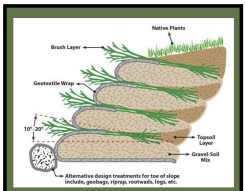
Summary of Actions to Help Rehabilitate Streambanks and Improve Recreation in Anchor River State Recreation Area

Final Report, July 31, 2019

Homer Soil and Water Conservation District

ACWA project to develop bank restoration plans along the lower Anchor River

Homer Soil & Water



Streambank Restoration Project

Homer Soil & Water CONSERVATION DISTRICT

Before

This area had been excessively trampled, leaving the bank denuded and prone to erosion. Without vegetation, it offered poor habitat for juvenile salmon and little protection against natural erosion processes.

After

Thanks to the volunteers who helped install this bioengineering project, the bank now will have willows rooting to hold the bank as well as woody debris to offer habitat and hiding places for juvenile salmon.

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"The banks matter more than folks think they do"
– ADF&G biologist

"Vegetation is nature's way of protecting a streambank."
– U.S. Army Corps of Engineers

A. Introduction

This is the final report for Homer Soil and Water Conservation District's 2018-2019 ACWA-funded project to develop bank restoration and trail improvement plans along a 0.9-mile stretch of the lower Anchor River. ACWA stands for Alaska Clean Water Actions (https://dec.alaska.gov/water/water-actions/), which is a program managed by the Alaska Department of Environmental Conservation(DEC) in collaboration with the Alaska Department of Fish and Game (ADF&G) and the Alaska Department of Natural Resources (ADNR). Projects to restore, protect or conserve water quality, quantity and aquatic habitat on identified waters are considered for funding. Local governments, citizen groups, tribes, and education facilities are often the recipients of ACWA awards.

The project area is the roughly 0.9-mile reach of the Anchor River downstream from the Old Sterling Highway bridge, see Map 1. This area is within the Anchor River State Recreation Area (SRA) managed by Alaska State Parks and includes the Picnic Hole, a site identified as an area of concern in the 2006 Community Action Plan for the Anchor River SRA (https://dec.alaska.gov/water/acwa/pdfs/fy06_anchorriver_communityactionplan.pdf). This project represents an update of that plan. In addition, this project reflects Homer Soil and Water's commitment to sharing information promoting informed and sustainable use of natural resources, along with Alaska State Parks' mission to provide outdoor recreation opportunities and conserve and interpret natural resources for public use, enjoyment, and welfare.

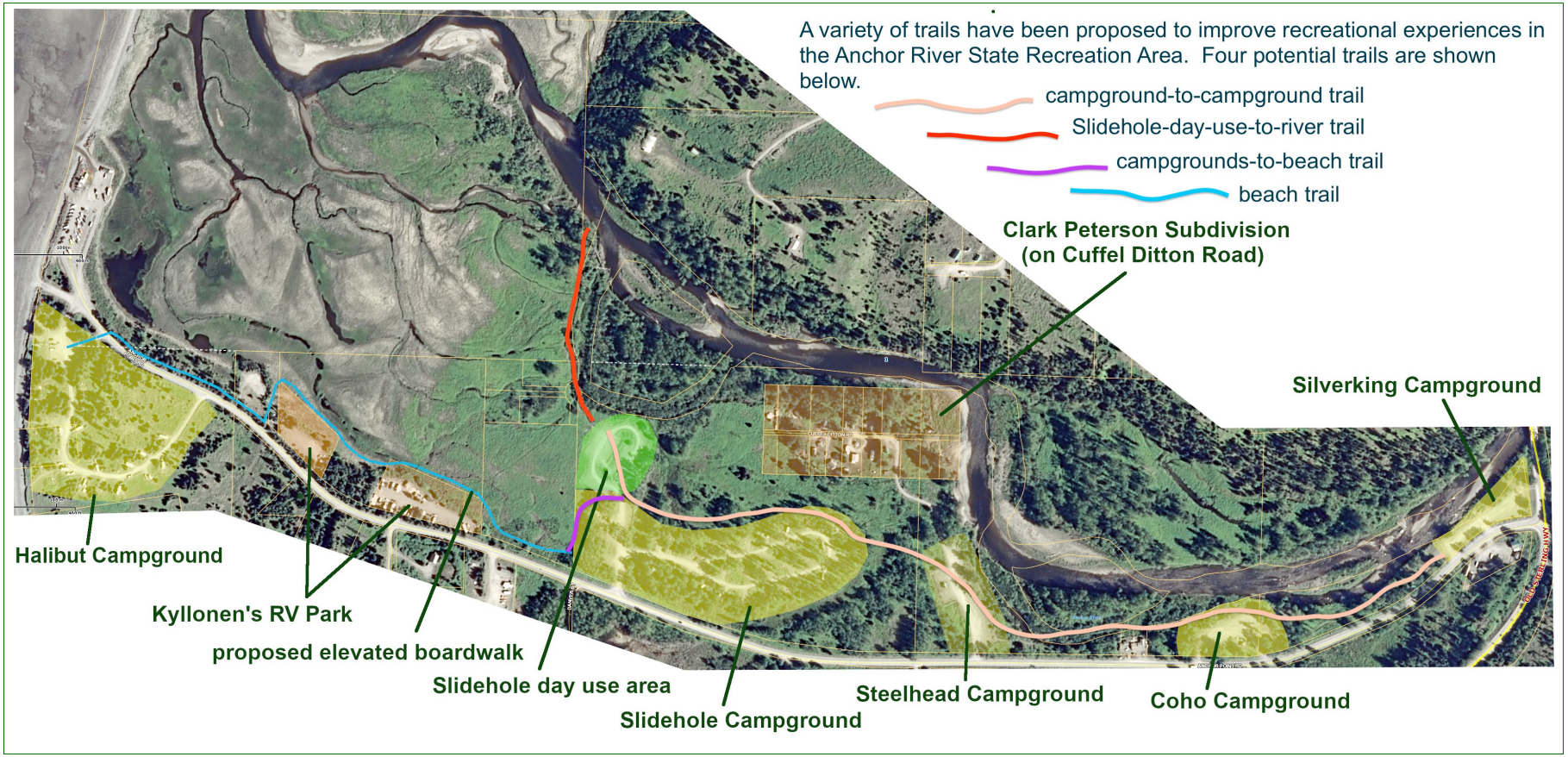
The fundamental goal of this project was to help improve both juvenile salmon habitats and recreation in the project area.

