Exxon Valdez Oil Spill
Restoration Project Final Report

Kenai River Habitat Restoration and Recreation Enhancement Project
Restoration Project 99180
Final Report

This report has been prepared for peer review as part of the *Exxon Valdez* Oil Spill Trustee Council restoration program for the purpose of assessing project progress. Peer review comments have not been addressed in this report.

Art Weiner

Alaska Department of Natural Resources
550 W. 7th. Ave., Suite 1400
Anchorage, Alaska 99501

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Study History: This project was initiated as Restoration Project 96180 and was completed as Restoration Project 99180. The project was proposed as a three-year effort. The summer of the year 2000 was the final year for construction activities.

Abstract: Adverse impacts to the banks of the Kenai River total approximately 19 miles of the river's 166-mile shoreline. Included in this total are 5.4 river miles of degraded shoreline on public land. Trampling, vegetation loss and structural development have impacted riparian habitats. This riparian zone provides important habitat for pink salmon, sockeye salmon and Dolly Varden, species injured by the *Exxon Valdez* oil spill. The project's objectives were to restore injured fish habitat, protect fish and wildlife habitat, enhance and direct recreation and preserve the values and biophysical functions that the riparian habitat contributes to the watershed. Restoration/enhancement techniques included revegetation, streambank restoration, construction of elevated boardwalks, floating docks, access stairs, fencing, signs, and educational interpretive displays. Twelve separate projects on the Kenai and Russian Rivers were completed.

Key Words: *Exxon Valdez*, riparian habitat, sport fishing, Kenai River, revegetation, streambank restoration.

Project Data: Twelve projects were completed on the mainstem of the Kenai and Russian Rivers. Several thousand feet of trail were constructed or upgraded; thousands of square feet of elevated gratewalk was constructed; thousands of linear feet of revegetation were emplaced utilizing a number of different techniques; numerous stairways into the rivers were constructed; dozens of signs and interpretive displays were placed at strategic locations. Details of these installations are to be found within this report and in previously submitted annual reports. Design and engineering construction drawings and details are available, for the Alaska Department of Natural Resources (DNR) projects, from: Daryl Haggstrom, DNR, Division of Parks and Outdoor Recreation (DPOR), Design and Construction Section, 550 West 7th Ave., Anchorage, AK, 99501, Phone/Fax: (907) 269-8732/269-8917. For the Alaska Department of Fish and Game (ADF& G) projects: Mark Kuwada, Alaska Department of Fish and Game (ADF&G), Habitat Division, 333 Raspberry Road, Anchorage, AK, 99503, Phone/Fax: (907) 267-2277/267-2464. For the Russian River project: USFS, Seward Ranger District.

Citation: Weiner, A. 2000. Kenai River habitat restoration and recreation enhancement project, *Exxon Valdez* Oil Spill Restoration Project Final Report (Restoration Project 99180), Alaska Department of Natural Resources, Anchorage, Alaska.

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Executive Summary

The Kenai River Habitat Restoration and Recreation Enhancement Project was initiated in the fall of 1995. A planning and evaluation process that included a scoring algorithm was developed and implemented to identify and prioritize damaged public-use sites along the main stem of the Kenai River. Sites were selected on their value as fish and wildlife habitat and recreation. In 1996, 16 projects were nominated and evaluated. The proposers withdrew four of these nominations and seven were selected from the remaining twelve for construction. Construction on one project began in the fall of 1996 and the remaining six projects were begun the following summer. Project sites include Kenai Beach Dunes, Big Eddy, Ciechanski, Funny River, Endicott, Rotary Park, and Russian River (Phase 1).

A second round of nominations and another evaluation were conducted in 1997. As a result, eight additional projects were evaluated and scored. One project was rejected, another project was funded from another source and six projects were chosen for funding. These six are Bing's Landing, Slikok Creek, Centennial Park, Russian River (Phase II and III), Kobylarz and Cone. Work on Bing's Landing, Centennial Park, Kobylarz and Cone was completed in 1998. The US Forest Service will provide the final report on the Russian River project. Work on the Slikok Creek project was completed in the summer of 2000. Twelve projects on the Kenai and Russian Rivers were completed.

Restoration work on most projects included one or a combination of the following techniques: revegetation of riparian plant species, streambank bioengineering, fenced exclosures, access improvements including trails, elevated, light-penetrating walkways, stairways into the river, floating docks and fishing platforms. The intent of this restoration strategy was to replace and protect streambank vegetation and redirect public access so that sportfishing and other recreation activities could take place with minimal impact to fish and wildlife habitat. In addition, interpretive displays and signs were placed in strategic locations to describe the need for these projects and to explain the restoration techniques.

INTRODUCTION

Public lands on the Kenai Peninsula, including those acquired with *Exxon Valdez* oil spill joint settlement funds, contain important habitat for several species injured by the spill and provide recreation services for tens of thousands of Alaska residents and tourists. Kenai River fish support a large commercial fishery, a commercial sport fishing industry, a subsistence fishery, and a recreational sport fishery. In the aggregate, revenues generated by sportfishing, commercial fishing and river-based tourism represent a significant and growing proportion of the local economy.

The riparian zone, the transitional area that lies between a river's channel and the uplands, provides important fish and wildlife habitat and plays a major role in the hydrology of the watershed by helping to control floods and erosion. This vegetated area functions as a buffer and filter system between upland development and the river, thereby maintaining water quality by absorbing nutrients, accumulating and stabilizing sediments, and removing heavy metals and pollutants that result from urban development and enter the river from surface runoff. It is also the area where a significant portion of the Kenai River's sportfishing and other recreational activities are concentrated. Degradation of the river's streambanks, riparian vegetation and fish habitat has the potential of jeopardizing its long-term productivity and degrading the quality of the recreational experience.

The present condition of North America's native fish fauna is attributable, in part, to the degradation of aquatic ecosystems and habitat (FEMAT Report, 1993). Loss and degradation of freshwater habitats are frequent factors responsible for the decline of anadromous salmonid stocks. Along with habitat modification or loss, changes in water quality and quantity are often cited as causative factors for degradation of aquatic systems and declines in anadromous fish populations.

The Kenai River Cumulative Impacts Assessment of Development Impacts on Fish Habitat (Liepitz, 1994) was designed to identify and evaluate the cumulative impacts of development actions including public and private land-use impacts on Kenai River fish habitat. The study documented that: 11.1 to 12.4 percent (18.4 to 20.6 miles) of the river's 134 miles of upland and 32 miles of island shoreline and nearshore habitats have been impacted by bank trampling, vegetation denuding, and structural development along the river's banks. Degraded public land along the Kenai River includes 5.4 miles of trampled riparian habitat and 3.5 miles of developed shoreline.

The Kenai River Habitat Restoration and Recreation Enhancement Project includes revegetation, streambank restoration, and public access improvements that promote pink and sockeye salmon and Dolly Varden habitat protection and restoration, as well as enhance recreational services in the Kenai River watershed. The project also includes educational and interpretive displays that inform the public of the proper manner in which to access and use the river's resources.

Restoration and enhancement proposals on public lands extending from the outlet of Kenai Lake to the mouth of the Kenai River (Figure 1) were nominated by public landowners and evaluated by an Interdisciplinary Team (IDT) of biologists and resource managers using specific threshold

and evaluation criteria (Table 1). The IDT designed the qualifying criteria used to evaluate and rank the proposals by considering a variety of factors, including the degree of damage at a site and the effects that each proposal would have on fish habitat, recreation, and the surrounding environment.

All proposals had to meet threshold criteria before the evaluation criteria were applied. The scores are a method of ranking those proposals that best achieve the overall project's goals for habitat restoration, compatible recreation enhancement, and educational value. In an attempt to identify the most cost-effective proposals and obtain maximum benefits from available funds, it was decided to compare the relative restoration benefits of the proposals in terms of costs. To facilitate that determination, the results of the evaluation process, i.e. the scores, were plotted against the estimated costs.

Conceptual restoration and enhancement plans were presented to the IDT for evaluation. Final engineered plans were provided to the Alaska Department of Natural Resources and the Alaska Department of Fish and Game prior to construction. Choice of building materials and construction methods were the responsibility of the landowner (but subject to IDT review) which must employ restoration techniques permittable by regulatory agencies (ADFG, ADNR, and the Army Corps of Engineers).

Construction on approved projects began in 1997. The last ADNR project, Slikok Creek, was completed during the summer of 2000. Monitoring of projects on State park lands will be carried out by ADNR Division of Parks and Outdoor Recreation to ensure the projects are constructed and function as designed. Monitoring will also be used to gather information regarding effectiveness of restoration techniques.

OBJECTIVES

The project's major objectives were to restore injured fish habitat and to establish public use patterns (i.e., sportfishing, camping, etc.) within the Kenai River watershed that are compatible with habitat protection for injured resources such as intertidal marshes, pink and sockeye salmon and Dolly Varden. The long-term goals of the project were to protect fish and wildlife habitat, enhance recreation and preserve the functions and values that the riparian habitat contributes to the watershed.

In summary, the objectives of this project were to:

1. Restore and protect fish habitat on the Kenai River,

2. Improve existing recreational access to the Kenai River watershed in a manner that restores and protects riparian fish and wildlife habitat, and

3. Provide information to the public that promotes their understanding of the river's ecology and proper use of its resources.

METHODS

Site specific project designs reflected site characteristics including: topography, hydrologic variables, vegetation, soils, extent and type of degradation and historic use patterns. Designs included elements that restore or enhance specific habitat values. Successful revegetation requires control of site impacts. Consequently, fences or signed closures were, in some cases, required to protect undamaged sites from human impact or to prevent additional damage to recovering sites. Project areas were closed and posted during the course of revegetation, or environmental engineering techniques were used that allowed public access but protected the recovering habitat from additional adverse impacts.

Habitat improvement and recreation enhancement techniques included:

On-site Revegetation/Restoration	Signage
Exclosures	Elevated Grating/Boardwalks
Spruce Tree Revetments	Access Stairs/Ladders
Access Trails	Floating Docks
Access Barriers	Fishing Decks
Viewing Decks	Toilet Facilities

Detailed descriptions of these techniques are described in several reports (Hauser and Weiss 2001; Bentrup and Hoag 1998; Muhlberg and Moore 1998).

Plant propagation and streambank restoration techniques were selected on the basis of site characteristics, constraints and cost. Revegetation designs attempted to reestablish the native riparian plant communities. Revegetation installations included: biologs, live siltation, sod rolls (native grasses), spruce tree cabling, brush mats and placement of willow cuttings.

Educational/interpretive displays were designed, constructed and placed in strategic locations along the river. Signs were also designed and located to prevent bank trampling in areas where revegetation efforts were occurring. Interpretive displays were designed to depict and explain the value of streambank habitat and how fish populations are affected by fishing activities. The purpose of these displays is to demonstrate that the resource could be jeopardized by poor decisions and to educate visitors that much of the actual damage to the resource is inadvertently caused by them.

An information video was produced depicting and explaining the restoration projects. The video was presented at the 10-year *Exxon Valdez* Oil Spill Symposium. In-water structures, such as floating docks, fishing decks and access stairs, were designed to be removable. This is necessary because of ice-scouring that occurs during the winter and spring. These units are removed in the fall and stored in the uplands.

Site plan concepts for several of the ADNR-managed projects are included in the Appendix. DNR-managed projects were designed by the Design and Construction Section of the Division of Parks and Outdoor Recreation. All projects were put out to bid according to Sec. 36.30 Alaska Statutes.

Table 1: Threshold and Evaluation Criteria

Threshold Criteria

1. The project will protect, restore or enhance the historic functional attributes of a site and the surrounding area.
2. The project is located on public land.
3. The managing agency agrees to endorse the project.
4. The managing agency agrees to future maintenance and management of the project in a manner that facilitates and is consistent with the restoration or enhancement endpoint (#1).
5. All elements of the project can be permitted.
6. The project is not a mitigation requirement.

Nomination must be in compliance with all Threshold Criteria.

Evaluation Criteria

1. Potential Habitat Value
   What is the potential habitat value of the project? [Score[1] = (20/10/5) x 3.5]

2. Potential Recreation Value
   What is the potential recreation value of the project? [Score = (20/10/5) x 2.5]

3. Disturbance Level
   What is the level of disturbance (human impact) in relation to habitat/recreation values? [Score = (20/10/5) x 2.0]

4. Rate
   To what extent will the project decrease the amount of time needed for riparian habitat to recover? [Score = (20/10/5) x 1.0]

5. Collateral Impacts
   What is the potential for adverse impacts to natural or cultural resources or to the nearby human community resulting from this project? [Inverse relationship:
   Score = (5/10/20) X3.0]

6. Design/Effectiveness
   How would you rate the project's design to its expected effectiveness?
   [Score = (20/10/5) x 2.0]

7. Vulnerability
   Is the protected, restored or enhanced site vulnerable to natural or human-induced degradation. [Inverse relationship: Score = (5/10/20) x 2.0]

Project score equals the sum of scores for all Evaluation Criteria.

[1] (High = 20; Moderate = 10; Low = 5) x weighting factor

RESULTS

Over the course of this restoration effort a total of twelve projects was completed. Their locations are depicted on the attached map. The completed projects and their managing agency are as follows:

* Big Eddy	(DNR)	Appendix A
* Bing's Landing	(DNR)	Appendix B
* Centennial Park	(ADFG)	
* Chester Cone	(ADFG)	
* Ciechanski	(DNR)	Appendix C
* Endicott Sonar Site	(ADFG)	
* Funny River	(DNR)	Appendix D
* Kenai Beach Dunes	(ADFG)	
* Kobylarz	(ADFG)	
* Rotary Park	(ADFG)	
* Russian River	(USFS)	Appendix F
* Slikok Creek	(DNR)	Appendix E

Table 2 summarizes the work accomplished on the five ADNR-managed projects. Photographs and technical illustrations of the DNR-managed projects are provided in appendices as referenced above. Results for the Russian River project are reported by the U.S. Forest Service in appendix F. Results for the ADF&G-managed projects were provided in the 1998 annual report.

In addition, sixteen interpretive displays and 24 signs that identify the funding sources for these projects were produced by ADNR. Of these, half were installed and the remainder are replacement backups. Signage detail is included in Appendix G.

