persons tubing the river. Many cars are parked illegally. Many drivers park illegally along Eckert Road. Boise police will ticket and tow illegally parked cars there. Neighborhoods near tuber access places are invaded by automobiles and tubers. Developing more access areas to the Greenbelt path and river may disperse some cars, and result in the need for more parking. A park board policy says there will be no net loss of green space in the parks system. This means no park green space will be converted to parking lots unless additional green space is gained.

There are few bicycle racks in the parks or along the Greenbelt path.

Recommendations

- The river and Greenbelt user study should examine parking and should include questions to users about parking.
- There should be no charge for tubers parking in Ann Morrison Park.
- New tuber and boater ports should be developed with parking as a key consideration.
- The City and County should seek cooperative agreements for after hours parking with businesses along the Greenbelt path or accessible to shuttle bus riders.

- Provide looped shuttle service between tuber ports to encourage people to take the bus when they float the river. This will be feasible when new road bridges are built.
- More bicycle racks should be installed at destination places such as parks, near restrooms, the MK Nature Center.

Boating

Part of the growing recreation demand on the Boise River is from non-motorized boaters. Kayakers would like a designated area, with a kayak course, to use for teaching and practicing skills. Currently there is no place with good river access. Different weirs and places on the river are attractive at varying flows. A challenge is to find a place for a kayak course that is attractive to boaters at many flows.

There is a vision of someday having a canoe trail on the Boise River from Lucky Peak Dam to the Snake River. There is no easy canoe access to the river in Boise and many of the diversions are hazardous to canoeists. Other non-motorized boats, such as drift boats, could use the river if there were access for boats and trailers. There are reports of jet skis being on the river below the 36th Street weir. Boise City and Ada County ordinances prohibit motorized craft on the river except for emergency boats and boats used by the Idaho Department of Fish and Game or Ada County Animal Control in the performance of their duties. The prohibition does not cover the entire river in Boise, Garden City or Ada County.

A kayak course on the Boise River would require some of the same elements as a tuber port. Two potential kayak course sites have been identified: below the Settler's Canal diversion by the Americana Bridge and at the end of 36th Street. Both sites have limitations dealing with land ownership and safety. Both have the hydraulics which would make a kayak course possible at varying river flows. Altering a diversion to increase its potential for kayaking is possible if an agreement is reached with the structure's owners. The Boise Canal diversion, though a popular play wave at some flows, was not considered due to difficult access and environmental concerns. A kayak course would require:

- Easy access to and from the river
- A staging area for boats and gear
- A restroom, water fountain, pay phone
- Nearby parking
- Access to the gates and moveable course elements
- An area for spectators

A canoe trail on the Boise River would require changes to accommodate that growing use. Canoeists tend to take longer trips than kayakers and in a downstream direction. Portages around diversions would make the trip safer for canoeists and probably would

be used by some tubers. Portage routes may need to be negotiated with private land owners. At a minimum, portages require these elements:

- Safe access in and out of the river
- Signs announcing and marking the portage
- A small staging area
- Emergency access should be provided at any tuber port or kayak course.

Recommendations

- Work with kayakers and irrigators to develop a recreational kayak course with adequate parking, no impact on water diversion, safe boater access and minimal disturbance to river banks and riparian areas. The Settlers' Canal Diversion is recommended as the first choice for a kayak course.
- Create one or more access points with adequate parking, safe access and minimal disturbance to river banks and riparian areas for canoeists.
- Create safe portages, accessible at flows of 1,500 cfs and less, around all diversions in the study area.
- Determine easement availability at portage sites.
- Encourage non-motorized boating downstream of Ann Morrison Park to reduce conflicts with tubers.
- Do not create public access for boats on trailers.
- The steering committee strongly recommends that Boise City, Garden City and Ada County review their ordinances regarding motorized craft on the Boise River and work together to strengthen the ordinances, if necessary, to prohibit motorized craft from the Boise River. Law enforcement officers should use non motorized craft for routine patrol or enforcement activities on the river.

Recreation Demand

Sometimes the Greenbelt path is used for fun runs or organized walks. The Boise River once floated a lighted night parade. To date, no organized bicycle, roller blade or skate board races have been held on the Greenbelt. Tubing the river is the activity which draws the greatest number of participants in a season. Many families use the Greenbelt path. Several concessionaires serve recreationists on and along the Boise River. A rafting company is licensed to provide day trips on the river through and near the City. A concessionaire at Shoreline Park rents bicycles and in-line skates. The Boise River Festival has attracted one million users in four days along the river and in riverside parks.

The most noticeable recreation trend has been the increase in the number of people who enjoy the river and the Greenbelt path. The path is heavily used after 4 p.m. on week days and from about noon to 8 or 9 p.m. on weekends in nice weather. People who stop on the path to talk or who walk four and five abreast clog the path and cause traffic jams and safety concerns.

Improvements in equipment mean that wheeled recreation has grown in popularity and speed. It is not known how many people participate in activities on or along the river in a day or a season or a year, or how many users the area can accommodate safely and with an acceptable degree of resource damage.

Recommendations

- The Boise Parks and Recreation Department should undertake a comprehensive recreation study to create an informational baseline against which to measure changes in types of recreational uses, number of users, patterns of use, patterns of resource damage and recreational demands.
- Some activities and uses are inappropriate for the Greenbelt and should not be permitted for safety reasons, i.e., wheeled racing events, rickshaws, etc.
- As more people of varying ages and abilities use the Greenbelt at the same time, emphasis on safety education becomes especially important.
- Identify traffic conflict areas on the Greenbelt and widen the path to the standard 12 foot width or improve traffic flow.
- Establish and sign bypasses in areas of congestion. Park roads may provide alternate routes in some places.
- Some high use stretches of the Greenbelt should be designated as slow zones. Where possible, develop two paths in these areas, one for faster and one for slower users, i.e. Municipal Park and near bridge underpasses.
- Trends in recreation should be monitored so the Boise Parks and Recreation Department can anticipate both negative and positive changes in types of uses and users and manage proactively.
- Monitor the cumulative effects of signs, trash cans, benches, signs. Assess the need for a facilities management plan.
- Consider ways to limit or to spread out tubing use. The number of tubers may be approaching the ability of the facilities and resources to sustain the level of use. Possibilities include a lottery for tubing, reservations, a limited number of launches each day or hour.
- Explore the potential for consolidating recreation services and giving one agency responsibility for recreation and resource management in the city and its impact area.
- Develop a jointly funded river ranger program to educate people, offer first aid, perform some rescues and enforce laws.

Litter Management

Litter is an on-going management challenge along the Boise River. The diversions trap a tremendous amount of litter. Ada County provides litter pick up crews with rafts and bags several times each floating season to collect garbage along the river. Currently, 36 groups volunteer for the Boise Parks and Recreation Adopt-a-River program each year. They collect trash monthly during spring, summer and fall. Aluminum cans are scavenged for recycling and are not a large component of the litter. Most litter is from recreationists and includes food wrappers and paper products, cans, bottles, bait

containers, clothing. Some litter is from transient camps. Used needles regularly are found. There is a dramatic increase in the amount of litter in the summer season. The greatest amount of litter is dropped in the downtown core, between Broadway and Americana Bridges. During the floating season, much trash accumulates in and along the river. Plastic bottles are an obvious litter component in the river. Additional trash cans have been provided in Ann Morrison Park, near the tuber take out. During high use times, those five or six cans are emptied twice daily, and still overflow.

Recommendations

- Continue the Adopt-a-River volunteer program.
- Encourage a zero tolerance attitude toward litter.
- Develop an educational program aimed at park, Greenbelt and river users which describes the negative effects of trash on fish, wildlife, people's health, water quality, etc.
- Provide as many trash cans as possible in convenient areas.
- Provide trash cans at all restrooms, including portables, and near bridges.
- Ban cans and bottles on the Boise River (see Public Safety, Alcohol Use).

Concessionaires

The Boise Parks and Recreation Department issues contractual permits to concessionaires who operate in Boise Parks or on the Greenbelt easement. The permits must be approved by the Parks and Recreation Board and City Council. The Board's concession review criteria are: safety of Greenbelt users, with path congestion being a major factor; whether there are available facilities; whether the concession would provide benefits for users; whether the concession would meet an existing demand, and whether the permitted activity would damage the path or natural resources.

Currently there is a bicycle and roller blade vendor across from Ann Morrison Park. The contract stipulates that no similar concession will be permitted within a mile radius. There is one permitted concessionaire who offers raft trips and educational tours on the study section of the Boise River. The shuttle bus for tubers is operated by the County. Outside the parks and Greenbelt, vendor permits are regulated by the Planning and Zoning Commission and permitted by the City Clerk.

In the past, a concession permit has not been granted for three-wheeled bicycle rickshaws or some food vendors because of safety concerns over the Greenbelt becoming too congested. Requests for concessionaire permits are reviewed on a case-by-case basis. "Fringe" concessionaires have started to rent equipment and provide activities to be used on the Greenbelt, although the concession is not located on the Greenbelt.

Recommendations

- Continue to review concession permit applications on a case-by-case basis using the existing criteria.
- Create proactive policies to deal with concessions near, but not on the Greenbelt.

- Coordinate among Parks and Recreation, Planning and Zoning and City Clerk staffs to avoid impacts to the parks and Greenbelt from vendors operating off park lands.

Wildlife, Fisheries and Riparian Zone

Cottonwood Forest and Riparian Zone

The cottonwood forest and riparian zone have been impacted by numerous activities. Cottonwoods regenerate naturally when there are spring floods followed by slowly decreasing flows which expose bare, mineralized soil where cottonwood seeds germinate. The absence of floods is one factor in the decline of the cottonwood forest and riparian zone. Cottonwoods sucker and sprout, but these often do not grow into big trees.

Ramping rates, the speed with which flows are increased or decreased in the river, also affect the riparian area. Rapid reduction of flows in the spring decreases the ability of riparian plants, including cottonwoods, to reproduce naturally. Rapid reduction of flows increases bank instability and the potential for riparian trees to fall over.

Several invasive species are displacing more desirable native plants in the riparian zone. Indigo bush and Tree of Heaven are two of the woody species which may be spreading due to disturbance in the riparian zone. Other noxious weeds, such as purple loosestrife and goathead stickers have invaded the river corridor. Purple loosestrife displaces more desirable vegetation and habitat. Goatheads can cause injury to feet and paws and puncture tires.

A number of desirable woody native riparian plants are missing or not abundant in the riparian zone. These include willows, dogwoods and yellow currant. Different age classes of cottonwoods and different heights of woody materials are necessary for a healthy riparian area.

Removal of woody debris should be carefully considered. Snags could be trimmed for safety, but not removed. Tall stumps provide food and habitat for many species of plants, insects and wildlife. Downed woody debris is desirable for the same reasons and may be used to manage volunteer trails in some places. This is a resource which needs to be considered.

Mowing is similar to grazing of natural riparian zones. Mowing, over time, results in loss of plant diversity, favors turf grass and reduces the filtering capacity of the stream side vegetation. The reduction of plant diversity in turn can decrease bank stability and reduce the width of the riparian zone. A 25-foot riparian setback from the 6,500 cfs line (as measured at Glenwood Bridge) is required by the Boise River System Ordinance. No-mow strips are evident in places along the Greenbelt and setback. Boise Parks and Recreation began using no-mow strips and integrated pest management several years ago to improve the quality of water running off the parks into the river.

Recommendations

- Boise City Parks and Recreation should develop a management plan for the riparian zone and river setback. This should include an inventory of the cottonwood forest and alternatives for planting or encouraging natural regeneration of cottonwoods. It should include an inventory of invasive species and alternatives for controlling them.
- As part of the riparian management plan, a list of desirable plant species and their values for wildlife, aesthetics, people management, should be developed.
- Use woody debris and plant materials, such as Woods rose, to block and rehabilitate volunteer trails.
- Grow native plants where possible between the river and the Greenbelt path. Native vegetation may need to be irrigated to become established. The Greenbelt path should be moved away from the river in places to make room for riparian type vegetation. Fig. 2 illustrates how in parks and wide areas of public land along the river, the path could be moved inland to provide more space for riparian and upland vegetation.
- Control invasive plants and noxious weeds.
- Post signs to inform users about the natural areas, places being rehabilitated and areas to stay out of and why.
- Develop some overlooks or surface hardened observation places to direct foot traffic out of riparian areas to places where resource damage will be minimized.
- Boise City Parks and Recreation should develop *a best management practices plan* for the Greenbelt path, river setback and park edges along the Boise River. It should include an inventory of and standards for no-mow zones and alternatives for increasing them and a plan for educating maintenance workers how to manage these zones. It should include policies about and standards for removal of woody debris. It should include a plan for continued integrated pest management.
- Establish a working relationship with the U.S. Bureau of Reclamation and the U.S. Army Corps of Engineers to influence flow regimes and ramping rates to enhance riparian plant regeneration and river bank stability.

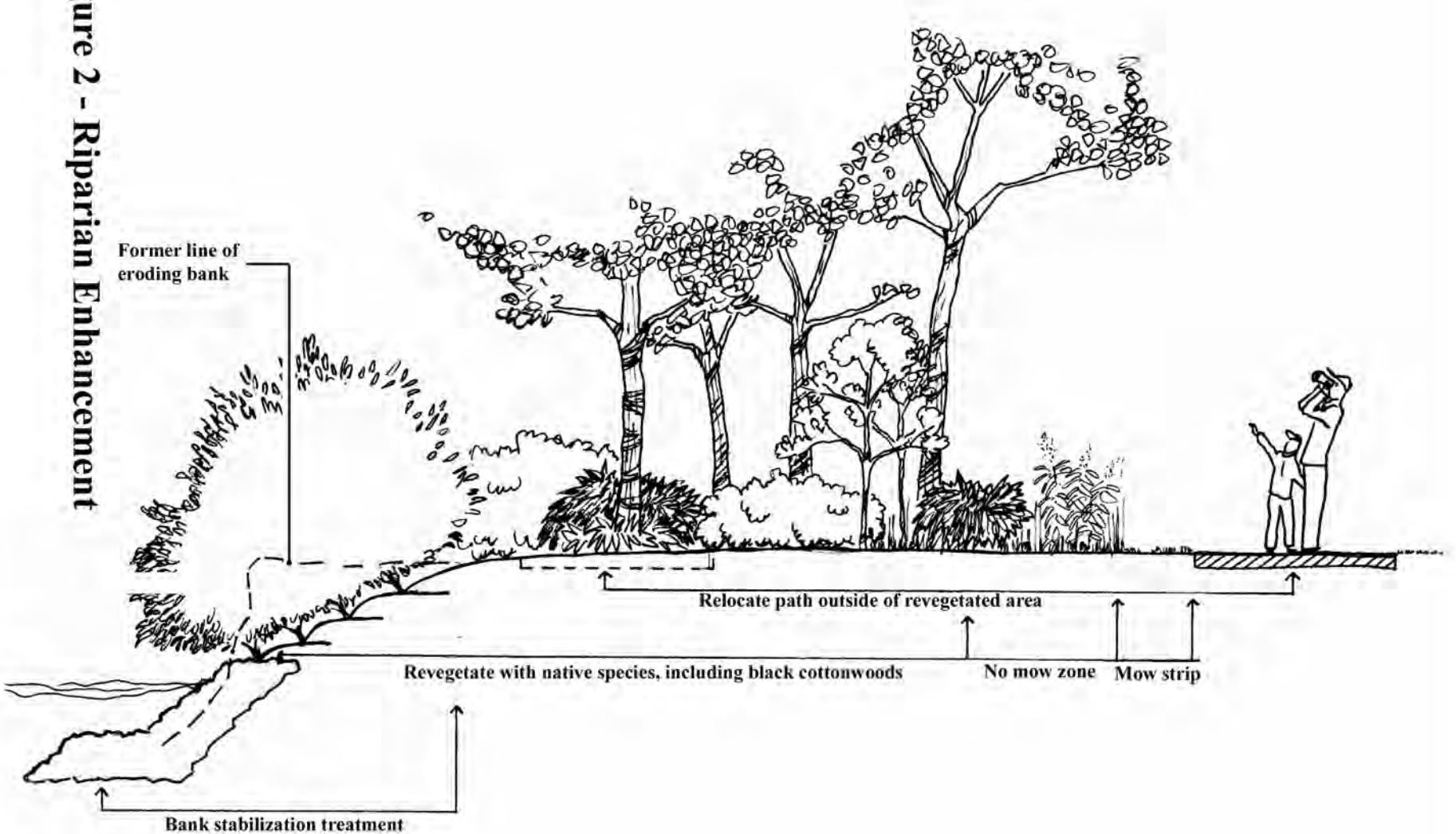
Important Wildlife Habitat and Wildlife Use Areas

The most recent comprehensive survey of wildlife habitat along the Boise River through the study area was completed in 1983. This habitat information was part of the basis for the Boise River System Ordinance adopted in 1985. Since that time, there have been many changes along and near the river. The 1983 *Boise River Fish and Wildlife Habitat Study* provided objectives for preservation and management actions for lands and waters designated as A, B or C. Class A areas, with highest habitat values, were mapped and labeled, " Areas Extremely Important for Preservation." Class A lands and waters provide extremely important habitats a for fish and wildlife and for flood control and protection. Some of the lands and waters included in Class A are floodways, the black cottonwood riparian plant community, riparian forests, Great Blue Heron rookeries and eagle winter habitat, lands within the riparian setback, side channels, trout spawning waters and the Barber Pool Natural Preserve.

Class B areas are, “Areas Moderately Important for Preservation.” This class includes agricultural lands, gravel pit ponds and small lakes and intermittent tributary streams. They show good potential for improvements to natural resource functions and values. Class C areas have minimal value for habitat and include such areas as parks where habitat enhancement is precluded by use, diversion dams, residential and commercial developments.

Acceptable land uses and regulations for building along the river vary by class. A permit is required for any construction in the Boise River System Management District which includes the 100-year floodplain boundaries, setback lands and waters and Class A, B, and C lands and waters. Mitigation and enhancement of riparian areas are key parts of the ordinance.

Figure 2 - Riparian Enhancement



Much of the habitat inventoried in 1983 offered values for different species of birds and small mammals. Eagle perch areas, heron rookeries and nesting places for other species of birds are important functions of riparian forests. Emergent wetlands have values for wildlife and reducing flooding. Over time there has been a change in the wildlife species along the Boise River to those more adaptable to urban areas. Some species of birds are more sensitive to human presence. Ground squirrels, migrating song birds and other native species have disappeared. Domestic and feral cats have a great impact on bird and small animal populations near the river.

Traditionally, the Boise Parks and Recreation Department has expertise in urban forestry, turf and ornamental horticulture. The Boise Parks and Recreation Department is taking responsibility for other types of lands and programs such as river corridor management, wetlands and open space in the foothills. With the added natural resource responsibilities, the department requires additional expertise to manage natural areas and open spaces. A naturalist or ecologist would guide resource planning , maintain and enhance natural areas and monitor the condition of these areas as well as revegetation projects and other enhancement activities. He or she would lend expertise to educational programs and information offered by the Boise Parks and Recreation Department. A recommendation in the comprehensive park and recreation plan states that the city should consider establishing such a position. The need continues to increase for this type of expertise.

Recommendations

- An inventory should be made to update the remaining habitat and its values for wildlife.
- Update the Boise River System Ordinance if necessary to make it more user-friendly and understandable.
- Where high quality habitat remains in the City, it should be designated and protected.
- A riparian management plan for wildlife habitat and use areas should be developed to minimize the effects of human use.
- Habitat is also a recreation issue as people like to watch wildlife. Boise Parks and Recreation Department has a responsibility to provide habitat on lands it manages.
- Educate cat owners about the impact of cats on small animal and bird populations.
- The Boise Parks and Recreation Department should seek stable funding for a naturalist or ecologist position.
- The naturalist/ecologist would have management and educational responsibilities.

Fisheries Habitat

The Boise River through the study area has variable limited capabilities for supporting a self-reproducing population of cold water fish, primarily rainbow trout, brown trout and

whitefish. The quality of existing fish habitat is highest in the upstream portions of the study area. Fish densities and diversity are highest above Broadway Bridge. Habitat conditions generally are best above Veterans Park. Below Lander Street, species diversity and monitored fish densities are lower than upstream reaches. Snag removal, for safety of tubers and other river users, presents a dilemma because the best fish habitat is above the Americana Bridge and it could be improved by leaving many snags. The river above Americana Bridge is also the most heavily used by river recreationists.

The Idaho Department of Fish and Game will stock approximately 40,000 catchable hatchery rainbow trout between Barber Park and Glenwood Bridge during 1999. Trout are stocked at flows between 1,800 and 200 cfs, usually from spring into December, depending on winter temperatures. Nearly 40 percent of fishing effort occurs above Broadway Bridge to Barber Park. Another 40 percent occurs between Glenwood Bridge and Veterans Park. Above Broadway Bridge, nearly 85 percent of fish caught are released by anglers, while harvest rates are higher downstream. Roughly 50 percent of the anglers above Broadway Bridge fish with flies or artificial lures, with the other 50 percent made up of anglers fishing with bait. Below Veterans Park, nearly 75 percent of anglers fish with bait.

In 1994, fisheries managers estimated there were 70,000 hours of fishing effort between Barber Park and Glenwood Bridge, up from an estimated 50,000 hours of effort in 1987. The average trip length in 1994 was estimated at 1.4 hours. This information is from the Idaho Department of Fish and Game. The fishery is valued at about $1.175 million based on an average value of $23.50 for an angler trip, using U.S. Fish and Wildlife Service data.

Tributary streams to the Boise River in the study area are significantly altered and degraded. Most have been channelized or placed in culverts, such as Cottonwood Creek, thereby losing connectivity between the river and tributary streams which provide habitat for aquatic species. Habitat studies of the Boise River have recommended restoration of side channels as one priority for addressing fisheries needs (Asbridge and Bjornn, 1988). Currently, Loggers Creek is the only Boise River side channel producing trout.

There is an agreement with homeowners along Loggers Creek for a riparian setback. Idaho Department of Fish and Game personnel spend a great amount of time working with homeowners to enforce the setback and terms of the agreement. The Wood Duck Island Homeowners Association has contractual responsibilities for maintaining and enhancing the riparian zone along the Boise River. Boise City Parks and Recreation should take a stronger role in management of these areas. The Department has the authority to seek code enforcement on lands regulated by the Boise River System Ordinance.

Recommendations

- Boise Parks and Recreation Department should take opportunities as they arise to work with other organizations to improve fish habitat in the City.
- Participate with the Idaho Department of Fish and Game and conservation organizations in habitat improvement projects to mitigate for removal of debris

and snags, i.e., connecting and rehabilitating side channels; constructing fish habitat as the opportunities arise. (See Public Safety, River debris and snags)

- Establish a working relationship with the U.S. Bureau of Reclamation and U.S. Army Corps of Engineers to influence flow regimes for fish and wildlife when possible and support minimum winter flows for fish and wildlife.
- Investigate the City taking a leadership role in managing the setback agreements with homeowners along Logger's Creek in River Run and Wood Duck Island.

Beaver Management

The Boise River has become a "beaver highway." Ada County and Boise Parks and Recreation have tried several methods of managing beavers including killing, relocation, spaying and neutering. New animals quickly move in to replace the ones which have been removed. The number of beavers fluctuates with the food sources. Beavers prefer willows and dogwoods to cottonwoods for food. Beavers are not territorial if sufficient food is available. The river has been channelized and development has encroached over the years which restricts the native food source to a narrow riparian area. The beavers are causing damage to trees in the riparian zone and setback and well into the parks and adjacent private property.

Boise Parks and Recreation has had a beaver management contract for at least five years. The 1999 contract is likely to cost approximately $8,000. This cost does not include volunteer labor to wrap with wire mesh several hundred trees a year.

Recommendations

- Beavers should be managed aggressively. To keep the population from expanding and causing more damage, the spay and neuter program should continue. Some beavers should be destroyed. Aggressive management of beavers is necessary if a healthy riparian area is to be reestablished and maintained.
- In consultation with biologists and ecologists, an acceptable population level should be determined and a monitoring and control plan devised.
- Beaver management should be a component of the riparian management plan.
- Continue the volunteer effort to wrap a diverse age class of trees each year.
- Consult with the Natural Resource and Conservation Service office in the Wood River Valley of Idaho on their beaver relocation program.

Educational Opportunities

There are few interpretive signs along the Greenbelt path and river about the ecology or natural history of the river corridor. There are some historical signs from the state's centennial and signs about the solar system display, which begins at the Discovery Center and extends into the parks. The river could be used as an outdoor classroom by Boise schools and people interested in the history and ecology of the river through Boise. At

this time there is not an expressed demand for more interpretive signs. Two books by local authors describe the history of the Boise River (*When the River Rises*, by Susan M. Stacy) and points of interest along the Greenbelt (*The History Along the Greenbelt*, by Jim Witherell). However there is not a single guide or brochure which describes the natural and human history along the Boise River.

A review of records in the State Historical Preservation Office showed there are no archaeological sites in the study area. Several sites have been designated to, or found eligible for, the National Historic or Engineering Records. None of these historical sites conflict with proposed Parks and Recreation Department projects. They do offer interpretive opportunities.

Recommendations

- Identify potential partners for an interpretive program.
- Explore interest in an interpretive program along the Boise River.
- Identify educational opportunities related to the Boise Parks and Recreation Department plans and objectives, i.e., comprehensive plan, river resource and management plan.
- Make a guide or brochure available which includes educational and interpretive information about the Boise River and Greenbelt.
- Restrict the number of signs on the Greenbelt. Put general information in the parks on kiosks.
- Create a program for volunteer interpreters to conduct guided walks on the Greenbelt.

River Bank Stabilization, Treatments and Hydrology

There are numerous sites along the Boise River banks through the City which are eroding and showing signs of damage from flowing water which will continue if not repaired. The river has been channelized and some of the damage is occurring because the flowing water is not easily confined in the channel. Erosion affects water quality, river aesthetics and over time threatens bank stability, stability of structures near the river and may result in significant property damage.

Some of the damage can be averted by constructing properly designed, in-stream barbs to direct the main flow away from a vulnerable river bank. Bank repair may include engineered solutions with construction materials only. Another approach, biotechnical engineering, incorporates plant materials with soil-holding properties as a way of stemming erosion and revegetating the bank. The ATEC report, *Boise River Channel Assessment: City of Boise, Ada County, Idaho*, is in Appendix A. The report identifies specific sites with erosion problems, offers potential solutions and provides a ranking of sites based on hydrological risk.

Recommendations

- Protect and restore river banks to meet multiple objectives – bank stability, safety, wildlife habitat.
- Boise Parks and Recreation should identify diversion structures which are contributing to erosion and resource damage to the Greenbelt and river banks. Using the Quadrant Engineering report on diversion structures on the Boise and Payette Rivers and the ATEC report, priorities should be established within the City for repairs and enhancements associated with diversions.
- Use some sites as prototypes to demonstrate the various restoration techniques, such as root wads. Biotechnical applications are the highest priority.
- Encourage the City of Boise to undertake a comprehensive flood protection study to include the river meander pathway as well as inundation of facilities, and how floods of varying magnitudes would affect the Greenbelt and parks.
- Boise Parks and Recreation Department should enter into discussions and negotiations with irrigation districts to repair the diversions. The guiding principle should be to identify multiple benefits from any proposed project, i.e., increase diversion efficiency and improve public safety and prevent bank erosion.

Water Quality

Non-Point Pollution Sources

Non-point pollution remains one of the largest, and most difficult, sources of pollution to the nation's streams and rivers. Urban areas contribute a vast array of pollutants to storm sewers and direct runoff to streams and rivers. The Boise Parks and Recreation Department has developed a system of no mow zones in riverside parks for filtering runoff to the river. It also has developed an integrated pest management (IPM) program to reduce the use of pesticides and herbicides used in parks. The mutt mitt program contributes to reducing the amount of pet waste that may flow into the river from the parks. Each park has a storm water operation and maintenance plan which includes best management practices and safety considerations.

Tributaries carry sediment and pollutants to the river. Most of the tributaries are now covered and not visible. For example, the Cottonwood Flume goes under Julia Davis Park. It could be uncovered and directed to the park ponds to provide a water amenity and to settle out sediments and some pollutants before the water flows to the river.

Recommendations

- The Boise Parks and Recreation Department should continue with no mow zones, integrated pest management and the mutt mitt programs as ways to reduce the amount of runoff and pollutants flowing into the river.
- The park storm water plans should be reviewed and updated regularly.
- The Boise Parks and Recreation Department should form partnerships with other agencies, such as Ada County Highway District, the Ada Soil Conservation

District and the Natural Resources Conservation Service to build treatment wetlands on park land whenever feasible.

Point Source Pollution

The City of Boise submitted its National Pollution Discharge Elimination System (NPDES) Permit Application in 1994 to the Environmental Protection Agency. The Boise Public Works department is partnering with Ada County Highway District, Idaho Transportation Department, Boise State University, and Drainage District #3 in the program development and has developed a number of recommendations for reducing toxic chemicals, sediment, and other pollutants in stormwater. Based on an environmental audit conducted in 1990, the Parks Department identified places and situations which could become point sources under certain conditions. The Parks Department has also been removing and remediating underground storage tank areas. The Department has devised a Spill Response Plan, which conforms with notification requirements and appropriate response by type of chemical or material spilled. Boise Parks and Recreation Department can lead by example, but has no enforcement authority over private lands in the river corridor.