- With respect to salmon, project efforts focused on: (a) increasing public awareness of how conditions in the Anchor River State Recreation Area affect the health and production of juvenile salmon and (b) beginning the process of improving habitats for juvenile salmon along streambanks in the project area. Information compiled and shared through this project is intended to promote effective and informed follow-up actions to reduce damage to streambanks from foot traffic and, in particular, to promote effective, community-supported rehabilitation of devegetated and eroding streambanks in the Picnic Hole area.
- With respect to recreation, project efforts focused on providing information useful in designing and installing appropriate and sustainable access for anglers along and into the Anchor River and trails for recreational users that connect SRA campgrounds to one another and to the beach. Public awareness and support are critical to successful accomplishment of this goal.

Accomplishing project goals involved collecting and sharing appropriate information and engaging the Anchor Point community in discussions so that their needs, desires, and concerns could be considered and documented throughout this project. A variety of methods were used to engage and share information with the Anchor Point community, and these are outlined below.

A highlight of this project was to organize a public workshop on how to install appropriate soil bioengineering techniques to rehabilitate two eroded sections of streambank in the Silverking Campground in the Anchor River SRA. The installation was accomplished with help from project partners and community volunteers and is described below. A video playlist on YouTube provides a permanent step-by-step record of how eroding sections of streambanks were rehabilitated.

Map 1. Campgrounds, existing trails, and potential pathways in the Anchor River State Recreation Area (SRA). The Slidehole-day-use-to-river trail has been developed; over use and poor treadway resilience lead to mud, rutting, and gradual widening of the trail. Trail improvements are proposed. Portions of the campground-to-campground trail are in place as a result of roadways, parking lots, and human use. An "Anchor River pathway" from the bridge to the beach has been proposed and is discussed by Jack Blackwell, Kenai Peninsula Superintendent of Alaska State Parks, in a video presentation uploaded by Homer Soil and Water at https://www.youtube.com/watch?v=sfITFqGcAxA&t=7s.



B. Project partners

Partnering with other agencies and organizations and with members of the Anchor Point community was essential in meeting project goals. Many groups and agencies supported efforts undertaken during this project. The table below identifies these players. Appendix A provides a more detailed outline of partner roles and credits individuals whose contributions were especially significant in accomplishing project tasks.

Table 1. Groups and agencies partnering in efforts undertaken during this project

Funding	**Alaska Dept of Environmental Conservation, Alaska Clean Water Actions Program (ACWA)**
Land Management and Permit Partner	**Alaska State Parks**
Project and Restoration Guidance	**U.S. Fish and Wildlife Service, Partnership for Fish and Wildlife**
Outreach and Education Partners	**Alaska Department of Fish and Game Cook Inletkeeper Kachemak Bay National Estuarine Research Reserve Kenai Watershed Forum – Stream Watch Program Kachemak Heritage Land Trust Homer Independent Living Center, TRAILS Program USDA Natural Resources Conservation Service**
Bioengineering Revegetation Contractor	**Moore's Landscaping**
Other Support	**Citizens of Anchor Point and Homer, Alaska Anchor Point Senior Center Coal Point Seafoods Alaska Recreational Management Anchor River Inn Moose Habitat, Inc. City of Soldotna Parks and Recreation Department**

C. Contents of this report – accomplishments of Anchor River project

This report summarizes actions undertaken, products developed, and tasks accomplished by Homer Soil and Water, with the help of its partners, during this ACWA-funded project. Where appropriate, online links are provided to products described.

Through this project and the support of its partners, Homer Soil and Water was able to accomplish the following:

1. Organize and host two public information meetings in Anchor Point to provide the community with a chance to learn about this project and other Anchor River activities planned by a number of agencies and organizations. These meetings also allowed agencies and organizations to learn from members of the public. Meetings are discussed under Phase 1 and Phase 2 below.
2. Create a Facebook page—Anchor River Updates—to disseminate information as it became available and to promote a wider sharing of information about the Anchor River; information was posted regularly on this page. That page can be found at: https://www.facebook.com/groups/181853742641179/
3. Prepare two reports about the Anchor River focused on different topics. These phase 1 and phase 2 reports are discussed below.
4. Write and include two articles about the Anchor River project in Homer Soil and Water newsletters (see Appendix B).
5. Work with project partners—especially U.S. Fish and Wildlife Service's Partners for Fish and Wildlife and the Alaska Department of Fish and Game—to organize and host a streambank revegetation workshop that demonstrated a number of soil bioengineering practices appropriate for rehabilitating damaged sections of Anchor River streambank, discussed below.

6. Videotape both community meetings, as well as the streambank revegetation workshop/demonstration, and upload edited videos on YouTube playlists—also discussed below.

D. Importance of streambanks to juvenile salmon

The concern with riparian (streamside) habitat in the Anchor River SRA is the result of ongoing damage to these habitats caused by foot traffic. As foot traffic has increased, plants have been unable to recover from season to season, and heavily used streambanks have become denuded, as shown in the photo below of the Picnic Hole area (HSWCD 11-6-18). As streambank vegetative cover is significantly reduced or eliminated, soils are exposed to compaction and erosion. Unless measures are taken to manage this process, streambanks will not be able to revegetate, and streambank erosion will become an increasingly serious problem for juvenile salmon dependent on well-vegetated streambank habitats.