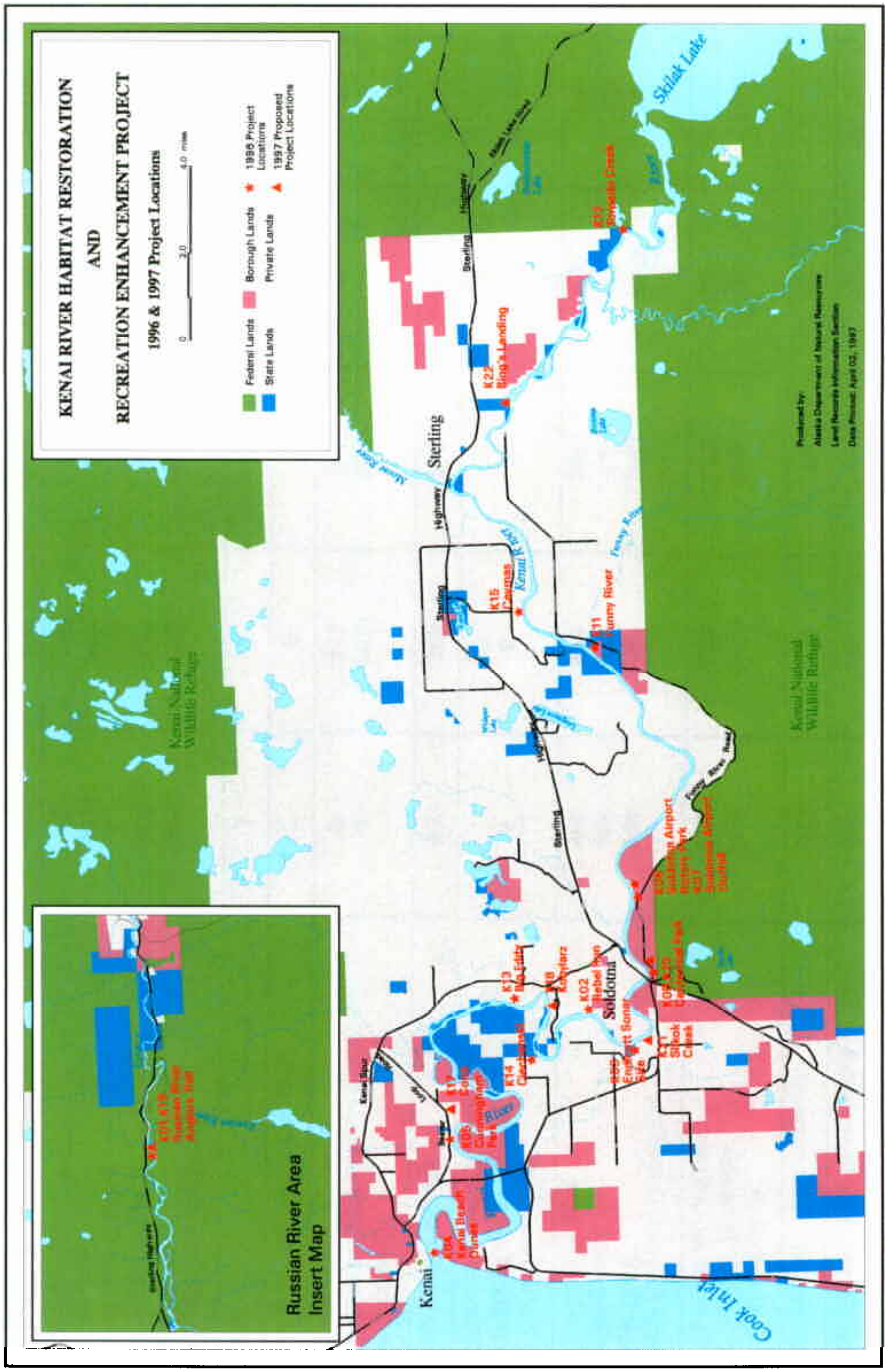
KENAI RIVER HABITAT RESTORATION
AND
RECREATION ENHANCEMENT PROJECT
1996 & 1997 Project Locations
Federal Lands
State Lands
Borough Lands
Private Lands
1996 Project Locations
1997 Proposed Project Locations
Russian River Area Insert Map
Kenai National Wildlife Refuge
Kenai National Wildlife Refuge
Skilak Lake
Sterling
Soldotna
Kenai
Cook Inlet

Table 2: Summary of Accomplishments

	EVOS Project Sites on the Kenai River				
	Bing's Landing	Slikok Creek	Big Eddy	Ciechanski	Funny River
Linear Feet of Trails Constructed.	450	0	0	0	0
Linear Feet of Trails Upgraded.	400	850	0	0	0
Elevated Gratewalk: - SF Area of Gratewalk - LF Length Along River	 2800 220	 3850 410	 800 175	 800 200	 1300 245
Type of Elevated Gratewalk: - Boat Dock - Fishing Deck - Riverbank Access	 yes yes yes	 no no yes	 yes no yes	 yes no yes	 no yes yes
Number of Stairways: - Hip-Boot Fishery Access - Upland to Riverbank Access	 5 1	 6 0	 1 0	 0 0	 2 0
Linear Feet of Railing.	500	980	350	400	500
Trail Gratewalk: - SF Area of Gratewalk - LF Length of Gratewalk	 0 0	 1360 450	 320 80	 0 0	 0 0
Number of Interpretive Displays.	0	6	2	2	2
Toilets.	1	0	0	0	0
Revegetation Installations: - LF of Biolog - LF of Live Siltation - LF of Tree Cabling - SF of Brush Mat - # of Cuttings	 440 400 0 3600 70	 700 720 440 2600 140	 100 50 75 80 70	 220 100 150 100 75	 0 0 0 0 0
Linear Feet of Enclosure Fence.	440	520	125	200	100
Any Other Information That Helps to Describe What Was Accomplished.					

DISCUSSION

Meaningful evaluation of this project can only be accomplished if it is considered within the larger context within which it is embedded. This project is one element in a multi-government, multi-agency attempt to prevent Kenai River fisheries from suffering the unfortunate, but not necessarily inevitable, fate of similar fisheries in the Pacific Northwest. Natural resources on public lands within the watershed are managed by four local governments, three state agencies, and three federal agencies. This effort recognizes the need to preserve anadromous fish stocks, maintain recreation values, and implement land use and restoration efforts that transcend political boundaries. The policy and management goals of the government programs are to:

1. maintain a sustainable harvest of fish for both commercial and sport fisheries, and
2. preserve a high-quality recreational experience for both residents and tourists.

Implementation is centered around a three-part strategy: land acquisition and habitat protection, riparian habitat restoration and protection, and enhancement of recreational access in a manner consistent with habitat protection (Weiner 1998).

The need for this comprehensive approach to management arises, in part, from the river's productivity, accessibility and popularity. The Kenai River is the most productive river in southcentral Alaska (Mills 1993), supporting 34 species of fish, including five species of Pacific salmon, Dolly Varden (*Salvelinus malma*) and rainbow trout (Oncorhynchus *mykiss*). Spawning, rearing, and migratory habitat occurs all along the river and extends into its tributaries. The watershed provides staging, nesting, rearing, and overwintering habitat for 21 species of waterfowl. It also provides feeding, nesting, and overwintering habitat for a large population of bald eagles (*Haliaeetus leucocephalus*). The watershed is habitat for river otter (*Lutra canadensis*), moose (*Alces alces*), bear (*Ursus arctos* and *U. americanus*), caribou (*Rangifer tarandus granti*), and other mammals and birds.

From 1988 to 1998 the Kenai River system produced approximately 40% of the commercial sockeye salmon (*Oncorhynchus nerka*) harvest in Cook Inlet and 30% of the commercial chinook (*Oncorhynchus tshawytscha*) salmon harvest. Liepitz (1994) reports that sport and commercial fishers contribute as much as $78 million to the state's economy. The watershed supports a substantial sport fishery for king, sockeye, silver salmon (*Oncorhynchus kisutch*), and rainbow trout. The chinook salmon is an especially popular sport fish, often weighing in excess of 50 lbs. The total 1992 sportfishing effort for all sport fish caught (includes catch-and-release fish) or harvested fish species was 332,573 angler-days. This represents 13.1% of the total sportfishing effort occurring in Alaska (Mills 1993), making the Kenai River the top sportfishing system in the state. Sportfishing on the Kenai River has doubled from 1981 to 1994, climbing from 129,076 angler days to 340,904 angler days respectively (Mills 1993). More than 300 sportfishing guides work the Kenai River, the highest number ever (ADNR 1997).

The increasing popularity of the river system for anglers and other recreationists is due to the world-class character of its salmon fishery, accessibility by road, and proximity to Alaska's largest urban population. The resident population of the area also is increasing, bringing with it

commercial and residential development within the watershed. Since 1980, the population of the Kenai Peninsula has increased from 18,000 to 40,000 (TNC 1994).

As the river's popularity has grown, it has become increasingly important to the local economy. Consequently, its recreational use and commercially harvested fish have been promoted both in Alaska and in the Lower 48 states. ADF&G manages the fisheries in a manner that maximizes sustainable production in order to satisfy these increasing public demands. This management philosophy has, unfortunately resulted in unintended consequences that will, in the long run, be counterproductive. Degradation of the river's streambanks, riparian vegetation, and fish habitat from angler trampling and boat wakes may jeopardize its long-term productivity and degrade the quality of the recreational experience, thereby leading to significant economic losses to local communities. An example is the opening of a personal use dip-net fishery at the mouth of the river without regard to secondary impacts to the local environment and community. These have included trampling and vehicular impacts to vegetation that stabilizes the dune system in the area around the mouth; parking and traffic problems for local neighborhoods; and trespass problems on private lands and publicly-owned wetlands. The Kenai Beach Dunes project helped to alleviate some of these outcomes by constructing an access stairway down the bluff and by placing 70-foot long concrete pilings as barriers to vehicular and foot traffic. Although this approach solved much of the problem, it is an aesthetically unattractive solution.

Management of the Kenai River watershed is somewhat schizophrenic. ADF& G's Commercial Fisheries and Sport Fish divisions focus on economically valuable species and work towards optimizing harvests. The Habitat and Restoration Division recognizes a diversity of human interests in the river as well as the sensitivity of its ecological systems. The Habitat group attempts to minimize negative environmental impacts through the exercise of their regulatory authority. Oftentimes, this effort has been somewhat overzealous. ADNR's Division of Parks and Outdoor Recreation works to manage and facilitate public use of the watershed by providing and enhancing recreation access and amenities. Local governments, including the Kenai Peninsula Borough, manage and regulate development and land uses in the riparian zone. Although historically, the Borough has taken a laissez faire attitude toward land use regulation, after a major flood in the fall of 1995, the Borough enacted a land use ordinance that restricts and regulates development within 50 feet of the ordinary high-water line and decided to work with the state government to revise and strengthen the Kenai River Comprehensive Management Plan.

The relevance of this analysis in the context of this report is that, this project is like a "band-aid" on a hemorrhaging wound. Given the current and increasing levels of human use, the fragmented and conflicting agency mandates and the lack of the political will to enact meaningful land-use regulations, restoration will never be able to remedy the environmental impacts to the watershed. Moreover, even if unlimited funding for restoration was available, the end result would be a riparian zone that looks like the boardwalk at Atlantic City. Rather than restoration, a unified, coordinated, holistic management approach to the watershed needs to be adopted. Management principles need to be implemented that accept multiple use, minimization of negative environmental impacts, sustained yield, aesthetics, and maintenance of species diversity within the context of the current economic and political situation. This may mean imposition of "limited entry fisheries" for both sport and commercial interests; meaningful and enforceable speed and boat wake limitations; closures of environmentally sensitive and recovering areas of

the riparian zone; public acquisition of critical habitats and full funding of all management and regulatory entities.

Within the limited context of this project, restoration and recreation enhancement goals have been achieved. Trampled areas along the riverbank, protected from human access, are showing strong signs of recovery. By the summer of 2000, dense stands of graminoids had become established beneath many of the elevated gratewalks. Access trails that were closed to the public are revegetating. Bioengineered riverbank slopes have stabilized and are supporting emerging stands of willow that were started from cuttings. In general, restoration/re-vegetation efforts have been successful. If these trends continue, targeted riparian areas will stabilize and once again function normally.

Based upon discussions with the Division of Parks and Outdoor Recreation staff and the public, efforts to enhance recreation and public access to the river have been quite successful. The new and improved trails have enjoyed considerable use. Old, unplanned trails that ran through the uplands and the riparian zone have been abandoned and are re-vegetating. Trail improvements have made it easier and safer to move from parking areas and campgrounds to the river without trampling environmentally sensitive areas. Stairs leading from elevated gratewalks into the river have also enjoyed considerable use. The improved trails, elevated gratewalks and fishing decks have made the river much more accessible to the disabled community. Stairways on steep slopes and new toilet facilities have been heavily used and public feedback on their location has been very positive.

Evaluation of the education elements of the project, although very important for the long-term benefit of the watershed, has been difficult to accomplish. Information signs and interpretive panels have been located in strategic locations and are quite visible and easy to read and understand. We do not know, however, whether or not they have been effective in communicating the resource protection message and thereby modifying behavior. If the public does not become informed and accept responsibility for protecting the sensitive riparian environment, trampling impacts and consequent habitat degradation will migrate outside of the recovering area and be displaced to the unimpacted portions of the riverbank.

CONCLUSIONS

The goal of restoring impacted riparian habitat within the project sites appears to be occurring successfully. The goal of enhancing public recreation has clearly been achieved. Restoration, re-vegetation and recreation enhancement techniques have been effective structurally and in terms of stability and maintenance. Achievement of the public education goal has not been evaluated. The relationship between the restoration of riparian habitat in this project and its effect on fisheries cannot be assessed. The assumption is being made, based on review of the literature, that protection, preservation and restoration of riparian habitat maintains and improves fisheries. Achievement of the goal of preserving a high-quality recreational experience for both residents and tourists is open to debate. There is no universally accepted definition for "a high-quality recreational experience." Sport fishing on the mainstem of the Kenai River, or dip netting at the mouth, especially during the red salmon runs, have been characterized as "combat fishing." For

many people, who fish to harvest food for the table, this is an acceptable recreation experience. For others, who seek solitude and a wilderness experience, it probably is not. Moreover, fishing in an area that is filled with power boats and constructed amenities such as gratewalks, docks and fishing piers eliminates even the possibility of a wilderness experience. But, there is no going back; the experience of sport fishing on the Kenai River has changed forever. The best that we can strive for is to protect and preserve what is left of the natural environment; restore what is damaged; and hope that the public will become sensitive to the environment that creates and sustains the fisheries and their recreation experience, however they perceive it.

ACKNOWLEDGMENTS

The Kenai River Restoration and Recreation Enhancement Project benefited greatly from financial assistance and commitment of the Kenai River Sportfishing Association.