Some storm sewers enter the Boise River within the Boise Parks system. The drainage in Ann Morrison Park is an example of a wetland treatment system for storm water runoff in a city park. It provides treatment of the runoff from an area on the bench above the park.

Recommendations

- Pollution sources should be noted by parks personnel and reported to the appropriate agency.
- The parks' stormwater operation and maintenance plans should be reviewed and updated regularly. Stormwater facilities should be inspected and maintained regularly.
- The Spill Response Plan should be maintained and updated as necessary.
- The Boise Parks and Recreation Department should integrate storm water runoff into designs for future parks and in any redesign of existing parks. Manage storm water on site.
- The Boise Parks and Recreation Department should work closely with the Boise Public Works Department to ensure that requirements of the NPDES permit are integrated as fully as possible into park management.
- Storm water from outside park boundaries should be treated in the parks when feasible.

Integrated Pest Management

The Boise Parks and Recreation Department has adopted a progressive, integrated pest management (IPM) program to reduce chemical use in the parks. The manual, "Chemical Pest Management Guidelines," guides the implementation of the program.

IPM is especially helpful in maintaining the quality of water running off the parks and Greenbelt into the river. Some examples of IPM include reducing chemical use by applying them only when they will be most effective in the pest's natural cycles. The least toxic chemicals to accomplish the goal are selected. Tolerance levels for pests have been established with differences for the rose garden versus neighborhood parks, for example. Best management practices for the Warm Springs Municipal golf course and other parks include use of fertilizers based on soil tests.

There are other private and public land owners along the river and just beyond the setback. The Boise Parks and Recreation Department can lead by example and provide some outreach to adjacent landowners who could improve their landscape maintenance practices. The Ada County Extension Office and Boise Public Works Department both have extensive guidelines and suggestions for best management practices for landscape maintenance to improve water quality.

Recommendations

- The Boise Parks and Recreation Department should continue, and expand where possible, the IPM program.
- Boise Parks should provide information on its IPM program to other landowners who are considering adopting these management practices.
- Boise Parks and Recreation should support adoption of IPM by other landowners by sharing information and providing examples. Other agencies, such as the Ada County Extension Agency, are better suited to leading the effort for adoption of IPM.
- Pest control companies which get a city permit to refill their trucks from fire hydrants could get information from the city on integrated pest management.

Mitigation Program

Potential Mitigation Projects and Program

Over the years there have been incursions into the riparian areas and setback lands in the Boise River corridor. A portion of this land is managed by the Boise Parks and Recreation Department. There are minimum standards in the Boise River System Ordinance for development and required mitigation. The Boise Parks and Recreation Department must comply with the ordinance for any of its projects in the regulated area. The Boise Parks and Recreation Department may set higher standards for projects on park and recreation lands and how impacts from projects should be mitigated. Although the focus is on the Boise River, the program could be expanded to wetland mitigation opportunities on other Boise Parks and Recreation Department lands.

Establishing a mitigation program, including a mitigation bank, is a way for the Department to guide enhancement and mitigation efforts to places where they will be most beneficial for natural resource values. The program would allow mitigation credits to be banked and used at a different time than the project which may have caused the

impacts. A mitigation program should include a monitoring plan to ensure that each mitigation project achieves its goals.

Several policy issues must be examined before establishing a mitigation program. Would a formal mitigation program require some legal action, such as changes in the Boise River System Ordinance? Should the mitigation ratio be changed to 2 to 1 to reflect the increased value of remaining habitat? How should a mitigation project be chosen for a specific development permit application? Boise City Parks and Recreation prefers that mitigation be at the site of disturbance, and if that is not possible, within the City limits when City property or parks are impacted.

Recommendations

- Boise Parks and Recreation Department should develop a mitigation program after appropriate review and discussion of the legal, hydrological and biological issues. This should include a review, and update if necessary, of the Boise River System Ordinance.
- Boise Parks and Recreation Department should develop a list of potential mitigation projects based on criteria developed for a mitigation program.
- The City should establish a wetlands mitigation bank to be administered by the Boise Parks and Recreation Department.
- Monitoring criteria and a general monitoring plan should be developed as part of a mitigation program.
- Boise Parks and Recreation Department should communicate with other City departments about potential mitigation projects, especially Planning and Zoning.

Intergovernmental Cooperation

A number of the management challenges faced by the Boise Parks and Recreation Department cross jurisdictional boundaries. Ada County and Garden City share many of the same management challenges along the Boise River. The Idaho Department of Parks and Recreation manages the Barber Pool Natural Area, just above Barber Dam, the start of the study area. Beaver management, tuber and recreational use of the river and Greenbelt path, motor boats and alcohol use on the Boise River are a few of the issues which cross city or county lines.

A coordinated approach to management challenges may help solve some problems and make management more efficient. Knowledge of neighboring entities' plans and enforcement approaches may lead to more seamless policies and management actions along the river corridor.

Recommendation

- Boise City Parks and Recreation Department should take a leadership role in developing a process for coordinating with other City departments, neighboring jurisdictions and germane state and federal agencies over shared management challenges and opportunities.

Plan for the River Corridor

The plan reflects general priorities as well as a number of site-specific recommendations and proposed actions. The general priorities reflect the need to guard public safety; to maintain and enhance natural values, and to provide appropriate recreational opportunities. The plan emphasizes the protection and enhancement of natural values along the Boise River from Barber Dam to approximately the west end of the Warm Springs Golf Course. This emphasis applies to the area from Veterans' Park downstream to the planning area boundary near Glenwood Bridge. In these areas the general management priority is the enhancement of natural values by preventing further resource damage and revegetating riparian areas and river banks with native plant species.

The middle part of the planning area will provide the most recreational opportunities and services. From Warm Springs Park to Veterans Park, the emphasis is on providing and managing access to the river and services for river users and Greenbelt users. Two developed tuber ports are recommended which would also provide emergency vehicle access, restrooms, and telephones. The services would be convenient to Greenbelt path users too.

The area between Broadway Avenue and Americana Boulevard is referred to as the "core" area. It is accessible from riverside parks, Boise State University, cultural sites like the Boise Art Museum and Boise Public Library. It is near downtown and is probably the most heavily used section of the Greenbelt path and river.

The number of night-time users on the Greenbelt path is increasing, thus a comprehensive lighting plan should be developed and implemented. In the core area, historic light fixtures lend character as well as increasing safety and visibility. However, not all of the Greenbelt in the core area is covered by the *Downtown Historical Lighting District*. In segments bordering the core, use is heavy and more lighting may need to be provided in these areas, especially at bridge tunnels and path intersections. The intensity of lighting needs to be monitored outside the core area to prevent light pollution in neighborhoods and the riparian areas. Moving toward the less developed, more natural areas of the Greenbelt path, low level lighting should be considered. Bollard-type lights or short lights with downward only light patterns at major path intersections, would improve visibility of users yet not add greatly to light pollution.

The planning area is long and narrow and specific sites and management actions are displayed and discussed moving from Barber Dam downstream. The map elements are not to scale and are for general planning purposes only. Many sites meet several objectives. For example, a site with severe erosion, described in the *Channel Assessment Report*, may offer an opportunity to enhance habitat and natural area values when the action causing the erosion is repaired and the bank revegetated. There are other sites mentioned in the *River Channel Assessment Report* which do not appear on the plan maps.

The plan sites are numbered from upstream to downstream. Each site is labeled on the map and discussed in the written plan. In the text, the map number is given with the *Channel Assessment Report* site number below it, if the sites coincide. The term "River right" refers to the right bank when looking downstream.

Boise River Resource Management and Master Plan

Map 2

Upstream Area


Volunteer access near Site 14.


Barber Dam, Site 1.

Plan Sites

1 Barber Dam
2 Nampa and Meridian Irrigation District Diversion
3 Harris Ranch
4 South Boise Mutual Irrigation Company Diversion
5 Wood Duck Island and Unpaved Path
6 Wood Duck Island and Unpaved Path
7 South Boise Water Company Headgate/ East Park Center Bridge
8 South Boise Water Company
9 Boise City Canal Diversion
10 Vicinity of Cottonwood Apartments
11 Warm Springs Golf Course
12 River Quarry
13 East River Footbridge / Baybrook Court
14 East River Footbridge / Baybrook Court

Existing Conditions

Open Space
- Park or Reserve
- Cemetery
- Golf Course

Trails and Pathways
- Greenbelt
- Natural Trail
- Volunteer Trail
- Bike Lane

- New Pedestrian Bridge
- New Highway Bridges
- Boise City Limits
- Boise City

Plan Elements

- Plan Sites

Management Areas
- Intensive Recreation Use
- Secondary Recreation Use
- Riparian Enhancement

- Proposed Portage Sites

N

1000 0 1000 Feet

This map is intended for planning purposes only.

BOISE PARKS & RECREATION

SPATIAL DYNAMICS

Boise River Resource Management and Master Plan

Map 3

Midstream Area

Veterans Memorial Park
27
State St
Garden City
26
36th St.
25
Pleasanton Ave
24
B. Quinn Riverside Park
Chinden Blvd.
23
N. 27th St
Fairview Ave
22
Americana Blvd
21
20
Kathryn Albertson Park
19
Emerald St
Ann Morrison Park
Lusk St
Capitol Blvd
Julia Davis Park
Broadway Ave
Warm Springs Ave
18
17
Boise State Universty
University Ave
Walnut St
Municipal Park
Natatorium
16
15
13
14
Beacon St
Parkcenter Blvd

Existing Conditions

Open Space

- Park or Reserve
- Cemetery
- Golf Course

Trails and Pathways

- Greenbelt
- Natural Trail
- Volunteer Trail
- Bike Lane
- New Pedestrian Bridge
- New Highway Bridges
- Boise City Limits
- Boise City

Plan Elements

- Plan Sites

Management Areas

- Intensive Recreation Use
- Secondary Recreation Use
- Riparian Enhancement
- Proposed Portage Sites

N

1000 0 1000 Feet

This map is intended for planning purposes only.

Boise Parks & Recreation

Spatial Dynamics

Plan Sites

15 Municipal Park
16 Park Center Near Loggers Creek/
West Park Center Bridge
17 Boise State University
18 Julia Davis Park
19 Ann Morrison Park Footbridge
20 Settlers Irrigation District Diversion and Headgate
21 Riverside Park to Old Railroad Bridge
22 Shilo Inn
23 Garden City Greenbelt Extension
24 36th Wave / Thurman Mill Ditch Co. Diversion
25 Bernardine Quinn Riverside Park and Lake
26 Farmers Union Ditch Company
27 Veterans Memorial Park

Boise River Resource Management and Master Plan

Map 4

Downstream Area

Upstream of Lander St Treatment Plant, Site 28

Cottonwood forest behind Lake Harbor, near Site 32.

Existing Conditions

Open Space

- Park or Reserve
- Cemetery
- Golf Course

Trails and Pathways

- Greenbelt
- Natural Trail
- Volunteer Trail
- Bike Lane
- New Pedestrian Bridge
- New Highway Bridges
- Boise City Limits
- Boise City

Plan Elements

- Plan Sites

Management Areas

- Intensive Recreation Use
- Secondary Recreation Use
- Riparian Enhancement
- Proposed Portage Sites

N

1000 0 1000 Feet

This map is intended for planning purposes only.

BOISE PARKS & RECREATION DEPARTMENT

SPATIAL DYNAMICS

Plantation Golf Course

State St

Downstream Boundary

33

32

31 Wylie Ln

30

29

28

27

Hidden Lakes Reserve

Glenwood St

Owens Park

Willow Lane Sports Complex

N. 36th St

Adams St

Cole Rd

Ustick Rd

Veterans Memorial Park

State St

Boise Valley Canal

Spring Creek

Plan Sites

28 Lander Street Water Treatment Plant
29 Willow Lane
30 Upstream of Lake Harbor
31 Wyliey Lane
32 Lake Harbor Lane
33 Ada County Greenbelt Bridges

Site Number	Description

1 **Barber Dam**

The only marked portage in the planning area is around Barber Dam. This is a longer portage than most proposed portages in the planning area. It is well-designated with signs, however is difficult to use and should be made more user friendly.

The Idaho Department of Parks and Recreation manages the Barber Pool area above the dam. The Department has begun a planning process for the area. It intends to manage the land around the pool as a natural area. Recreation will not be promoted.

Recommended Action:

- Improve portage.

2 **Nampa and Meridian Irrigation District Diversion**
R-44

The diversion structure spans the river and is hazardous to river users. A portage is required. Easements or purchase of land for a river right portage should be investigated.

Recommended Action:

- Design a safe portage on Harris Ranch Property which does not encourage river launching..

- Improve habitat and riparian vegetation.
- Acquire easement or access rights.

3
R-39 A,B,C

Harris Ranch

Several groups and interests including local property owners and conservationists have discussed building side channels through part of the Harris Ranch property to create fish habitat or flood channels. Side channels are important to some species of fish as places to spawn and to rear young fish. The only remaining functional side channel in the planning area is Loggers Creek. In addition to improving stream habitat, there are opportunities to create riparian buffers and to improve habitat for birds and small animals.

A memorandum of understanding exists between the Harris Ranch owners and Boise City Parks and Recreation for an unpaved path along the river, through a natural area. Negotiations are underway regarding a setback easement for the Greenbelt and possibly a park. There will be no tuber access. The Harris Ranch development is a prime opportunity for the Boise Parks and Recreation Department to encourage habitat improvement on private lands.

Recommended Action:

- Site and construct an unpaved Greenbelt path.
- Enhance riparian buffers.
- Create side channel if possible.

4
R-42

South Boise Mutual Irrigation Company Diversion

This site offers opportunities to improve public safety and possibly emergency access. The Boise Fire and Boise City Public Works departments have suggested development of emergency, maintenance, and construction access sites at the structure. Most tubers float over the diversion, but canoeists often portage. The portage should be restructured and improved for the protection of the riparian area. The diversion, if rebuilt, should include safer construction materials and safer passage. The Boise Parks and Recreation Department should work with the irrigation company to evaluate the structure for recreational safety and access.

Recommended Action:

- Designate and improve portage route.
- Discuss safety concerns with irrigation company.
- Investigate emergency access potential.

5 - 6
R-40, 41

Wood Duck Island and Unpaved Path

The natural area and path on river left present institutional and management problems to be solved. A coordinated management approach should be adopted by the city and county as this area spans both jurisdictions. The path in the City of Boise has a deed restriction which prohibits bicycles. The Ada County portion is signed for pedestrian use and dogs on leash. There are many access points to the path. The alternate bike route, which meanders through the River Run and Spring Meadow subdivisions,

is not well-marked and many cyclists ride the unpaved path. The bike path should be stenciled on the roadway to help cyclists find the route.

This river segment represents some of the best remaining riparian vegetation in the study area. There is an active heron rookery in this reach. Ada County, Boise City and the Idaho Department of Fish and Game should work together to enhance the existing habitat. The Wood Duck Island Homeowners Association has a fund to manage and enhance the riparian zone along the river. Although the riparian area is one of the best remaining, it is crossed by foot trails. Foot trails damage the vegetation and result in soil compaction, especially when the ground is wet. Volunteer trails – created at random by people walking where no trail exists – should be rehabilitated in this area. One or two points of access to the river should be developed and people educated about the need to stay on designated paths. The path is covered with water during high flows in spring. All access should be prohibited when the ground is wet.

The steering committee recommended that there be one or more places for foot traffic and no bicycles. This is a prime area for foot traffic only. Bollards or some barrier could be placed in the path to emphasize the prohibition against bicycles. All barriers must comply with the *Americans With Disabilities Act*, and would serve as a reminder to cyclists rather than a physical barrier.

Recommended Action:

- Coordinate management between city and county agencies.
- Stencil bikepath on roadway.
- Rehabilitate volunteer trails.
- Create one or two river access points.
- Use signs to demarcate approved paths; explain rehabilitation.

7
R-38

S. Boise Water Company Headgate / East Park Center Bridge

This site is near the alignment for the proposed East Park Center bridge. Construction of the bridge will provide an opportunity to connect the bike path on both sides of the river. Mitigation for bridge construction could occur upstream along the natural area and may include relocating part of the path and rehabilitating the riparian area.

This site is not proposed for tuber access, although emergency access should be provided. Public access should be designed to

serve path users. There may be future parking for Greenbelt access on the north side of the river when the Harris Ranch property is developed. There should be parking on the south side of the bridge too. The riparian values are high and can be more easily maintained by designating one or two places for pedestrians to access the river.

Recommended Action:

- Mitigate bridge construction.
- Provide Greenbelt-accessible parking on both sides of the river.
- Designate river access.
- Provide emergency access

8 **South Boise Water Company - Abandoned Diversion Structure**

R-37

Because this structure is no longer used by the water company, potentially it could be removed. Removal may affect an amenity water flow on the river right property. Volunteer and undeveloped portage routes are on both sides of the river suggesting that the public has determined the necessity of an intentional and maintained portage improvement. The benefit of removing the cross-river structure is to improve in-river safety. Until it is removed, the site should be monitored for safety hazards and damaging hydrologic conditions. The site may provide access for emergency vehicles and construction equipment along a track used by maintenance vehicles.

Recommended Action:

- Investigate removing diversion.
- Designate and improve a portage.
- Investigate potential emergency access.

9 **Boise City Canal Diversion**

R-34

The diversion spans the river, creating a play wave for kayakers at some flows. The diversion is not easily accessible from land. An improved path to the diversion from Warm Springs Avenue and a marked portage on river left would improve the recreational experiences for boaters who want to play in the wave, and tubers who do not want to go over the drop. A marked portage with stable access to the river may alleviate some of the volunteer trails and river access places which have developed on river left near the diversion.

Recommended Action:

- Improve path from Warm Springs Avenue to the diversion.
- Designate and improve a portage.

10
R-29

Vicinity of Cottonwood Apartments

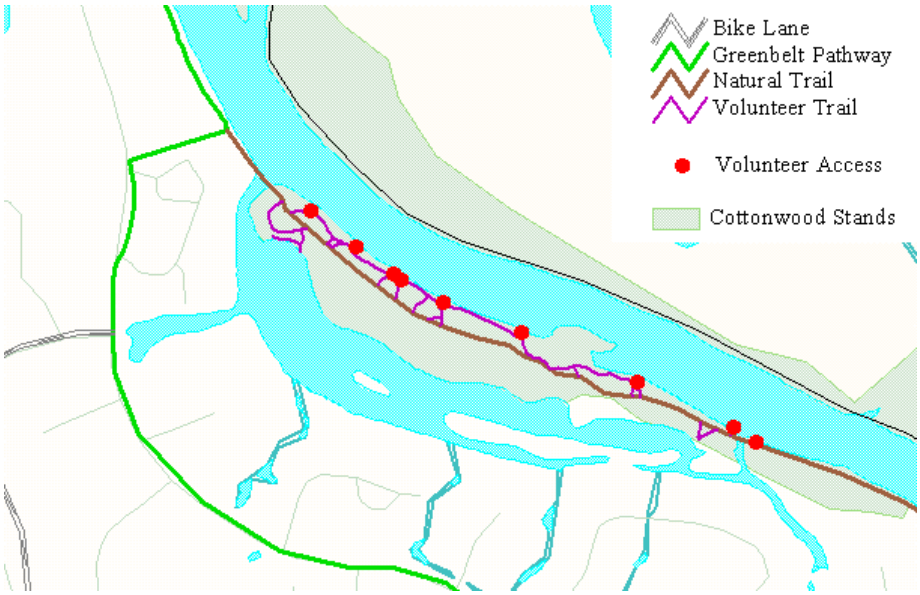
In this location the paved bicycle path and the Greenbelt Wildland Reserve unpaved path split. The bicycle path through the River Run development is difficult to follow and should be marked more clearly. Stenciling the route on the road would help cyclists and minimize the need for signs. Bollards or some barrier should be placed in the path to emphasizes the prohibition against bicycles. A barrier must be compatible with the *Americans With Disabilities Act*, and would be a reminder to cyclists rather than a physical barrier.

In this area, active erosion of the banks and a dike could be stemmed by installing flow deflectors and reshaping the bank. The resulting bank should be revegetated and a riparian buffer planted.

Upstream of the point where the path splits, many trails are worn through the vegetation to the river. Some river access sites have become enlarged as the fragile vegetation is worn away by foot traffic, exposing the sandy soil. A site specific plan should be developed to close most of the trails, and to construct some limited river access points from the main trail. Rustic log benches are provided intermittently. Some benches could be more inviting by opening the view to the river from the stopping place.

Recommended Action:

- Stencil bikepath on roadway.
- Install barrier to cyclists.
- Develop site-specific plan to manage volunteer trails and river access.
- Bank treatments.
- Riparian enhancement.



11
R-28

Warm Springs Golf Course

The Warm Springs Golf Course is owned by the City of Boise. Because of this, it is an excellent site to use as a demonstration area for bioengineering and biotechnical approaches to hydrological modification and bank repair before applying them throughout the planning area. Revegetation plots can be monitored and techniques honed. There are approximately 300 feet of bank erosion from this site downstream on river right.

The construction of an unpaved trail on the perimeter of the golf course is opposed in these recommendations. An unprotected trail raises safety issues and a trail with the requisite net fence would not be aesthetically pleasing. This zone is a key area for habitat improvement and revegetation. An undeveloped trail would conflict with those priorities.

Recommended Action:

- Create demonstration area for bioengineering and biotechnical bank treatments.
- Develop techniques for riparian enhancement.

12
R-27

River Quarry -Emergency Access

The emergency access is newly constructed and accessible from a parking lot off Park Center Boulevard. There is a large turning radius and straight sight line for the Boise Fire Department's utility vehicle towing the rescue boat. Five parking spaces are designated for Greenbelt users after business hours and on weekends. It appears from casual observation that the easy accessibility is drawing many Greenbelt users to this point.

Just upstream of the emergency access ramp is a problematic area where the river flow is eroding a narrow berm which separates the river from a former gravel pit, now a lake, which is being used as a water amenity in the new development. Bioengineering and biotechnical treatments should be taken soon to shore up the bank to prevent the river from breaking through the berm during high flows. The existing river barbs should be amended to further deflect the flow away from the vulnerable bank.

An emergency floodway was incorporated into the Park Center area development from this point to the Park Center Pond. No structures or land changes will be allowed which would affect the floodway to the pond.

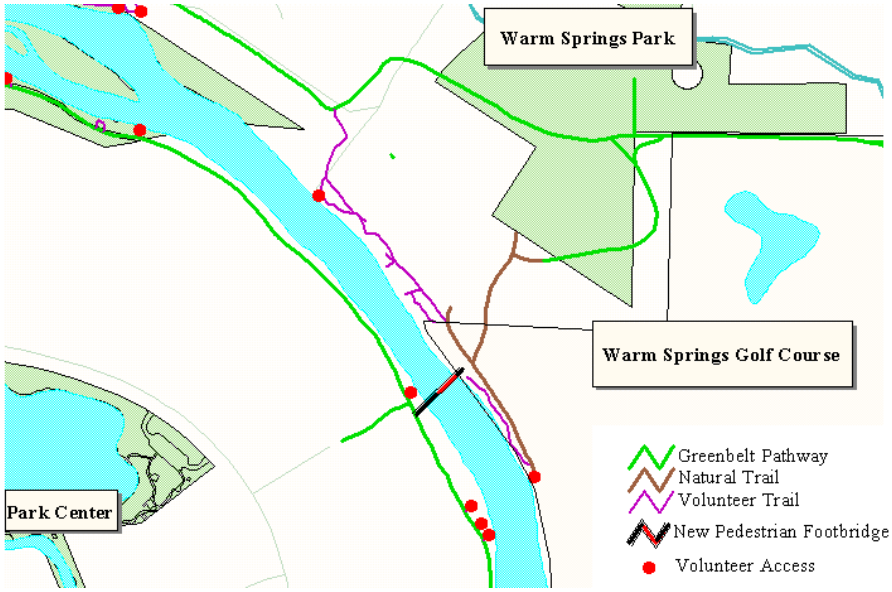
Recommended Action:

- Bioengineering and biotechnical bank treatments.
- Hydrological treatments.

13, 14
R-26, 25

East River Footbridge / Baybrook Court

The Boise Parks and Recreation Department is constructing a footbridge, scheduled to open in late 1999, which will span the river from the west end of the golf course to Baybrook Court in the Park Center business area. The crossing is just downstream from the emergency access ramp at River Quarry.



Warm Springs Park will be developed in the future at the river right end of the footbridge near the water purification plant. A year-round restroom will be in the park. This site should provide limited river access to minimize damage to the river banks.

Parking will be limited in the new park. Across the bridge in the Park Center business area, it may be desirable to negotiate parking access for non business hours. The access would serve primarily the Greenbelt path. River access should be discouraged by bank treatments, vegetation and signs.

Recommended Action:

- Hydrologic or bank treatments.
- Revegetation
- Negotiate with businesses for Greenbelt parking.

15

Municipal Park

Along Municipal Park, the river banks are steep and in places have no vegetation. An unpaved trail along the top of the river bank gives people numerous places to climb down the bank to the river. Some of the access places should be closed and rehabilitated. New observation decks would provide a view of the river, but no access. Providing one or two constructed paths to the river may alleviate much of the scrambling up and down the steep banks. The path should be moved farther away from the river and riparian and upland vegetation should be planted between the river and the new path location. (See Fig. 2)

Recommended Action:

- Relocate path away from river.
- Rehabilitate volunteer access points.
- Construct one or two observation decks.
- Construct one or two river access points.

16
R-23

Park Center Near Loggers Creek/West Park Center Bridge

Part of the Greenbelt path has been destroyed by high water in this area just downstream from the former Idaho Shakespeare Festival site. The outside bend of the river is experiencing erosion and eventually may result in private property damage if the hydrology is not sufficiently altered. At this site, the path will be rerouted in conjunction with construction of the West Park Center Bridge. The rerouting construction provides an opportunity to install barbs in the river and to tie them into the bank. The site should be revegetated with riparian vegetation.

The bridge will be a major river crossing. The Department should explore whether the opportunity still exists to incorporate a major public access point to the river in the bridge development. The Greenbelt path will go under the bridge on both sides of the river. Street access to the Greenbelt will be on Walnut Street. Boise Public Works received a grant in 1999 from FEMA to install flow deflectors just upstream of the West Park Center Bridge Site.

Recommended Action:

- Reroute Greenbelt path.
- Hydrologic or bank treatments.
- Riparian enhancements.
- Explore potential river access

17 **Boise State University (BSU)**
R-21

The bank on river left shows active scour for several hundred feet. The bank is steep and bare of vegetation along much of its length. The Channel Assessment Report recommends a combination of rip rap and bioengineering to reclaim the bank. A challenge will be to restrict people from walking through the area. Signs explaining why the area is closed and plant materials which are not friendly to people should be included in the repair project. The BSU Master Plan, completed in 1999, proposes extensive development of a pedestrian way along the Greenbelt. The Board of Parks and Recreation has adopted the BSU plan, which includes observation decks and constructed incursions into the riparian area. The Parks and Recreation Department will be responsible for the area between the river and the path. The BSU Master Plan extends from the path into campus.

Recommended Action:

- Hydrologic and bank treatments
- Coordinate walk way development and bank treatments.

18 **Julia Davis Park - Boise State University Footbridge**
R-20

The Cottonwood Flume enters Julia Davis Park near Broadway Avenue. The flume is covered and its outfall into the Boise River is not very visible. The Cottonwood Creek Flume could be rerouted through the ponds in the park. Most heavy sediments are collected from the creek in a sediment basin in Military Reserve park. Rerouting Cottonwood Creek into the ponds would keep the water fresher during the year.

An informal access to the river has developed on river right just upstream of the foot bridge. This site should be developed for multiple use access and access discouraged elsewhere near the bridge. The multiple use site could be for the public and for emergency river rescue vehicles. Restrooms, water, picnic tables and phones are accessible from the footbridge. Construction of the river access may be done with materials other than concrete, so that the developed access is less formal and will fit aesthetically with the river environment. The Julia Davis Park Master Plan should be reviewed and possibly updated to reflect this use.

The network of volunteer trails should be rehabilitated in this area and one or two trails designated along the river. One or more river

overlooks with benches would provide stopping places along the Greenbelt path for all users.

Recommended Action:

- Review the Julia Davis Park Master Plan.
- Develop emergency access point.
- Develop multiple use river access.
- Construct observation decks.
- Rehabilitate volunteer trails.
- Investigate rerouting Cottonwood Flume.

19
R-18

Ann Morrison Park Footbridge

The major tuber take out is on river left, just upstream of the footbridge. It has evolved as a major access point without any design or construction. A tuber port should be constructed here. Boise Parks and Recreation should provide another restroom, water and pay phone near this site, even though there are other facilities within view of the take out. This site is used for emergency access though it should be upgraded to meet the tuber port conceptual design.

This site should be developed to increase safety for recreationists and to stem resource damage. Other options discussed by the committee include encouraging shuttle use through some type of bonus and finding other large parking places near Ann Morrison Park where shuttle riders may leave their cars, such as county-owned property on Royal and Lusk Streets.

In 1999, Ada County Parks Department negotiated an agreement with Timberline High School to use the parking lot for tuber shuttle parking. The Boise Police Department has been strictly

enforcing no parking zones near Barber Park. And, the Barber Park parking area is being expanded. Still, the shuttle parking has been popular and heavily used.

Recommended Action:

- Develop a tuber port.
- Develop emergency access.
- Encourage shuttle use by tubers.