It would be difficult to overemphasize the importance to juvenile salmon of vegetation growing along streams. Juvenile salmon DO use the Anchor River SRA and hence are affected by loss of streambank vegetation in the area. One goal of this study has been to help spread awareness of this fact. To this end, the report for phase 1 of this project emphasized the use of the SRA by juvenile salmon and outlined processes of streambank erosion that reduce fish habitats. These are the processes that will need to be managed if maintaining habitat areas for immature and growing salmon is a priority for decisionmakers and the community.

The phase 1 report summarized results from a study by the Kachemak Bay National Estuarine Research Reserve (KBNERR) entitled *Estuary Habitat Use by Juvenile Chinook and Coho Salmon in a Kenai Lowlands, Anchor River*. That study documented the importance of the lower Anchor River to juvenile coho and chinook salmon. (The study can be downloaded from Files on the Anchor River Updates Facebook page, or directly at https://www.facebook.com/download/preview/370154433692567.) Immature salmon use the project area—along with areas upstream and down—to feed, rest, hide from predators, and overwinter. The KBNERR report noted that "Of the over 16,400 fish sampled [during 2015 and 2016], fifteen species were represented, nine of which were present at multiple life history stages... The most abundant captured fish included three age classes of juvenile Coho Salmon; juvenile Chinook Salmon; starry flounder, including young of year; staghorn sculpin, including young of the year; and threespine stickle back, including young of the year."

The Phase 1 report also included a section entitled "Erosion and human effects on streambanks." The report noted that density of plant roots and surface protection by plant cover are key factors in helping streambanks resist erosion. The role of plants in protecting streambanks and providing salmon habitat is well established. Vegetation stabilizes banks by binding soil particles together, increasing shear strength of the soil (helping soils resist tractive forces of flowing water), reducing erosive water velocity (when growing in or hanging into the water), armoring the bank, and when plants are transpiring, reducing soil wetness. The more vigorous, dense, and deeply rooted the plants, the more effectively they protect the bank from erosion. Woody shrubs and trees have deeper, more extensive root systems than herbaceous vegetation, but herbaceous plants can provide excellent ground cover, protecting soil particles from the dislodging effects of raindrops and erosion from surface runoff during storms. The combination of the two is highly effective in protecting streambanks from erosion. For juvenile salmon, naked streambanks have little value; they represent areas of faster currents,

reduced food, higher temperatures, increased sediments (and often other pollutants), and greater exposure to predators.

An excellent overview of the importance of streambank vegetation in Alaska to juvenile salmon was presented by ADF&G biologist Lucas Byker during the June 7, 2019, Anchor River streambank restoration workshop and demonstration organized by Homer Soil and Water. That presentation—*Stream Banks and Salmon Production*—was videotaped by Homer Soil and Water as part of its information-sharing efforts and is available in two parts on YouTube (see https://www.youtube.com/watch?v=A4plVrZFQIw and https://www.youtube.com/watch?v=S2bk0unLdSQ).

Sharing information about the needs of juvenile salmon in the Anchor River SRA was a key priority throughout this project. Information was shared in the following ways:

- The KBNERR report referenced above was uploaded to Homer Soil and Water's Anchor River Updates Facebook page.
- During the April 9, 2019, public information meeting, four of the nine presentations focused on salmon in the Anchor River. Homer Soil and Water videotaped these presentations, edited them, and uploaded them to a YouTube playlist, which can be found at: https://www.youtube.com/playlist?list=PLqcfzBIDNuozTNII7M95qdEl976MAHk62. Links to all nine presentations were posted on the Anchor River Updates Facebook page. Presentations focused on salmon were those given by:
  - Syverine Bentz. Coastal Training Program Coordinator, Kachemak Bay National Estuarine Research Reserve
  - Sue Mauger, Science Director, Cook Inletkeeper
  - Lynn Whitmore, long-time local angler and co-chair of Moose Habitat, Inc.
  - Carl Kerkvliet, Lower Cook Inlet Sport Fish Area Management Biologist, ADF&G Sport Fish Division.
- As mentioned above, during the June 7, 2019, Anchor River streambank rehabilitation workshop and demonstration, ADF&G biologist Lucas Byker gave a presentation that very effectively summarized information on the importance of streambank vegetation to juvenile salmon. Homer Soil and Water also videotaped and uploaded that presentation to YouTube and provided links on the Anchor River Updates Facebook page (see above).

E. Previous project reports

Phase 1 report – Compile information

The objective for phase 1 of this project was to work with partners, including the Anchor Point community, to compile information on streambank conditions, flow dynamics, and human uses in the project area. In particular, information was needed to help decisionmakers identify effective ways to restore damaged streambanks and improve recreation.

Compiled information was summarized in the phase 1 report: *Phase 1 – Conditions and Concerns in the Anchor River State Recreation Area*. Figure 1 provides a copy of the cover and table of contents of that report, as well as links to online copies. The phase 1 report introduces the ACWA project, identifies project partners, summarizes recent research on juvenile salmon use of the lower Anchor River, outlines flow conditions and human uses within the area, and describes and illustrates accelerated streambank erosion in terms of four river segments in the SRA, each associated with a state park campground. Options suggested by State Parks to address accelerated erosion in each campground are included with discussions of each river segment.

As noted above, a key goal throughout this project was to engage and inform the community of Anchor Point. During phase 1, a community meeting was held on May 14, 2018, in the Anchor Point Senior Center to inform the public about this and other projects planned on the Anchor River during summer 2018. The meeting was

videotaped, and comments from community members are recorded in the following videos:

- Anchor River May 14, 2018, bridge & Coho Campground segments: https://youtu.be/TGfGAgJURmA
- Anchor River May 14, 2018, corridors, discourage "golf course" lawns, keep dense veg on bluffs: https://youtu.be/B79era4vSpU
- Anchor River May 14, 2018, safe beach access from campground, westernmost sign, Anchor Point and Anchor River names, history: https://youtu.be/2n2ysMGv5zw
- Anchor River May 14, 2018, habitat rearing, river closures: https://youtu.be/4eHzDuUSnZw
- Anchor River May 14, 2018, Ruby Creek, fish friendly culverts, rearing habitat, DOT project: https://youtu.be/0gufscZV4eU

Some comments from the May 14 meeting were transcribed and included in the phase 1 report. It was in preparation for the May 14 meeting that Homer Soil and Water established the "Anchor River Updates" Facebook page and began posting Anchor River-related updates (see https://www.facebook.com/groups/181853742641179/).