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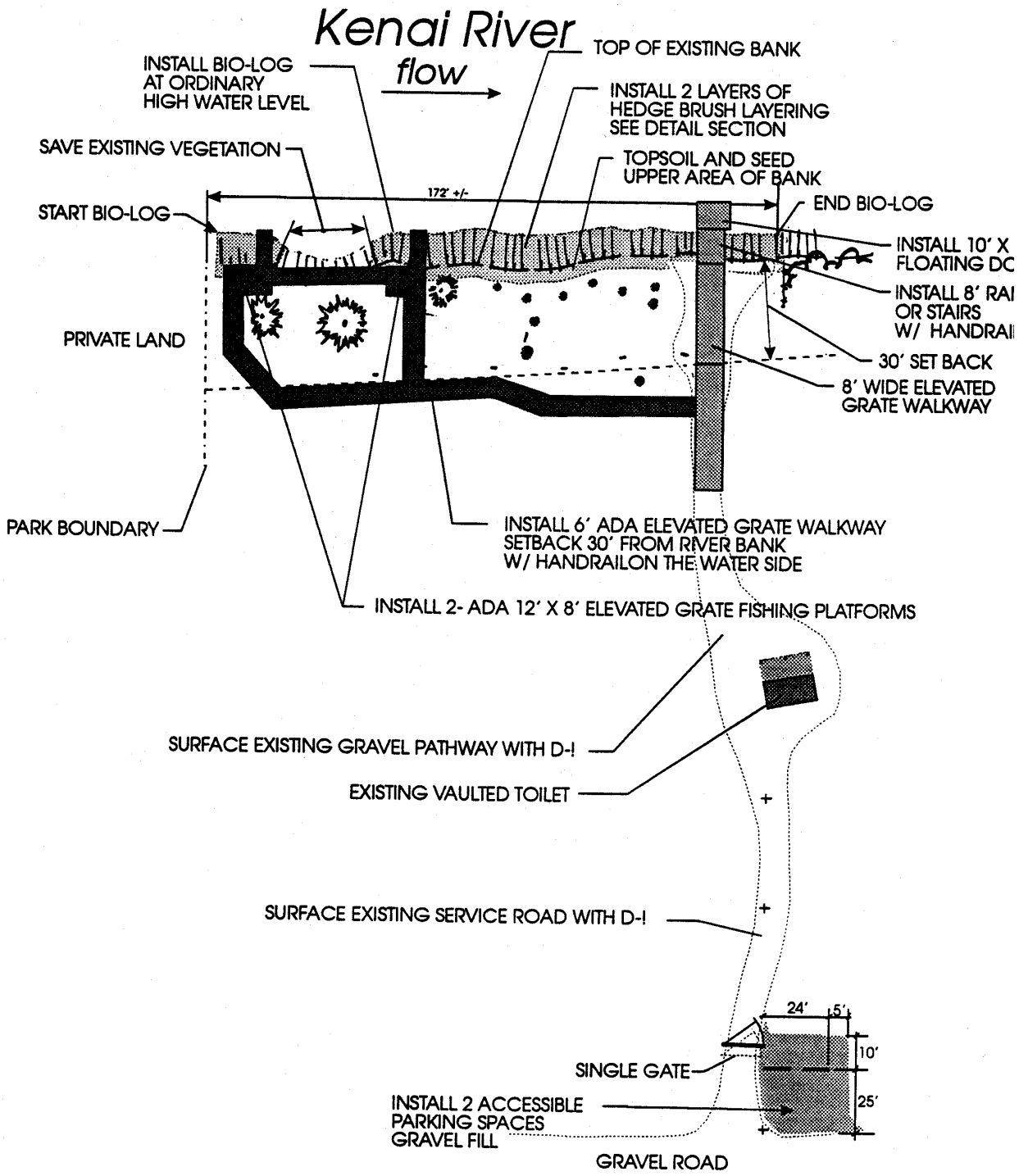
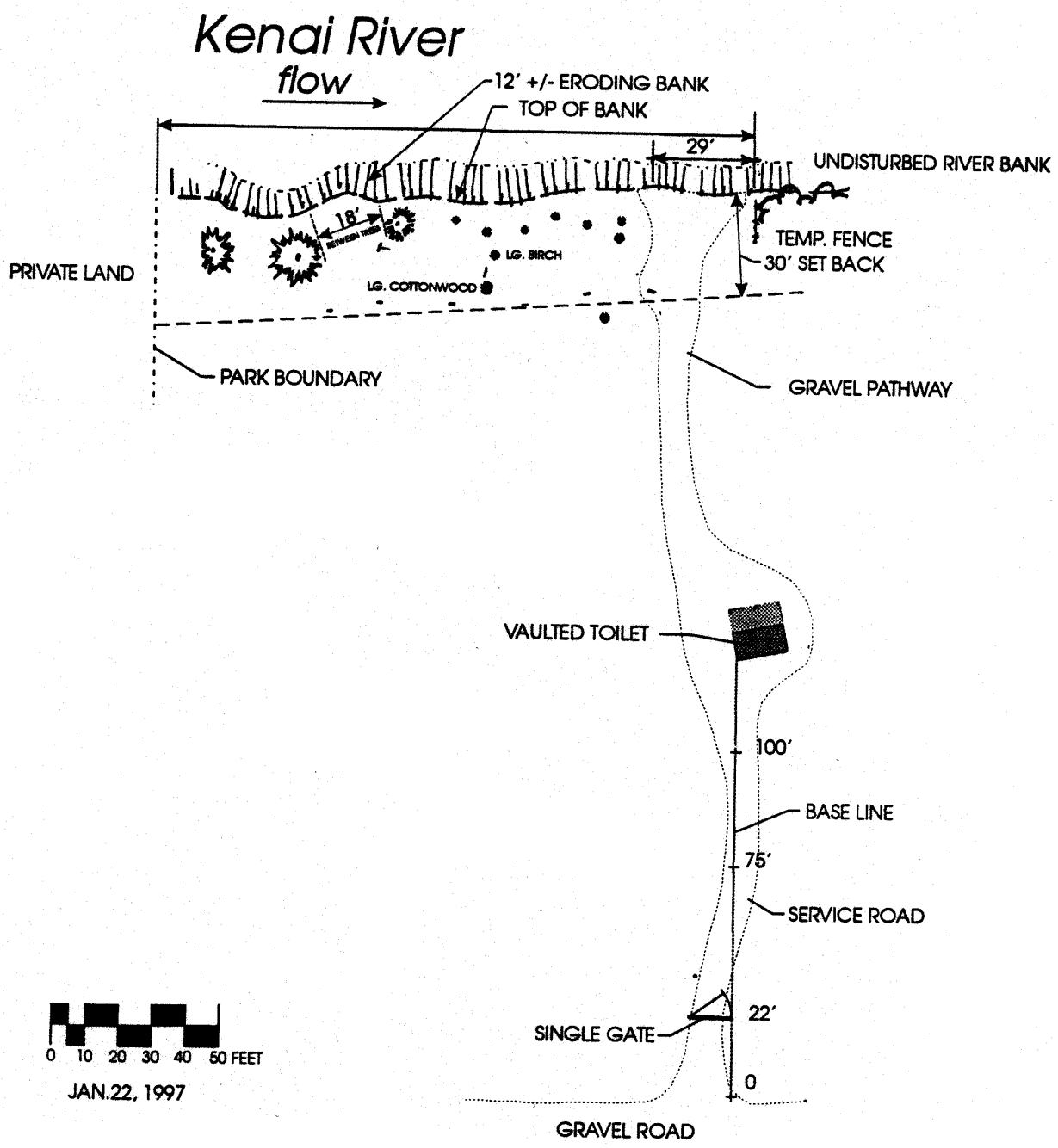
APPENDIX A: Big Eddy Restoration Project



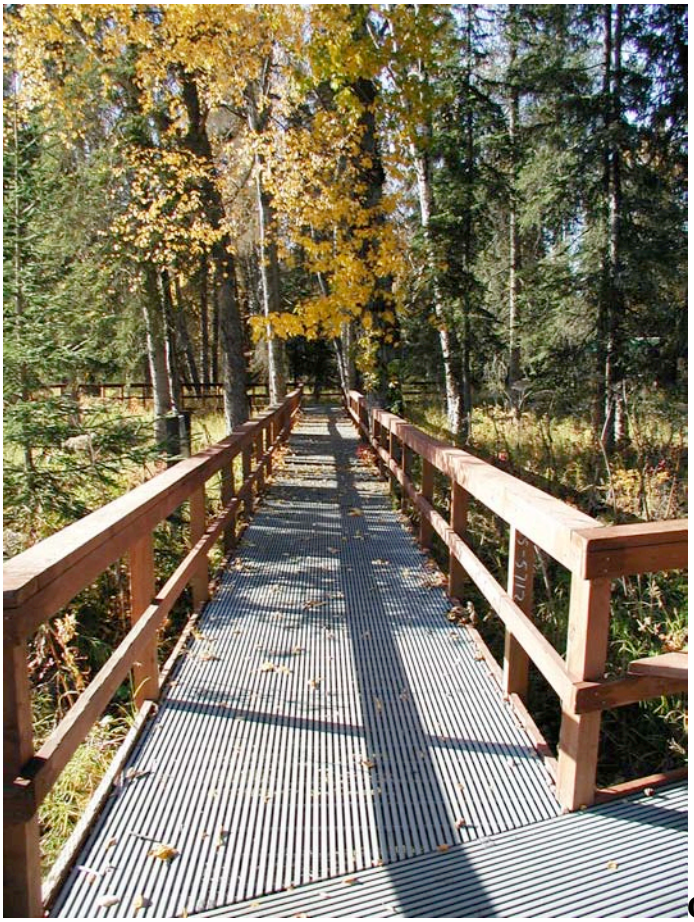
Big Eddy Unit Alaska State Parks
Kenai River Special Management Area
Existing Conditions, January 1997.



Big Eddy Unit Alaska State Parks
Kenai River special Management Area
Site Plan, January, 1997.

Floating Dock photos follow:

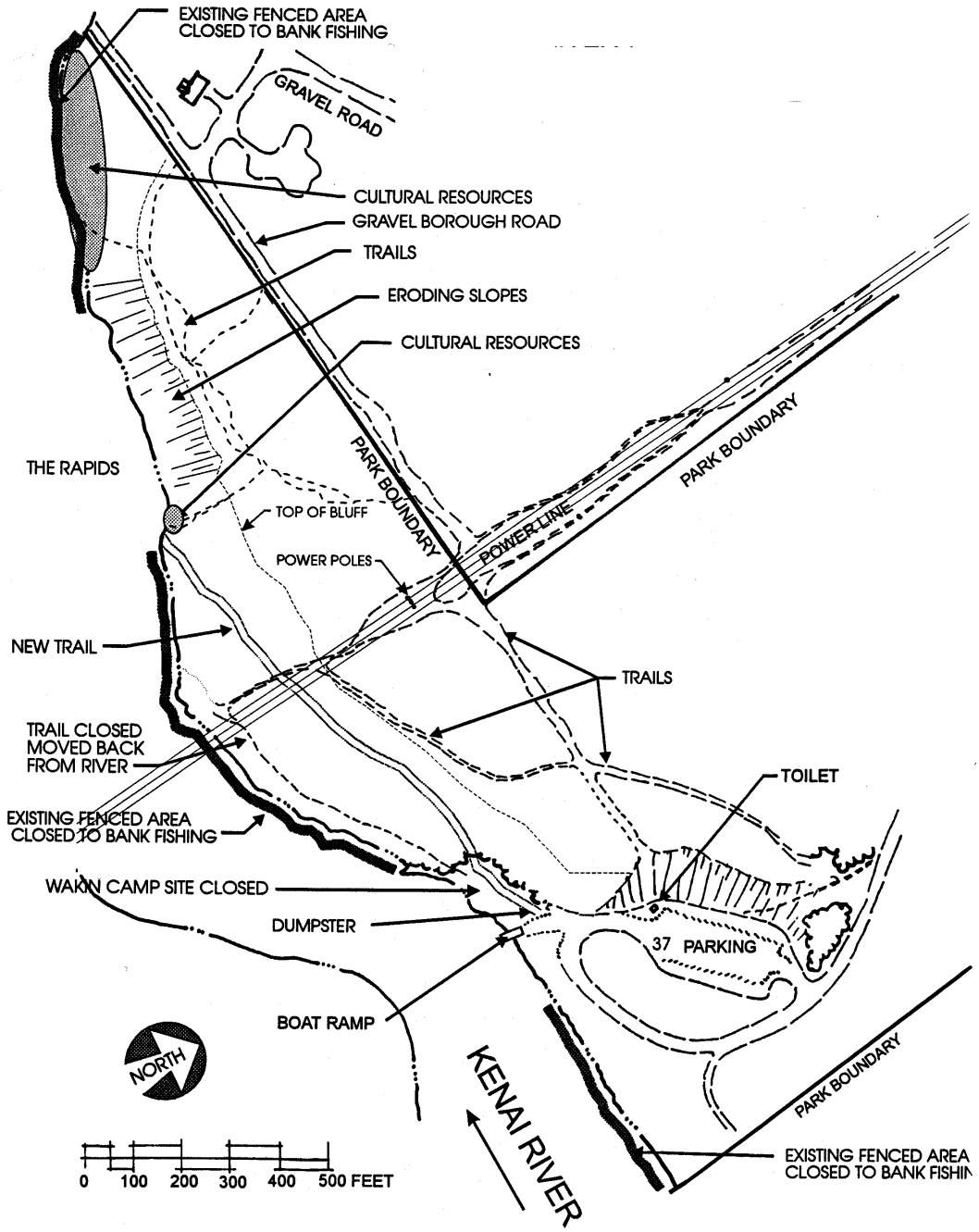

NO DISCHARGE OF FIREARMS OR FIREWORKS
ALL-TERRAIN VEHICLES PROHIBITED
NO GROUND FIRES



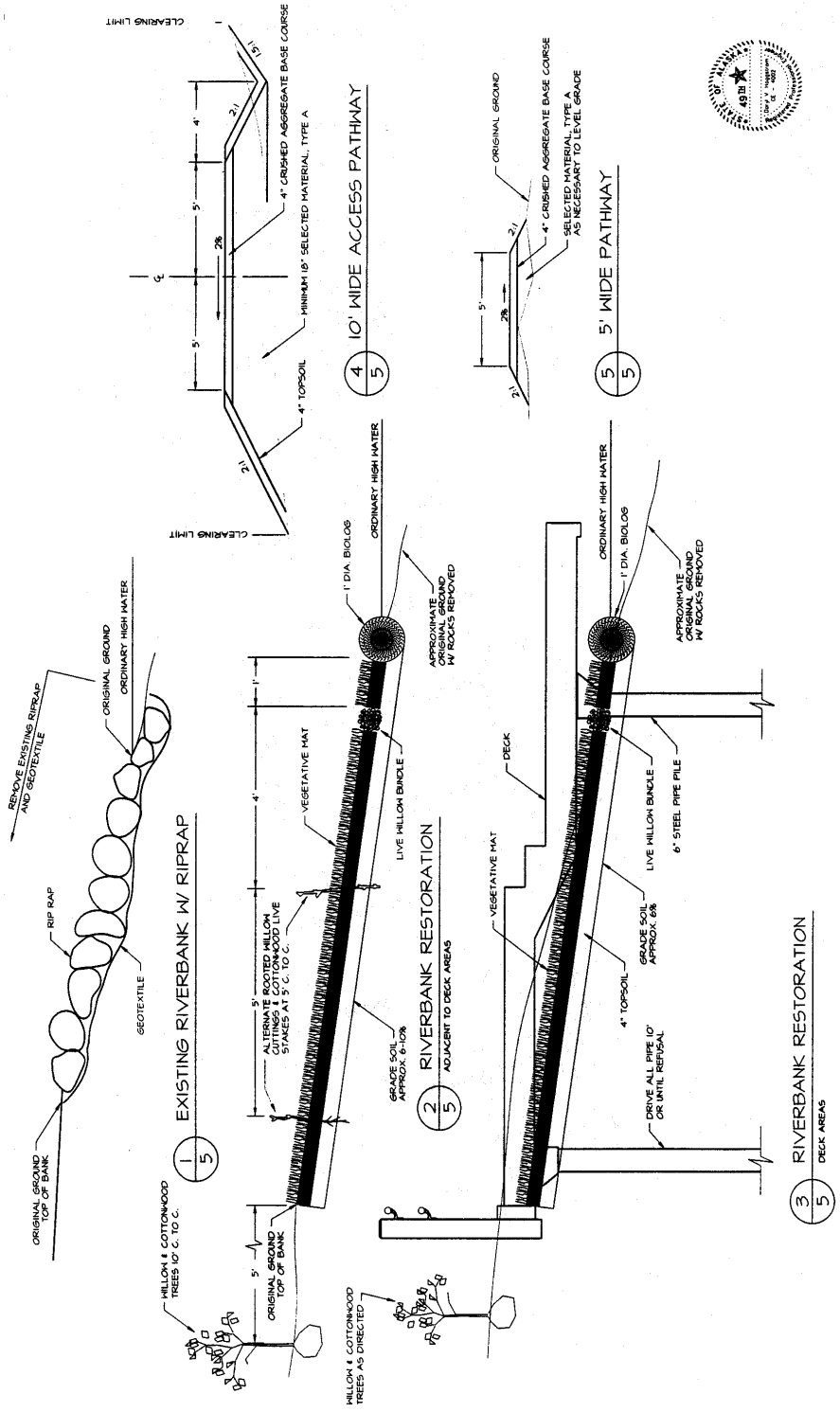
Gratewalk Big Eddy

Big Eddy Revegetation:

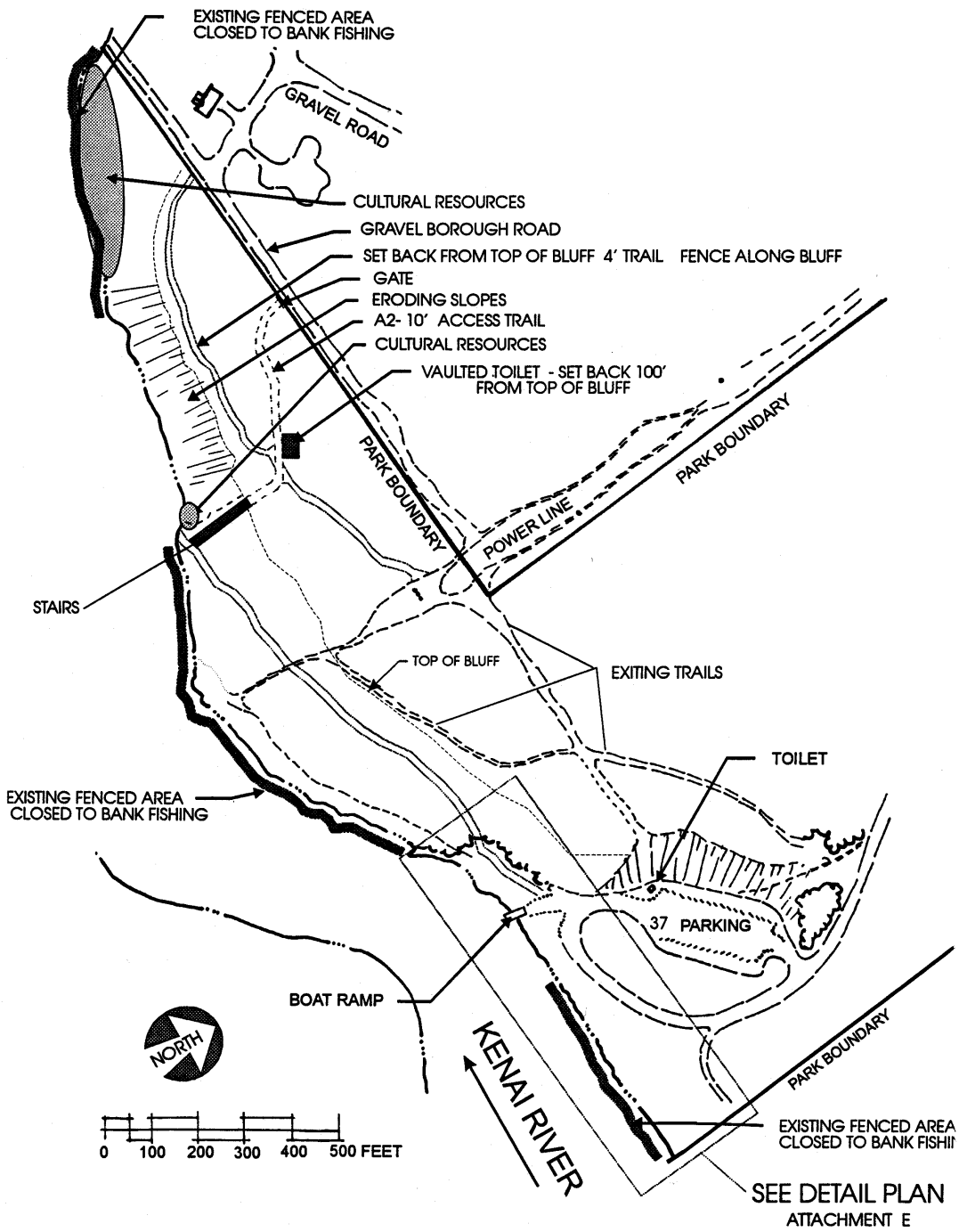
APPENDIX B: Bings Landing Restoration Project



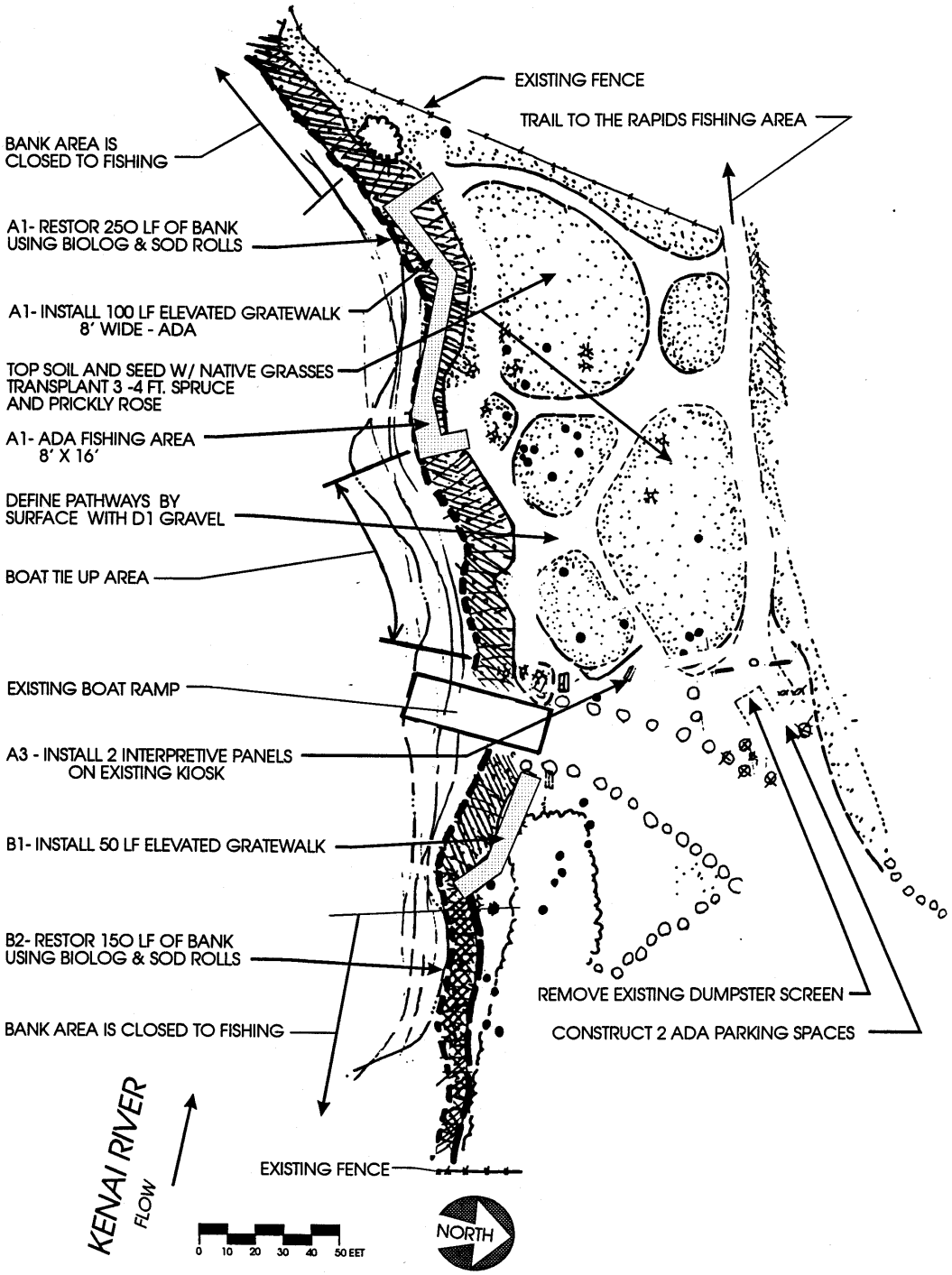
Bings Landing Unit Alaska State Parks
Kenai River Special Management Area
Existing Conditions,



Bings Landing Unit Alaska State Parks
Kenai River Special Management Area
Bings Landing Sportfishing Access
Typical Sections



Bings Landing Unit Alaska State Parks
Kenai River Special Management Area
Site Plan - Concept

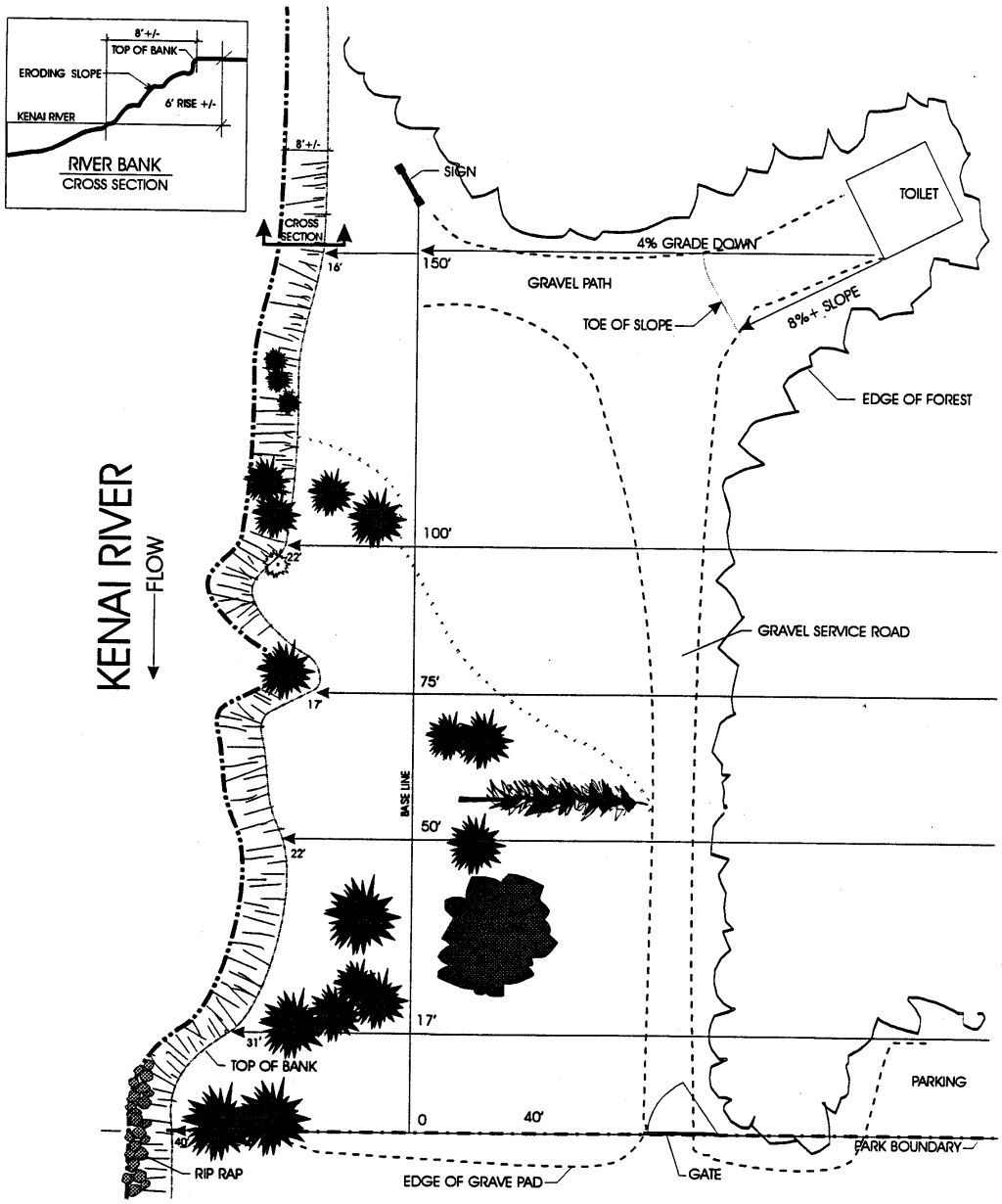


Bings Landing Unit Alaska State Parks
Kenai River Special Management Area
Site Plan – Concept