20
R-17

Settlers Irrigation District Diversion and Headgate

Settlers Irrigation Diversion is a key location in the planning area for several reasons. This diversion has been the traditional barrier which kept most tubers upstream, thus dividing the planning area into two river recreational zones based on the number and type of users. It is the top site for a potential kayak course. The hydraulics, in part caused by the diversion, are causing downstream erosion.

The kayak course would be for instruction, recreation, demonstration and low-level competition. A kayak course likely will draw significant spectators. The safety of spectators must be determined when considering where to put a kayak course.

The Channel Assessment Report contains several suggestions including modifying the diversion for boater passage and building another weir downstream of the Settlers Irrigation diversion to trap sediment to cover a sewer line buried under the river, which is at risk of being exposed. A new diversion, properly shaped, would direct flow away from the right bank, ending some of the scouring action downstream.

Recommended Action:

- Investigate putting a kayak course here.
- Designate and improve a portage route.
- Hydrologic and bank treatments.

21 **Riverside Park to Old Railroad Bridge**
R-16

The right bank in the stretch along Riverside Park to the Railroad Bridge is being damaged by river hydraulics which may be modified with a combination of engineered and biotechnical techniques. Existing gabions are being undermined. The Greenbelt may need to be replaced to construct the hydrological treatments.

In Riverside Park there may be opportunities to improve river access for boaters associated with some of the repair work. Additionally, the fire training tower and yard may be moved to another location, vacating space which could be used for parking by boaters on the kayak course, canoeists and Greenbelt users.

On river left, the Greenbelt Path ends at the American Bridge. A deck, built about 15 years ago in anticipation of Greenbelt expansion is isolated by surrounding private property. A Greenbelt expansion on river left could connect the path from the Americana Bridge to the Main Street Bridge.

Recommended Action:

- Bioengineering and biotechnical bank treatments.
- Potential river access for boaters.
- Connect the Greenbelt path on the south side of the river
- Remove deck and rehabilitate bank if Greenbelt can not be extended.

22 **Emergency Access through Shilo Inn**
R-15A

There appears to be access through the Shilo Inn parking lot for maintenance construction equipment. This should be investigated as a potential access for Boise Fire Department emergency vehicles, including the rescue boat.

Recommended Action:

- Investigate emergency access potential.

23 **Garden City Greenbelt Extension**
R-14

The Greenbelt was built in 1999 from the Double Tree Riverside to 36th Street. This provides direct Greenbelt access to a Garden City neighborhood.

24 **36th Street Wave/Thurman Mill Ditch Co. Diversion**
R-13

The 36th Street wave is created by a rubble and concrete diversion owned by the Thurman Mill Ditch Co. and associated with a canal system on river left. The wave is popular with kayakers during flows of 6,000 cfs and more. At low flows there is exposed broken concrete and rubble and the diversion must be portaged on river left. The portage route necessitates crossing the concrete canal structure. An upgraded portage would improve safety. This is another choice for a kayak course, if modifications can be made to the diversion and access improved.

Recommended Action:

- Investigate potential kayak course.
- Clear river of unsafe debris.
- Designate and improve portage route.

25 **Bernardine Quinn Riverside Park and Lake**
R-12

On river right, a narrow berm separates the river from Quinn's Pond, which previously was the site of gravel extraction. The Greenbelt path is on top of the berm. The berm is eroding, in part because of the hydraulics created by the Thurman Mill Ditch Co.

This is a high priority site in the Channel Assessment Report as the berm is at risk of being breached, which would cause significant damage to the Greenbelt path.

A relatively new access from Pleasanton Street to the Greenbelt borders Quinn's Pond. This site may be suitable for an emergency point of access. The pond is a fishing place and provides open space. The pond and approximately five surrounding acres are slated to be developed into a riverside park, including a canoe landing. The parking area at this access point is well-used and it appears more parking may be needed. The Quinn property on the downstream side of the Pleasanton Street access should be considered for acquisition by the city to develop a riverside park.

Recommended Action:

- Acquire additional riverside property.
- Hydrologic and bank treatments.
- Develop more parking.
- Investigate emergency access potential.

26
R-12

Farmers Union Ditch Company

This abandoned diversion structure now litters the river with broken concrete and rubble, and must be portaged during low flows. This site presents a safety hazard to river users and an opportunity to improve river recreation by removing the unsafe materials and reconstructing a weir with a boat notch. The weir would re-direct the river flow off the right bank to prevent further unnatural erosion of the narrow berm separating the river from a pond, also a former gravel pit. The Greenbelt path is on top of the berm. It would be destroyed if the berm were breached.

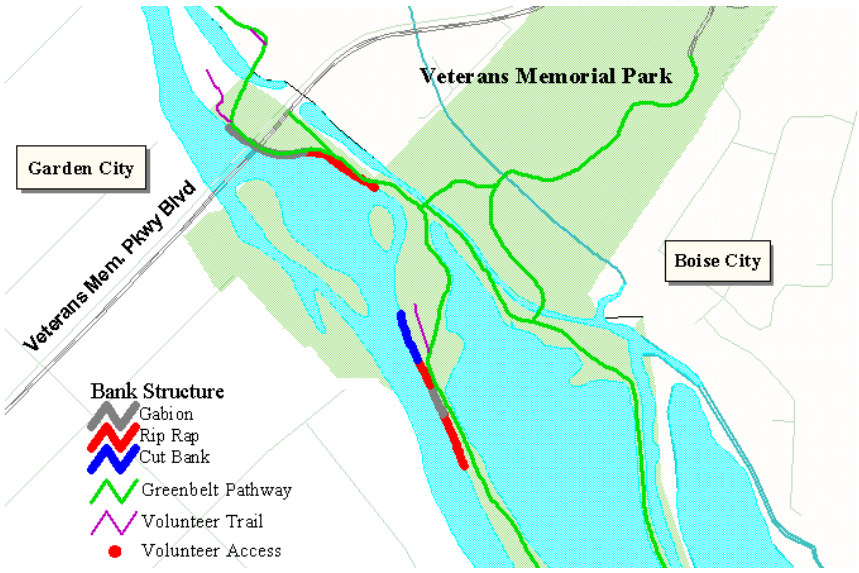
A pit toilet in this area will be removed due to water quality concerns.

Recommended Action:

- Clear river of unsafe debris.
- Reconstruct diversion with boaters' notch.
- Designate and improve portage route.
- Hydrologic and bank treatments.

27
R-11

Veterans Memorial Park



The river right bank has sustained much damage from high flows in the past. The Greenbelt path goes over gabions and fill underneath the Veterans Memorial Bridge, slightly downstream from the historical bank cutting area. A failure of the bank or gabion structure would result in damage to the path. The river flow should be directed away from the bank by installing in-river barbs.

Recommended Action:

- Hydrologic and bank treatments.

28
R-9

Lander Street Wastewater Treatment Plant

A new year-round restroom is available on this City property. It is accessible from the Greenbelt path.

29
R-8

Willow Lane

There is an emergency access point at the end of Willow Lane.

Recommended Action:

- Retain the emergency access point.

30
R-6

Upstream of Lake Harbor

The Greenbelt goes through a wooded, more natural appearing area. The opportunity is to replace introduced landscape plants with native species. For example, several pines which do not normally inhabit areas with high water tables, are observed along this part of the Greenbelt. Using native plants would improve wildlife habitat and contribute to bank strength.

Recommended Action:

- Riparian enhancement.

31
R-5

Wylie Lane

There is potential emergency access at the end of Wylie Lane.

Recommended Action:

- Investigate emergency access potential.

32
R-4

Lake Harbor Lane

This area has a low bank and there may be a potential emergency access from the small parking area and Greenbelt access. The *Channel Assessment Report* describes the hydrological conditions and risks and warns that mitigating bank treatments here must be coordinated with downstream conditions.

Recommended Action:

- Investigate emergency access potential.
- Further assess hydrology and the need for bank treatments.

33
R-1

Garden City Greenbelt Bridges

The channel splits and there are bridges over both channels. Both bridges are undersized for flood events and should be evaluated for alteration or replacement. The bridge on the left channel is showing signs of failure. If the bridges were to fail, the Greenbelt path would be destroyed.

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Recommended Action:

- Evaluate adequacy of bridges.

The matrix on the next page summarizes the attributes at the sites. The five columns to the right of the site listing indicate what actions are recommended. The matrix shows the relative benefits in terms of public safety improvements, emergency vehicle access, recreational and natural area opportunities, whether a bank stabilization treatment is recommended. The last column is from the Channel Assessment Report and is an assessment of the priority rating for addressing the hydrologic situation. It is presented as a risk factor.

Site Attribute Matrix

Site	Safety	Emergency	Recreation	Natural	Bank Trt.	Hyd. Risk*
2	X		X	X		M
3				X		H
4	X	X	X	X		M
5,6			X	X	levee	S,H
7			X	X	levee	S
8		X				Mon.
9			X			M,Mon.
10		X	X	X	X	H
11				X	X	H
12		X			X	S
13,14		X	X			H
15						
16		X	X	X	X	S
17				X	X	S
18		X	X		X	M
19	X	X	X		X	H
20			X		X	H
21			X	X	X	S
22		X				M
23			X			M
24	X		X		X	S
25						
26	X		X			S
27					X	S
28						
30				X		H
31		X				S
32					X	S

- S - Severe H - High M - Moderate L - Low
  Mon. - Monitor

Policy Implementation Matrix

Priority	Policy Implementation	Public Safety	Recreation Enhancement	Resource Preservation / Enhancement	Feasibility	Cost
	I. Public Safety					
	a. Emergency Access Points					
H	1. Identify at least one potential access between each diversion	X	X	X	H	L
H	2. Every tuber port should include emergency access	X	X	X	H	M / H
H	3. Develop access points for multiple purposes		X	X	M	M / H
H	4. Develop a jointly funded river ranger program	X	X	X	H	L / M
H	5. Tie recreational skill levels to flow levels - hotline	X	X		H	L
	b. Irrigation Diversions and Weirs					
H	1. Provide portages around all diversions	X	X	X	M / H	L / M
H	2. Partner with irrigators, recreationists, agencies to identify and remove hazards at diversions	X	X	X	M / H	H
H	3. Investigate liability associated with portages on diversions	X	X		H	L
L	4. Remove diversions no longer in use	X	X	X	L	H
M	5. Develop safety guidelines for materials in river, on banks	X	X	X	H	L / M
H	6. Meet with irrigators annually to discuss diversions	X	X	X	H	L
	c. River Debris and Snags					
H	1. Continue to identify dangerous debris and snags to remove for safety reasons	X	X		H	L
H	2. Evaluate snags case by case. Remove dangerous snags from tuber channel, Barber to Ann Morrison Park	X	X	X	H	L
H	3. Seek cost sharing with Ada County for snag removal	X	X		H	L
M	4. Work with IDFG, conservation organizations. to mitigate for snag removal	X	X	X	H	L / M
	d. Lighting and Emergency Phones					
M	1. Provide lighting along the Greenbelt between Municipal Park to Americana Blvd.	X	X		M	H
H	2. Provide pay phones - Greenbelt, tuber ports, parks, bridges	X	X		H	H
M	3. Continue to evaluate feasibility of emergency phones	X	X		H	L
	e. Existing Warning Signs; Reference Points					
H	1. Limit signs to major hazards and presence of phones	X	X		H	L/M
H	2. Use river crossings for some signs, e.g., bridge name	X	X		H	L
M	3. Simplify the signs – start mileage at Sandy Point	X	X		H	L / M
H	4. Put a map at each phone	X	X		H	L
H	5. Identify bridges with signs visible from the river	X	X		H	L
M	6. Have separate sign systems for river and Greenbelt users	X	X		H	M
	f. Alcohol Use on the Boise River					
H	1. Investigate policies to limit or prohibit alcohol on the Boise River	X	X	X	H	L
H	2. Work with Ada County on an alcohol policy	X	X	X	H	L
H	3. Develop a jointly funded river ranger program	X	X	X	H	L / M
H	4. Have a consistent alcohol policy for entire river corridor	X	X	X	H	L
	g. Structures					
L	1. Connect Greenbelt on south side between Americana and Main Street Bridge		X		L	H
M	2. Remove deck and rehabilitate bank if Greenbelt is not extended	X			M	M
	h. Design of Bridges					
H	1. Urge ACHD and ITD to design bridge pilings and abutments which are safe for river recreationists	X	X		H	L
H	2. Request bridges be used for informational signs for river users	X	X		H	L
H	3. Use bridge construction to provide access for emergency vehicles and river users	X	X	X	M / H	M
H	safety	X	X		H	M / H
M	5. Create a marker on at least one bridge which shows flow levels	X	X		H	L
	i. Greenbelt Path					
H	1. Conduct a study to identify types and numbers of users of the Greenbelt path throughout the year	X	X	X	H	L / M
H	2. Standard path width should be 12' wherever possible	X	X	X	H	M
H	3. Maintain 6'minimum path standard for unpaved paths	X	X	X	H	L / M
H	4. Educate users to ride at appropriate speeds - no speed limit	X	X		H	L
M	5. Have dual path system where possible to separate users	X	X		M	M
H	6. Continue safety programs, e.g., "Stay to the Right"	X	X		H	L
H	7. Stripe the paved Greenbelt path	X	X		H	L
H	8. Require dogs to be on leashes	X	X	X	H	L
H	9. Conduct a survey of property boundaries, confirm ownership of easements and land parcels				H	L
	II. Recreation					
	a. Restrooms					
M	1. Locate restrooms in new parks to be more accessible from the river	X	X	X	M	H
H	2. Put restrooms at tuber ports	X	X	X	M	H
H	3. Look for opportunities to put restrooms on south side of river	X	X	X	M	H
M	4. Create accessible routes between river and restrooms		X	X	H	M
H	5. Use portable restrooms at strategic locations along the river and Greenbelt in summer		X	X	H	L / M

Priority	Policy Implementation	Public Safety	Recreation Enhancement	Resource Preservation / Enhancement	Feasibility	Cost
	b. Developed Access Points					
H	1. Develop river access or tuber ports between Barber and Ann Morrison Parks	X	X	X	M	H
M/L	2. Potential access for boaters are fire training center, Willow Lane	X	X	X	M	H
H	3. Develop standard design for pedestrian accessed tuber port with emergency access	X	X	X	H	L
	c. Heavily Used Undeveloped Recreation Sites					
H	1. Block some volunteer trails	X	X	X	H	L / M
H	2. Develop some trails	X	X	X	H	L / M
H	3. Explore opportunities to create overlook or bench at end of river access trails		X	X	H	M
H	4. Revegetate where resource damage is occurring		X	X	H	L / M
M	5. Use temporary educational signs to explain damage, repair		X	X	H	L
H	6. Continue Adopt-A-River volunteer program		X	X	H	L
H	7. Create safe, accessible tuber ports with restrooms	X	X	X	M	H
H	8. Consistently enforce no camping regulation along Greenbelt	X	X	X	H	L
	d. Trails					
H	1. No more footbridges in Boise; perhaps Garden City		X	X	H	L
H	2. Do not put a path along Warm Springs Golf Course	X		X	H	L
H	3. Link Greenbelt path to neighborhoods and other trails	X	X		M	M / H
H	4. Sign and mark bicycle route alternative to natural path	X	X	X	H	L
M	5. Put bollards or other obstacles at end of unpaved path	X	X		H	L / M
M	6. Seek parking opportunities for users of natural paths	X	X		M	L
	e. Parking					
H	1. The river and Greenbelt user study should examine parking	X	X	X	H	M
H	2. No charge for tuber parking in Ann Morrison Park		X		H	L
M	3. New tuber and boater ports should consider parking	X	X	X	H	L / M
M	4. City and County seek after hours parking agreements with businesses for Greenbelt user parking	X	X		H	L
M	5. Provide looped shuttle service between tuber ports	X	X	X	M	L
H	6. More bicycle racks at destination places		X	X	H	L
	f. Boating					
H	1. Work with kayakers, irrigators to develop a kayak course	X	X	?	M	H
H/M	2. Create one or more access places for canoeists	X	X	X	M	M
H	3. Create safe portages around all diversions	X	X	X	H	L / M
H	4. Determine easement availability at portage sites	X	X	X	H	L
M	5. Encourage boating downstream of Ann Morrison Park	X	X		M	M
H	6. No public access for boats on trailers	X	X	X	H	L
	g. Recreation Demand					
H	1. Comprehensive recreation study to create a baseline to measure changes in user #s, types, patterns, etc.	X	X	X	H	M
H	2. Do not permit uses which are safety hazards	X	X	X	H	L
H	3. Education increases in importance with increases in users	X	X	X	H	L
H	4. Identify traffic conflict areas on Greenbelt and widen or path or improve traffic flow	X	X	?	H	M / H
M	5. Establish and sign bypasses in areas of congestion	X	X		H	M
H	6. Designate some high use path areas	X	X		H	M
L	7. Develop two paths in high-use areas		X		H	M
H	8. Monitor recreation trends so BPR can manage proactively	X	X	X	H	L
H	9. Monitor cumulative effect of signs, trash cans, benches, etc. Assess need for facilities management plan.	X	X	X	H	L
L/M	10. Consider ways to spread out tubing use, users.	X	X	X	L / M	M
M	11. Explore potential for consolidating recreation services and management in city and its impact area	X	X	X	M	M
H	12. Develop a jointly funded river ranger program	X	X	X	H	L / M
	h. Litter Management					
H	1. Continue the Adopt-A-River volunteer program		X	X	H	L
H	2. Adopt zero tolerance attitude toward litter		X	X	H	L
H	3. Educate users about negative effects of litter on resources		X	X	H	L
M	4. Provide as many trash cans as possible in convenient areas		X	X	H	M
H	5. Put trash cans at all restrooms and near bridges		X	X	H	M
H	6. Ban cans and bottles on the Boise River	X	X	X	H	L
	i. Concessionaires					
H	1. Continue to review permit apps., using existing criteria	X	X	X	H	L
M	2. Create proactive policies to deal with concessionaires near, but not on, the Greenbelt	X	X	X	M	L
H	vendors	X	X	X	H	L
	III. Wildlife and Vegetation and Fisheries					
	a. Cottonwood Forest and Riparian Zone					
H	1. Develop management plan for riparian zone and river setback. Inventory native and invasive species		X	X	H	M
M	2. Develop list of desirable plant species and their values		X	X	H	L
M	3. Use woody debris and plants to block and rehabilitate volunteer trails	X	X	X	H	L

Priority	Policy Implementation	Public Safety	Recreation Enhancement	Resource Preservation / Enhancement	Feasibility	Cost
H	4. Move path away from river in places for riparian zone		X	X	M	L
H	5. Grow native plants between river and Greenbelt path		X	X	M	M
M	6. Control invasive plants and weeds		X	X	M	H
L/M	7. Post educational signs about natural areas, rehabilitation		X	X	H	H
H	8. Establish relationship with BOR/COE to influence flows to benefit riparian zone.		X	X	H	L / M
H	9. Develop BMPs for Greenbelt path, river setback and park edges along the Boise River		X	X	H	L
	b. Important Wildlife Habitat and Wildlife Use Areas					
M	1. Inventory remaining habitat and its values for wildlife		X	X	H	L / M
H	2. Update Boise River System Ordinance if necessary			X	M	L
H	3. Designate and protect remaining high quality habitat		X	X	H	M
H	4. Develop riparian management plan for wildlife habitat and use areas to minimize effects of human use		X	X	H	L / M
H	5. BPR has a responsibility to provide habitat on its lands		X	X	M	L / H
L	6. Educate about cat impacts on bird and small mammal populations			X	L	M
H	7. Seek stable funding for naturalist or ecologist		X	X	M	M
H	8. Naturalist/ecologist would have management, educational responsibilities		X	X	H	M
	c. Fisheries Habitat					
H	1. Take opportunities to work with other organizations to improve fish habitat in the city		X	X	H	L / M
H	2. Work with IDFG, organizations to improve habitat and mitigate for removal of snags for floaters		X	X	H	L
H	3. Establish relationship with BOR and COE to influence river flows to benefit fish and wildlife	X	X	X	L	L
M	4. Investigate City taking leadership in managing setback agreements in River Run and Wood Duck Island		X	X	H	M
	d. Beaver Management					
H	1. Manage beavers aggressively – spay/neuter program; destroy some beavers; remove	X		X	H	L / M
M	2. Determine acceptable population of beavers			X	M	L / M
H	3. Beaver management a component of riparian management plan			X	H	L / M
H	4. Continue to have volunteers wrap trees with wire mesh			X	H	L
M/L	5. Consult with NRCS about beaver relocation			X	H	L / M
	e. Educational Opportunities					
L	1. Identify potential partners for an interpretive program		X	X	M	L / M
L	2. Explore general interest in an interpretation program along river		X	X	H	L / M
L	3. Identify educational opportunities related to department plans and objectives		X	X	H	L / M
M	Greenbelt		X	X	M	L / M
M	5. Restrict number of signs on Greenbelt. Use kiosks		X		M	M / H
L	6. Create volunteer interpreter program		X	X	M	M
	IV. River Bank Stabilization, Treatment and Hydrology					
H	1. Protect and restore river banks to meet multiple objectives	X	X	X	H	M / H
H	2. Identify diversion structures contributing to resource damage (Greenbelt and river banks.) Establish priorities for repairs and enhancement assoc. with diversions	X	X	X	H	L
M/H	3. Use sites as demonstration areas. Biotech has top priority			X	H	M
M	4. Encourage City to do comprehensive flood protection study to include meander pathways as well as flood channels	X		X	M	H
M/H	5. Enter into discussions/negotiations with irrigators about repairing diversions	X	X	X	H / M	L
	V. Water Quality					
	a. Non Point Pollution Sources					
H	1. Continue with no mow zones, IPM, Mutt Mitt		X	X	H	L
H	2. Review and update regularly the storm water site operation and maintenance plans			X	H	L
L/M	3. Form partnerships with other agencies to build treatment wetlands on park land whenever feasible		X	X	M	M
	b. Point Source Pollution					
H	1. Pollution sources should be noted by BPR personnel and reported to appropriate agency	X		X	H	L
M/H	2. Develop flood protection measures for potential pollution sources on park land	X		X	M	L / M
H	3. Maintain and update as necessary the Spill Response Plan	X	X	X	H	L
H	site.		X	X	H	M
H	5. Work with Public Works Dept. to incorporate NPDES into park management			X	H	L / M
M	6. Storm water from outside park boundaries should be treated in the parks when feasible	X		X	M / H	M / H
	c. Integrated Pest Management					
H	1. Continue and expand IPM program	X		X	H	L
M	2. Provide information on IPM to landowners	X		X	M	L
M	3. Support IPM of other landowners by sharing info and providing examples	X		X	M	L
H	from the city	X		X	H	L
	VI. Mitigation Program					
M/H	1. Develop mitigation program after comprehensive review of the issues – legal, hydrological, biological		X	X	H	L
H	2. Develop a list of potential mitigation projects		X	X	H	L
M	3. City should establish wetlands mitigation bank to be administered by Boise Parks and Recreation.		X	X	M	L
M	4. Monitoring plan should be developed as part of mitigation program			X	M	L / M

Priority	Policy Implementation	Public Safety	Recreation Enhancement	Resource Preservation / Enhancement	Feasibility	Cost
H	5. Communicate with other city depts. about potential mitigation projects, especially P&Z		X	X	H	L
	VII. Intergovernmental Cooperation					
H	1. BPR should take leadership role in developing a process for coordinating with other depts., neighboring jurisdictions, etc. over shared management challenges and opportunities	X	X	X	H	L

Site Improvement Matrix

		RECOMMENDED SITE IMPROVEMENTS								
Site Number	**Hydrological Risk (Channel Assessments refer to Appendix A)**	**Bank Treatment**	**Safety**	**Emergency**	**Recreation**	**Resource Protection/Enhancement**	**Feasibility (High, Moderate, Low)**	**Cost (High, Moderate, Low)**	**Recommended Actions**	**Priority Level**
1					■				**Barber Dam**	
							H	**L**	*Improve Portage*	**H**
2 (R-44)	HIGH	■	■		■	■			**Nampa and Meridian Irrigation District Diversion**	
							H	**L**	*Designate and Improve Portage Route*	**H**
							M	**L**	*Enhance Habitat and Riparian Areas*	**H**
							M	**L**	*Easements*	**M**
3, (R-39A,B,C)	MODERATE	■				■			**Harris Ranch**	
							H	**H**	*Side Channels*	**M/L**
							H	**M**	*Enhance Riparian Buffers*	**H**
							H	**M**	*Unpaved Path*	**H**
							H	**M**	*Habitat Improvement*	**M**
							H	**L**	*No Tubing Access*	**H**
4 (R-42)	SEVERE, HIGH	■	■	■	■	■			**South Boise Mutual Irrigation Company Diversion**	
							H	**L**	*Discuss safety concerns with irrigation company*	**H**
							M	**H**	*Emergency Access for Boise Fire and Boise Public Works Departments*	**H**
							H	**L**	*Designate and Improve Portage Route*	**H**
5,6 (R-40,41)	SEVERE	■			■	■			**Wood Duck Island and Unpaved Path**	
							H	**L**	*Coordinate Management with City and County*	**H**
							H	**L**	*Stencil Bikepath for Safety and Guidance*	**H**
							H	**L**	*Revegetate / Remove Volunteer Trails*	**H**
							M	**M**	*Provide Designated Points of Access*	**M**
							H	**M**	*Signage Marking Approved Pathways*	**H**
7 (R-38)	MONITOR	■			■	■			**South Boise Water Company Headgate/ East Park Center Bridge**	
							H	**L**	*Mitigation for Bridge Construction*	**H**
							M	**M**	*Emergency Access*	**H**
							M	**M**	*Greenbelt Accessible Parking*	**M**
							H	**L**	*Designate Pedestrian River Access through Riparian Areas*	**H**
8 (R-37)	MODERATE / MONITOR		■	■					**South Boise Water Company**	
							M	**H**	*Consider Removal of Abandoned Diversion Structure*	**M**
							H	**L**	*Designate and Improve Portage Routes*	**H**
							H	**L**	*Investigate Emergency Access Potential*	**H**
9(R-34)	HIGH				■				**Boise City Canal Diversion**	
							M	**H**	*Improve Warm Springs Pathway to Diversion*	**L**
							H	**L**	*Designate and Improve Portage Route*	**H**
10 (R-29)	HIGH	■		■	■	■			**Vicinity of Cottonwood Apartments**	
							H	**L**	*Stencil Bicycle Route*	**H**
							H	**L**	*Emphasize Pedestrian Only Zones*	**H**
							H	**L**	*Develop Site-Specific Management Plan for Volunteer trails and Volunteer Access*	**H**
							M	**M**	*Hydrological or Bank Treatments (see Channel Assessment Report)*	**M**
							H	**M**	*Riparian Enhancement*	**M**
11 (R-28)	HIGH	■			■	■			**Warm Springs Golf Course**	
							H	**M**	*Bioengineering and Biotechnical Exhibit Site*	**H**
							M	**M**	*Develop Techniques for Riparian Enhancement / Hydrologic or Bank Treatment*	**M**
12 (R-27)	SEVERE	■		■					**River Quarry** - ***Emergency Access***	
							H	**M**	*Bioengineering and Biotechnical Treatments for Berm Protection*	**H**
							M	**M/H**	*Hydrological or Bank Treatments (see Channel Assessment Report)*	**H**
13,14 (R-25,26)	HIGH			■	■				**East River Footbridge/Baybrook Court**	
							H	**L**	*Revegetation Projects*	**H**
							H	**M**	*Hydrologic or Bank Treatments (see Channel Assessment Reports)*	**M**

Site Improvement Matrix

		RECOMMENDED SITE IMPROVEMENTS								
Site Number	**Hydrological Risk (Channel Assessments refer to Appendix A)**	**Bank Treatment**	**Safety**	**Emergency**	**Recreation**	**Resource Protection/Enhancement**	**Feasibility (High, Moderate, Low)**	**Cost (High, Moderate, Low)**	**Recommended Actions**	**Priority Level**
							H	L	*Signage*	H
							M	L	*Negotiate with businesses for Greenbelt Parking*	M
15									***Municipal Park***	
							M	M	*Relocate Path*	M
							H	L	*Rehabilitate / Close Points of Access*	H
							M	M	*Observation Decks*	M
							M	M	*Develop Prepared Walkways / Points of Access*	H
16 (R-23)	SEVERE								**Park Center Near Loggers Creek/West Park Center Bridge**	
							M	H	*Re-Route Path*	M
							M	H	*Hydrologic or Bank Treatments (see Channel Assessment Report)*	H
							L	H	*Explore Potential River Access*	M
							H	L	*Riparian Enhancement*	H
17 (R-21)	SEVERE								**Boise State University**	
							M	M	*Hydrologic or Bank Treatments (see Channel Assessment Report)*	H
							H	L	*Coordinate bank treatment and revegetation with walkway development*	H
18 (R-20)	MODERATE								**Julia Davis Park**	
							L	H	*Re-Route Cottonwood Flume*	L
							H	L	*Review Park Master Plan*	H
							M	M	*Develop Multiple Use of Access*	H
							H	M	*Emergency Vehicle Access*	H
							H	L	*Rehabilitate and Revegetate Volunteer Trails*	H
							M	M	*Observation Decks*	M
19 (R-18)	HIGH								**Ann Morrison Park Footbridge**	
							H	M/H	*Tuber Port*	H
							M	L	*Encourage Shuttle Use*	M
							H	M	*Emergency Access*	H
20 (R-17)	HIGH								**Settlers Irrigation District Weir and Headgate**	
							H	H	*Potential Kayak Course*	M
							H	L	*Designate and Improve Portage Route*	H
							M	M	*Hydrologic and Bank Treatments (see Channel Assessment Report)*	M
21 (R-16)	SEVERE								**Riverside Park to Old Railroad Bridge**	
							M	M	*Assessment Report)*	H
							M	H	*Improve Emergency Access*	H
							M	M	*Improve Boater Access*	M
							L	H	*Connect Greenbelt of South Side*	L
							H	L	*Remove Deck if Path Wont Be Built*	M
22 (R-15A)	MODERATE								**Shilo Inn**	
							H	M	*Potential Emergency Access*	H
23(R-14)	MODERATE						M	H	**Garden City Greenbelt Extension**	L
24(R-13)									**36th Street Wave/Thurman Mill Ditch Co. Diversion**	
							M	H	*Potential Kayak Course*	L
							M	H	*Clear River of Unsafe Debris*	M
							H	M	*Designate and Improve Portage Route*	H
25(R-12)	SEVERE								**Bernardine Quinn Riverside Park and Lake**	
							H	M	*Hydrologic and Bank Treatments (see Channel Assessment Report)*	H
							M	H	*Acquire Riverside Property*	M
							H	L	*Investigate Emergency Access*	H
							H	M	*Develop and Enhance Parking and Point of Access*	M

Site Improvement Matrix

Site Number	Hydrological Risk (Channel Assessments refer to Appendix A)	RECOMMENDED SITE IMPROVEMENTS								
		Bank Treatment	Safety	Emergency	Recreation	Resource Protection/Enhancement	Feasibility (High, Moderate, Low)	Cost (High, Moderate, Low)	Recommended Actions	Priority Level
26(R-12)	SEVERE								**Farmers Union Ditch Company**	
							H	M	*Hydrologic and Bank Treatments (see Channel Assessment Report)*	H
							H	M	*Designate and Improve Portage Route*	M
							M	H	*Reconstruct Diversion with Boat's Notch*	M
							M	M	*Clear River of Unsafe Debris*	M
27(R11)	SEVERE								**Veterans Memorial Park**	
							H	M	*Hydrologic and Bank Treatments (see: Channel Assessment Report)*	H
28(R-9)	SEVERE						H	L	**Lander Street Water Treatment Plant**	H
29(R-8)									**Willow Lane**	
							M	M	*Potential Emergency Access*	M
30(R-6)	HIGH								**Upstream of Lake Harbor**	
							H	L	*Riparian Enhancements*	H
31 (R-5)	SEVERE								**Wylie Lane**	
							M	M	*Potential Emergency Access*	M
32 (R-4)	SEVERE								**Lake Harbor Lane**	
							M	H	*Potential Emergency Access*	M
33 (R-1)									**Garden City Greenbelt Bridges**	
							H	L	*Evaluate Bridges*	M

Information Sources

Other Plans

Barber Area Common Issues Report: A Joint Effort To Determine Issues Pertaining to Use of the Boise River and Public Parks in the Barber Area. Ada County Parks and Waterways, Boise Parks and Recreation Department; Idaho Foundation for Parks and Lands; Idaho Department of Parks and Recreation. Boise, Idaho. June 1998.