Phase 2 report – Develop and present recommendations

The objective for phase 2 was to develop recommendations for ways to rehabilitate damaged streambanks and improve recreation. One goal was to identify appropriate options for rehabilitating the denuded sections of streambank adjacent to the Picnic Hole. Phase 2 information was summarized in the report: *Phase 2 – Potential Practices for Rehabilitating and Protecting Streambanks in the Anchor River State Recreation Area (SRA)*. Figure 2 provides a copy of the cover and table of contents of that report, as well as a link to an online copy.

The phase 2 report reiterated the importance of vegetated streambanks to juvenile salmon and laid out a potential phased approach for rehabilitating and protecting riparian areas while improving recreation. A variety of practices and actions were outlined to achieve those goals, and most of them were compiled into a reference table providing a handy compendium of methods. That table exists as a stand-alone product that can be downloaded from Files on the Anchor River Updates Facebook page.

When submitted to DEC, the phase 2 report was accompanied by a DVD containing drone footage illustrating 2018 streambank conditions at various seasonal flows. For further information about this footage, please contact Homer Soil and Water Conservation District.

As in phase 1, a community meeting was held to inform the Anchor Point community about activities planned in the project area and to encourage their input. The meeting was held on April 9, 2019, in the Anchor River Inn. Ten agencies and organizations gave presentations about their plans for activities in the project area during 2019 and 2020. Presentations were videotaped and videos are available on a YouTube playlist. The playlist can be accessed at: https://www.youtube.com/playlist?list=PLqcfzBIDNuozTNII7M95qdEl976MAHk62.

Figure 1. Cover and table of contents for Phase 1 report, Reduced-file-size version is available by clicking here

The phase 1 report can be downloaded in its entirety from the "Anchor River updates" Facebook page established by Homer Soil and Water to inform the Anchor Point community about this project. The Facebook page can be reached at https://www.facebook.com/groups/181853742641179/. Because of the many high resolution color images included, the phase 1 report is a large file. A reduced-file-size version is available by clicking here. A high-resolution copy is available in five parts, click on Part 1, Part 2, Part 3, Part 4, and Part 5.

Phase 1 -- Conditions and Concerns

Anchor River State Recreation Area

Homer Soil and Water Conservation District

2018 ACWA project to develop bank restoration plans along a 0.9-mile stretch of the lower Anchor River

Vegetation is nature's way of protecting a streambank

-- U.S. Army Corps of Engineers

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A well-vegetated streambank in Segment 4, Slidehole.

Figure 2. Cover and table of contents for Phase 2 report.

The phase 2 report can be downloaded from the "Anchor River updates" Facebook page at: https://www.facebook.com/download/preview/2358979227518460.

Phase 2 Report – **Potential Practices for Rehabilitating and Protecting Streambanks in the Anchor River State Recreation Area**

Homer Soil and Water Conservation District
2018 ACWA project to develop bank restoration plans
along a 0.9-mile stretch of the lower Anchor River

"Vegetation is nature's way of protecting a streambank."
- U.S. Army Corps of Engineers

"The best treatment for a streambank is to prevent problems... Leave native vegetation intact within the floodzone."
- Alaska Department of Fish and Game

Above: Eroding trampled streambank

Below: Well-vegetated streambank

Which streambank provides better habitat for young salmon?

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Phase 2 recommendations

Using a logical phased approach

As noted in the phase 2 report, actions to rehabilitate streambanks and improve recreation should be implemented in logical order and coordinated ways. This helps avoid "putting the cart before the horse," as when a trail route is blocked or a structure is installed before local support for these actions has been gained. One ADF&G biologist commented that her team avoids doing streambank restoration projects in Alaska state parks because anglers wanting to access the river don't hesitate to cut through fencing and trample plantings or other techniques installed to benefit salmon. She noted that some streambank restoration demonstrations in the Valley have disappeared completely. She also commented, however, that elevated, light penetrating walkways and sacrificial access points can be effective in directing foot traffic and thus in protecting streambank areas from trampling. Clearly, protecting streambanks through actions such as blocking off access will be effective only if anglers and other access users are provided with appealing and sustainable alternate routes to their destinations.

Collecting needed information and conducting outreach and education to involve the local community are always advisable initial actions. Once community understanding and support are gained, practices to reduce trampling on sensitive streambanks can be initiated with local input. In the Anchor River SRA, local input can help determine:

1. how many access points down the streambank and into the river should be provided from each campground;
2. what locations are best suited to provide access points and trail routes;
3. which access points have the highest priority for rehabilitation or protection, and what methods have the highest acceptance by the local community—for example river access provided by seasonally removable stairs or ramps into the river;
4. which existing access points and routes should be blocked off and how, e.g., with natural barriers such as log piles or thorny plantings or with manmade barriers such as fencing; in general, natural barriers are preferable both in terms of aesthetics and their effects on wildlife;

Signage is another important early action to take because the more river users understand why changes are being made that affect how they access and move along the river, the more likely they are to cooperate. Cooperation from anglers and visitors will be minimal if they have no idea why they're being blocked from trails and access points they've used for years.

A phased approach for installing streambank rehabilitation and protection measures was outlined in the phase 2 report. Table 2 provides an example of that kind of approach.