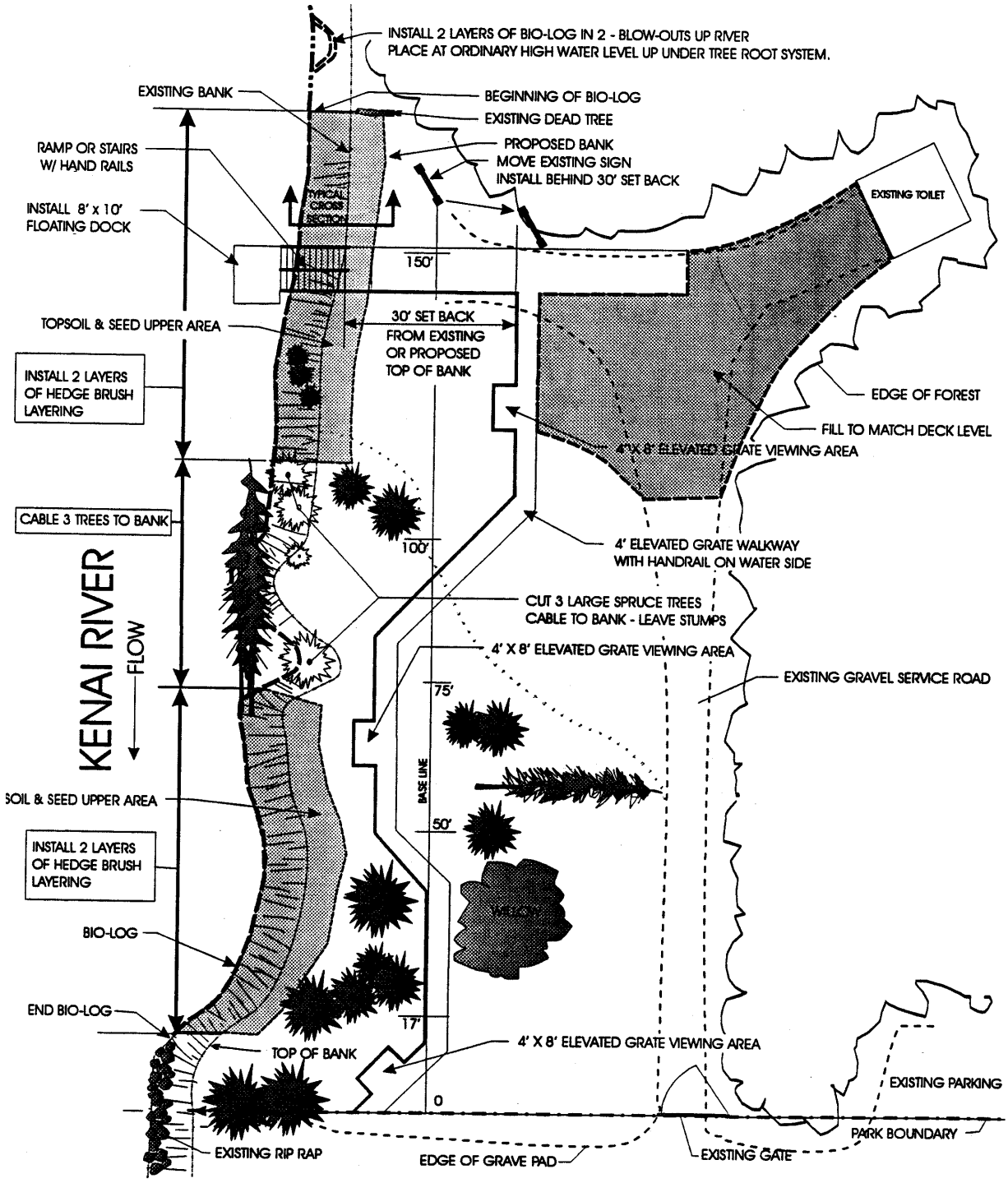
 **Coir Log Stabilization,**

Bings Landing Dock and Stairs

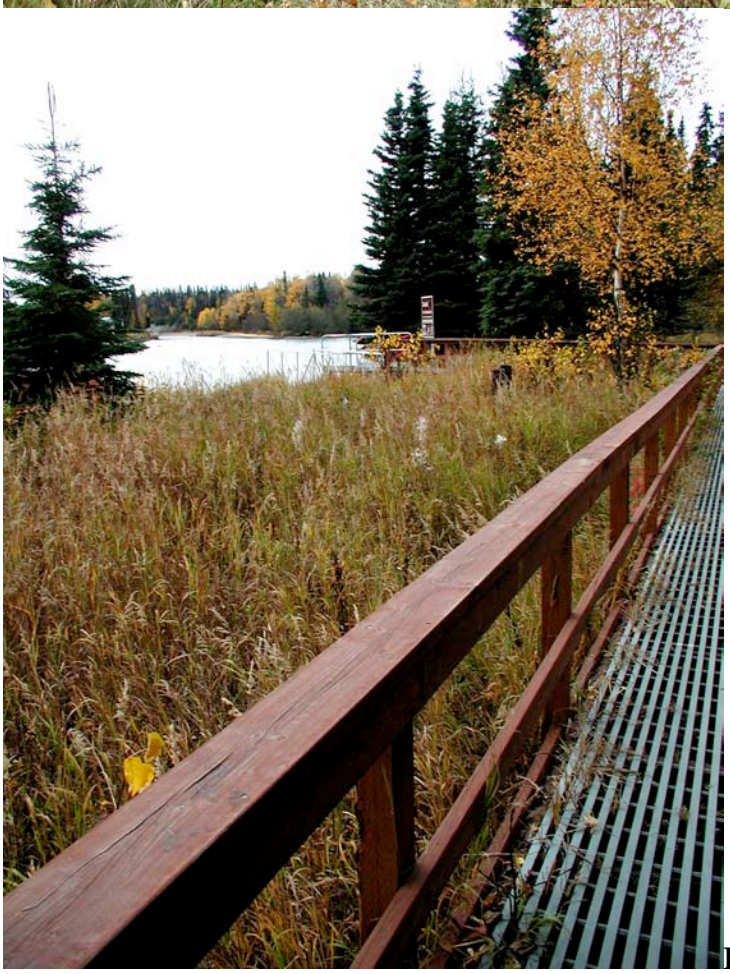
APPENDIX C: Ciechanski Restoration Project



Ciechanski Unit Alaska State Parks
Kenai River Special Management Area
Existing Conditions

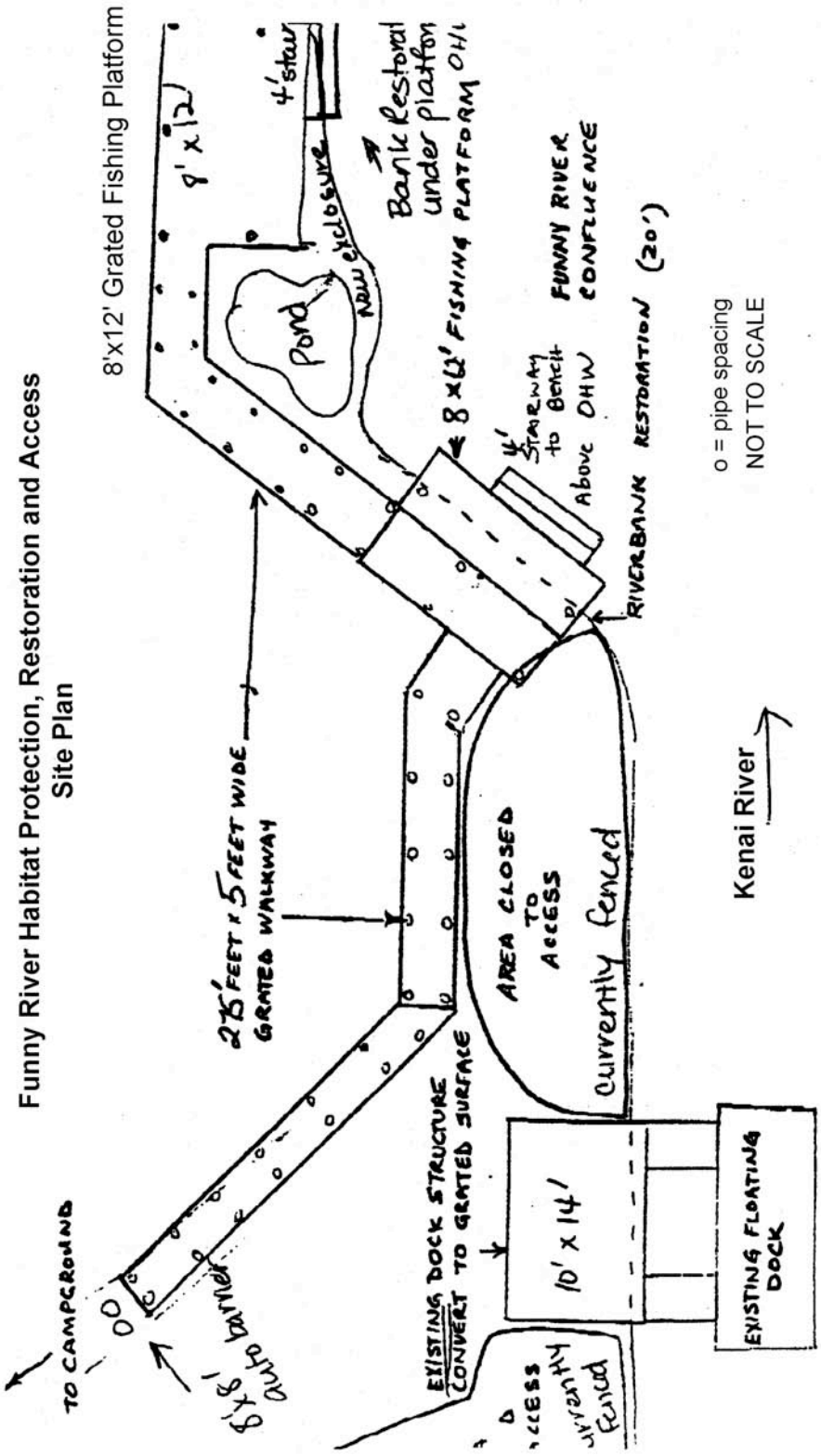


Ciechanski Unit Alaska State Parks
Kenai Special Management Area
Site Plan – Concept

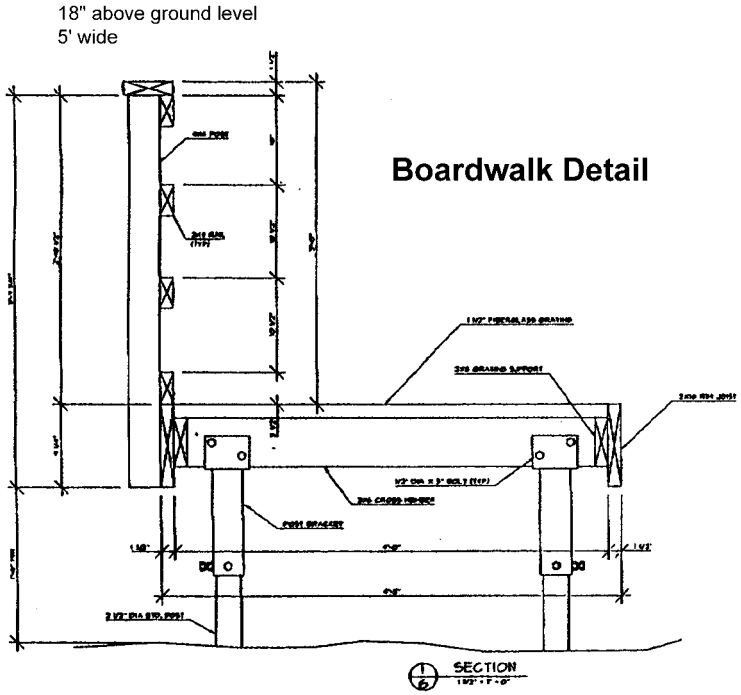


Revegetation, gratewalk.

APPENDIX D: Funny River Restoration Project



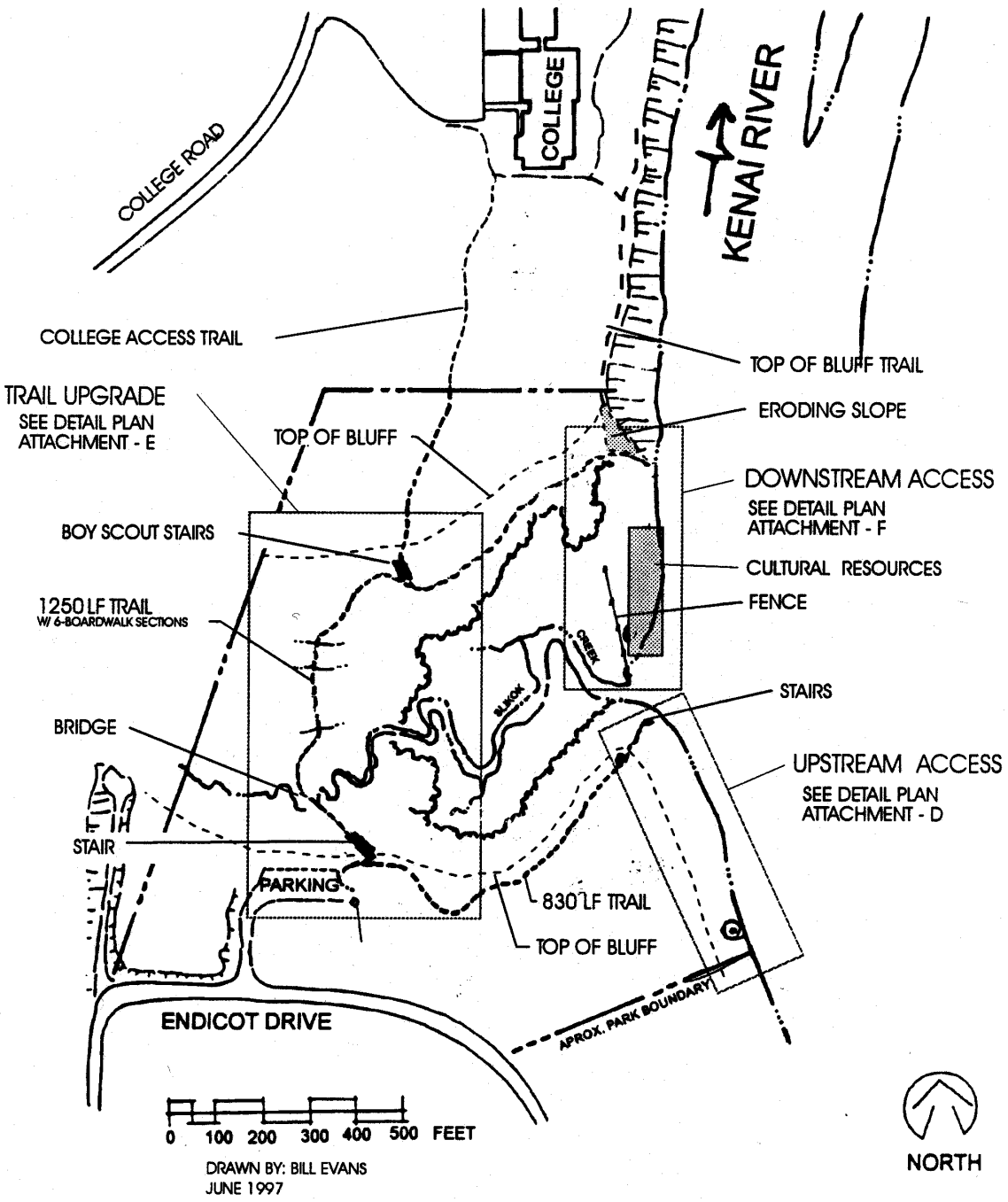
Boardwalk Detail



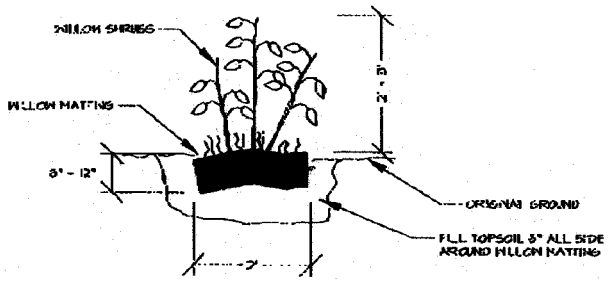
Funny River Gratewalk to Fishing Platform

Funny River Fishing Platforms

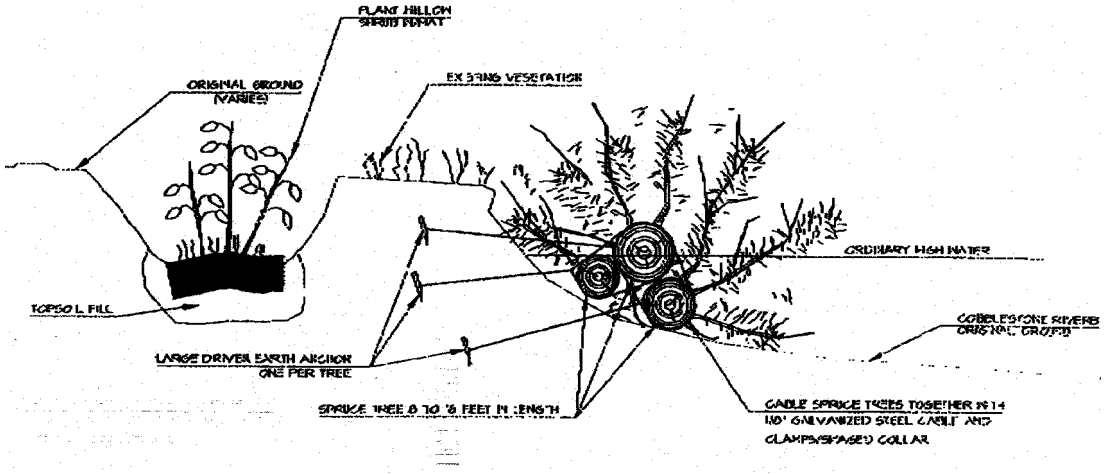
APPENDIX E: Slikok Creek Restoration Project