Boise State University Campus Lane Pedestrian Improvements. Joseph La Marche, Ivy Design; McKibben and Cooper Architects; Foresgren Engineers Boise, Idaho. July 1999,

Comprehensive Park and Recreation System Plan, Volume 1, Strategic Plan. Boise Parks and Recreation Department. Boise, Idaho. September 1993.

Facility Master Plans. Boise Parks and Recreation Department. Boise, Idaho. Updated February 1999.

Veterans Memorial Park Development and Management Plan. The Land Group, Inc. for Boise Parks and Recreation Department. Boise, Idaho. . March 1999.

Other Information Sources

Ada County Code, 2-27: Prohibited Acts on the Boise River.

An Inventory of Irrigation Diversion Structures, Task 1 Report. Quadrant Consulting, Inc., McLaughlin Water Engineers Inc. and Resource Systems, Inc. Boise and Payette Rivers Diversion Upgrade Project. 1997.

Boise City Code, 6-17-06: Prohibited Acts on the Boise River.

The Boise River Greenbelt Perceived Benefits and Problems Associated with the Pathway as a Place for Exercise. Daniel G. Line. Masters Thesis, Boise State University. Boise, Idaho. August 1996.

Boise River System Ordinance, Chapter 11-16. Boise City Code. Boise, Idaho.

Boise River System Recreation Study, Phase II. Shalkey Walker Associates, Inc., Denver, Colorado, for U.S. Bureau of Reclamation and Idaho Department of Water Resources. Boise, Idaho. September 1995.

Canoeing the Boise River. Tom Chelstrom, REI, 8300 W. Emerald St., Boise, Idaho. July 1997.

Garden City Code, 2-1: Greenbelt Committee.

History Along the Greenbelt: An Idaho Centennial Project of the Ada County Centennial Committee. Jim Witherell. No date.

State Historic Preservation Office. Review of site files adjacent to the Boise River from Lucky Peak Dam to Eagle. Boise, Idaho. March 1999.

Survey of Potential and Available Salmonid Habitat in the Boise River. G. Asbridge and T.C. Bjornn. Job Completion Report Project F-71-R-12, Subproject III, Job. No 3. Prepared for the Idaho Department of Fish and Game. June 1988.

The Treasure of Our Valley: A Conservation Blueprint for the Boise River. Marti L. Bridges. Idaho Rivers United, P.O. Box 633, Boise, Idaho. September 1998.

When the River Rises: Flood Control on the Boise River 1943 - 1985. Susan M. Stacy. Institute of Behavioral Sciences, University of Colorado. Boulder, Colorado. 1993.

Spatial Data Collection

The Spatial Dynamics team has compiled information from a variety of sources, as well as collecting data in the field using a GPS unit in order to develop a comprehensive Geographic Information System (GIS) for the Boise River project. The purpose of the GIS is to characterize the current conditions of the river corridor in terms of the environmental condition, public recreation facilities, irrigation and flood control infrastructure, and existing use levels. This information will be used to educate the steering committee members and the public on the current status of the resource as well as support the development and evaluation of resource and recreation management alternatives.

Following is a list and brief description of the data layers being integrated into the project GIS. Whenever possible use has been made of GIS information available from Boise City and Ada County. This includes most of the data layers related to infrastructure, general surface hydrology, and developed recreational facilities along the river. Items that were not currently available such as bank features, undeveloped recreational use areas, and wildlife use areas, have been collected with a GPS unit during a detailed field survey of the study area. Spatial and tabular data from previous reports and studies along

the river such as the *1993/94 Bald Eagle Study* are also being incorporated into the GIS whenever possible.

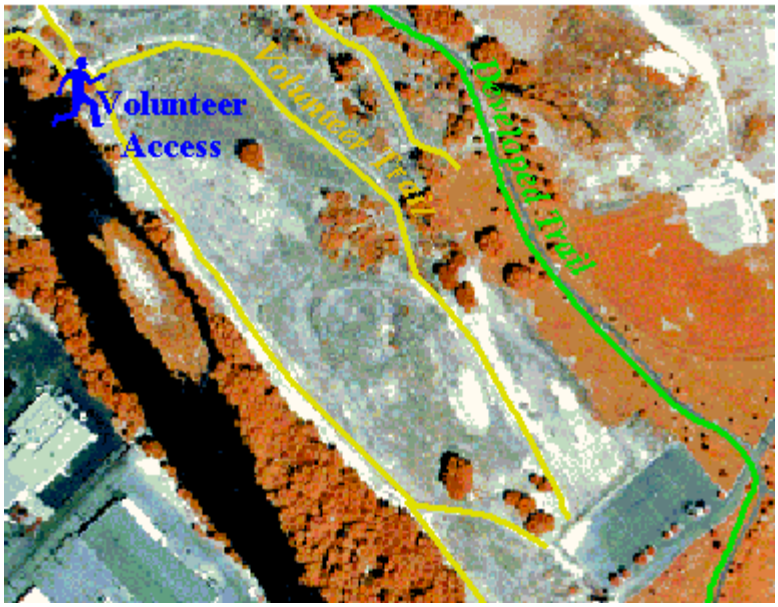
Note: The GPS data collection has been somewhat hindered by the high river flows. The entire river corridor was inventoried but in some areas it was difficult to characterize the resource condition.

Public Safety

- ***Emergency Access*** – emergency access locations currently being used by the fire department.
- ***Hazards*** – areas with snags into the river and/or associated debris piles have been located with the GPS unit.
- ***Irrigation Structures*** – all irrigation structures in or adjacent to the river as identified by Quadrant Engineering for BR2000 (ie: diversion, rivercheck, pump, headgate). Detailed information on each structure as well as digital photographs are available.
- ***Lights/Phones*** – existing lights and phones visible from the river corridor have been located with the GPS.
- ***Signs*** – existing signs, warning and informational, were located by the Park's department and have been field verified and incorporated into the GIS.
- ***Litter*** – obvious dump sites, areas with a lot of broken glass, and obvious campsites have been located with the GPS.

Public Facilities and High Use Recreation Areas

- ***Recreation Facilities*** – restrooms, developed picnic sites and vendor stations have been located by the Park's department, field verified and incorporated into the GIS.
- ***Recreational Access*** – developed as well as undeveloped 'volunteer' access points from outside the river corridor to the Greenbelt trail system and from the trail system to the river have been located with the GPS.



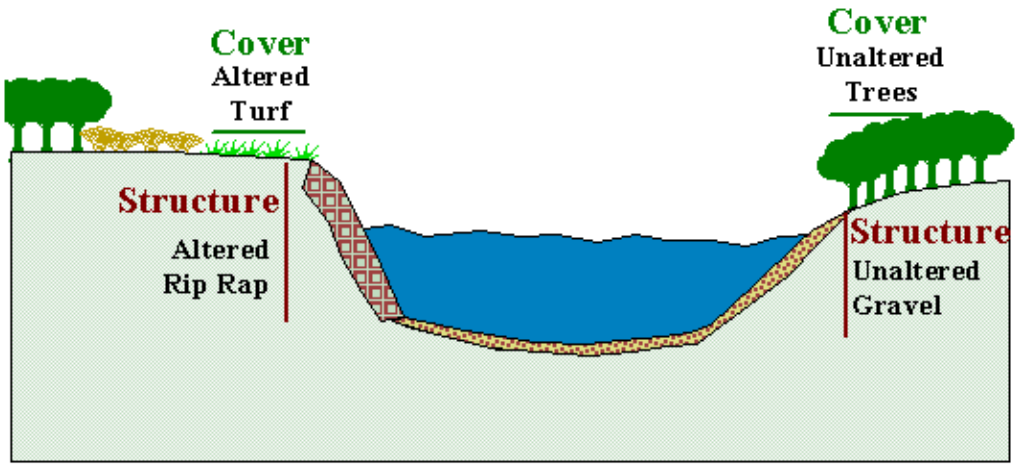
- ***Trails*** – includes developed trails such as the Greenbelt and all undeveloped 'volunteer' trails; attribute information includes the trail surface and general condition.
- ***Parking*** – developed and undeveloped parking areas.
- ***Trash Receptacles*** – located with a GPS unit by the Park's department.
- ***Bike Racks*** – located with a GPS unit by the Park's department.
- ***Water Fountains*** – located with a GPS unit by the Park's department.
- ***Benches/Picnic Tables*** – located with a GPS unit by the Park's department.
- ***Misc. Structures*** – decks or other structures not identified in other data sets.

Water Quality

- ***Discharge Points*** – discharge points into the river have been identified in the field whenever possible and integrated with digital data from Boise City Public Works and the ACHD.

Physical Features

- ***Erosion*** – areas identified with obvious bank erosion problems have been located by GPS.
- ***Bank Structure*** – identifies and describes altered and unaltered sections of bank (the vertical interface between ground and water), ie: rip rap, levee, gabion wall, cut bank, point bar, gravel, vegetated.
- ***Bank Cover*** – identifies and describes altered and unaltered bank cover (the horizontal plane immediately adjacent to the river), ie: turf, native grasses, shrubs, trees, impervious barren ground and pervious barren ground.



Note: Problem areas identified by ATEC will be mapped and described briefly in the GIS. A more detailed description of these features with recommendations for mitigation and restoration will be included in the final report.

Wildlife

- ***Avian Use*** – locates and identifies heron rookeries and bald eagle perch sites from the 1993/94 Bald Eagle study and provides GPS location of nesting boxes found during field survey.
- ***Beaver Use*** – locates areas with heavy beaver damage and identifies areas where trees have been wrapped.
- ***Fish Habitat*** – river segments will be delineated to indicate pool, riffle, run and pocketwater habitat classifications as identified in the 1988 report *Survey of Potential and Available Salmonid Habitat in the Boise River*, prepared by University of Idaho for the Idaho Dept of Fish and Game.
- ***Habitat*** – identifies cottonwood forests, riparian areas, and natural shrub and grasslands; habitat classifications as defined in the *Boise River Fish and Wildlife Habitat Study* (1983) prepared for the City of Boise will be integrated into the habitat map layer.

Jurisdictional Boundaries

- ***City Limits*** – boundary identifying existing Boise City limits.
- ***Irrigation Districts*** – boundary identifying irrigation districts provided by Ada County.
- ***Drainage Districts*** – boundary identifying drainage districts provided by the ACHD.

Other Features

- ***Roads*** – road network from the Ada County Digital Base Map.
- ***Surface Hydrology*** – streams, canals, Boise River, and lakes provided by Ada County.

- ***Comprehensive Plan*** – Boise City Comprehensive Plan indicating proposed land uses**.**
- ***Land Use*** – 1994 land use classifications developed by the Idaho Department of Water Resources from 1994 aerial photography.
- ***Vacant Land*** – identification of existing vacant lands along river corridor, developed from assessor's data, 4th quarter 1998.

BOISE RIVER CHANNEL ASSESSEMENT:

CITY OF BOISE, ADA COUNTY, IDAHO

PREPARED FOR:
CITY OF BOISE PARKS AND RECREATION DEPARTMENT
BOISE, IDAHO

PREPARED BY:
AGUA TIERRA ENVIRONMENTAL CONSULTING, INC
(ATEC)
OLYMPIA, WASHINGTON

1.0 INTRODUCTION

At the request of the City of Boise Parks and Recreation Department (BPRD) this channel assessment report was prepared by Agua Tierra Environmental Consulting, Inc. (ATEC). This report was created as supplementary information to a larger management plan document and program being led by BPRD with participation by many other organizations. ATEC's work focused on topics of channel stability. The primary goal of this work was to provide an assessment of channel conditions and provide some guidance for conceptual treatment alternatives and management recommendations for sites within the study area. Topics covered by this report include:

- Channel requirements for fluvial geomorphic stability;
- Fluvial geomorphology within the study area;
- Channel mapping and reference site identification;
- Annotated discussions of key channel features, sites, and conditions identified in the map work;
- Specific problem area discussions;
- Conceptual treatment alternatives for problem areas; and
- Discussion of meander belt migration/avulsion risks.

1.1 Location

The Boise River drains a portion of southeastern Idaho and the project area lies within Ada County and the City of Boise. The attached figure, "Project Area Regional Map" shows the general location within Idaho. More detailed project area maps are provided elsewhere in this document.

Study Area Boundaries. The study area delineated for this project includes all mainstem channel areas within Boise City limits that are bounded by greenway areas managed by BPRD. The upstream end of the project area is Barber Dam. The downstream end of the project area lies at the Ada County line at a river mile even with the County Fairgrounds. This downstream point is roughly even with point where the greenway trail crosses the river by means of an island and two steel, open-truss, pedestrian bridges.

This study has included several additional sites and points of concern along this reach of channel that are not on land directly managed by the BPRD. These areas were included because ATEC observed conditions that were of concern and worthy of mention to other involved stakeholders and/or to a sub-reach of channel that does involve BPRD sites and concerns.

1.2 Assessment Goal and Objectives

The goal of this assessment was to evaluate channel conditions within the study area and provide conceptual treatment an/or design recommendations for improving channel stability. The channel and existing structures were also evaluated for the potential to make modifications that optimize recreational opportunities while not compromising other beneficial uses (in particular irrigation diversions).

The two primary objectives of this goal were to address (a) human needs for greater control and predictability over channel behavior, and (b) channel needs for greater control over adverse human impacts to the channel.

Human needs were assessed through interviews with participating stakeholders gathered during the course of this assessment effort and by ATEC's field observations of problems humans were encountering with the channel. Channel needs were assessed during fieldwork and site mapping performed by ATEC during spring 1999.

1.3 Approach

ATEC's assessment and design approach is based on improving channel stability conditions. Human needs for channel stability can only be achieved when a channel's basic physical requirements for energy, water, and sediment load stability are met. Human and channel requirements can and must be managed in a complimentary manner. This statement may appear to contrast with the past experience of residents along the channel. There have been some cases where past channel projects have resulted in less than favorable channel responses. Recommendations in this assessment describe channel treatments that can address both human and channel needs for stability.

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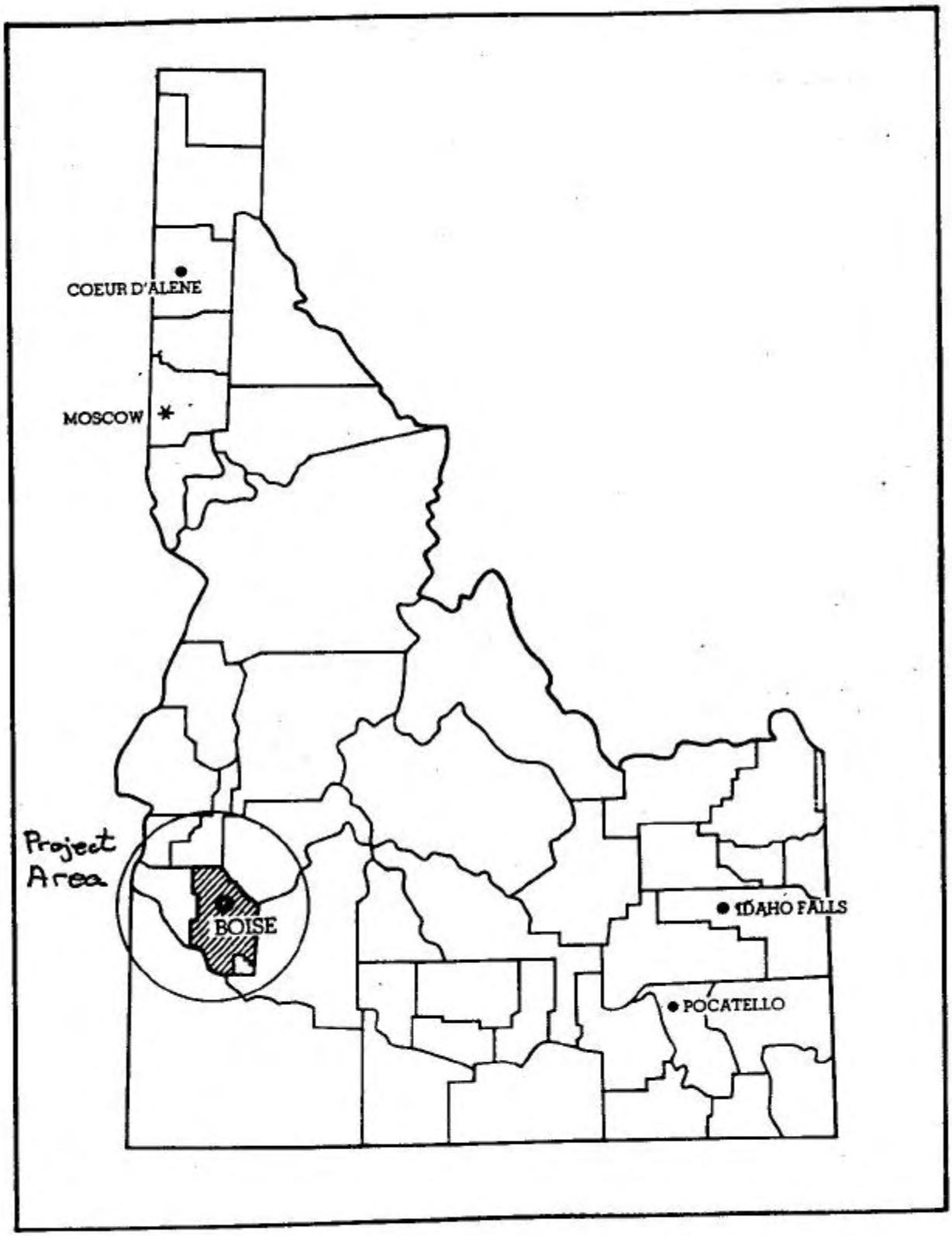

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TEL. (360) 754-3755

FIGURE:
PROJECT AREA REGIONAL MAP

ATEC\TMP\TB\REG-MAP.DWG\990722

Assessment of the project reach was performed within the context of overall watershed influences. This assessment began with a review of some background information for the watershed as a whole, followed by more detailed coverage of the project reach.

2.0 FLUVIAL GEOMORPHOLOGY AND CHANNEL STABILITY: GENERAL TOPICS

2.1 Fluvial Geomorphology: Purpose and Definition

For centuries humans have been living with fluvial systems (stream and river channels) and using to them to benefit livelihood and commerce. We have also physically manipulated channels in an effort to control or limit the adverse impacts related to flooding, sediment loads, and meander migration. Much of this work has been done in the absence of a sound understanding of: natural river behavior; river responses to disturbance; natural river evolutionary processes; and stable channel concepts. Traditional engineering practices have commonly focused on intensive river training structures designed to attempt to restrict channel behavior. This approach has come at a great cost. Chronic and substantial maintenance budgets have been devoted to mitigating channel responses to engineering works that were not designed with an understanding of river channel behavior. Moreover, emergencies and disasters have resulted from structural works installed without appropriate knowledge of channel processes.

The science of fluvial geomorphology is devoted to the study of flowing systems (rivers, streams, glaciers, tides, currents, etc.) and how they shape and are shaped by landscapes, including geologic influences. River and stream channels are in a constant state of change and evolution driven by an energy gradient. Fluvial systems chronically adjust their physical shape and hydraulic properties in response to changing inputs of water, sediment, debris, ice and human impacts.

2.2 Stability Defined

Geomorphic stability is defined here as, "Overtime the ability of a stream to transport sediment and flows generated by its watershed in such a manner that the dimension, pattern, and profile [remain stable] without aggradation or degradation" (adapted from Rosgen and Leopold, Fluvial Processes in Geomorphology; Proceedings; Pagosa Springs, CO. 1996). Aggradation and degradation are natural processes of channel evolution and adjustment following disturbance. These processes become problematic when chronic disturbance disrupts the sediment budget beyond a channel's ability to process the material at a metered rate.

2.3 Geomorphic factors and channel evolution

There are eight geomorphic factors that are interrelated and determine the physical geometry and hydraulic behavior of a channel. Each of these geomorphic factors is in a continuous state of adjustment, all the while maintaining a dynamic equilibrium. When one of these factors changes the other characteristics are altered in response. These geomorphic factors are listed below.

EIGHT INTERRELATED GEOMORPHIC FACTORS	
• Width	• Slope
• Depth	• Sediment (size)
• Discharge	• Sediment (load / concentration)
• Velocity	• Roughness / Resistance

Many channels are also in a state of geomorphic evolution from one general channel type to another. Mountain streams gradually erode their beds and banks and over geologic time their slopes flatten. Geologically young valley floor channels will incise into their flood plains (eroding vertically into the channel bed) and then at some point in time begin to widen by eroding their banks and develop a new meander pattern. This kind of channel evolution is a natural physical behavior driven by energy dissipation, sediment loads, and flow patterns. Natural rates of evolution of this kind occur very slowly. Channels can be either stable or unstable while evolving through geomorphic changes. It is important to distinguish between design treatments that restore channel stability as opposed to treatments that alter natural channel evolution.

2.4 Stable Channel Design Criteria

The shape and dimension of channel geomorphic features provide critical reference information for assessment of channel stability and, ultimately, the development of stable channel design criteria. Selected geometric parameters used in this work were drawn from the list below. Qualitative review of these parameters is performed during assessment level studies. Quantitative review occurs at the design phase.

FLUVIAL GEOMORPHIC PARAMETERS USED FOR ASSESSMENT AND DESIGN OF STABLE CHANNEL CONDITIONS		
PLAN VIEW PARAMETERS	CROSS-SECTION PARAMETERS	PROFILE
• Sinuosity • Meander belt width: active and historic • Meander wave length • Meander amplitude • Meander radius of curvature	• Bankfull flow • Bankfull width • Bankfull cross-sectional area • Bankfull average depth • Flood prone width • Entrenchment ratio • Vegetative conditions (not a geometric value but critical to stability), • Large woody debris loads • Manning's "n" values of resistance (not a geometric value but critical to velocity and flow conveyance evaluation)	• Channel slope • Valley slope • Localized and prevailing headcutting patterns • Base level lowering • Large woody debris loads and bed control • Qualitative assessment of sediment size, sediment loads, and prevailing sediment transport processes at play. • Soil and in-situ substrate assessment and relative resistance to erosion have also been considered.

2.5 Reference Reach

Relatively stable reference reaches have been sought within the project area to assist in modeling/typing stability conditions for units of channel. Evaluations were performed at reference reaches, subreaches, sites and/or channel segments, wherever available. In many cases long term undisturbed reference reaches were difficult to find within the project area. Human impacts and past flood event damage are wide spread. In such instances units of channel were used that exhibit relatively stable features with respect to recent and prevailing hydrologic patterns and sediment loads. As needed, channel reference reach observations were made outside of the project area to provide a calibration template for stability within the project reach. In all cases, vegetation condition, form, function, and age have been used as supporting indicators of geomorphic stability or in-stability.

3.0 HUMAN NEEDS FOR STABILITY

Channel bed and bank erosion damage has been occurring at many sites within the project area. Numerous individual excavation and structural channel projects have been performed in well meaning attempts to manage channel behavior. Many of these projects have been at least partially effective in achieving the primary design objective intended. However, many of these same projects have had not been designed with an understanding

of channel geomorphic stability. Some negative impacts have resulted, in some cases creating additional damage and repair expense.

During our discussions with participating stakeholders ATEC recorded concerns surrounding channel stability, channel impacts on users and landowners, and characteristics sought in a design and restoration program. We have combined our notes from these discussions with some of our own observations. ATEC has applied some "editorial license" in organizing these topics under the most appropriate key word headings appearing below. ATEC found that some of the reported observations of channel behavior fell more into a category of "Perceived: guilt by suspicion" channel behavior, than an "Actual cause and effect" channel behavior. We have made a concerted effort to address all concerns raised and organize them into cause and effect categories. We hope that if we have overlooked or misrepresented any comments our reviewers will draw these to our attention.

- ***Control channel changes.*** Participants generally recognize that changes in channel alignment are a natural process and that efforts to control or eliminate it have costs. However, stakeholders do desire some level of control and predictability over the frequency and magnitude of channel changes. Substantial channel avulsions or chronic fluctuations in channel alignments can create serious risks to health and welfare and limit stakeholder ability to manage land with any level of certainty.

- ***Allow meandering within limits.*** Stakeholders generally understand channel requirements to meander. Some established meander boundaries are desired and required under existing development conditions.

- ***Control sediment and large woody debris loads.***

  Floodplain Deposits. Deposition of sediment and large woody debris (sand, gravel, cobble, and tree materials) and other flood transported materials (garbage, and noxious weeds) within channel adjacent areas reduce land value and create maintenance problems.

  Riparian forest buffers provide a natural filtration function by trapping sediment, large wood, and other debris before reaching adjacent land. These forested buffers ultimately create a natural levee formation made of the trapped materials.

  Bar Deposits Within Active Channel Area. Bar formation is seen by many stakeholders as damaging to channel alignment, the source of bank erosion, and the source of general channel in-stability. Bar formation is a natural process. Some bars will migrate downstream over time. Excess sediment loads can occur as a result of watershed disturbances or excessive bank erosion along the channel.

  When observed, ATEC has noted what appears to be unnaturally elevated and destabilizing sediment loads within the project area. This type of observation is included in the channel mapping products in this report.

Within the mainstem of the Boise River downstream of the major dams a number of once active side channels have been plugged, cut-off, somewhat blocked by dense vegetation, and substantially regraded and filled. These channels once provided important floodwater conveyance. Modifications have reduced this function. The result is an added requirement for flow regulation (dam – function), added flow conveyance demands on the remaining main channel/s, and increased flooding hazards.

However, ATEC has not found conclusive evidence to support some perceptions of wide spread sediment loading and aggradation problems within the main channel/s of the project area. In fact, there has more likely been a general channel bed degradation occurring because of the added shear stress on the main channel/s.

Additional discussion of bed aggradation is included elsewhere in this report under the heading "channel straightening".

- ***Channel Straightening.***
  Some reaches of channel have been straightened by human activities. Other reaches have, or have the potential to be, straightened by natural channel avulsions. Flatter gradient reaches where levees have been installed, or where side channels have been obstructed, are vulnerable to channel bed aggradation when sediment loads are heavy. Excessive sediment deposition within the channel or between the levees displaces floodwaters and creates more frequent out-of-channel flood events.