Table 2. Example of a phased approach to reduce trampling from foot traffic and rehabilitate streambanks

step	Action
1.	Continue to conduct **research on Anchor River salmon** habitats conditions and their use by juvenile salmon
2.	Continue to **develop and disseminate informational products documenting research and other activities conducted on the Anchor River**
3.	Plan and **conduct ongoing outreach and education** about Anchor River salmon, streambanks, revegetation, and any activities to be conducted on the Anchor River in the project area, e.g., develop YouTube playlists of informational and documentary videos about relevant Anchor River topics; this should include conducting ADF&G/USFWS streambank rehabilitation workshops as needed (see step 11)
4.	Provide ongoing **mechanisms for interested members of the public to inform themselves about and provide input** on Anchor River information and activities
5.	Determine best **access points for anglers into the Anchor River channel**, plan appropriate bank protection for each access site, e.g., seasonally removable stairs and ramps; consider the needs of anglers with disabilities
6.	Determine and clear as needed the **best routes from campgrounds and parking areas to angler access points into the river**
7.	Determine and clear as needed the **best route for a trail connecting Anchor River SRA campgrounds with each other and**

	with the beach
8.	Select appropriate materials and practices to **create sustainable, non-erosive treadways for selected trail routes**, including materials such as elevated light-penetrating boardwalks, geowebbing with/without fill, sod protection matting, etc.; consider the needs of anglers with disabilities in designing trails
9.	Select appropriate ways to **block off pathways and streambank access points to be rehabilitated**; e.g., with natural or manmade barriers
10.	Plan needed **signage** and **develop appealing, informative signs**
11.	As appropriate, **arrange for and conduct ADF&G streambank revegetation workshops at selected streambank sites**
12.	Clear relocated trail
13.	Install treadway protection
14.	Install fencing and signage
15.	Install access infrastructure and protection

F. Streambank rehabilitation workshop and demonstration in Silverking Campground

Ongoing planning to address erosion by the Picnic Hole

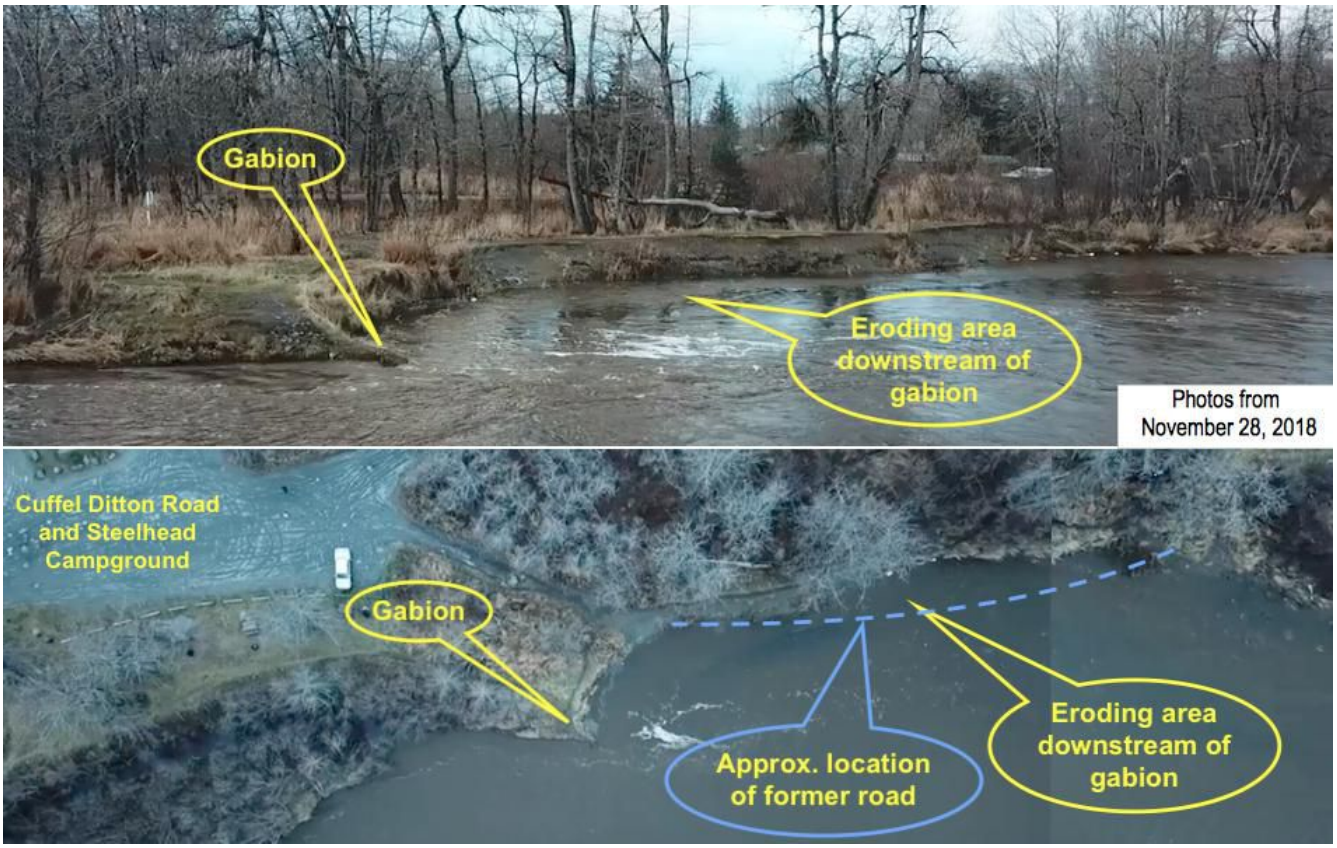
As explained in the phase 1 report, concern with accelerated erosion on streambanks adjacent to the Picnic Hole provided the original impetus for this project. That accelerated erosion was triggered both by trampling and by installation and maintenance of a poorly designed gabion, believed to have been originally installed in 1984 (Brandon Ryder, personal communication)[1].

The photograph at right shows the Picnic Hole streambank during flooding on October 26, 2002. Greenness suggests that the gabion area had been recently worked on. Photographs on the following page show the gabion and downstream erosion as it looked in 2018.

Much of the erosion just downstream of the gabion is due to a back eddy created by the gabion itself. Video footage taken by Homer Soil and Water on May 9, 2018, shows the action of this back eddy, see https://youtu.be/BIVz4OwHrkQ.