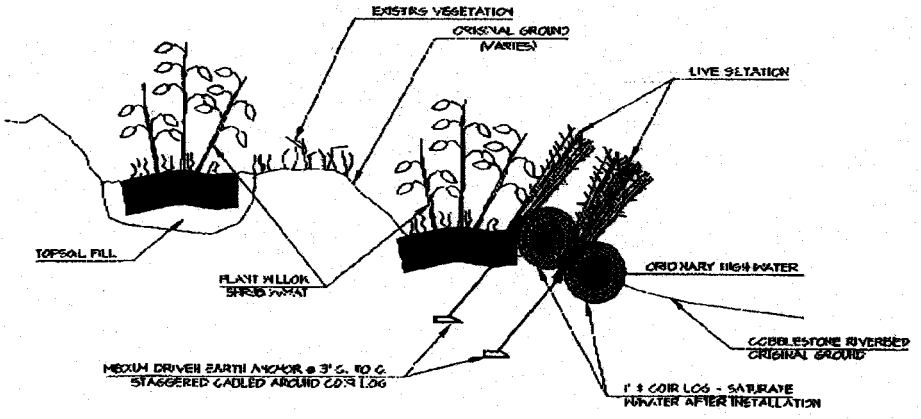
Slikok Creek
Kenai River Special Management Area
Existing Conditions