  In cases where sediment supply is not heavy aggradation might not occur. However, if side-channels are obstructed flood conveyance capacity is lost and more frequent out-of-channel flood events will occur. These conditions prevail on the Boise River within the project area. Three major dams and the Barber Dam have largely controlled sediment loads above the project area. Dam regulation of flood flows has reduced the frequency of flow through many of the side channels. Many of these channels have been partially obstructed by development or thick vegetation. At some point in time a flood will eventually occur that exceeds the capacity of the dams. In this instance remnants of the former side channels will be the first places to flood and may be the locations of channel changes.

  Channel straightening on steeper reaches results in accelerated runoff velocities. Higher velocities and steeper slopes typically result in channel bed degradation. Water tables drop. Riparian adjacent vegetation can die back and/or be replaced by other species. Bank erosion eventually accelerates and increases sediment loads to the channel. The potential for channel plugging by woody debris, resulting in out of channel flooding and avulsions, increases on channels that have become narrow and incised.

  Some stakeholders have observed and understand these negative side effects of channel straightening. Many understand the need to restore continuity between the

channel and the natural floodplain / low terrace areas in order to reverse these damages. Some of these conditions resulted from loss of meanders (channel sinuosity) and flood conveyance capacity.

- ***Bridge Constrictions and Large Woody Debris.***
  Undersized bridge openings impact active channel areas as well as floodplain and low terrace areas. Abutments, piers, or roadway fill for bridge approaches disrupt flow patterns during floods. Sediment, large woody debris, and ice transport (no ice issues within the project area) are also impacted. Sediment deposition patterns and channel alignments are altered by these constrictions and result in aggravated erosion. Large wood debris jams frequently occur upstream of bridges.

  Many stakeholders see the solution to this problem as the removal of large woody debris from the channel. Throughout the United States attempts have been made to purge reaches of many different channels of large wood. This is a never-ending battle that can not be won. Wood will always be present in a channel and it moves during large flood events when it is hazardous to manage. Removal of wood from channels generally creates more damage than good. Furthermore, wood reinforces and stabilizes channel beds, providing erosion control. When wood is removed the stability it provides to the channel bed is lost and bed erosion accelerates.

- ***Reduce erosion rates***
  Stakeholders have recognized that some level of bank erosion is a natural process as in the case of meander migration. However, when the rate or extent of bank erosion exceeds some threshold of concern, perhaps threatening a significant capital improvement adjacent to the channel, intervention is often desired. Appropriately designed slope and bank stabilization structures are needed to address these issues without creating adverse side effects.

- ***Correct design treatments.***
  Past bank and channel stabilization treatments have varied in success. Some are believed to have failed because not enough rock was installed, the riprap used was too small, the shape of the rock structures were inappropriate, the wrong rock design was selected, the rock was not properly graded, the key-way work was inadequate, or the wrong materials were used (construction debris, gabions, large woody debris, or vegetation). Other suspected reasons for failure included too many repetitive temporary fixes and channel manipulations (gravel push up berms / levees / and sugar dikes), or incompatible treatments not designed or installed in a coordinated fashion. We have found many strong and diverse viewpoints among stakeholders on the sources and mechanisms of failed channel projects. Projects must be designed for fluvial geomorphic processes as well as their intended purpose.

- ***Coordinated design.***
  To be successful a stable channel design must be coordinated among all owners and managers of involved lands. Involved land includes sites already impacted, as well as adjacent sites where future impacts can be expected. Landowner concurrence with a

single unified design is needed. Individual projects pursued independently of one another will often have counter-productive results.

Concurrence is different from consensus. Concurrence means that participants are willing to agree to an overall course of action. Typically, points of view along the channel are strongly held and diverse. It is unlikely that all stakeholders will agree to all details of a plan. Minor differences must be set aside for the success of the overall project.

♦ ***Equipment Access to Channel***. Various requirements for equipment access points have been noted. These include access sites for the following equipment applications: emergency rescue and emergency construction, agricultural and irrigation, and water craft put-in and take-out sites. Access point must be located at geomorphically stable sites. These locations will be the easiest to maintain and not create adverse impacts to the channel.

- ***Fish and Wildlife Habitat.*** Channel work must be in compliance with regulatory habitat protection and enhancement goals. Successful project permitting requires this compliance. Potential access to government funding assistance generally requires this as well. Other financial incentives exist for riparian buffer related restoration and/or set-asides along rural reaches of channel. Among these are riparian conservation reserve programs (federal cash incentive), conservation easements that may qualify for reduced property taxes, carbon dioxide banks achieved through tree production (available as mitigation in some air quality limited regions of the USA), limited access leases for hunters (rural sites), and cottonwood production for the wood products industry (rural sites).

- ***Aesthetic Values Restored and Pollution Control.*** Some residents shared historical accounts of past conditions of well established stands of trees, more shaded areas, and more fish and fish habitat features within the project area. Concerns were raised over unsightly concrete and construction demolition waste placed in channel construction projects; and with fill materials placed within flood prone areas.

- ***Cost of Solutions.*** In many cases the cost of intensive structural work to restore channel areas can be very expensive. In rural areas this work can be more expensive than the property value of the land itself. By contrast, land prices for urban commercial sites can be so high that very expensive and intensive channel control structures are considered, often with insufficient regard to there geomorphic impacts. Project expense is best considered in light of the long-term cost of not treating the problem area. It may also be instructive to view these costs, for some problem areas, as the result of generations of deferred maintenance or adverse channel impacts passed on by predecessors not fully understanding the impacts of their landuse practices.

  Sources of financial assistance exist from public and private sources for riparian restoration related projects. Local area Improvement Districts (LID's) can also be

created as a self-taxing program to recover channel work costs. Many communities have successfully established these programs.

Throughout all of the concerns (and ultimately, guidance criteria) listed above, recovery of a stable channel is a central theme. Once stable channel conditions are created other landuse objectives and habitat values can be realized.

3.0 PROJECT AREA AND WATERSHED CONDITIONS

3.1 Geomorphology and Drainage Patterns

The Boise River headwaters drain from the Sawtooth Mountains in the Idaho Batholith subdivision of the Northern Rocky Mountain Province. Lower portions of the watershed drain a portion of the geologic area known as the Malheur-Boise Basin section of the High Lava Plains sub-province of the Columbia Intermontane province. The drainage basin area is approximately 4134 square miles and the highest elevation within the basin is approximately 10,600 feet. The main axis of the watershed directs flow from east to west. The mouth of the Boise is at its confluence with the Snake River on the boarder between the towns of Parma in Idaho and Nyssa in Oregon.

Three major dams in the upper half of the Boise River regulate flow within the basin. These dams are: Arrowrock, Lucky Peak, and Anderson.

The project area is a little over 10 river miles in length (measured along the main thread of the channel). Geomorphically the project area flows through a medium to low gradient valley bottom area and is bounded by three alluvial terraces. These terraces represent former floodplains that once bordered the channel during past geologic and climatic periods. The Boise River has since developed a new base level and floodplain at a lower elevation. The attached figure, "Generalized Geomorphic Setting of Project Area" (SCS, 1980) graphically depicts the geomorphology of the valley floor and project area. The specific name labels shown on the landforms refer to soil unit names not discussed in this report.

Dominant fluvial geomorphic conditions and processes within the project area are driven by a combination of geologic and human influences. Geologically the channel flows through a relatively flat valley floor area where, prior to heavy settlement and intensive landuse modifications the stable channel condition appears to have been anastomosed.

Anastomosed channels
Anastomosed channels are multiple-thread systems (ie. flow divided among many active channels during low and high flow conditions) with very low gradients. Stream banks materials are often fine grained and cohesive and form well defined bank features. Banks, floodplains, islands, and lower terrace surfaces between channels typically support well-established stands of densely rooted woody vegetation. Lateral migration rates of individual channels are very low except for occasional avulsions. Valley morphology commonly associated with anastomosed channels contains broad, gently sloping wetland areas often developed on or within lacustrine deposits, river deltas or splays, or finer grained alluvial (or eolian) deposits. (Rosgen, 1996).

On the Boise River within the project area heavy settlement and intensive landuse modifications (urbanization, water diversions, dam construction, mining, livestock production, and agricultural development) heavily impacted natural channel conditions. The stable anastomosed conditions began to break down and were replaced by braided

reaches of channel. By contrast to the stable character of the anastomosed channel system, braided channel conditions are highly unstable.

Braided Channels

Braided channels will develop in response to natural conditions as well as human caused conditions.

Naturally formed braided channels typically develop at locations where slopes enter a flatter gradient and sediment loads are high. The lower energy zones of the gentler slopes create a depositional environment. These conditions can occur under a variety of landscape conditions. Some of these sites include: deltas at the upstream end of lakes (or unnaturally in reservoirs) or in estuaries where channels flow into marine waters (distributaries), at breaks in valley floor slopes, or at rapid transitions in valley width from a steeper confined reach to a flatter unconfined reach. Localized braiding may often occur at confluences where sediment loads and deposition rates are high. Braiding regularly occurs at the base of glaciers where sediment loads are extremely high, gradients are steep, and runoff is flashy.

Unnaturally braided channels will occur in response to human caused disturbances to the channel. Often when valley slope conditions are suitable (involve a rapid flattening of grade in the down valley direction) and human landuse practices cause increased flooding and/or erosion rates at upstream locations (urbanization, timber harvest, mining, cropping, or ranching) rapid aggradation occurs within the flatter valley slope areas. Added sediment loads fill former channel areas, form central gravel bars that create split flows and increased bank scour, and ultimately result in wider and shallower channels. These channels are unable to contain flood events of any magnitude and chronic channel changes result during even small flood events.

Woody vegetation can not become established under these conditions and, once this cycle is initiated a channel is unlikely to recover back to its original single thread condition without substantial human intervention to assist recovery. Heavily braided channels are also subject to increased intermittency of flow during low flow periods. Such intermittency can radically degrade, or destroy, aquatic habitat within the impacted reach. The attached figure, “Channel Patterns” shows a conceptual plan view of both an anastomosed and a braided channel.

Subsequent changes in some of the more heavily impacting land use practices and the construction of dams (altering the runoff characteristics within the basin) resulted in yet another shift in channel condition. A system of single thread, double thread, and split-flow channels developed. This shift represents a partial return to the anastomosed channel type. This pattern is largely present today within the project area. Many of the formerly active threads of braided and/or anastomosed channels are still present and can be easily observed during periods of high flow and high water table conditions, or by inspection of topographic maps covering the project area.

Some of these former channel features represent potential channel avulsion sites within Boise City limits. The attached figure, "Meander Reconstruction in a Braided Channel" provides a conceptual view of how remnant channels adjacent to "primary thread channels" create potential avulsion routes.

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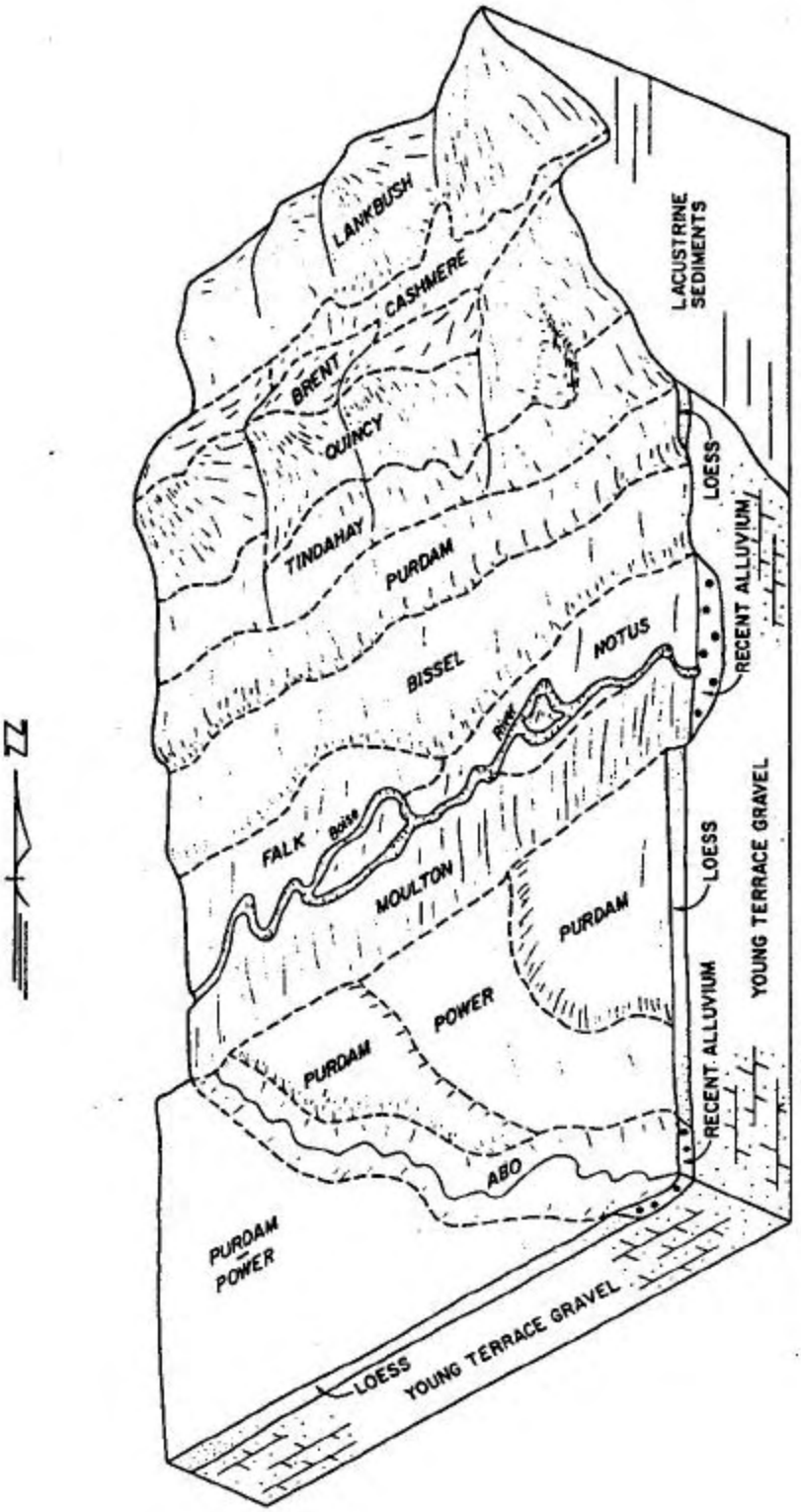

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FIGURE:
GENERALIZED GEOMORPHIC SETTING OF PROJECT AREA

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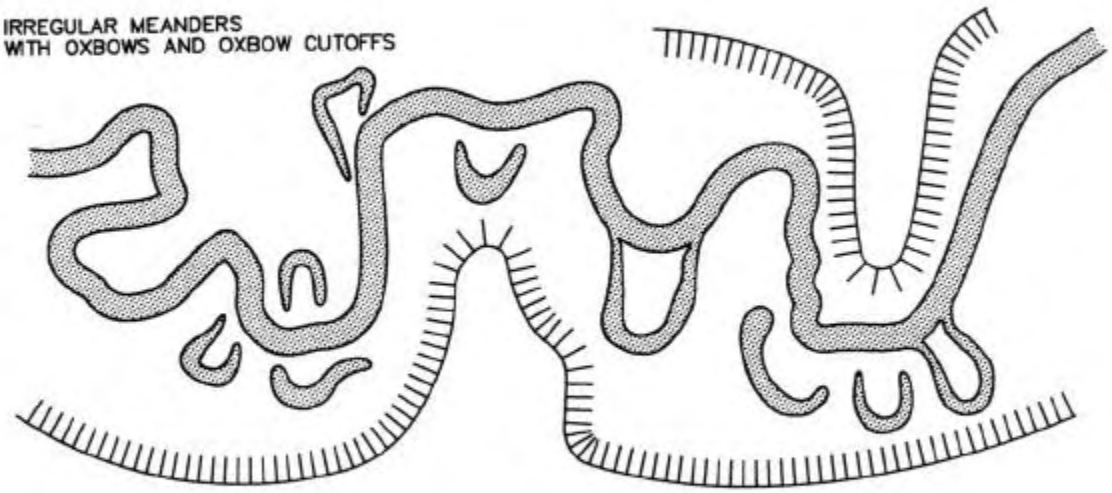
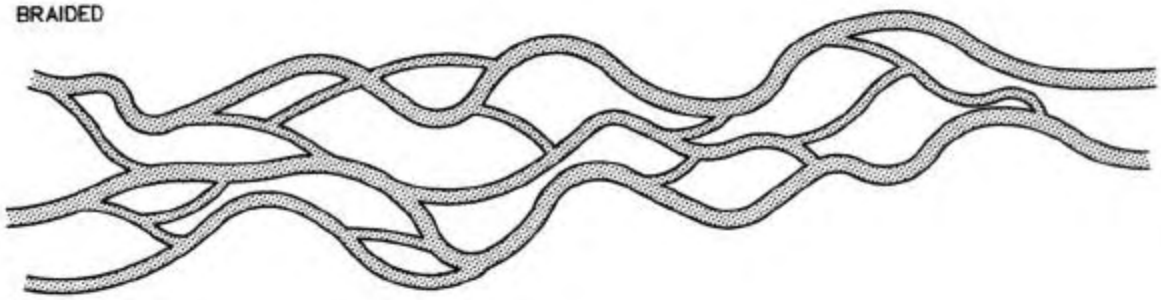
IRREGULAR MEANDERS
WITH OXBOWS AND OXBOW CUTOFFS



BRAIDED



ANASTAMOSED

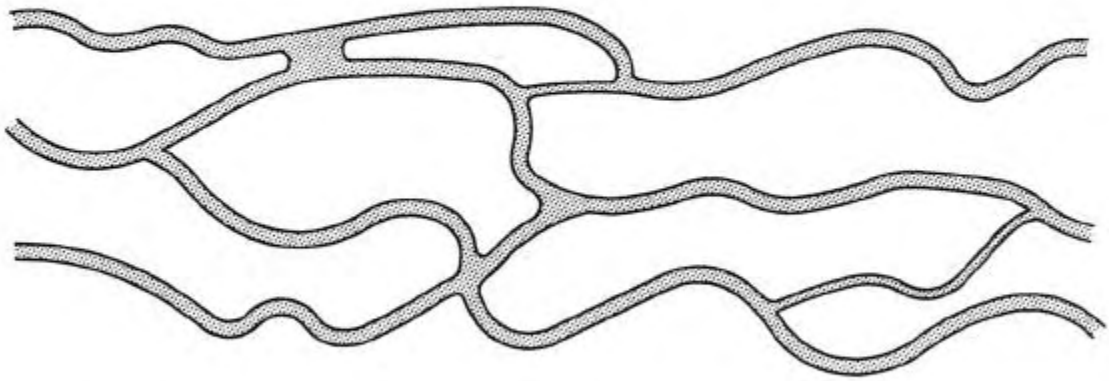


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FIGURE:
CHANNEL PATTERNS-C
ADAPTED FROM GALAY ET AL. (1973) AND ROSGEN (1996)

ATEC\FLUV-GEO\CHAN-PAT-C_BW.DWG\990723

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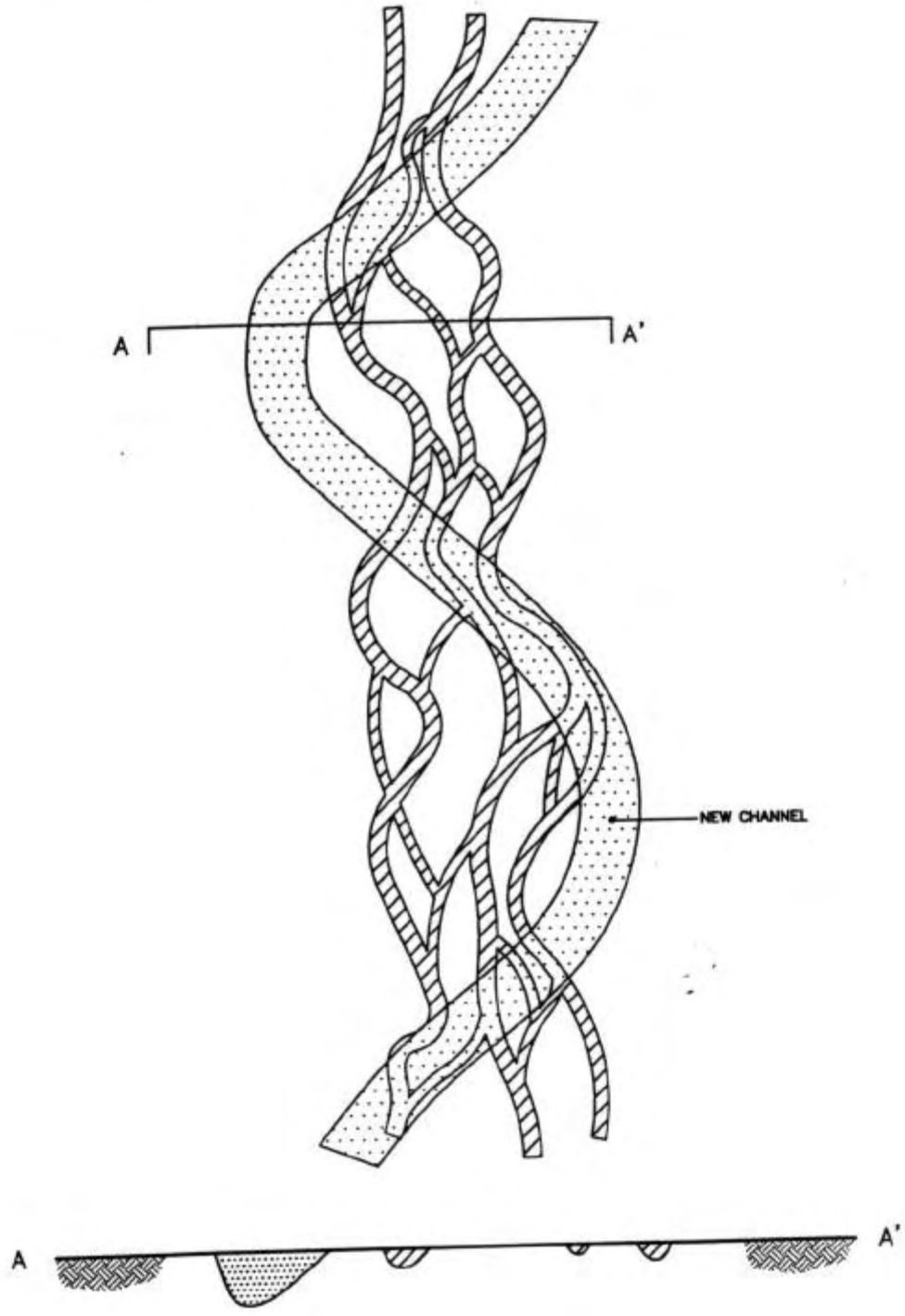

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FIGURE:
MEANDER RECONSTRUCTION IN A BRAIDED CHANNEL

ATEC\FLUV-GEO\MEAN-RECON-A_BW.DWG\990720

Meander Belts and Avulsion Risks.

Meandering reaches of channel will laterally shift location over time. In geologic time a meandering channel will be mobile over a very broad area, termed the meander belt. Human landuse on valley floors or adjacent to terraces and valley walls are susceptible to erosion by meandering channels. Some common patterns of channel migration are shown in the following figure, "Channel Migration Patterns". These illustrate the breadth of planning considerations needed when identifying channel migration and avulsion risks.

Meander amplitudes, and therefore overall meander belt widths, vary over geologic time. As do the rates of meander migration. As a channel downcuts, new floodplains are created. Upper terrace areas are former floodplains that have since been abandoned.

Meandering channels will commonly intersect upper terraces and valley walls. Once an upper terrace or valley wall is intersected, migration rates tend to slacken (locally). While some channel types will create a meander neck cut-off through these topographic features, they are infrequent and can generally be anticipated based on channel characteristics.

Flooding impacts and landuse and development restrictions within the 100-year floodplain are commonly understood. However, the mobility of channels is often not properly accounted for when development is planned in a channel environment. For example, building construction sites may be safely outside of the 100-year floodplain but still be at risk of channel meander migration.

The figure below, "Construction in a Meander Belt" illustrates the importance of limiting development within the 100-year floodplain (as identified by Federal Emergency Management Agency [FEMA]) **and** within meander migration belts.

When allowable meander widths (amplitudes) are constrained by river engineering structures or development pressure the channel responds by seeking to flood, erode and/or deposit sediments in other locations. It is therefore appropriate to limit landuse practices within a meander hazard area to activities that fall within some threshold of health, safety, and welfare for humans as well as the channel environment.

However, since rates of meander migration can vary widely it is useful to evaluate some practicable limits on the amplitude of meandering that will not excessively constrain a channel, nor excessively constrain human landuse. This idea is somewhat analogous to use of the 100-year floodplain as a threshold for development planning.

Regulatory and structural limits can be placed on meander belts and designed at geomorphically acceptable locations. This is an act of compromise that, if performed with adequate geomorphic consideration, can be successfully implemented. For example, a reach of channel that has migrated to a point of intersecting a high terrace or valley wall feeder bluff may be considered to be functionally at the maximum limit of its meander

belt. Installation of some channel training structures at the toe of the feeder bluff may be geomorphically acceptable at this location.