1 On June 24, 2019, an ADF&G/USFWS biologist familiar with the river provided Homer Soil and Water with the following comment: The gabions were installed by State Parks to protect the road loop, so people coming into the [Steelhead] campground could turnaround. (There may have been gabions placed earlier than the current ones but I don't remember them.) When they were installed in 2001 (I think), I spoke with someone from State Parks. My concern was that the downstream extent of the gabions was designed for failure... [T]he downstream end was not properly tied into the river bank, and the entire installation would be subject to failure. I suggested the gabions be extended downstream another 40 feet... I think the gabions were funded with federal money from USFWS under an ADF&G program. The gabions failed during the fall floods in 2002 (https://pubs.usgs.gov/fs/2004/3023/) just as I predicted" (Phil Brna, personal communication).

Figure 3. Photos of eroding streambank adjacent to the Picnic Hole



At left: Trampling and sloughing ("unzipping") of streambanks just downstream of the gabion contribute to accelerated erosion, HSWCD 5-9-18

Above: Looking upstream towards gabion; bank devegetated and eroding, HSWCD 11-6-18

The Picnic Hole area is a challenging and expensive situation for streambank rehabilitation. State Parks has been looking at designs to address erosion there and is awaiting EVOS funding to move forward with appropriate streambank rehabilitation. During phase 2 of this project, Homer Soil and Water received a rough estimate of $53,000 from a contractor proposing to remove the gabion and rehabilitate 250 linear feet of bank using coir logs, willow cuttings, reinforced soil lifts, and vegetative mat, including the area where the gabion would be removed. Although that estimate for rehabilitating the Picnic Hole area was beyond the scope of this project, the streambank restoration techniques proposed by the contractor reflect soil bioengineering approaches recommended in Homer Soil and Water's phase 2 report. These have been used successfully since the early 1990s on the Kenai River both to repair eroding streambanks damaged by trampling and other causes of devegetation and to improve habitat for rearing salmon.

Bringing soil bioengineering to the Anchor River

As mentioned above, many of the recommendations in the phase 2 report are soil bioengineering techniques. Streambank soil bioengineering is the use of plant materials and engineering techniques to control erosion and stabilize streambanks whose streambeds are not actively eroding downward (becoming deeper). Plants are the major component in bioengineering installations; live and dead herbaceous and woody plant materials are used in combination with natural and synthetic materials to provide erosion control, slope and streambank stabilization, landscape restoration, and fish and wildlife habitat. The primary living material generally used is adventitiously rooting woody plant species such as willows and cottonwoods. These species have root buds along the entire stem. When stems are placed in contact with soil, they sprout roots; when in contact with the air, they sprout stems and leaves. This ability to root, independent of the orientation of a stem, is a reproductive strategy of riparian plants that has developed over time in response to flooding, high stream velocities, and streambank erosion.

Soil bioengineering techniques were first installed on the Kenai River in the early 1990s, when the USDA Natural Resources Conservation Service (then called the Soil Conservation Service) introduced these techniques through the Kenai River Cooperative River Basin Study. The City of Soldotna saw the value of such techniques and obtained funding for installations at Soldotna Creek Park and Centennial Campground—the first soil bioengineering demonstrations in the state. Given the clear benefits of these techniques to salmon and other wildlife, ADF&G soon established effective programs for encouraging use of bioengineering methods and published what has become the go-to guide for bioengineering in Southcentral Alaska: *Streambank Revegetation and Protection* (available at http://www.adfg.alaska.gov/index.cfm? adfg=streambankprotection.main). In addition, the U.S. Fish and Wildlife Service Partners for Fish and Wildlife program helped provide funding to landowners interested in rehabilitating their streambanks with these techniques. (The Natural Resources Conservation Service can also cost-share installation of these techniques on private or Native lands through its Environmental Quality Incentives Program, contact the NRCS Homer Field Office for further information.)

ADF&G's streambank revegetation workshops allow individuals in local communities to learn first hand about soil bioengineering by helping to install practices on selected sites. Homer Soil and Water and its partners—especially U.S. Fish and Wildlife through its Partners for Fish and Wildlife program and the Habitat Division of the Alaska Department of Fish and Game—agreed that it would be beneficial to bring a streambank revegetation workshop to Anchor Point, rehabilitating a site or two in the Anchor River State Recreation Area as the hands-on portion of the workshop. Conducting such a bioengineering workshop in the SRA offered the following benefits: It could:

- potentially improve habitat for juvenile salmon in at least a small area or two;
- potentially be funded as part of Homer Soil and Water's ongoing ACWA grant;
- provide a test case that could be monitored to see how well installed practices fared over time when exposed to the dynamic conditions in the project area, including varying water levels, ice dam flooding, and abrasion from floating chunks of ice—successful techniques could then be identified for installation along Picnic Hole streambanks;
- familiarize the local community and partner agencies and organizations with a variety of bioengineering

techniques; and

- provide demonstration sites readily accessed by hundreds of locals and visitors interested in plant-based approaches to repairing their own streambanks and reducing erosion on their properties.

Silverking Campground streambank revegetation demonstration sites

Homer Soil and Water, USFWS Partners for Fish and Wildlife, and State Parks met in the Silverking Campground on November 8, 2018, to identify potential sites to use for the hands-on portion of a streambank revegetation workshop. Two potential sites were identified, shown in photographs below. Homer Soil and Water then approached DEC with a request for funding to add a revegetation workshop component to its ACWA grant, and that request was approved.

November 8, 2018, Silverking Campground, Anchor River State Recreation Area
Jason Okuly from Alaska State Parks, Emily Munter from U.S. Fish and Wildlife Service, and Kyra Wagner from Homer Soil and Water discuss the site chosen as site 1 for the June 7, 2019, revegetation workshop.

November 8, 2018, Silverking Campground, Anchor River State Recreation Area – Above left: Grisgris—facing upstream—considers what is chosen as site 2 for the streambank workshop; Below right: site 2 looking downstream.