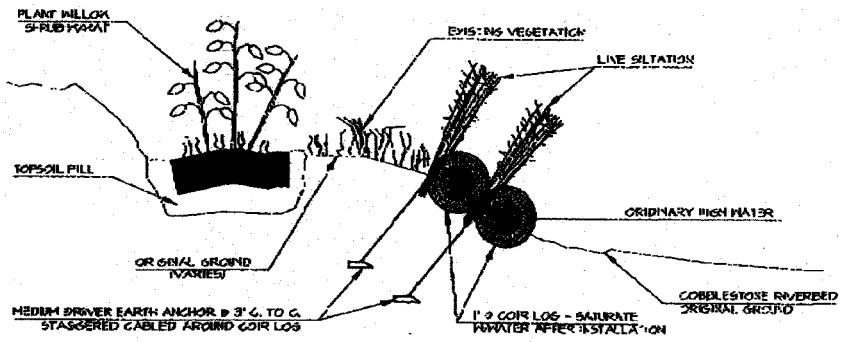
Willow Shrubmat



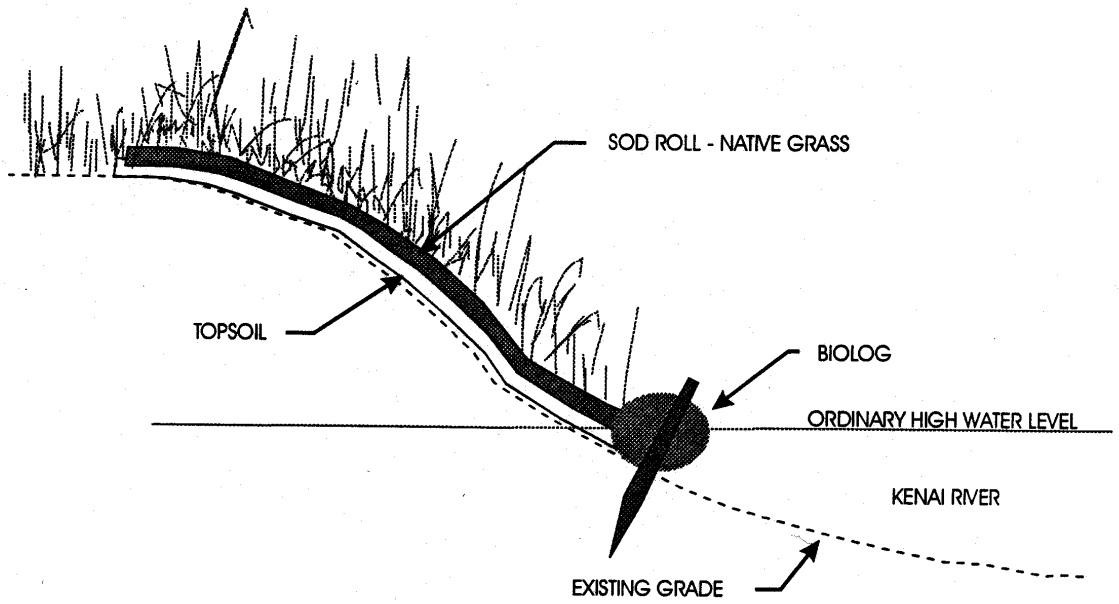
Spruce Tree Revetments

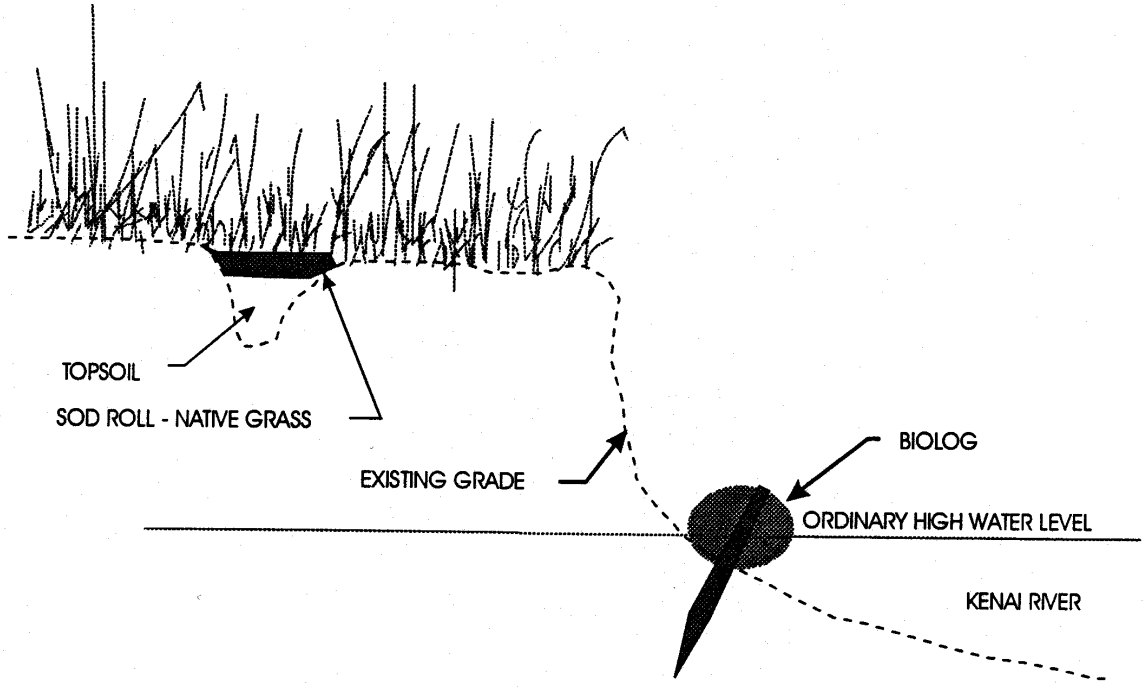


Coir Log Revetments

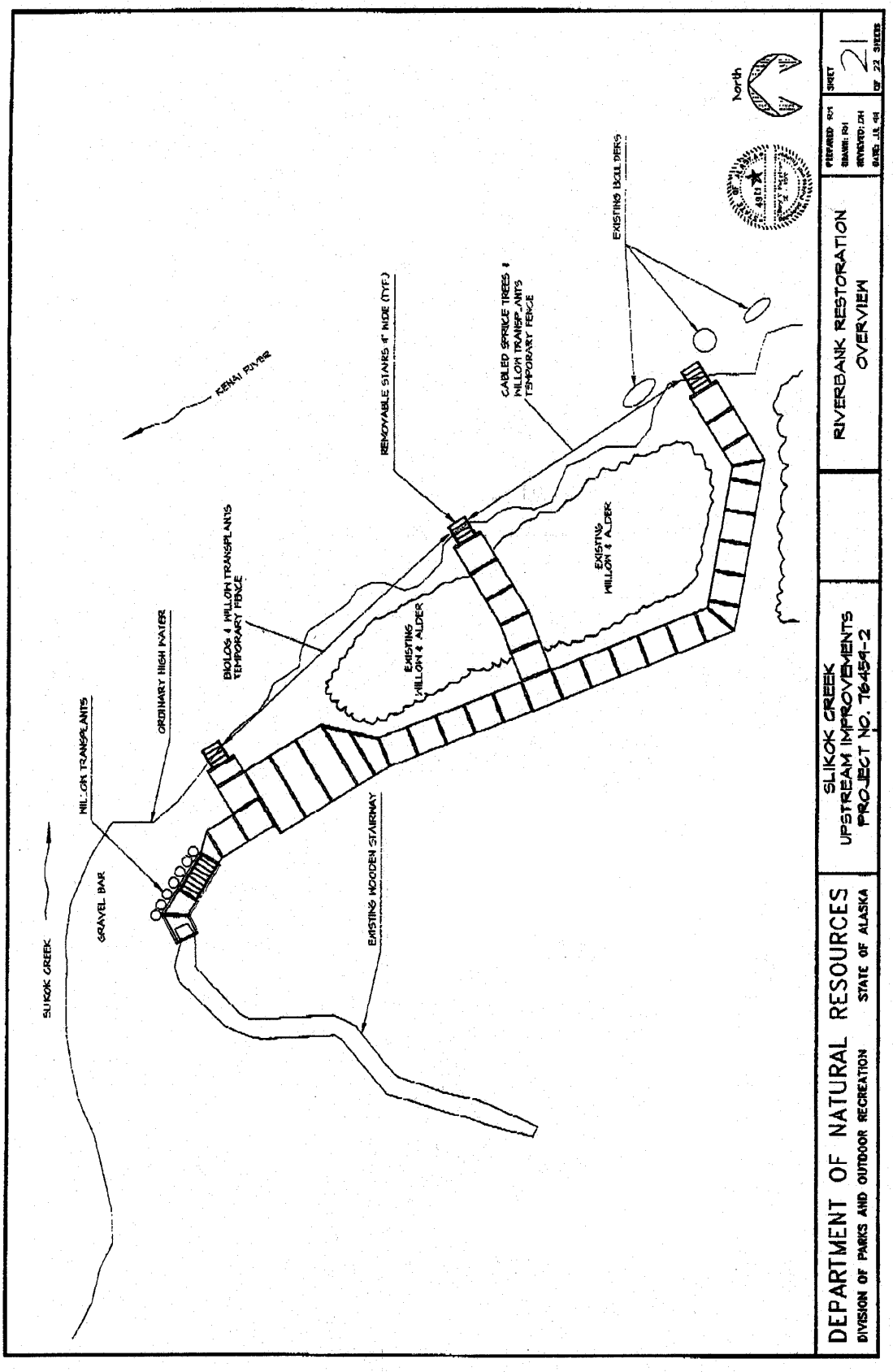


Coir Log Revetments

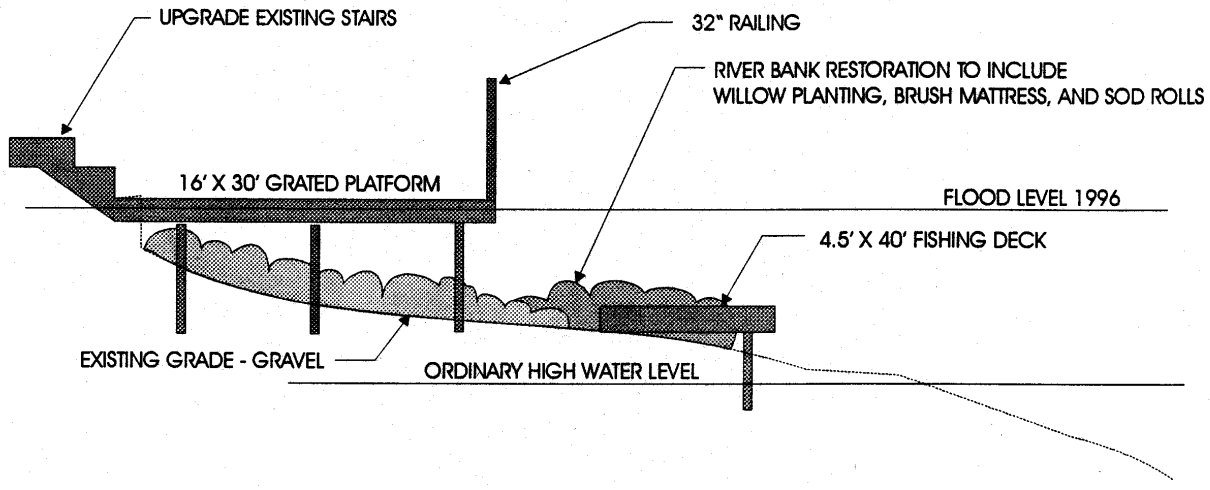


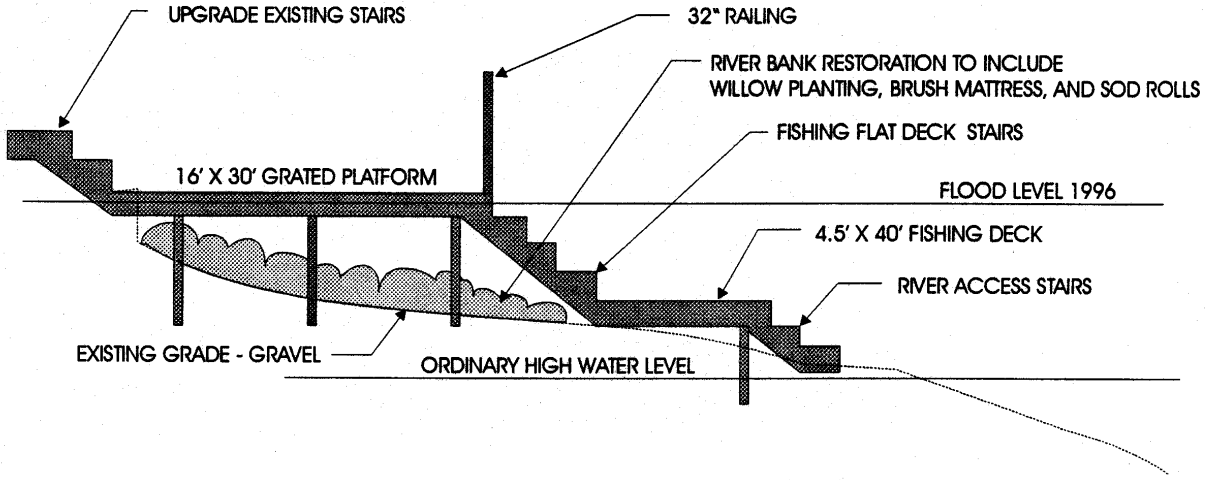


Cross Sections
Slikok Creek Unit
Kenai River Special Management Area

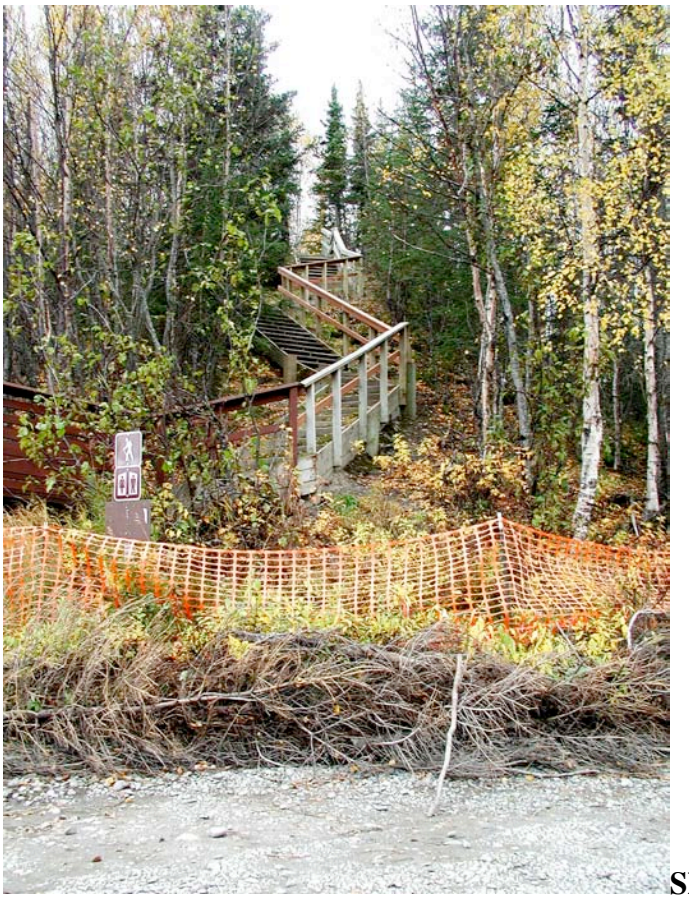


Slikok Unit, Upstream Overview

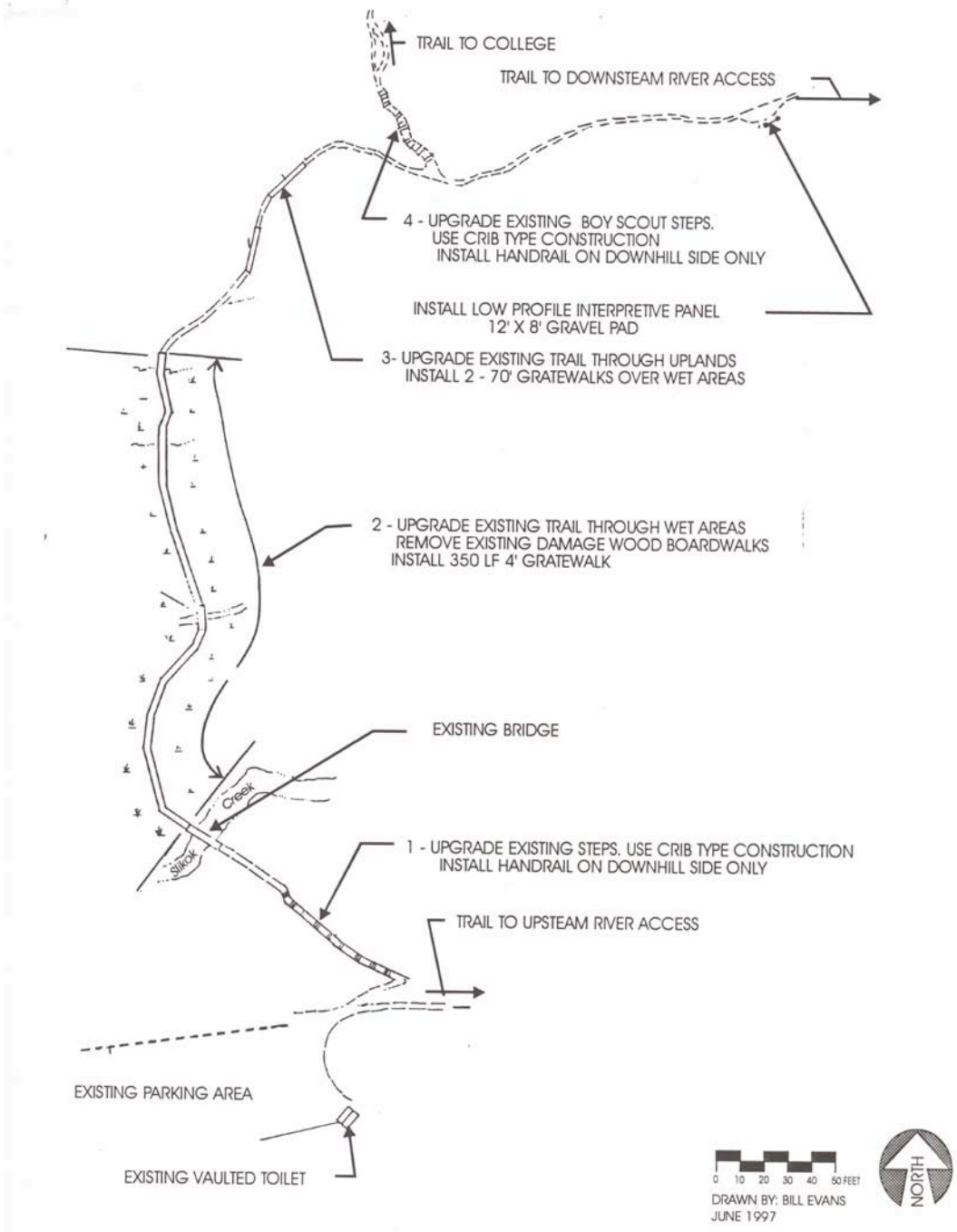




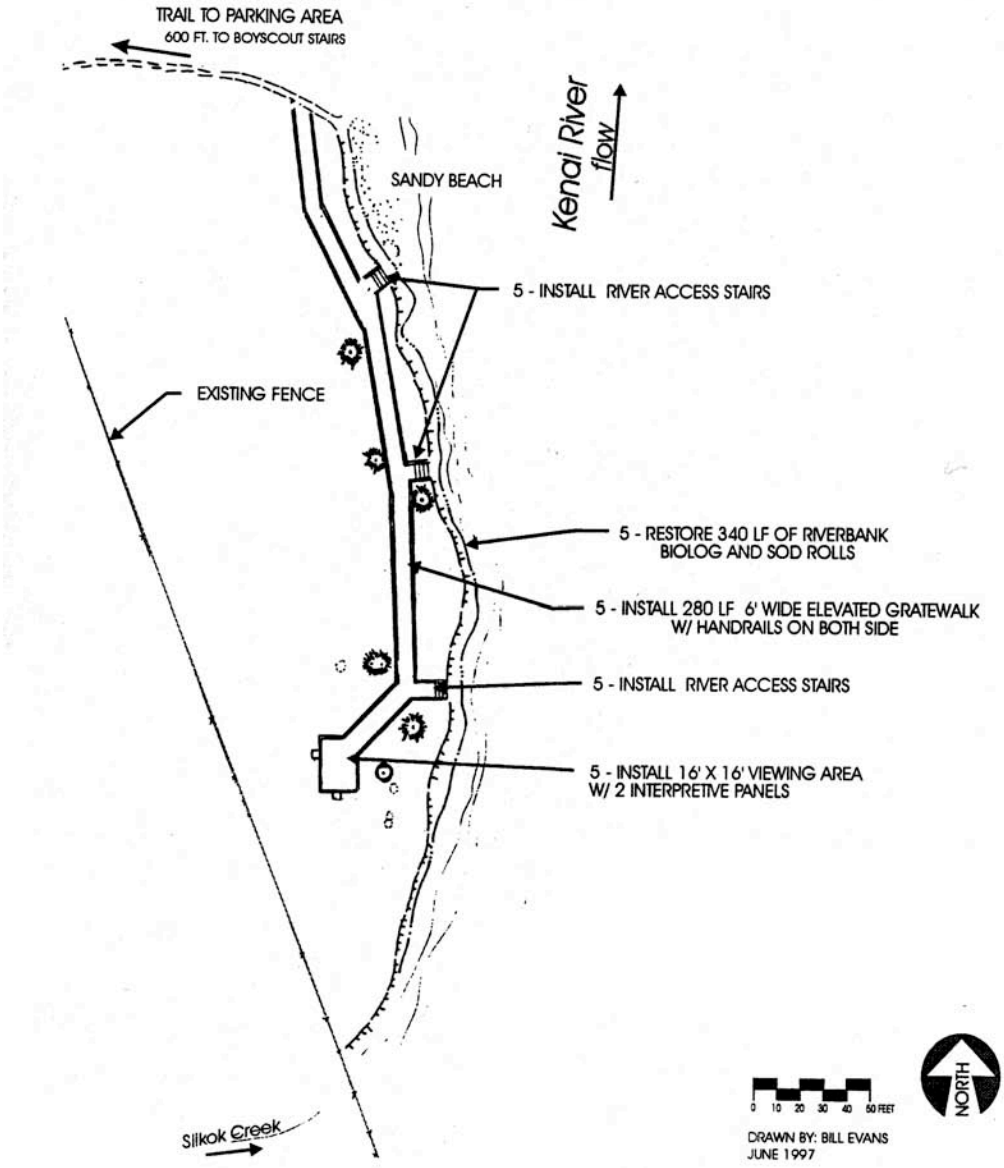
Upstream Cross Sections
Slikok Creek Unit
Kenai River Special Management Area



Slikok Restoration Upstream Portion



Slikok Creek Downstream Concept Plan
Slikok Unit
Kenai River Special Management Area



Slikok Downstream River Access
Conceptual Site Plan
Slikok Unit
Kenai River Special Management Area

APPENDIX F: Russian River Restoration
Youth Restoration Corps

By Dean Davidson and Kelly Wolf

The Exxon Valdez Oil spill Trustees Council contributed $20,000 for river bank and trail restoration on the Russian River; a tributary to the Kenai River, which is included in the 1999 Kenai River restoration Project. This money was used to restore and stabilize approximately 200 feet of bank and 600 feet of closed fish anglers access trail and the adjacent impacted areas. The money was also used to make a 24-minute video movie that documents the Youth Restoration Corps program and their role in the restoration project. This movie will be distributed to numerous individuals, agencies and companies throughout the United States.

In 1997 the Chugach national Forest started a multi-year and multifaceted program to restore the Russian River stream bank, improve and install river access sites, construct an env8ironmental friendly transportation system and educate the public. An agreement was made with Youth Restoration Corps, a newly formed non-profit education/work organization for youth, to do the bank restoration. This program is designed to give 16 – 19 year old youth hands-on training in riparian ecosystem processes and bio-restoration techniques. The program emphasizes the use of low cost, locally available, natural materials, and the use of a variety of techniques. A second objective is to use and develop techniques that could also be used by the local streamside homeowners. Funding is provided by numero9us federal and state agencies, and contributions by private businesses and individuals.

The program for 1999, which took place during J8une, completed restoration on approximately 1790 lineal feet of trail and stream bank along the Russian River adjacent to the Russian River campground, on the Chugach national Forest; and at Swift Water Park fish walk in the city of Soldotna. These accomplishments exceeded the original goal of 1200 feet by almost 600 feet. The program also planted 11000 spruce trees, adjacent to the Russian River, to help replace those killed by the spruce bark beetle infestation and to accelerate reestablishment of the structural component of the riparian ecosystem. This years' program employed 12 youth and two group leaders. Education was provided by representatives from the Chugach National Forest and the Alaska State Department of Fish and Game.

Bank restoration and stabilization techniques used this year included the hand placement of root wads and coir logs anchored with duckbill type anchors driven with a gas-powered jackhammer. Brush and hedge layers, log terraces, soil bags, and sod rolls were then placed behind and above these structures in accordance to methods approved by Alaska Department of fish and Game. Revegetation was accomplished by transplanting sod clumps consisting of native herbaceous and woody plants form adjacent riparian ecosystems. Topsoil was imported and seeded with approved mixtures of grass seen native to the State of Alaska. Willow stems and rooted seedlings of alder, birch, and cottonwood; and seeds from the adjacent riparian vegetation were also used to help produce structural integrity on the soil.

Restoration of the foot trail started with loosening the compacted topsoil. Native sod was then transplanted from the adjacent riparian area to make a patch-quilt pattern on the trail surface. The remainder of the exposed mineral soil was broadcast seeded and covered with a biodegradable

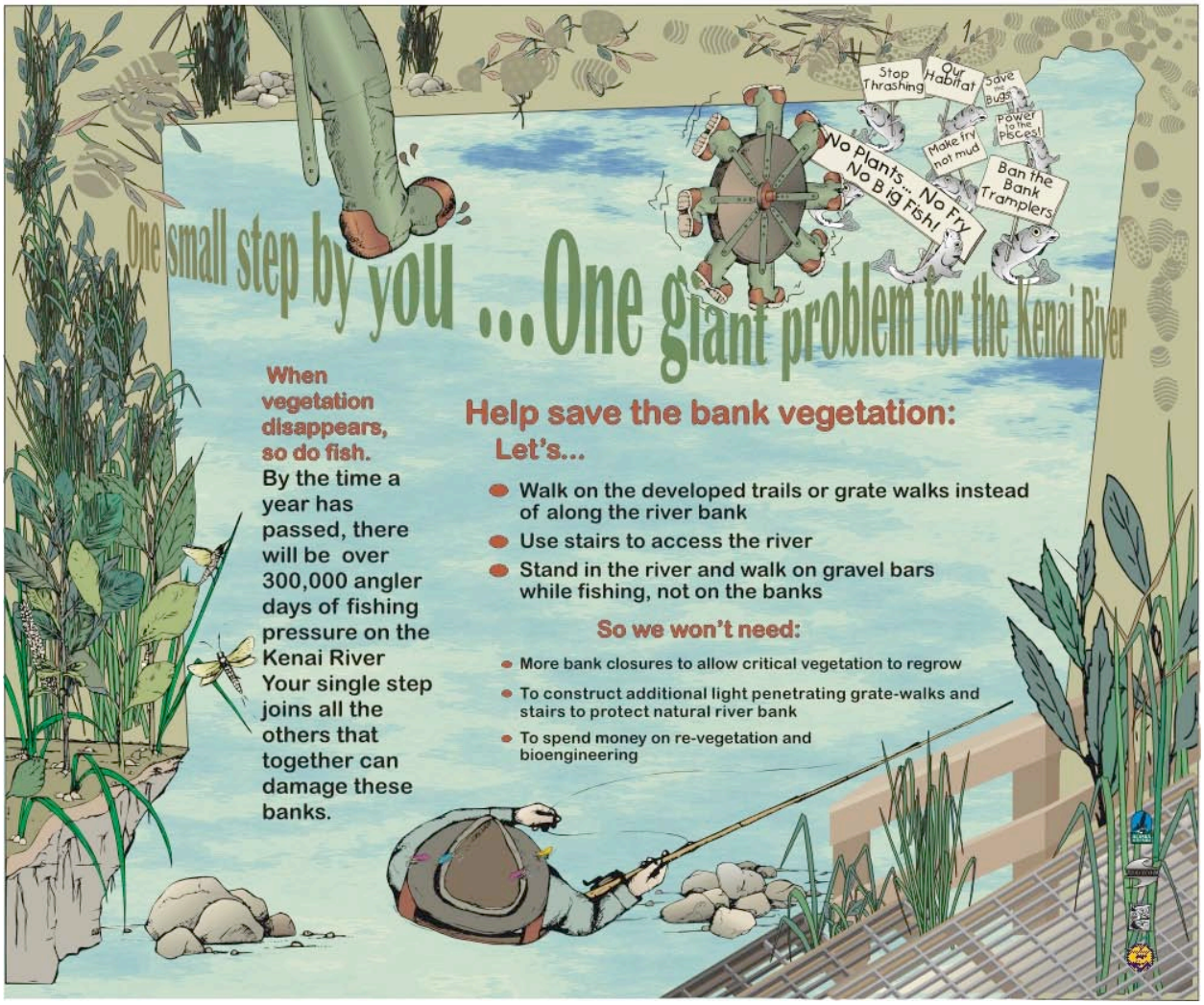
erosion mat to help retain soil moisture and prevent erosion in the event of flood. These youth also took the lead to mentor 24 peers, ranging in age from 8 to 19 years, at Swift Water Park in the city of Soldotna. Through education and working friendships, the group completed 280 lineal feet of bank restoration in a two-day period.