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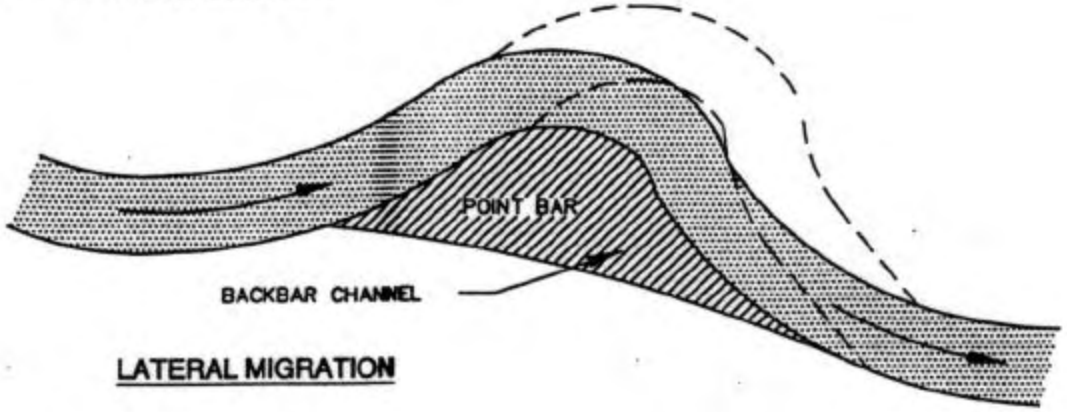
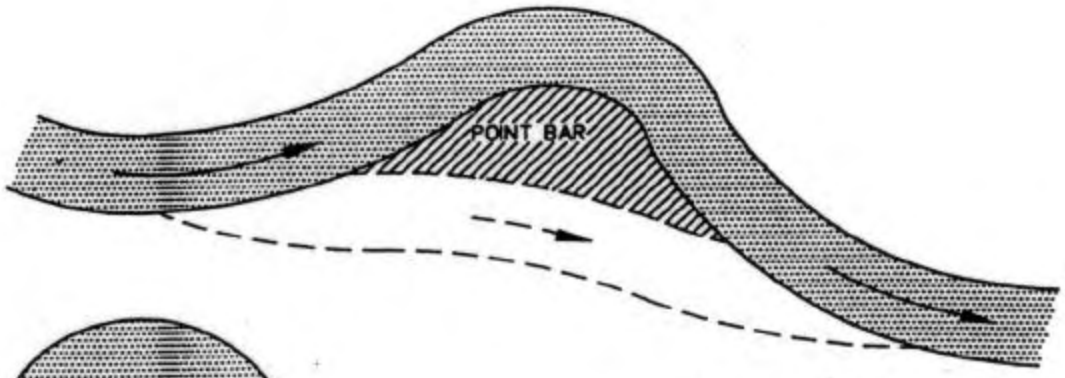
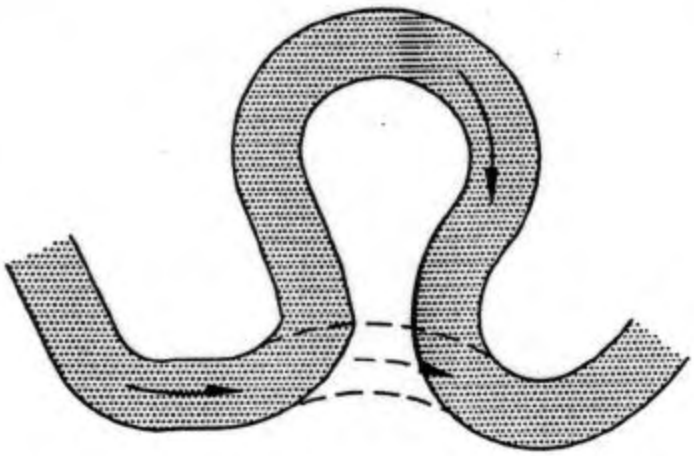


LATERAL MIGRATION



CHUTE CUTOFF



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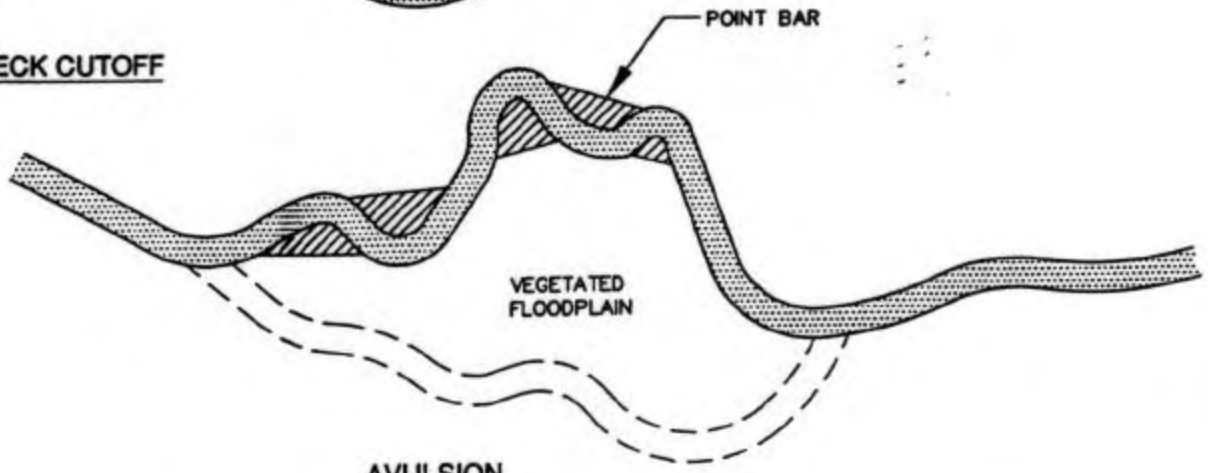

AVULSION

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FIGURE:
CHANNEL MIGRATION PATTERNS

ATEC\FLUV-GEO\PATTERNS.DWG\990406

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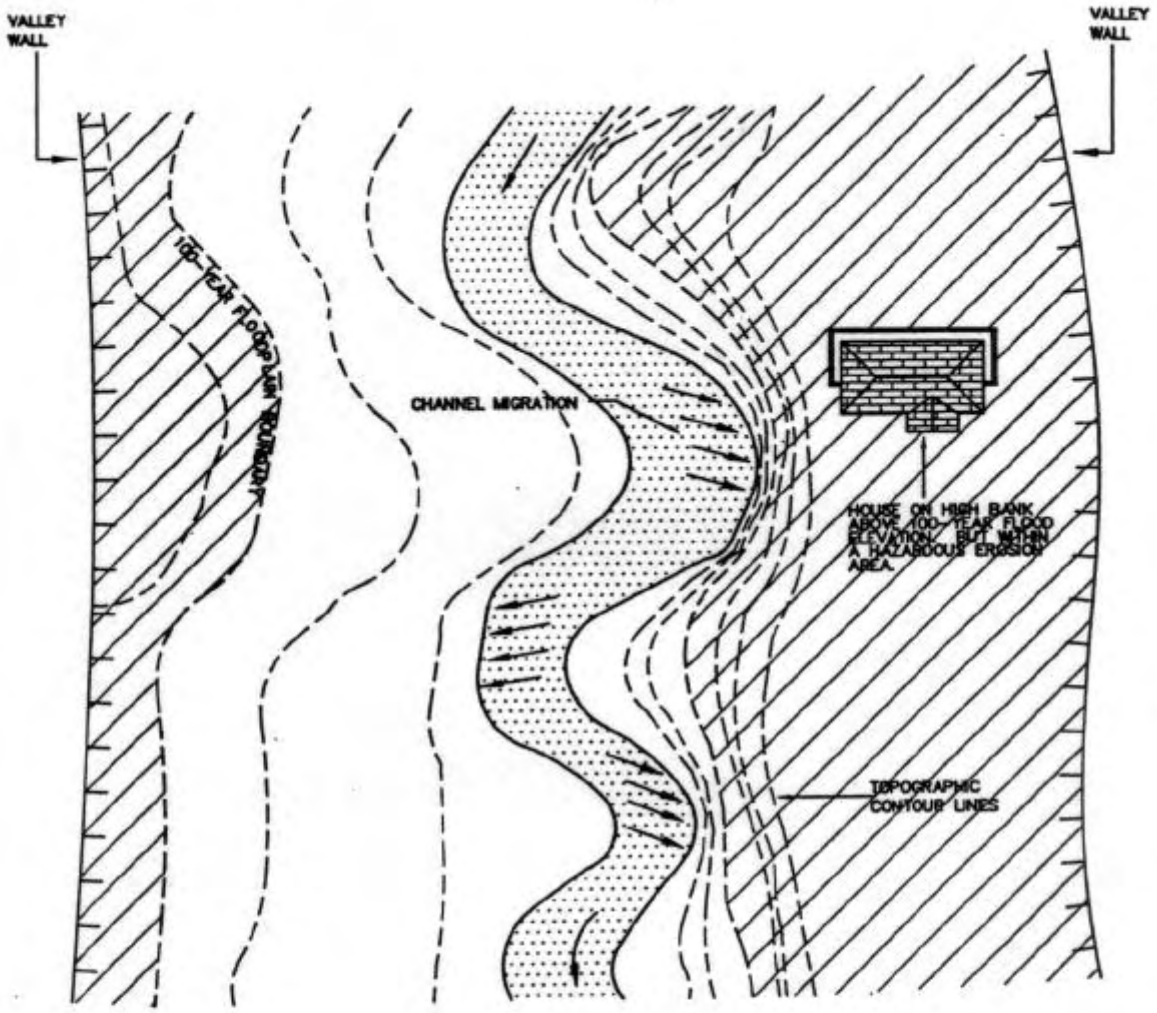

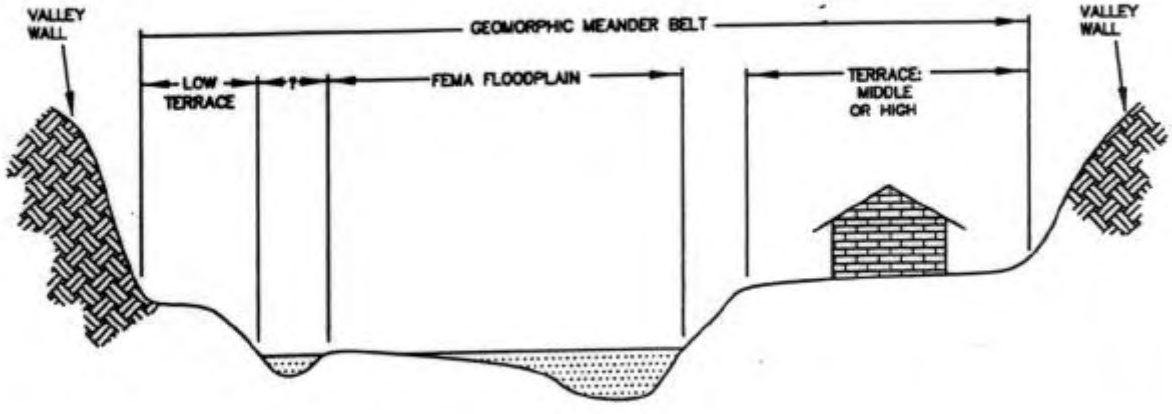

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FIGURE:
MEANDER BELT VS. FEMA FLOODPLAIN

ATEC\FLUV-GEO\FLOOD-REVEG-C_SW.DWG\990719

3.2 Landuse Impacts to Channel Conditions

Human influences to watershed and channel conditions are dramatic. Cumulative human impacts on the form and function of channels can be as influential as geologic events or climate changes. Construction of transportation projects for road beds, bridges, and bridge approach fills have rerouted entire reaches of channel. Conversion of land to different types of covers and land usage has altered water runoff conditions (timber harvest, land clearing for agriculture or buildings and pavement, etc.). Dams alter the quantity and rate of transport of water and sediment. Direct and indirect results from human activities have altered the processes of erosion, deposition, channel lateral movement, and the size, duration, and frequency of flood events.

Human impacts within the project area and watershed are substantial. Some form of landuse modification has influenced virtually every acre of the watershed. These impacts have included:

- Urbanization;
- Flow regulation by dams;
- Altered runoff and flooding patterns associated with timber harvest, land clearing and conversion, and fires in the headwaters and snow zone;
- Possibly an apparent shift in weather patterns (globally with local impacts);
- Loss of streamside and floodplain vegetation causing: elevated water temperatures, loss of root reinforcement to soils, loss of natural flood debris trapping and loss of natural levee building;
- Historic and current livestock traffic on banks and channel resulting in: hoof shear to banks, erosion, nutrient loading, aquatic ecosystem degradation, increased sediment transport and deposition, increased bank cutting, increased rates of sediment deposition in fields;
- Irrigation diversion structures that have impacted streamflow, channel alignment, and elevation of channel beds;
- Channel straightening and slope steepening resulting in: increased rates of downcutting and bank scour, and bedload deposition and channel changes to downstream sites; and
- Local losses of bank definition and channel capacity to route and contain floods of a given magnitude as channels (or once active side channels) fill with sediment and the width: depth ratio becomes distorted.

Efforts by private landowners, government agencies, and others have been made to control and repair some of these impacts to the channel.

4.0 FLUVIAL GEOMORPHIC ASSESSMENT WORK PERFORMED

ATEC's work focused on evaluating channel stability, problem area conditions, and the development of management recommendations for selected sites and/or or reaches. ATEC's fieldwork was performed in the spring of 1999 and covered the approximately 10 river mile long project area. Above average snowfall during the winter of 1998-99 resulted in a prolonged high flow discharge along the channel as water levels were drawn down above the dams. Streamflow during the fieldwork period was between 6500 and 7000 cubic feet per second. Water levels were at or near channel full conditions and covered from view some bank conditions that may otherwise have been noted in this report.

4.1 Channel Assessment

Channel assessment and documentation work included the tasks listed and described below. Unless otherwise noted all tasks were performed by ATEC as part of its channel work. These tasks were:

- Channel site mapping;
- Legend for site assessment maps (includes problem area evaluations and recommendations; and
- Meander belts and avulsion risk discussion;

Each of these tasks is described below.

- **Channel Site Mapping.** Specific sites of interest or concern noted in this study are located on the channel mapping work presented in the main body of this report. The map work identifies locations of human and natural features influential to channel geomorphology, in need of stability work, or otherwise of interest to the objectives of this study.

  The mapping product is attached as Appendix A.

- **Legend for Site Assessment Maps.** Annotated site-specific geomorphic descriptions have been provided on a subreach and subunit basis within the project area. These annotations have been presented in a legend format (Annotated Legend) with unique reference identification numbers for each described site. The Annotated Legend has reference numbers that correspond to the same numbers shown on the channel site mapping.

  Individual sites, sub-reaches, and/or channel segments were identified and evaluated for geomorphic stability problems or concerns. The reviewed sites included those identified by stakeholders and/or by ATEC within the project area. Locations of these sites are shown on the channel maps. ATEC's evaluation of

these sites and discussion of treatment/s are included in the Legend for Site Assessment Maps (Appendix B).

- **Meander Belts and Avulsion Risks.** Meander belt migration potential and avulsion risks are generally high throughout much of the Boise River valley downstream of Barber Dam. There are several sites of particular concern within the project area. These sites are identified in the Legend for Site Assessment Maps (Appendix B).

  ATEC strongly recommends proactive development of a meander belt management plan for the project area to mitigate the risks of major channel avulsion or changes. Recommended items to consider in such a plan are included in Appendix C.

5.0 CONCEPTUAL DRAWINGS AND GENERAL TREATMENT ALTERNATIVES

Site specific treatment alternatives have been discussed for problem area sites included in this assessment.

Some summary sheets and conceptual drawings have been prepared for some of the most commonly applied treatment alternatives discussed in this assessment. The conceptual drawings show graphical examples of some of the treatments. These summary sheets and drawings are included in Appendix C.

REFERENCES

SCS, 1980. Soil Survey of Ada County Area, Idaho. United States Department of Agriculture, Soil Conservation Service (now called the Natural Resources Conservation Service).

Rosgen, Dave, 1996. Applied River Morphology, Wildland Hydrology, Pagosa Springs, CO.

Boise River Resource Management and Master Plan

Map 5

Channel Assessement Map

Existing Features

Open Space

- Park or Reserve
- Cemetery
- Golf Course

Trails and Pathways

- Greenbelt

Corridor Features

- Channel Assessment Sites

Other Features

- Roads
- Hydro
- Boise City Limits

N

3000 0 3000 Meters

This map is intended for planning purposes only.

BOISE PARKS & RECREATION DEPARTMENT

SPATIAL DYNAMICS

Downstream Boundary

Upstream Boundary

R-1 R-2 R-3 R-4 R-5 R-7 R-6 R-8 R-9 R-11 R-10 R-12 R-13 R-14 R-15 R-15A R-16 R-17 R-18 R-20 R-21 R-22 R-23 R-24 R-26 R-25 R-27 R-28 R-29 R-31 R-30 R-34 R-32 R-35 R-36 R-37 R-39A R-38 R-41 R-39B R-42 R-43 R-44 R-39C R-45

Garden City

Boise State University

Airport

Hyatt Hidden Lakes Reserve

Catalpa Park

Wylie Ln

Willow Lane Sports Complex

Veterans Memorial Park

Crane Creek Golf Course

Hulls Reserve

Camels Back Reserve

Military Reserve

Foothills East Reserve

Foothills East Park

Castle Rock Reserve

Pioneer Cemetery

Julia Davis Park

Municipal Park

Natatorium

Warm Springs Golf Course

Kathryn Albertson Park

Ann Morrison Park

Morris Hill Cemetery

B. Quinns Riverside Park

Hillcrest Golf Course

Phillippi Park

Murgoitio Property

Indian Lake Golf Course

Barber Dam Hydro Project

Glenwood St

Collister Dr

Hill Road

N. 36th St

N. 29th St

Harrison Blvd

Adams St

Veterans Mem. Pkwy Blvd

State St

Ustick Rd

Maple Grove Rd

Milwaukee St

Northview St

Cole Rd

Fairview Ave

Curtis Rd

Orchard St

Americana Blvd

Capitol Blvd

Lusk St

Broadway Ave

Warm Springs Ave

Franklin St

Beacon St

Vista Ave

Federal Way

Overland Rd

E. Boise Ave

Pleasanton Ave

Eckert Rd

BOISE AVE

E. Amity Rd

Victory Rd

W. Amity Rd

84

184

New York Canal

Ridenbaugh Canal

RIVER ASSESSMENT SITE DATA DICTIONARY
(991001)

ATEC's treatment sites are accompanied by the following information.

Information	Abbreviation or code used
Some reference sites discussed are not problem areas and have not been coded with any of the following data. These sites are labeled as non-applicable: "N/A".	N/A
SITE ID NUMBER:	R-##
PROBLEM TYPE:	
• Bank erosion: hydraulic source	EH
• Localized bank erosion: human source	EP
• Localized bank erosion: livestock source	EL
• Avulsion and channel change risks	AV
• Recreation safety concern	RS
• Emergency channel access: construction equipment or rescue	EA
• Recreation enhancement opportunity	RE
• Fish and Wildlife enhancement/management opportunity	FW
• Other flood hazard risk (hydraulic capacity)	FH
PRIORITY RATING	
• Severe	S
• High	H
• Moderate	M
• Low	L
• Monitor	MON
SOLUTION ALTERNATIVE/S CATAGORIES	
• Structural fix-in-place	S
• Hydraulic techniques	HT
• Channel manipulation (major)	CM
• Avulsion and channel change mitigation	AV
• Landuse management	LM
• Modify existing human structure	MS
• Biotechnical	BT
• Mitigation: Fish & Wildlife or Channel stability	MIT
• Buffer Enhancement	BE
• Flood plain and floodway analysis	FP
• Combination	C

LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
R-1	Bridge over left split channel. Same bridge construction style as location R-3. The County owns this site. During ATEC's March 1999 site visit, stream flow was observed at 6,500 – 7,000 cfs through this bridge passage. Incremental increases in stream flow will create a proportional increase in shear stress along the toe of the left bridge abutment. Bank scour along the left shoreline can be expected. Some limited additional flow may be an option to be routed down this left split channel on the left side of the island. However, hydraulic analysis and modeling is required to make this determination. The bridge at R-1 is undersized, as is the bridge at R-3. **Solution Alternative/s:** The most appropriate solution at both locations is to increase the bridge spans. Pipe arches should be added through the right floodplain and right low terrace areas currently occupied by fill for the bridge approach, to provide relief flow during higher events. An additional 30-40 feet of bridge length is required to properly span the left channel.	EH	S	MS
R-2	The county owns this site. This is a small bank erosion site located on the island that splits flow between the two footbridges. The erosion location is along the right split channel and it's located at the left edge of water. The location is approximately 770 lineal feet downstream from the right bridge (paced off along the centerline of the bike trail). This scour location is immediately adjacent to a black cottonwood along the right edge of the trail. This is a mature tree. At about 3 feet above ground elevation the trunk splits into 3 individual trunks. High water conditions precluded inspection of the toe of this erosion site. However, site conditions appear to indicate that apparently only a low intensity erosion repair effort is required at this site. **Solution Alternative/s:** The design solution recommended would be to shape back the slope and install brush layers with fabric lifts and an erosion control seed mix. Toe rock installation is probably necessary but can not be determined at this high flow condition.	EH	L	BT, S
R-3	This is a county owned site. Footbridge over right split channel. The span is too short. ATEC observed flow at 6,500 – 7,000 cfs during March 1999 site visit, creating high shear stress conditions at the left abutment. The left abutment almost failed in spring run-off of 1998. Emergency repairs included a concrete block retaining wall with soil fill behind to protect the abutments. Additional repairs on the downstream side were made with poured in place concrete. The poured in place concrete was attempted to pave the surface of the bank slope. These repairs and the original abutment on the downstream side are rotating indicating toe failure. The bay opening is far too constricted for existing flow conditions. Higher flows will substantially worsen the situation. Failure can be expected in a 10,000-cfs event. **Solution Alternative/s:** 1) Build a better longer full-spanning bridge structure. Remove approach fill out of floodplain and low terrace zone. Potential may exist to extend the length of the existing bridge with an additional section (contact the manufacturer.) This appears to be a modular type structure. Approximately 30-	EH	S	MS

*See "River Assessment Site Data Dictionary" for definitions of abbreviations.

LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	40 additional feet would be required. The manufacturer must be contacted to determine whether the bridge can support the additional span. 2) Tear up fill along left low terrace and floodplain. Install 2 corrugated multi-plate pipe arches. Pipe arches will pass through fill. Restore bridge approach fill over pipe arches. Pipe arch diameter would be in the size class of 15-18 feet with significant embedment into low terrace floor or former channel bed. Pipe arches will pass water but not debris. Regular maintenance clearing will be required. 3) Further analysis may allow additional flow to be routed down the left split channel (probably a temporary fix). The bridge span over the left split channel is equally undersized. Conditions there currently appear to be able to support limited additional flow, but a 10,000-cfs event may fail both bridges.			
R-4	Active scour zone along right shoreline adjacent to mid-channel island. Erosion along the shoreline has created a side slope that is 1:1 or steeper. Bank material is highly erosive gravel and appears to be a pushed up berm or "sugar dike". Greenway trail is close to the ordinary high water mark at this location and 15 feet from the crest of the eroding bank in some spots. New housing development along right shoreline in old floodplain and low terrace is at risk of channel migration. A major flood event could catastrophically realign the channel at this site with the new channel eroding a meander bend directly into the area of new homes. Any mitigating bank treatment practices at this location must be coordinated with downstream conditions at the footbridges crossing the channel via the island R1 and R3). **Solution Alternative/s:** Install 2 to 3 rock barbs along the left shoreline.	EH	S	HT
R-5	Boise City Engineer's office has identified this site as a desirable point for emergency access development for flood damage relief. Such sites could be used for river rescue operations also.	EA, RS	H	C
R-6	Remnant reach of anastomosed channel. Several islands and split channels exist through this area. Recently installed asphalt bike trail includes a light duty bridge that will support maintenance pick-up truck loading. Bridge is undersized for higher flood events and debris loads. Replacement is a low priority at this time. Recent landscape plantings include several non-native tree and shrub species that are not adapted for life in high moisture soils. Soil strength, erosion control, and wildlife habitat will be improved by replacing these plantings with native species.	FH, FW	L	MS, MIT, BE
R-7	Lake Harbor Residential Development. This site surrounds an old gravel pit. Homes closest to the channel were observed visually for foundation elevations above floodplain. Elevations appear too low for flood prone area conditions. A low profile earth berm has been constructed adjacent to the property line fence (approximate height above surrounding floodplain is less than 3 feet). Remnant components of an earth levee were observed along the right shoreline upstream of R-7 and R-6.	FH	M	FP, BE
R-8	Willow Lane Parks Department Athletics Area. Remnant sugar dikes exist at this location.	N/A	N/A	N/A
R-9	Boise Municipal Sewage Treatment Plant. No observed or reported scour problems at this right migrating meander site were observed at this water level. Monitoring for erosion is recommended.	N/A	MON	N/A
R-10	Veterans Memorial Park Way Bridge. Recent gravel bar migration and deposition has occurred into the left	FH	H	HT

*See "River Assessment Site Data Dictionary" for definitions of abbreviations.

LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	bay of the bridge. As a result, additional flows are being passed along the right shoreline. Velocities and scour are increasing locally along the right shoreline.			
R-11	Veterans Memorial Park along the right shoreline. Park area is owned by Idaho State Parks but recently management has been transferred to the City of Boise under a 75-year lease program. The right shoreline at this location has been subject to erosion in the past. In the recent past, a sheet pile revetment was installed by the State. Sheet pile revetment was removed and replaced with a permitted continuous riprap installation and gabion system at the bend. The downstream end of the riprap treatment, just upstream of the Veterans Memorial Park Way Bridge is a vertical gabion wall system supporting fill and the greenway as it passes underneath the bridge. Observed flow conditions during ATEC's March visit included very high velocities immediately against the shoreline. Shear stress is great. A deep scour hole is expected immediately adjacent to this shoreline. Toe undermining is also expected. The gabions are not expected to be a permanent solution at this location and can be expected to fail. **Solution Alternative/s:** A permanent solution at this site would be to install one to two barbs to shift flow off of the right shoreline.	EH, AV	S	H
R-12	Farmers Union Ditch Company. The originally installed facility at this location was composed of two different components. One was reportedly a full spanning concrete weir across the channel. The second was the intake headworks that fed water at a metered rate into the canal system. The canal system is along the right shoreline. The original concrete weir across the channel has failed and the existing structure at that site now is composed of basalt rock riprap and concrete rubble. Reportedly the irrigator is not maintaining the structure. Inflow rates are adequate without maintenance. The basalt and concrete rubble berm have been washed and individual stones and concrete scraps have been dispersed by floodwaters. Low flow passage is difficult for tubers and other recreationists with the sharp angular chunks of material exposed through the water. Portage conditions during low flow are reportedly mandatory given the amount of sharp materials exposed. Rebar may or may not be among the concrete. Passage options at higher flows include running the small white water rapid that exists at this site or alternatively portaging along the right shoreline over the greenway. Portage put in and take out locations and conditions are limited by steep banks. The right shoreline bank in this area is generally a sugar dike type of push-up berm. In recent years, the greenbelt installed a longer bridge span over the canal intake structure and the irrigator lowered the invert elevation by approximately 5 feet. Lowered base levels of the invert reduced the need for a diversion weir in the main channel. The irrigator does not report any problems with excessive sediment depositions at the intake. Along the right shoreline at this location the greenway trail immediately parallels the channel with less than 15 feet of buffer existing between it and the active channel in some locations. Erosion has been active in the greenway along this right shoreline in the past year and continues under existing conditions. Erosion here is resulting from 2 conditions: 1) angle of attack of flow, and 2) potentially poor alignment of the remaining weir structure in the channel. The impact area extends over	EH, EP, RS, RE, AV	S	HT, MS

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LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	approximately 300 lineal feet of eroding shoreline. **Solution Alternative/s:** Approximately 3 very low profile barbs are needed to protect this shoreline. It may be possible to place the upstream barb of the series just upstream of the intake works. Detailed site analysis must be performed prior to barb layout. The upstream barb must not significantly create adverse impacts at the impact structure. The remaining rubble structure in the channel should be replaced with a full spanning rock weir equipped with a boat notch. Alignment of the weir lengths and chevron angle must be designed to turn water away from the eroding right shoreline. A remnant concrete abutment can be found at the left edge of water presumably remaining from the original concrete diversion weir structure. This is a high priority treatment area. If not addressed, additional bank erosion at this location could create an avulsion. The probable avulsion route would be to break through the relatively narrow berm that separates the active channel from a remnant gravel mine along the right shoreline. The channel would course its way through the gravel pit and potentially break through into an old remnant channel within the Veterans Memorial Park area. Footbridges could be destroyed and significant bank erosion could occur. Greenway damage also would result in the area of R11.			
R-13	Thurman Mill Ditch Company. This structure is also referred to as the 36th Street wave because it is adjacent to the terminus of 36th Street and it creates a wave during high flow conditions that is very popular with kayakers as a play spot. Heavy kayak use was observed on 3/11 – 3/13/99, during stream flows of approximately 6500 cfs. Reportedly, the full spanning rubble and concrete apron weir is still in use as a diversion facility. A canal system connects to the channel at the left shoreline. The Boise River 2000 committee report indicates that a concrete apron exists on site that is equipped with weir jack stands for the purpose of supporting flashboards to elevate water levels in the river and diverting additional flow into the ditch. The concrete apron width is reportedly 10-12 feet wide with slots to receive jacks spaced 8 foot on center across the weir for the full width of the channel. The irrigator has historically left a passage near the right bank for water born sports. Reportedly the width of the passage is 40-50 feet wide. Observations during March 1999 by ATEC revealed installed jacks and flashboards at either edge of water extending out into the channel at a distance of approximately 20 feet. A large standing wave was present in the central portion of the weir and was being used by kayakers. High flow rescue conditions are restricted at this site. A kayaker in distress will be drifted some distance downstream before reaching an area of quiet water or a point where they can withdraw from the channel. Low flow photography indicates considerable concrete construction debris material used as rubble to build up the weir and to protect the downstream end of the apron from bed scour. Reportedly some recently placed basalt boulders were added along with concrete rubble to protect the downstream end of the apron from undermining. Low flow passage through the structure is limited due to the sharp angular surfaces of the exposed concrete and riprap boulders.	EH, EP, AV	S	HT, AV, LM, MS, C

*See "River Assessment Site Data Dictionary" for definitions of abbreviations.

LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	Solution Alternative/s (General) include developing the left shoreline access point and connecting it with the greenbelt trail, extending upstream towards Main Street. Currently, the right shoreline contains a green belt pass on a low profile berm or sugar dike separating the channel from an old gravel pit, which is now a lake. This right shoreline is currently in unstable condition. Existing portage conditions are best along the left shoreline. Portage conditions need to be enhanced and are best maintained on the left shoreline, which is in a lower energy setting. **Solution Alternative/s (Specific):** 1) Completely tear out existing structure and replace with a full-spanning basalt rock weir structure. This structure would be a "W" weir configuration. Two low flow notches would be provided as chutes for any water born sports activities. The angular "W" alignment to flow within the channel would provide hydraulic conditions more conducive to boater safety than a perpendicular alignment to flow (i.e. a weir with a sharp crest that creates a dangerous hydraulic standing wave on the downstream side of the structure). A boat ramp egress location could be installed on the downstream left shoreline side of the structure at this site. This remains a lower energy site on the downstream side and could provide emergency access. Rock boulder/s (individual or clusters) could be installed to create several supporting conditions [low energy sheltered areas for exiting boaters, and slalom features for other boaters]. Tubing traffic could exit the channel at this location if the upstream structure at Settlers Ditch was upgraded and safety improved for tubing traffic. Tubing traffic could be removed at the 36th Street wave site or be allowed to proceed downstream to Veterans Park upstream of Veterans Memorial Bridge. Existing utilization status of this structure and the diversion works at this site are unknown to ATEC at this time. The Boise River 2000 report suggests that the irrigator have an active interest in maintaining the structure. Original construction of the structure is reported to have been in the 1920's. The dike along the right shoreline at R-13 and both upstream and downstream is actively eroding, poorly constructed to begin with and has a dangerously low crest elevation. The Thurman Mill Ditch Company structure creates a bad angle of attack along the right shoreline downstream of the weir. The combination of the low elevation berm between the channel on the right shoreline and the poor angle of attack makes the berm a potential breach point. Some recently installed riprap exists along the right shoreline. The City Parks Department is open to possibilities of an intensively designed kayak course. ATEC identified this site as a strong option.			
R-14	Riprap installation protecting the left shoreline adjacent to the hotel. This is the Garden City side of the channel. Tom Governale (Boise City Parks) and Christian Fromuth (ATEC) discussed on 3/13/99 possible design option for the left shoreline of the channel: Extend the Greenway bike path trail along the left shoreline from Main Street down to the 36th Street wave at the Thurman Mill Ditch Company. Conditions at the 36th Street wave would be enhanced for boater utilization.	RE	M	LM
R-15	Existing emergency access for construction vehicles appears to be available through the Shilo Inn.	N/A	N/A	N/A
R-	Presently the site of the Boise Fire Department training practice tower. The tower is tentatively slated for	RE, EA	M	LM, BE

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LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
15A	removal out to the airport or another location. The City of Boise Parks & Recreation Department is expected to inherit the site. This site could become greenway and an access point to the channel.			
R-16	Right shoreline scour downstream of Americana Bridge resulting from flow conditions generated at the weir upstream of the bridge and possibly bridge hydraulics. The Solution Alternative at R-17 that includes an additional rock full-spanning weir downstream of Americana Bridge would potentially mitigate this scour situation. The active bank scour within this zone is approximately 250 lineal feet in length. The existing vegetation condition is moderate to good. Most of the vegetation should be left undisturbed. **Solution Alternative/s:** Install two barbs approximately 40-foot long each measured along their centerline. May potentially need a third to protect a right edge of water as far down as the old abandoned railroad bridge and the bridge adjacent to it. Within this 250 feet, the right shoreline at the upstream end is at a middle terrace height and then descends to a low terrace height towards the downstream end. The right shoreline at the old railroad bridge is eroding. Gabion walls support the bike path. Piping conditions are occurring within the fill behind the gabions. Upstream of the bridge on the right shoreline, the surface is equivalent to a middle terrace. It transitions to a low terrace under the new bridge downstream (Interstate 84 bypass). Under the bridge, the bike path is protected from scour by a continuous riprap toe treatment and sparse vegetation. Hydraulic flow conditions passing along this riprap have a high shear stress condition. Erosion may be occurring at this site, but was obscured by high water during 3/99-site visit. The barb installation treatments recommended under R-16 would improve this condition. R-16 treatments must include a barb installed upstream of the 8th Street Bridge tied into the right shoreline. Keying of the barb is required. The bike path must be torn up, gabions disposed, a keyway installed for the barb under the bike path, and the bike path restored. Adjacent to the barbs, bioengineering treatments are needed trenches should be installed per a typical ATEC barb design. The City Engineer's Office desires emergency equipment access at this location (i.e. upstream of I-84).	EH, EP, EA	S	HT, MS, LM
R-17	Settlers Irrigation District. Existing full-spanning concrete weir and left shoreline diversion head gate structure. Weir represents a passage hazard for all tubing traffic. No established portage exists at this location. Many injuries have been reported at this site. The full-spanning weir structure is of concrete construction. The left half of the structure has raised concrete dividers that were largely obscured by high flow during ATEC's 3/99-site visit. Inspection may reveal that these dividers are fitted to receive flashboards to adjust flow level on the left half of the structure. The right half of the structure is a broad crested weir. The diversion headworks are on the left shoreline and flow underneath the Americana Bridge. This structure effectively divides the study area into two reaches (upstream and downstream). Currently, tubing traffic is limited to the upstream half. ATEC does not currently know whether this is an active irrigation diversion site. The existing diversion outlet elevation appears to be much lower than the weir crest. Therefore, the potential appears to exist to lower the crest elevation of the weir and not adversely impact irrigation diversion performance. These observations are rough estimates based on ATEC's visual inspection. No survey measurements have been performed to	EH, RS, EA, RE	H	HT, LM, MS

*See "River Assessment Site Data Dictionary" for definitions of abbreviations.

LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	date. The City Engineer's Office reports that there is a sewer line that crosses the channel downstream of this weir and upstream of the Americana Bridge. Reportedly the concrete weir structure may be experiencing some undermining conditions. Furthermore, the sewer line is reported to be showing some risk of exposure. Flow conditions at the time of ATEC's inspection were too high to allow visual observation of the sewer line and the foundation for the weir. **Solution Alternative/s:** 1) Do nothing. Allow the site to continue as a breakpoint between the two reaches of the channel. However, this solution should include multiple warnings and tuber traffic guidance to mandatory egress from the channel at the Ann Morrison Park footbridge (upstream at R-18). 2) Improve passage within the concrete structure by installing a boat notch through the concrete. This would involve temporary water diversion and modifications to the concrete weir structure. 3) Perform modifications per Alternative 1 and install an additional full-spanning rock weir structure downstream of the Americana Bridge in order to create backwater under the bridge and trap sediment, raising base level of channel under bridge, over sewer line, and to the toe of the concrete weir. The addition of a downstream weir will reduce the total elevation drop at the existing Settlers Weir. This will reduce hazard to boaters passing through the boat notch in the weir. The downstream rock weir construction should be in "hockey stick" configuration to provide added protection to the right shoreline downstream. The weir length perpendicular to the channel would be 320 feet including keyway. Additional length would be necessary to account for any chevron angles included in a multiple-legged weir. Under existing conditions, the right shoreline is scouring downstream of Americana Bridge. The proposed treatments would include bank stabilization treatments at this site. Boat notch work can be replaced with additional weir construction to create more backwater. Floodway analysis work must be done with this design.			
R-18	City foot bridge. Active scour along left shoreline on both upstream and downstream sides. Existing conditions include gabion retaining walls to hold soil and approach fill surrounding the abutment on the left shoreline. Gabions on the upstream and downstream side of the left shoreline abutment are failing. **Solution Alternative/s:** Remove gabions on both sides. Replace with rock toe and bioengineered vegetated geogrids above the rock toe on both sides. On the downstream side of the bridge, aggressively revegetate entire shoreline and buffer area up to the path. Install deterrent vegetation to discourage foot traffic. On the upstream side of the left shoreline, allow continued ingress and egress. Enhance access conditions. Site is a low energy deposition point. Sand sediment prevails. This is a major take out spot for tubers at this location. In short term, this site should be developed and all tubing traffic directed off of the river at this location, prior to arriving at the Settler's Irrigation District diversion immediately downstream of the foot bridge. Signs should be hung from the bridge, calling for a mandatory egress from the channel for all tubing traffic.	EH	H	S, LM, BT, BE
R-19	Reach that spans between Broadway Avenue Bridge and the Capital Boulevard Bridge. Signs of past channel	N/A	N/A	N/A

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LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	manipulation can be seen within this reach and may have involved channel excavation or dredging and push-up berms on either side of the channel. Boise State University owns left shoreline within this zone.			
R-20	Boise State University footbridge. Concrete and steel parabolic arch construction. Right edge of water appears to be an unofficial ingress and egress point into the channel. Presumably mostly from student traffic. Access trails have been worn through landscaped shorelines. This right shoreline location is an inside point bar depositional zone and is predominantly sand covered. **Solution Alternative/s:** This is a good site to develop as a designated access point since it is going to be used anyway. Create designated traffic routes. Remove existing arborvitae ground cover. Install a sand slope with a timber step retaining wall system. Develop site as an emergency access point for boat related rescues. Deter use of opposite shoreline, left edge of water, as an access point adjacent to the bridge abutment. Bank barbs may be needed along left edge of water in this zone.	EH, RE	M	LM, BE, BT
R-21	Active shoreline scour along left edge of water on the property of Boise State University. Approximate length is 300 lineal feet (± maybe as much as 100 feet). Bank height approximately 10-14 feet. Side slopes 1:1 or steeper. Vegetation absent. Old levee is scouring away. Damage at this site largely due to highly erodable shoreline material. Sugar dike construction methods appear to have been used. Mid-channel or transverse bars are influencing scour along this left shoreline. **Solution Alternative/s:** Riprap toe with bioengineered vegetated geogrid lifts above. Incorporate pedestrian deterrent plant species.	EH, EP	S	BT
R-22	Proposed new road bridge site.	N/A	N/A	N/A
R-23	Bank erosion site through this outside bend. Three barbs were installed in the summer of 1998 to prevent channel breaking through and damaging commercial property. A section of low-elevation asphalt bike trail was destroyed. ATEC visited this site on 3/11/99 with City engineering staff Jim Wiley. Jim reported no keyway excavation for the barbs and barbs were visible by ATEC despite the high water conditions. Barb length appears to be too short. Keyways need to be installed under bike trail and into floodplain. Barb angle is not clear during existing flow conditions. Additional active erosion is occurring at upstream end of treated area. An additional barb and bioengineering treatments are needed.	EH	S	HT
R-24	Localized bank erosion. Install Large Woody Debris Revetment as a demonstration project on the Boise River. Or, install rock toe with biotechnical bank stabilization above.	EH	M	BT, S, BE
R-25	Existing emergency construction access point available through IBM parking lot and facility.	N/A	N/A	N/A
R-26	Active shoreline scour location in Warm Springs Golf Course. **Solution Alternative/s:** Continuous riprap toe with bioengineering vegetated geogrids above. Proposed design and construction work should include emergency river rescue access at this point.	EH	H	S, BT, BE

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LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	R-26 is also the location of a proposed footbridge. Abutments have been installed as of 3/99.			
R-27	City recently installed 3 barbs along the left shoreline to protect the new Park Center development. ATEC visited site with City engineering staff Jim Wiley. Limited ability to inspect was experienced due to high flow conditions. General recommendations to City Engineer were provided. These included: increased barb lengths and a keyway installation. This reach appears to need an additional barb structure. An emergency access point was recently installed at this location between the upstream barb and the middle barb. "Grass-Crete" blocks were installed to allow grass to grow through the concrete yet provide a stable foundation for emergency vehicles. The old gravel pit lake adjacent to the site is being developed into a landscaped site as part of a larger development plan for the site. The berm that separates the active channel from this lake is relatively narrow. Potential for channel capture of the lake may exist at this site.	EV, AV	S	HT, AV, BT, BE
R-28	Scour conditions confirmed at this location by ATEC. Approximately 300+ lineal feet of bank erosion at this location. **Solution Alternative/s:** Continuous rock toe with bioengineering lifts in upper bank. Bioengineering lifts divided into two zones. Lower elevation moister hydric zone and upper elevation dryer xeric zone. Plant species selected accordingly.	EH	H	S, BT, BE
R-29	Existing access point is available through the Cottonwood Apartments area at this location. This could be potentially upgraded to emergency access standards as needed. An older riprap installation exists here. Chronic erosion location in the outside bend. Recent riprap addition has been installed here by Parks Dept. on an emergency basis. This bend requires a more aggressive treatment. **Solution Alternative/s:** Install 3-5 barbs throughout this bend. There's active recent scour at this site. Floodplain vegetation appears to be in good condition with some moderately mature trees along this stretch. Landward of the floodplain trees, a sugar dike has been installed that resembles a low terrace feature. This feature is actively scouring away. Vegetation is gone. Side slopes are 1:1 or steeper. The overall length is approximately 400 lineal feet. Shoreline between installed barbs can be shaped to a 2:1 side slope where vegetation is not damaged. The resulting shaped side slope shall be aggressively vegetated and a riparian buffer installed.	EH, EA	H	HT, BT
R-30	River Run Development. The developer installed a network of small year round flow streams throughout this residential setting. The system of streams connects old gravel pits and the main channel. The intent was to develop some trout rearing and spawning habitat in this area. Stream flow temperatures in this reach below the dams generally is sufficiently cold to support species such as rainbow, brown and steelhead trout, and whitefish. Presence of whitefish generally indicates good water quality. The River Run development construction was started approximately in 1983. Reportedly some sedimentation has occurred in these	N/A	N/A	N/A

*See "River Assessment Site Data Dictionary" for definitions of abbreviations.

LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	channels impairing their performance as habitat for trout, at least in a spawning capacity.			
R-31	Bank erosion site reported by Tom Governale (pers. comm. 3/13/99). Water levels limited ATEC's ability to inspect site.	EH	H	S, BT, BE
R-32	Reportedly former gravel pit lake. This lake site has since been filled.	N/A	N/A	N/A
R-33	This is the only reach of US Army Corps of Engineers recognized levee in the study area. Although other remnant levee features exist within the project area, the Corps. only recognizes this section as providing function for flood control (pers. comm. Jim Wiley, City Engineer's office, 3/11/99). This levee was reportedly constructed by the River Run developer circa 1983.	N/A	N/A	N/A
R-34	Boise City Canal Company. Existing structure is reportedly a low-profile rubble mound dam that has been capped with concrete. The Boise River 2000 committee reports that the crest elevation appears to span the full channel at a relatively uniform elevation. No information is given regarding the height of the structure. The structure in low flow photography appears to not exceed 3 feet in height. This site is reportedly popular with kayakers performing surfing tricks at this location. Passage appears to be safe for tubers. Canoeists can best navigate the structure during low flow towards the right edge of water. The diversion canal departs from the channel along the right shoreline. A portage route is available along the left shoreline through the greenway. (Upgrades are recommended).	EH, RE	M, MON	LM, BE
R-35	Two barbs reported to be at this location. ATEC did not confirm. Installation reportedly occurred approximately 1990 ± 3 years (pers. com. John Heimer, retired Idaho Fish & Game, 3/11/99).	N/A	MON	N/A
R-36	Three or four recently constructed, very expensive homes are on a point bar, completely within the floodway in an extreme hazard area prone to channel avulsion. The point bar is separated from the right shoreline by a high flow chute with standing water observed on 3/18/99 at a stream flow between 6500 and 7000 cfs. Several additional parcels are currently advertised for sale on this same point bar. No further construction should be permitted at this site until a flood hazard study, an updated floodway evaluation, and an avulsion risk assessment is performed.	EH, AV	S	LM, AV
R-37	South Boise Water Company diversion head works (abandoned) and full-spanning basalt weir. The basalt rock weir is a low profile structure and remains in place. The head gate is located in the left shoreline and is no longer used. Sediment deposition has been occurring along the upstream side of the structure. City engineering desires emergency access at this location for construction equipment.	EA	MON	Access Construction
R-38	South Boise Water Company existing diversion works. To date, high flows have obstructed ATEC's ability to directly inspect channel conditions diverting and directing water into the head works. An inventory performed by the Boise River 2000 committee reports no in-channel structure and that it is a naturally high or resistant point in the channel that diverts flow into these head works. A relatively limited amount of total flow volume is routed through the head works and into the ditch system known as Logger's Creek. Flow routed down Logger's Creek supplies in-stream flow to the habitat complex installed in the River Run sub-division. Reportedly, 200 acres of irrigated land is served by this ditch, including acreage owned by Boise State	AV	S	AV, HT

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LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	University and various residences and businesses in the area. City engineering reports that the diversion head works include twin 60-inch diameter pipes. Visual inspection reveals that the structure is largely concrete and that potential exists for overtopping flows to create an avulsion around the structure and avulse a new channel down the Logger's Creek ditch. Damage could result to the River Run Community. Additional avulsion risk assessment study is required. City engineering desires emergency access at this location for construction equipment. The proposed new bridge crossing the channel, which would be the Park Center Boulevard Bridge, is approximately at or just downstream of this R-38 structure. The new bridge would service the proposed Harris Ranch Development Project. Bridge construction and management would be through the Ada County Highway District (ACHD). The proposed new bridge crossing should be designed to have adequate channel conveyance in both the active channel, the floodplain, and low terrace areas adjacent to the channel. ATEC recommends that the bridge deck should be elevated sufficiently to exceed a non-regulated 100-year flow event. A setback levee system could be designed in conjunction with the bridge approach and the fill material required for the approach. An upgraded green way trail could be installed on top of the setback levee thus enabling year round usage including during high flow events. The bridge should include a discrete recreation trail lane linking both sides of the green way on opposite shorelines. Avulsion mitigation should be designed into bridge construction work.			
R-39	Harris Ranch. Proposed location of a high-density residential sub-division in near future. Site lies predominantly within the historic 100-year floodplain and channel migration meander belt. FEMA study is currently being updated. Results should be compared to existing conditions and site locations proposed for homes. Currently the City proposes a high flow bypass channel to be excavated through the proposed development area. Initial rough estimates for this channel have the following specifications: length approximately 2 miles and excavation volume approximately 250,000 CY. Spoils are to be spread into adjacent floodplain area raising the land elevation. Additional work proposed in conjunction with this project within this reach includes two side channels proposed by Trout Unlimited (TU). The proposed locations of these side channels are shown on the ATEC map layer as R-39A and *R-39B*. Particularly high impact site from foot traffic damage is shown at *R-39C*. The greatest source of damage is believed to be pedestrian anglers seeking steelhead fishing spot points below the dam. Steelhead gather downstream of the dam and anglers take advantage of this opportunity. **Solution Alternative/s:** Create designated foot traffic trails. Outside bend erosion control protection in the location of R-39B must incorporate planning for the proposed TU off-channel rearing area. If the rearing area is going to proceed, barbs may not be an option in this outside bend location. A more appropriate fix may be rock veins or rock toe with bioengineered upper slope. Attraction flow hydraulic conditions should be	FW, RE, AV, EA	H	HT, BE, BT, AV

*See "River Assessment Site Data Dictionary" for definitions of abbreviations.

LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	considered for off-channel rearing areas. These off-channel-rearing areas also must include provisions to prevent plugging with debris floated in as top water and sediment transported in as bottom water. An engineered intake structure can perform this function. Buffer recommendations for this area include a 200-foot riparian vegetation zone measured from the ordinary high water mark (7000-cfs elevation line). The 200-foot buffer zone would be measured landward from the ordinary high water mark or the newly created off-channel rearing area whichever is further landward. If a year round bypass channel is permitted at this location, it will reduce flows downstream in the Nampa area, impairing conditions for boaters and in-stream flow conditions. City engineering reports that the proposed plan is for a high flow chute relief bypass channel only, not a year round flow conditions. Concern has been raised that the proposal may be modified in the future to expand the channel usage to year round flow. A proposed mitigation for the Harris Ranch sub-division is to improve boat passage over the structure at R-44. ATEC recommendation: any bypass channel construction should include heavy vegetation to provide shading and prevent temperature elevation. If year round flow is intended through bypass channel, it will significantly alter the width to depth ratio of the main channel. Avulsion prevention designs will be required in any side channel.			
R-40	Left shoreline green way, high impact area. Land based human recreation activities within this zone closely border the edge of channel. During periods of high run-off much of the green way and the currently established trail system is inundated. The green way within this zone is predominantly a native riparian forest area and well suited for its current use as a floodplain area. During periods of inundation the more determined recreationists seek alternate routes through this area. The resulting impact is multiple unofficial trails worn throughout the area. Heavy trampling of vegetation results. **Solution Alternative/s:** 1) Designated trails accessible during a full range of flow conditions except for extreme events. These could be placed on a set back levee system installed to protect Wood Duck Island from flood-related hazards and avulsion. 2) Shut down this section of green belt to all use by foot traffic during periods of high flow. This would include some form of physical barrier and clear signage to users, installed and posted at both the upper and lower limits of this reach. Under this option the dominant use of this area would be wildlife usage.	EA, RE, AV, FW	H	AV, LM, BE, FP
R-41	Wood Duck Island Residential Community. Geomorphically this entire development was placed within a very active meander belt of the old anastomosed channel. If a major flood event were to occur, this community appears to be at a high risk to both inundation and meander migration. The ditch associated with the South Boise Mutual Irrigation Company structure is referred to as “Bub Ditch”. Under current conditions, there is a high potential risk for an avulsion at the head works of this structure. The most probable route would be through the left shoreline (destroying the head works of this irrigation diversion structure) and downstream through old meander channels and connect with the Logger’s Creek ditch system. The avulsed channel could re-enter the main channel at the abandoned South Boise Water Company structure downstream or at the	AV, EA, RE, FW	S	AV, LM, BE, FP

*See “River Assessment Site Data Dictionary” for definitions of abbreviations.

LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	existing South Boise Water Company structure. Alternatively, it could potentially connect with the Logger's Creek system and run into the River Run Community. Any one of these routes and events would be accompanied by significant destruction to existing structures. Ada County owns a 200 feet wide zone between the channel and City ownership at this location. City engineering reports that to date a coordinated management plan for this strip of riparian shoreline does not exist between the City and the County. Emergency access conditions have been limited due to the lack of a plan. **Solution Alternative/s** for protecting this residential development include the following: 1) Do nothing. Allow flood damage to occur. Do not rebuild and reoccupy this zone following flood damage. 2) Construct a setback levee. 3) Install a designated high flow chute with controlled inlet and outlet structures to prevent head cutting and control avulsions. ATEC recommends a combination of 2 and 3. Note: ATEC toured site on 3/11/99 with City engineering staff Jim Wiley. Though out the Wood Duck Island area (R-42 essentially, and the area bounded by R-40) there are remnants of old push-up levee construction along the left shoreline. Breaches and wash outs have occurred in numerous locations. The remaining levee is not functional as a levee. The shoreline is generally very well vegetated.			
R-42	South Boise Mutual Irrigation Company Ltd. This site includes a full spanning weir and a left shoreline irrigation diversion head works. City engineering describes the weir design as follows: approximately 25 feet wide with a rounded top; the spillway design type resembles an OG standard typical design. The original structure was reportedly a concrete one and failed due to undermining at the downstream end. Piece meal repair and upgrade attempts have been performed at this site over the years. High flows prevented ATEC visual inspection of the full-spanning structure in the channel. The structure is reportedly composed of construction demolition debris, concrete, and perhaps some rebar and brick materials. Reportedly in the early 1970's concrete material was added as a cap to the structure to improve hydraulic efficiency and perhaps safety. Reports indicate that the cap dimensions are approximately 16 feet wide from upstream to downstream and with a blanket thickness of 8-12 inches. The Boise 2000 report states that approximately 60 CY of concrete were placed by hand to form the cap. In the past, increased crest elevation of the weir was achieved by adding flashboards between jacks placed in the crest of the structure. Portage and safety conditions at this site are reported as follows: Reportedly most tubers float right over top of the structures. Canoes have the potential to swamp or capsize. The right shoreline is the preferred route based on reports from boaters. Geomorphically the right shoreline is a point bar and a lower energy site, creating a depositional environment. The right shoreline is the preferred location for safety and long-term structural stability for a portage route. Reportedly a life was lost at this site in 1969 when an individual was trapped against an upright jack and drowned. Given the site's high intensity use by tubers passing right over this structure, substantial	RS	M	HT, LM, BT, MS

*See "River Assessment Site Data Dictionary" for definitions of abbreviations.

LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	reconstruction is recommended. City engineering desires emergency access at this location for construction equipment. **Solution Alternative/s for the structure**: 1) Completely remove all existing structure and replace with a full-spanning rock weir equipped with a low flow notch or a boat notch. Design elevation and hydraulics must be coordinated with the irrigation users. 2) Mandatory portage requirements on the right shoreline in a designated route. 3) Complete removal. 4) Do nothing. ATEC recommends option 1.			
R-43	This map unit held in reserve for potential future use.	N/A	N/A	N/A
R-44	Nampa & Meridian Irrigation District diversion weir and head works. This weir is a full-spanning low profile structure. The head works is a left shoreline irrigation diversion feeding the Ridenbaugh canal system. This site is described in the Boise River 2000 inventory of diversion structures on the channel. In that report the following information is included: *The full-spanning weir across the channel is constructed of 10 concrete bays. Each of the bays spanning the channel can be fitted with wood check boards to control river surface elevation. An additional 40 bays parallel the left shoreline to allow flow routing into the head works. The 40 bay segment helps to filter out large woody debris from entering the trash rack down stream.* **Solution Alternative/s:** Portage conditions. Physical barriers and safety hazards along left shoreline are significant. ATEC recommends investigating right shoreline route options and presenting them to the Harris Ranch Development. The right shoreline at this location is a convex bend or inside bend and is a low energy zone and therefore much more conducive to human access, ingress, and egress upstream and downstream of the diversion works. Geomorphically this is lower energy setting and depositional environment. Trout Unlimited is proposing a side channel/off-channel habitat feature through the point bar. The habitat mitigation and portage mitigation activities should be coordinated at this site. Opportunities for complimentary design exist.	RS, RE, FW	M	LM, BE, BT
R-45	County jurisdiction Barber Dam Hydro Project and old Barber Pool log pond. The dam remains in place and in good condition. It is currently being used as a hydropower project site. The pool upstream of the dam has been drained. Multiple thread channels have been cut through the old lake bottom sediments or sediments that have settled into the base of the pool. An anastomosed channel is developing in the old pool sediments. In the absence of chronic future disturbance to the channel form these channels can become stable. Well-vegetated islands can develop. The site is planned for a wildlife refuge and park area. Reportedly the lead sponsor for the parks projects is the State of Idaho Parks Department. On the upstream side of the dam, within a thousand feet of the dam itself, are remnants of an old earth berm structure. The berm structure has been breached in a number of places resulting in a series of small islands of remnant berm. These islands currently are oversteepened and unstable earth masses and should be leveled to reduce safety hazards to boaters who might climb on them. The dam construction itself is an earthen embankment. The spillway is a broad crested concrete structure and there is a penstock through the dam itself. Portage conditions around the structure for	N/A	N/A	N/A

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LEGEND FOR SITE ASSESSMENT MAP/S

MAP UNIT ID#	SITE DESCRIPTION (Existing Conditions Annotations with Solution Alternatives where prescribed)	PROBLEM TYPE*	PRIORITY RATING*	SOLUTION ALTS*
	boaters are generally good. Recent improvements have been made to this site. This site was included in an inventory performed by the Boise River 2000 committee. On the downstream side of the dam is a park. Barber dam represents the upstream end or limit of the study area. A Rock groin structure is at this site on the downstream side of the dam extending from the left shoreline, possibly intended as protection for a created swimming access area.			

*See "River Assessment Site Data Dictionary" for definitions of abbreviations.

APPENDIX C

- **SUMMARY SHEETS DESCRIBING GENERAL TREATMENT ALTERNATIVES**
  - **Bank Stabilization: Fix In Place**
  - **Meander Realignment**
  - **Floodplain Restoration and Meander Belt Management**
  - **Meander Belt Management Plan Factors to Consider**
  - **Riparian and Shoreline Buffer Areas**

- **CONCEPTUAL DRAWINGS OF SOME TREATMENT OPTIONS**
  - **Biotechnical Bank Stabilization Option: Time Series**
  - **Biotechnical Bank Stabilization Option: Fix in Place vs. Construction with a Low Terrace**
  - **Meander Reconstruction / Realignment Detail**
  - **Large Woody Debris Revetment: Typical Section**
  - **Large Woody Debris Revetment: Typical Plan View**
  - **Bank Barb**
  - **Full Spanning Rock Weir**
  - **Setback Levee and Floodplain Restoration**

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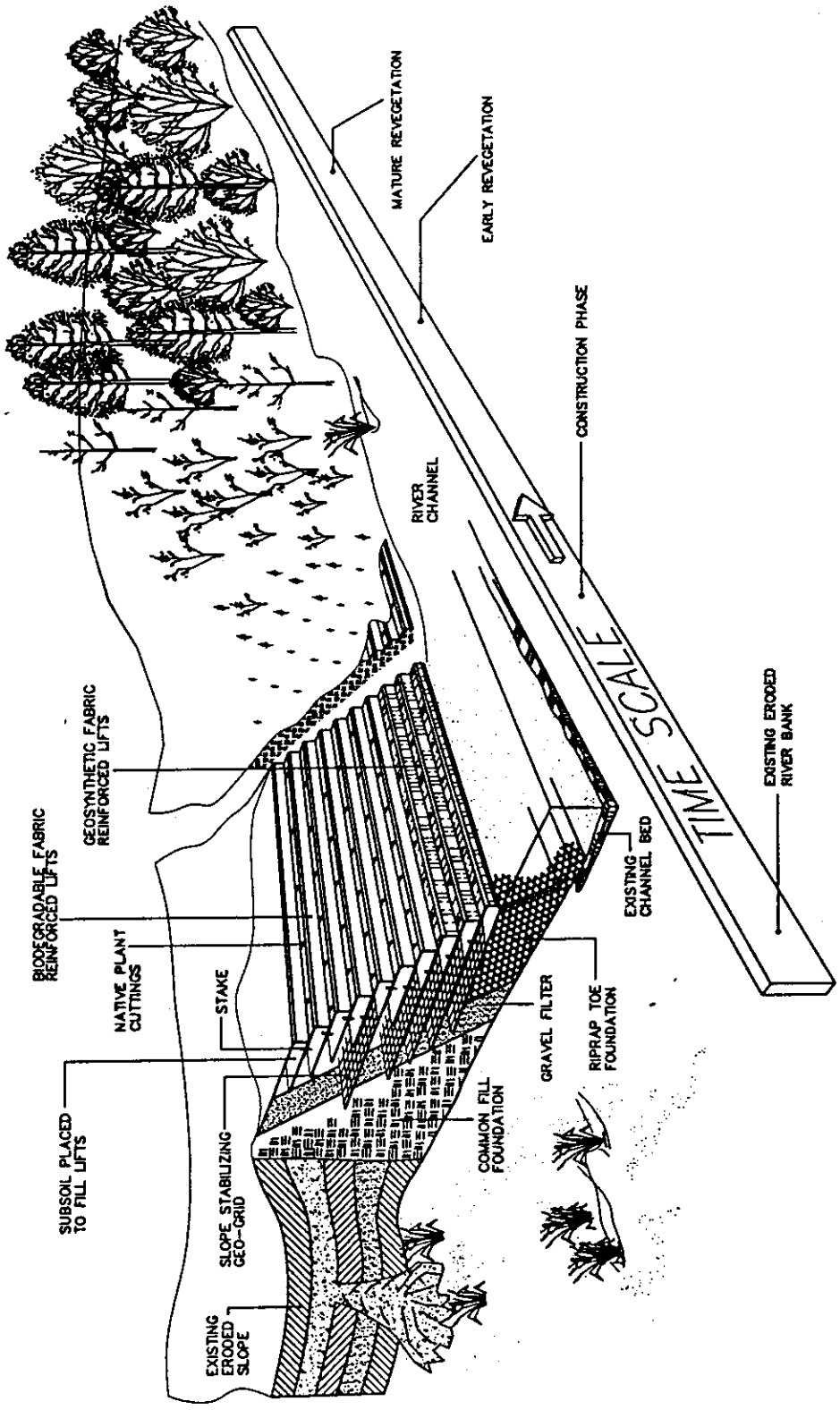