June 7, 2019, streambank revegetation workshop

A streambank revegetation workshop was held in Anchor Point on June 7, 2019, to allow participants to gain both knowledge and hands-on experience of soil bioengineering techniques. A 3-hour class-room component from 8:00 to 11:00 am prepared participants for the following hands-on installation of several soil bioengineering techniques, which took place from noon to about 5:00 pm. The restoration of two eroding streambank sites in Silverking Campground was videotaped to document each step of the process.

Streambank revegetation workshops offered by ADF&G generally last 2 days—a 1-day classroom component and a 1-day hands-on component during which participants install streambank rehabilitation practices. Given constraints in funding and staff time during this project, the typical 2-day workshop was compressed into 1 day, with a 3-hour class-room session in the morning and the rest of the day for participants to install streambank restoration practices in Silverking Campground.

Participation in the workshop was invited through emails to agencies, groups, and individuals; announcements in the *Homer News* and on the KBBI online calendar; postings and an event notice on Homer Soil and Water's Anchor River Updates Facebook page; and flyers posted on buildings in Anchor Point. The flyer is shown at right.

Step-by-step videos of each installed bioengineering technique

Both sites in Silverking Campground were rehabilitated with a coir log, brush layering (which consisted of willow cuttings above and below a soil lift), veg mat, and spruce tree revetment. Installation was videotaped and step-by-step videos were edited and uploaded to a YouTube playlist to illustrate the process. The Anchor River Silverking Campground streambank restoration playlist consists of the following videos:

- Step 1: install coir log and backfill behind it with soil, https://youtu.be/kT0DJfQEheU;
- Step 2: install the first layer of willow cuttings with soil shoveled over the rooting ends, https://youtu.be/Z5aPfqKQGAQ;
- Step 3: install soil lift, consisting of two layers biotextile laid over soil-covered willow roots, then filled with gravel, and folded back over itself to create a burrito-shaped wrap, https://youtu.be/FRxMz9uIXPQ;
- Step 4: install second layer of willow cuttings, https://youtu.be/Q_Juz8U99bQ;
- Steps 5 and 6 install vegetative mat & cut exposed willow ends to about 8-inch length, https://youtu.be/-1TeF8qquqg;
- Step 7: bury duck bill anchors holding cables for spruce tree revetment (anchors are driven about 4 ft deep at the base of the streambank and cable ends are left exposed to be used in the next step), https://youtu.be/BkgpCrVQUV0;
- Step 8: install a spruce tree revetment—against the toe of the bank and in front of the coir log—using cables attached to duckbill anchors, https://youtu.be/7O3-rL28Y0A;
- Fence off restored sections of streambank with temporary fencing and put up explanatory signage (not videotaped);
- Step 9: begin monitoring—sites were revisited and photographed on July 6 and 20, https://youtu.be/BVoQwBpSXJ8.

In addition, the playlist includes videos of presentations made by USFWS and ADF&G on the morning of the workshop. As mentioned on page 7, ADF&G biologist Lucas Byker provided a presentation on the importance of streambank vegetation to juvenile salmon. Emily Munter, USFWS, provided participants with background on streambank erosion processes and streambank restoration techniques, including soil bioengineering. Each presentation is available in two parts:

- Lucas Byker on streambanks and salmon production, part 1: https://www.youtube.com/watch?v=A4plVrZFQIw, part 2: https://www.youtube.com/watch?v=S2bk0unLdSQ
- Emily Munter on riverbank erosion processes and restoration techniques, part 1: https://youtu.be/a—txeQxM5Q, part 2: https://youtu.be/WUVeaIBcH9U.

Site 1 Silverking Campground before restoration

January 25, 2019

June 3, 2019

Photos below are from step-by-step videos described above. In addition, still photos like these illustrating the entire installation process for site 1 in Silverking Campground have been uploaded as a photo album on the Anchor River Updates Facebook page. That album is at: https://www.facebook.com/media/set/?set=oa.472890603537490&type=3.


Install coir log


Backfill with soil behind coir log


Install first layer of willow cuttings


Water willow cuttings


Lay down biotextile and backfill with gravel


Fold biotextile to make soil lift ("burrito")


Install second layer of willow cuttings


Backfill with soil and gravel


Water and compact backfill over willows


Install vegetation mat


Cut willows leaving about 8 inches exposed


Install spruce tree revetment

Install fencing and signage

Site 1 on July 6, 1 month after installation

Site 1 on July 6, practices labeled

G. Closing comments

Success of streambank rehabilitation and habitat improvements undertaken in the Anchor River State Recreation Area will ultimately depend on anglers and other visitors to the SRA, as well as on the local community. Their understanding of Anchor River salmon habitats and commitment to maintaining them will determine what happens along the banks. It's clear that many locals care very much about Anchor River salmon and are highly motivated to become as knowledgeable as possible about the processes that sustain them. The hope is that information provided through this ACWA-funded project can promote the success of future efforts to sustain salmon populations in the SRA. Encouraging everyone who visits the river to understand the importance to salmon of streambank conditions can only help in building support for effective streambank protection.

Improving recreational trails and angler access in the SRA in ways that enhance visitor experiences of this beautiful area is a goal that can have significant benefits to the community—both economically and experientially. Designs and locations of trails and river access should meet the needs of all SRA users—both locals and out-of-towners, whether anglers, birders, campers, or other visitors, including those with disabilities who seek to enjoy this area in the same ways as others. Improvements must also be designed and installed in ways that are sustainable in the long term despite the dynamic conditions affecting the Anchor River floodplain (see phase 1 report).

Trails and angler access along and into the river should be designed with extensive involvement of the local Anchor Point community—particularly the many knowledgeable anglers regularly fishing the area. Trail and access improvements must work for locals in order for locals to support and respect using them. If such improvements work for locals, their positive buy-in will help motivate them to educate visitors to the Anchor River SRA about the importance of using sustainable trails and river access and thereby protecting healthy vegetated streambank habitats essential to juvenile salmon.