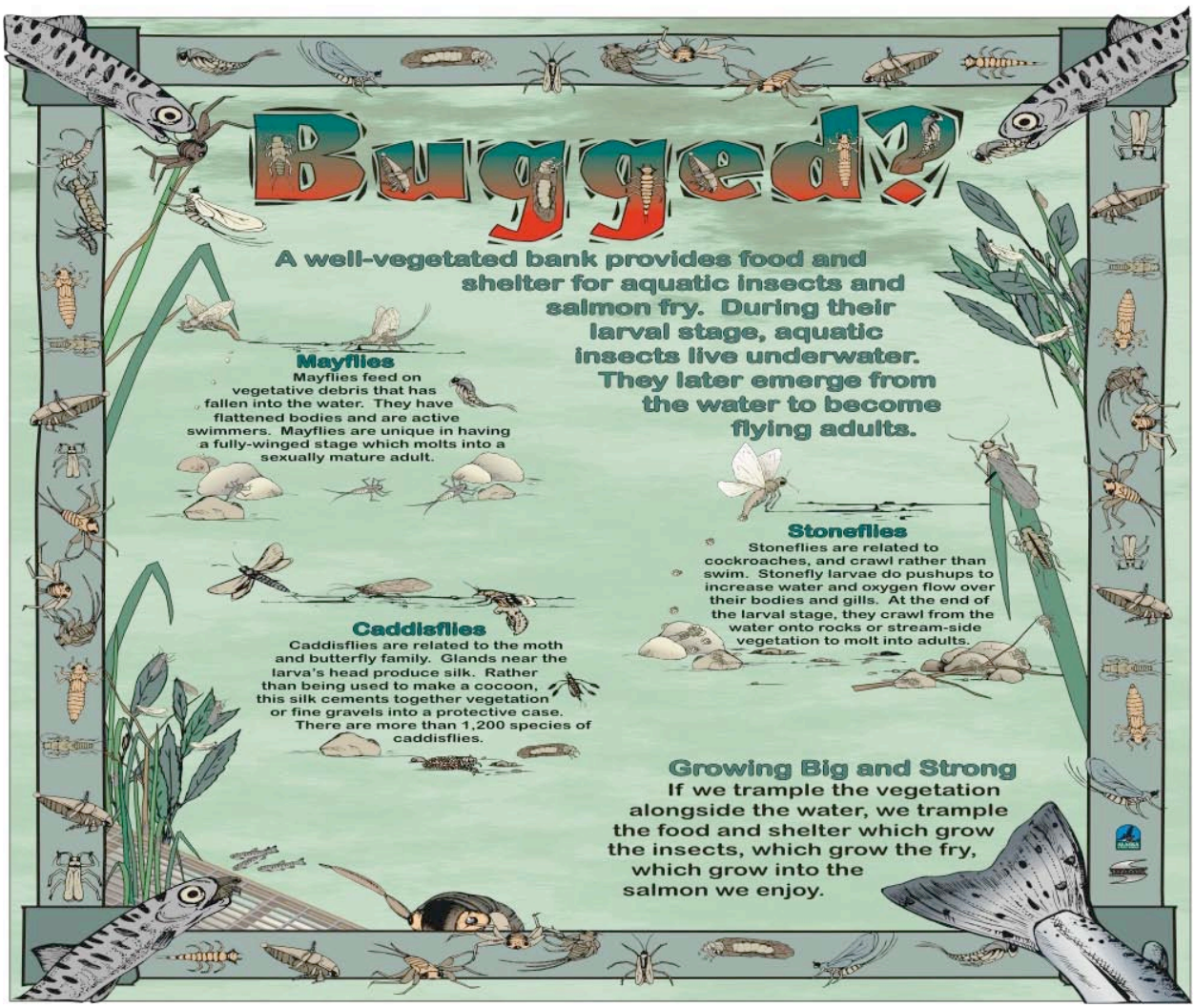
A visual review of this summers' projects made in September, indicates an excellent initial success rate. All of the structural components of the project are functioning as intended. The sod transplants have established themselves will and in many places have spread so it is difficult to tell restoration has taken place. An estimated 50 to 75% of the dormant willow cuttings appear to be well on the way to permanent establishment. Transplanted birch, alder and woody shrubs also appear to be well on the way to establishment. It is vital that supplementary watering be done on all vegetational components of restoration. The amount and frequency of watering is directly responsible for the degree of success, especially during the first year. There were a number of sites that have less than desired growth, presumably because of less supplemental water. Trampling by people stepping over and around fences, or the lack of a fence, in areas where new walkways have yet to be constructed, has severely reduced the success on a couple of sites.

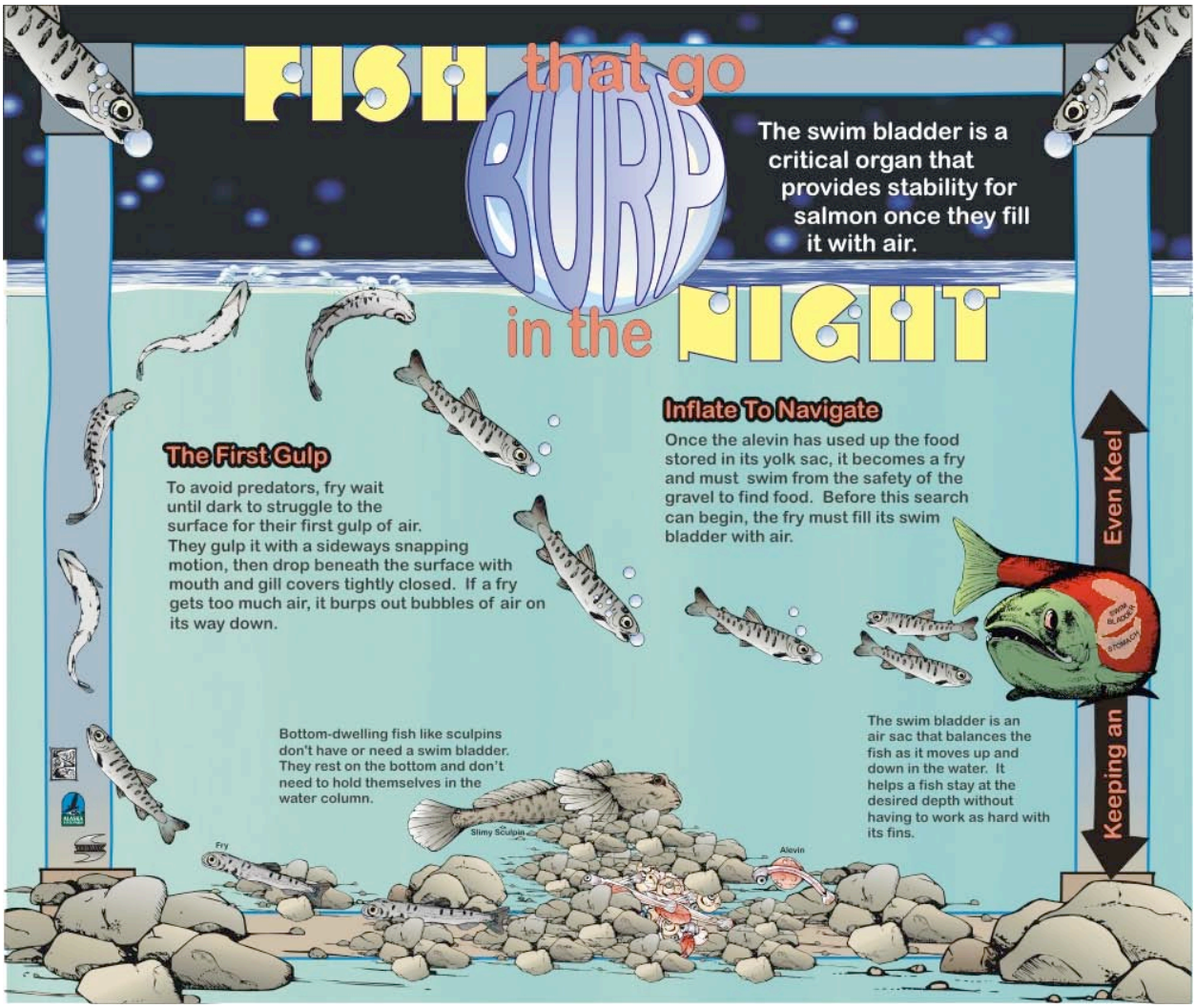
Total cost of this year's program was $79,000. Over 45 new sponsors contributed to the program during 1999. This comes to a total of over 90 sponsors contributing funds, materials, and time to the Youth Restoration Corps during their three-year existence.

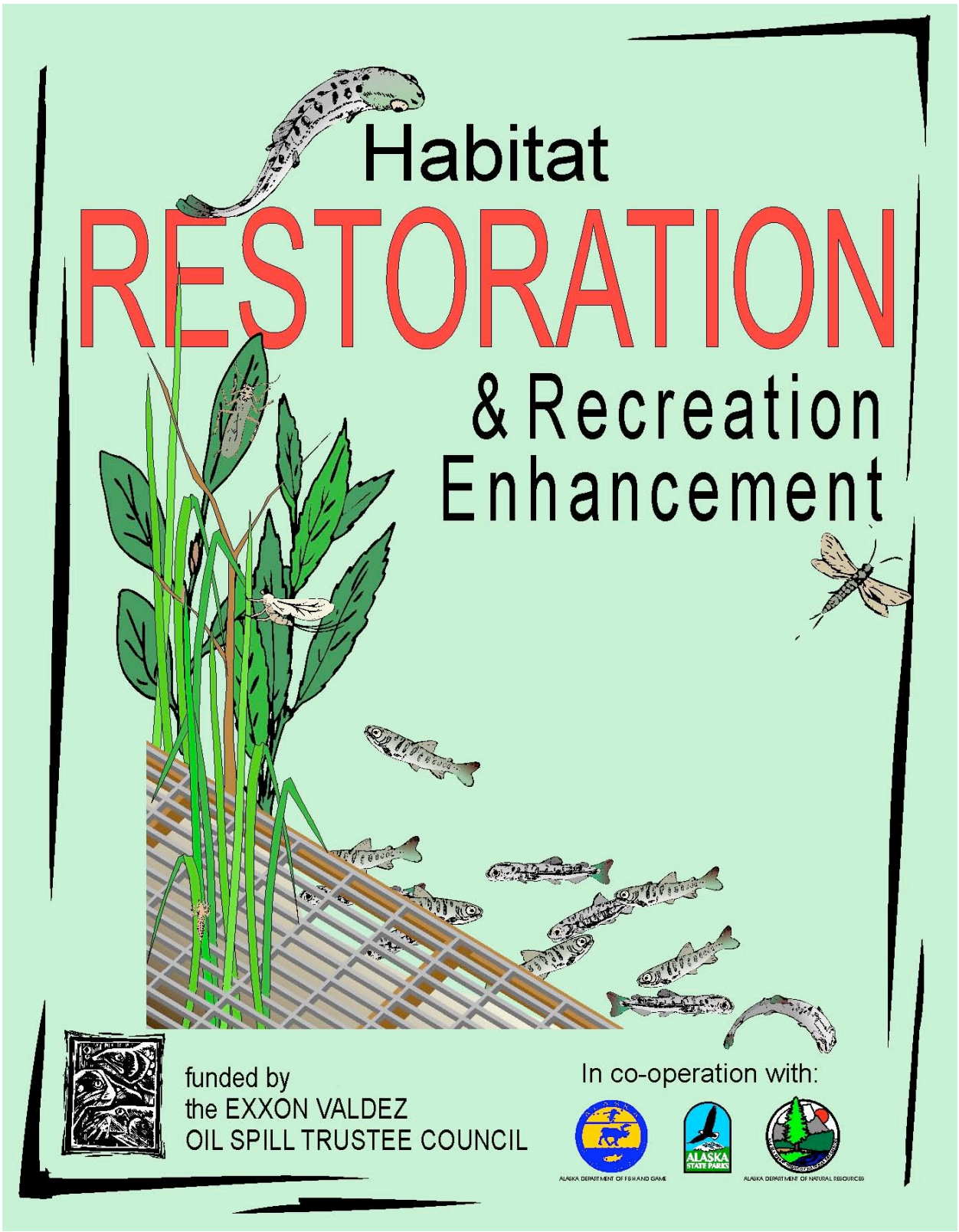
APPENDIX G: Educational Component

A variety of interpretive panels were created and posted at restoration projects in order to encourage appropriate use of the river's resources and acknowledge participating and funding entities.




Bugged?
A well-vegetated bank provides food and shelter for aquatic insects and salmon fry. During their larval stage, aquatic insects live underwater. They later emerge from the water to become flying adults.
Mayflies
Mayflies feed on vegetative debris that has fallen into the water. They have flattened bodies and are active swimmers. Mayflies are unique in having a fully-winged stage which molts into a sexually mature adult.
Stoneflies
Stoneflies are related to cockroaches, and crawl rather than swim. Stonefly larvae do pushups to increase water and oxygen flow over their bodies and gills. At the end of the larval stage, they crawl from the water onto rocks or stream-side vegetation to molt into adults.
Caddisflies
Caddisflies are related to the moth and butterfly family. Glands near the larva's head produce silk. Rather than being used to make a cocoon, this silk cements together vegetation or fine gravels into a protective case. There are more than 1,200 species of caddisflies.
Growing Big and Strong
If we trample the vegetation alongside the water, we trample the food and shelter which grow the insects, which grow the fry, which grow into the salmon we enjoy.


FISH that go
BURP
in the NIGHT
The swim bladder is a critical organ that provides stability for salmon once they fill it with air.
The First Gulp
To avoid predators, fry wait until dark to struggle to the surface for their first gulp of air. They gulp it with a sideways snapping motion, then drop beneath the surface with mouth and gill covers tightly closed. If a fry gets too much air, it burps out bubbles of air on its way down.
Inflate To Navigate
Once the alevin has used up the food stored in its yolk sac, it becomes a fry and must swim from the safety of the gravel to find food. Before this search can begin, the fry must fill its swim bladder with air.
Even Keel
Keeping an
The swim bladder is an air sac that balances the fish as it moves up and down in the water. It helps a fish stay at the desired depth without having to work as hard with its fins.
Bottom-dwelling fish like sculpins don't have or need a swim bladder. They rest on the bottom and don't need to hold themselves in the water column.
Slimy Sculpin
Fry
Alevin


Habitat
RESTORATION
& Recreation
Enhancement
funded by
the EXXON VALDEZ
OIL SPILL TRUSTEE COUNCIL
In co-operation with:
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