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FIGURE:
BIOTECHNICAL BANK STABILIZATION OPTION

ATEC\FLUV-GEO\BENG-TOE-A_BW.DWG\990718

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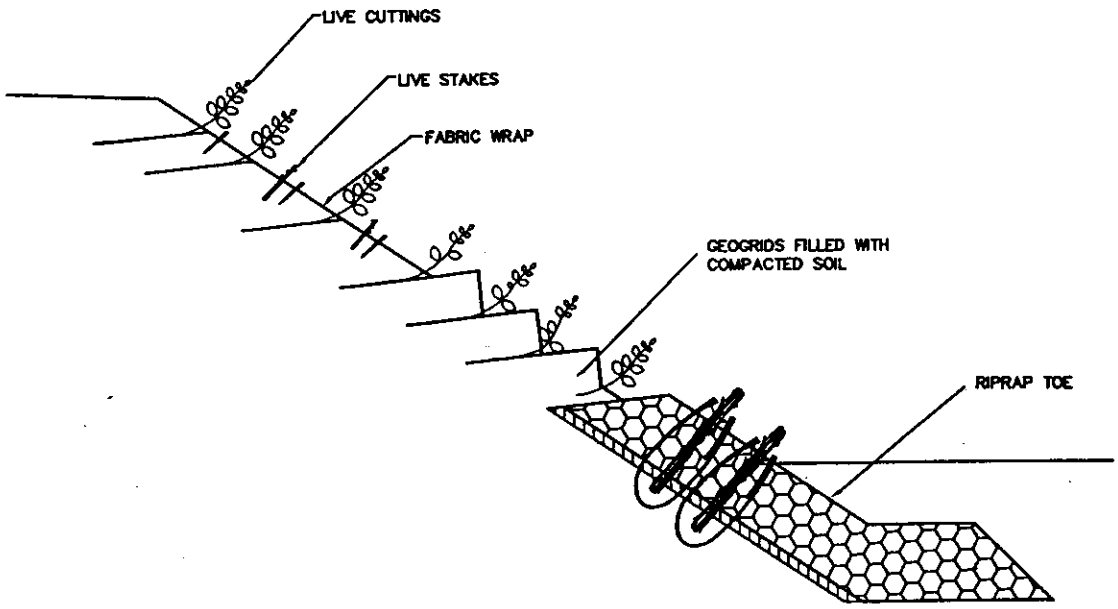
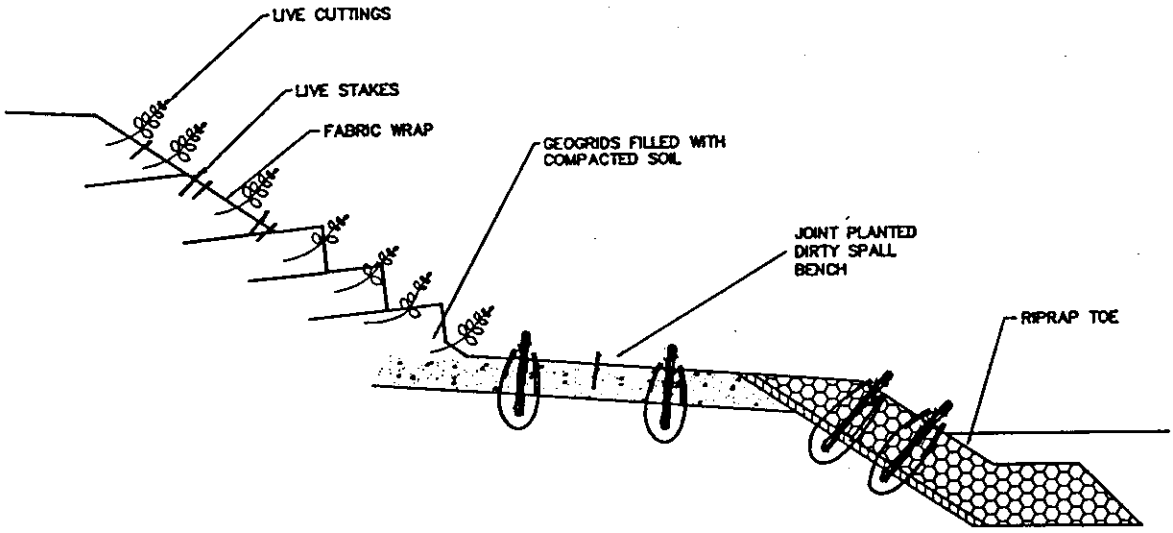


FIX IN PLACE VERSION



BANK LAYBACK VERSION WITH LOW TERRACE

ATEC
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OLYMPIA, WA 98501
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FIGURE:
BIOTECHNICAL BANK STABILIZATION OPTION
FIX IN PLACE VS. CONSTRUCTION WITH LOW TERRACE

ATEC\FLUV-GEO\ENG-TOE-B_FIX.DWG\990719

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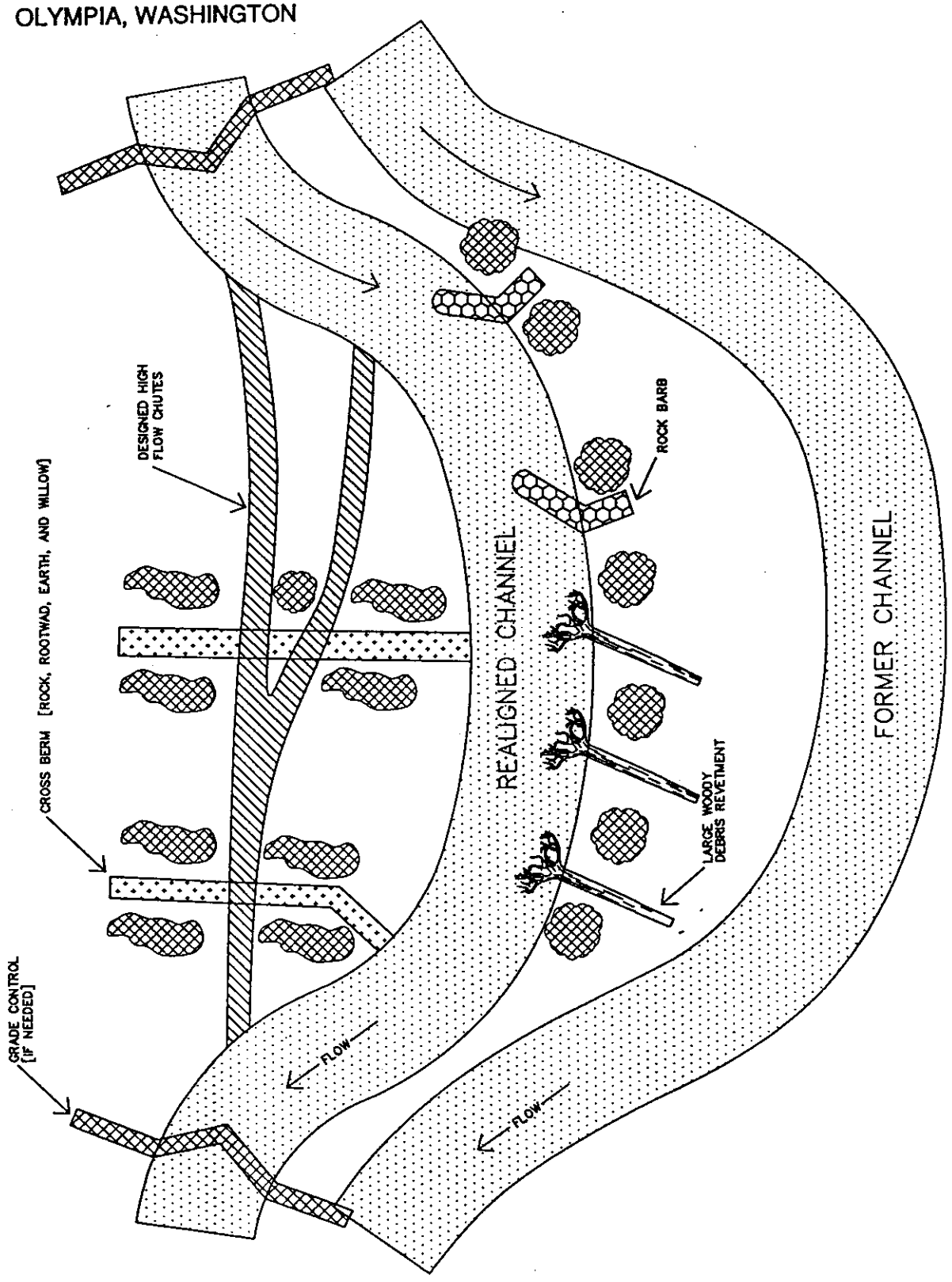

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FIGURE:
MEANDER RECONSTRUCTION / REALIGNMENT: DETAIL

ATEC\FLUV-GEO\MEAN-RECON-C_BW.DWG\990720

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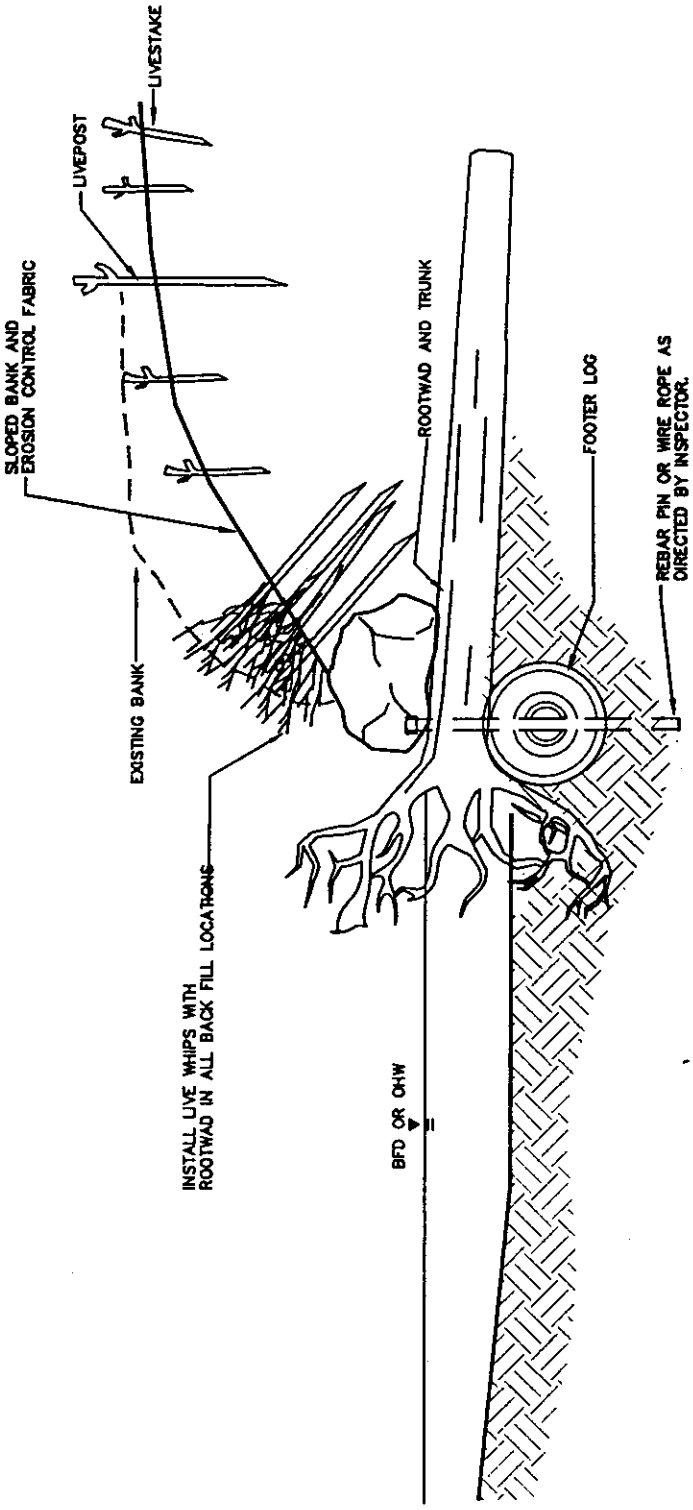

TYPICAL SECTION VIEW
NTS

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FIGURE:
LARGE WOODY DEBRIS REVETMENT: TYPICAL SECTION

ATEC\FLUV-GEO\LWD-REVET-SEC_BW.DWG\990720

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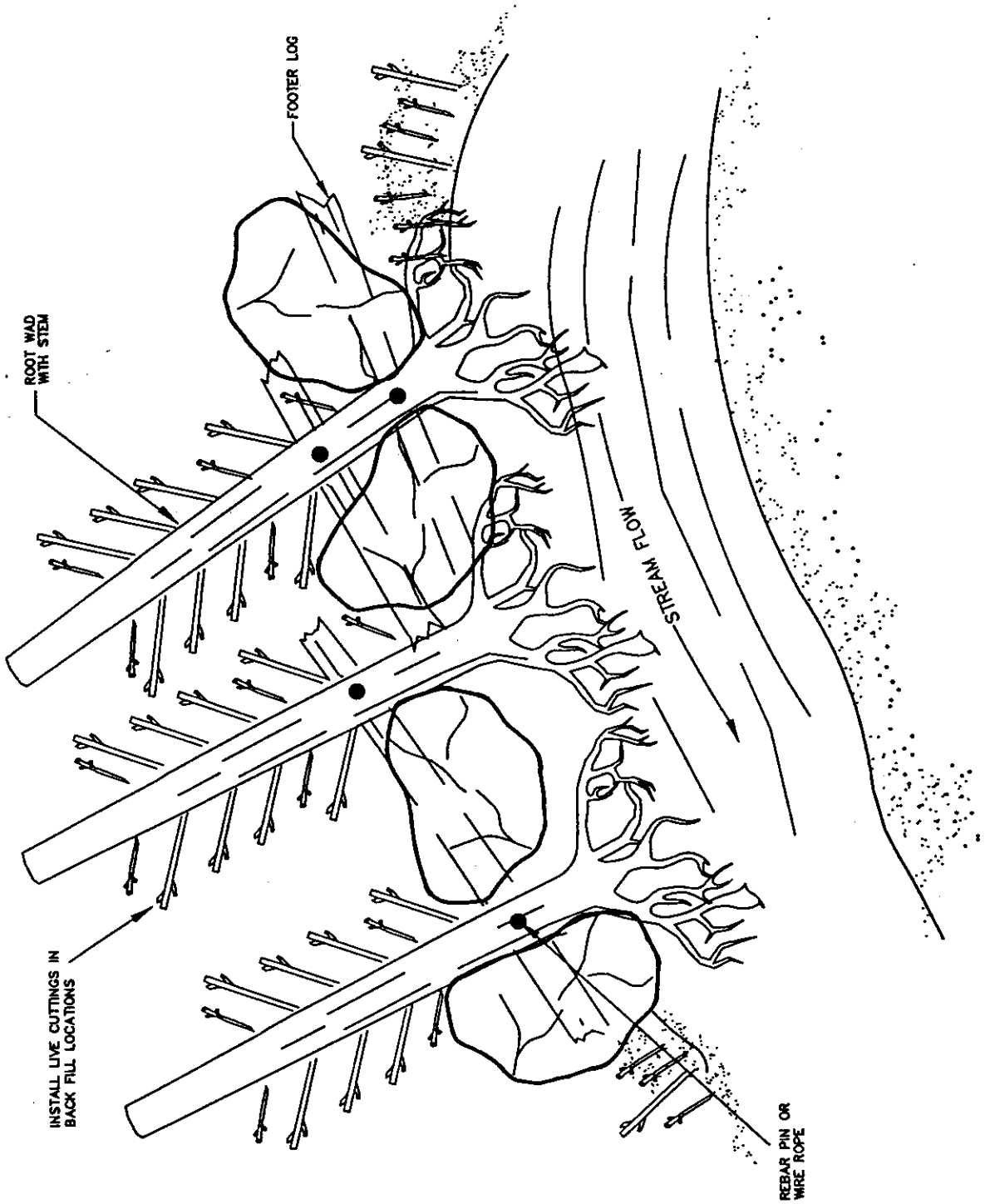

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FIGURE:
LARGE WOODY DEBRIS REVETMENT: TYPICAL PLAN VIEW

ATEC\FLUV-GEO\LWD-REVET-PLAN_BELDW\990720

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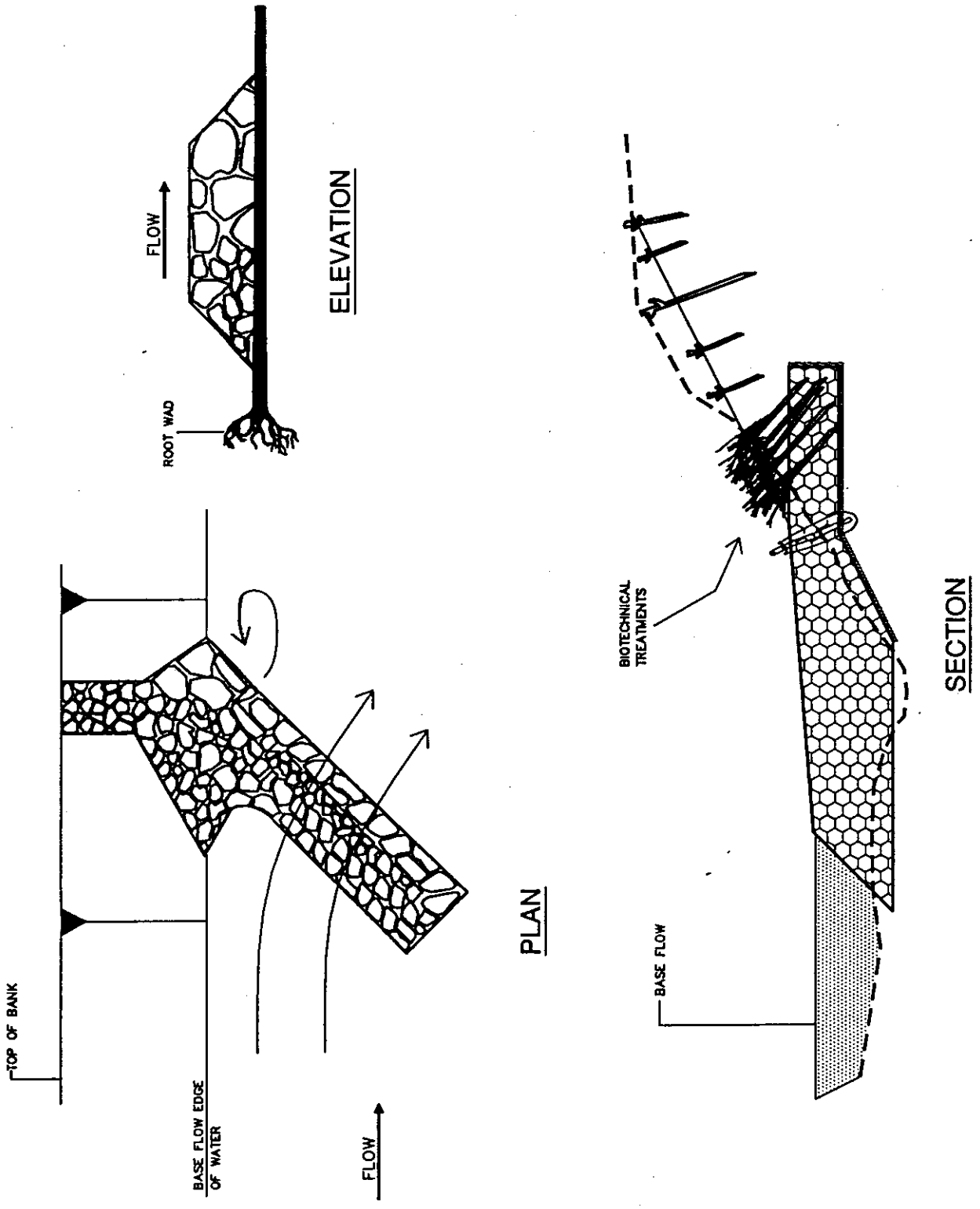

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FIGURE:
BANK BARB

ATEC\FLUV-GEO\ROCK-BARB-A_SW.DWG\990719

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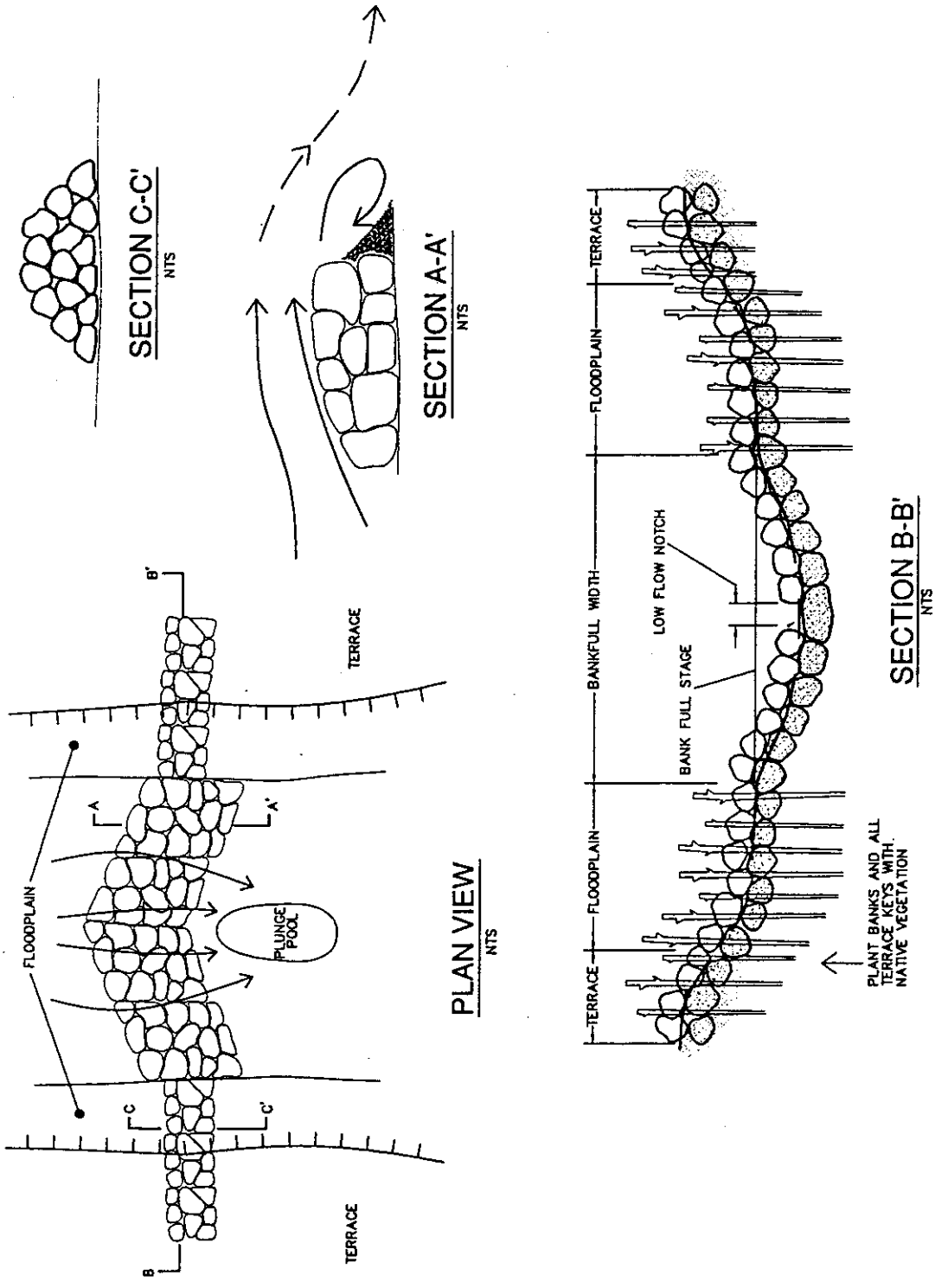

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FIGURE:
FULL SPANNING ROCK WEIR
(CONCEPT ONLY: NOT FOR DESIGN)

ATEC/CONCEPTUAL/FULL-SPAN-WEIR_BW.DWG/990720

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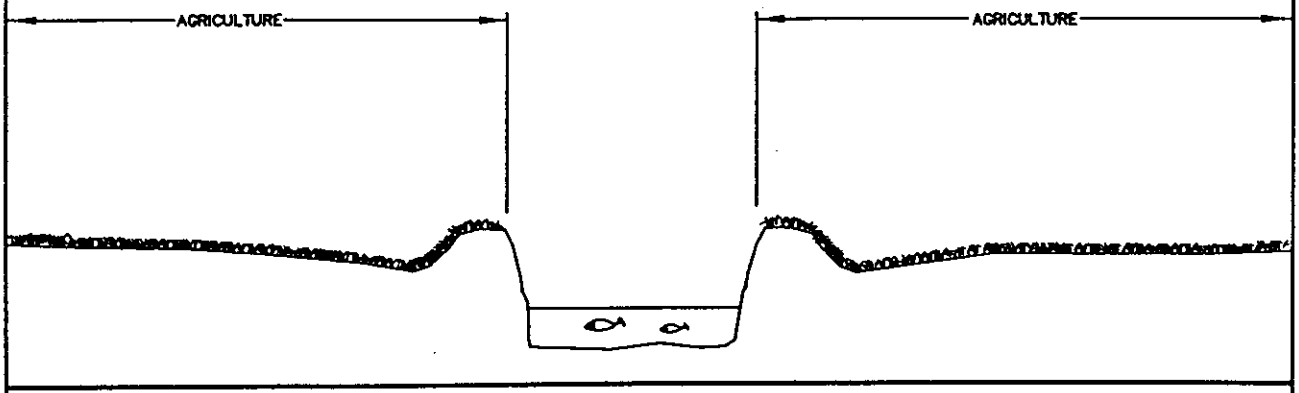
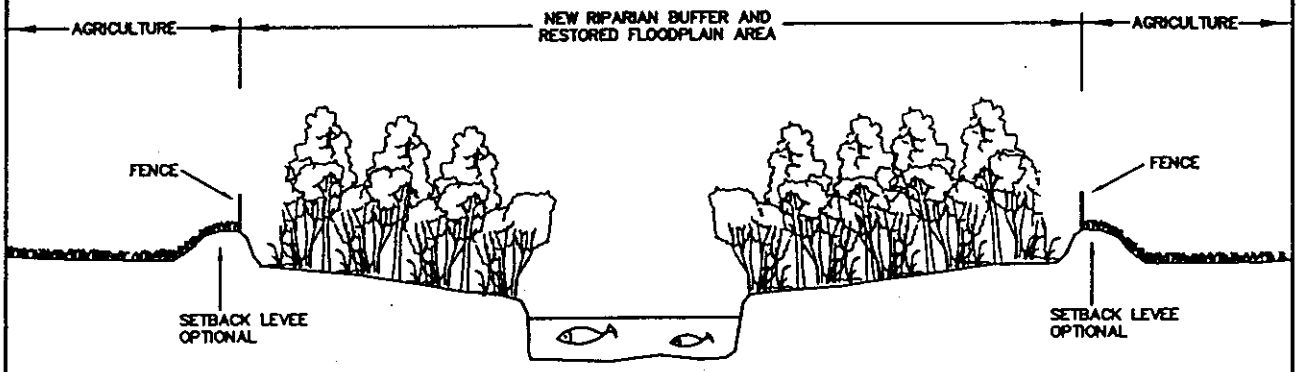
EXISTING CONDITIONS



10 YEARS



50 YEARS

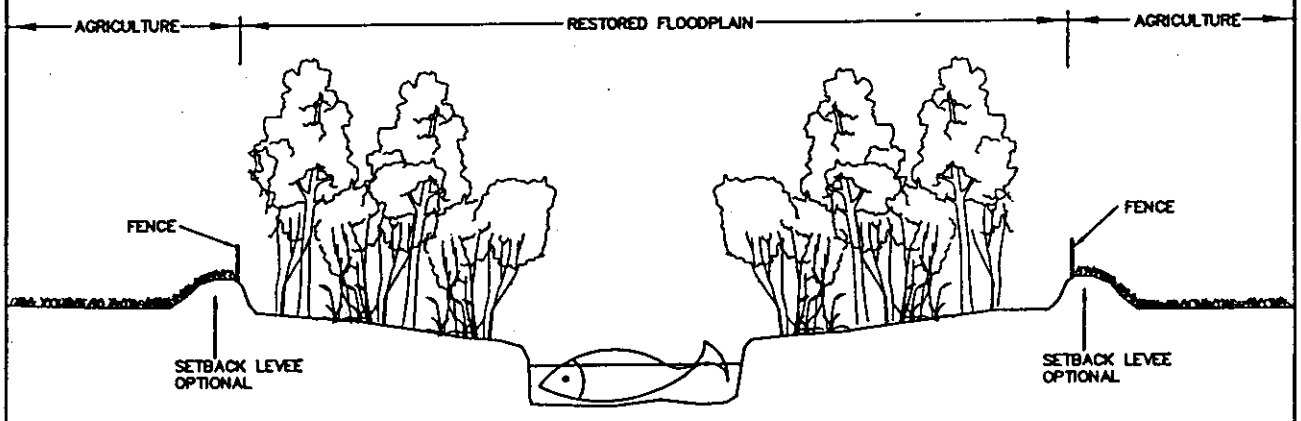


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FIGURE:
SETBACK LEVEE AND FLOODPLAIN RESTORATION

ATEC\FLUV-GEO\FLOOD-REVEG-D_BW.DWG\990720