Appendix A – Individuals providing significant support to this project

Contributions from the following partners were significant in accomplishing the goals of this project. Partners: (a) assisted in engaging and informing the public (and one another) about Anchor River salmon, salmon habitats, and streambank restoration activities, particularly at public meetings held in Anchor Point; (b) contributed information compiled by Homer Soil and Water for Phase 1 and 2 project reports; (c) donated material or services to prepare for and host the streambank restoration workshop and demonstration conducted in Silverking Campground on June 7, 2019; (c) assisted in acquiring permits; and/or (d) helped install bioengineering practices at the two demonstration sites.		
1	**Alaska Department of Natural Resources, Division of Parks and Outdoor Recreation, (aka Alaska State Parks).** State Parks is the landowner of the project area; it provided initial information about streambank conditions and human effects along the lower Anchor River, contributed options during discussions of recommendations to improve salmon habitat and recreation, assisted in identifying eroding sites for bioengineering demonstrations, reviewed streambank restoration designs, assisted with public information and outreach, reviewed and approved permit applications, and waived the State Parks permit fee. State Parks is awaiting funding from EVOS for perform follow-up activities designed to (1) create sustainable trails within and through the Anchor River State Recreation Area and (2) lead to restoration of streambanks in the Picnic Hole area (Steelhead Campground).	Participating staff: • Jack Blackwell, Park Superintendent, Kenai Peninsula, 907.262.5581, jackblackwell@alaska.gov • Jason Okuly, Park Ranger, 907.226.4688, jason.okuly@alaska.gov • Cody Cunningham, Alaska Recreational Management, State Parks vendor for management of Anchor River State Recreation Area campgrounds
2	**Alaska Department of Fish and Game.** Carol Kerkvliet participated in both the 2018 and 2019 community public information meetings held in Anchor Point; she was joined by Michael Booz and Holly Smith for the April 9, 2019, meeting at the Anchor River Inn. During the classroom portion of the June 7 streambank restoration workshop, Lucas Byker gave an excellent presentation on the importance of riparian vegetation for juvenile salmon.	Participating staff: • Lucas Byker, Habitat Biologist, Habitat Division, Soldotna, 907.71.2478, lucas.byker@alaska.gov • Carol Kerkvliet, Lower Cook Inlet Sport Fish Area Management Biologist, Sport Fish Division, Homer (now retired) • Michael Booz, Fishery Biologist, Sport Fish Division, Homer, 907.235.1742, michael.booz@alaska.gov • Holly Smith, Fishery Biologist, Sport Fish Division, Homer, 907.235.8191, holly.smith@alaska.gov
3	**U.S. Fish and Wildlife Service, Partners for Fish and Wildlife** USFWS helped organize and coordinate the June 7 streambank restoration workshop and demonstration; Emily Munter's presentation on river dynamics and streambank restoration techniques was central to the classroom portion of the workshop, and she also arranged storage for spruce trees for spruce tree revetments, which had been reserved by Homer Soil and Water through the Spruce for Salmon program at the Kenai National Wildlife Refuge. She was also key in selecting streambank sites to revegetate for the demonstrations, identifying the most qualified contractor, helping guide the bioengineering installations, and educating workshop participants onsite in Silverking Campground.	Participating staff: • Emily Munter, Partners for Fish and Wildlife, U.S. Fish and Wildlife Service, Kenai Fish and Wildlife Conservation Office, Soldotna, 907.260.0124, emily_munter@fws.gov
4	**Cook Inletkeeper** CIK helped coordinate this ACWA project, compiled relevant information for reports, and assisted in public education and outreach; Sue Mauger presented at the April 9, 2019, Anchor Point community public information meeting; she also was a hands-on worker during installation of soil bioengineering practices at Silverking Campground on June 7, where she was accompanied by CIK summer intern Rosie Skovron.	Participating staff: • Sue Mauger, Science Director, Homer, 907.235.4068 x24 sue@inletkeeper.org • Rosie Skovron, Intern,
5	**Kachemak Bay National Estuarine Research Reserve** KBNERR helped coordinate this ACWA project, compiled relevant information for reports, and assisted in public education and outreach; Syverine Bentz presented at	Participating staff: • Syverine Bentz, Coastal Training

	the April 9, 2019, Anchor Point community public information meeting, describing salmon research being conducted by KBNERR in the lower Anchor River.	Program Coordinator, Homer, 907.235.1592, syverine@alaska.edu • Coowe Walker, Manager and Lead Watershed Ecologist, Homer, 907.235.1591, cmwalker9@alaska.edu
6	**Kenai Watershed Forum, Stream Watch Program** KWF helped compile relevant information for reports and assisted in public education and outreach; Alice Main presented at the April 9, 2019, Anchor Point community public information meeting, describing KWF's Stream Watch Program.	Participating staff: • Alice Main, Environmental Scientist, Stream Watch Coordinator, Soldotna, 907.260.5449 x1205 alice@kenaiwatershed.org
7	**Kenai Peninsula Borough, Gilman River Center** Tom Dearlove presented during the classroom portion of the June 7, 2019, streambank restoration workshop and demonstration, describing the borough's habitat protection ordinance along anadromous streams.	Participating staff: • Tom Dearlove, Manager, Donald E. Gilman River Center (aka Kenai River Center), Soldotna, 907.714.2462, tdearlove@kpb.us
8	**Moose Habitat, Inc.** Lynn Whitmore presented at both the April 9, 2019, Anchor Point community public information meeting—describing MHI's program of purchasing key salmon habitat lands along the Anchor River—and during the classroom portion of the June 7, 2019, streambank restoration workshop and demonstration, where he emphasized the dynamic nature of the Anchor River—particularly ice dams and ice-dam-caused flooding on the lower Anchor River and the gouging effects of ice chunks on the streambanks.	Participating staff: • Lynn Whitmore, Chair, Anchor Point, lkwhitmore@acsalaska.net
9	**City of Soldotna, Parks and Recreation** Andrew Carmichael made available to HSWCD willows for cuttings in Soldotna Creek Park and had his staff collect the stems cut by HSWCD and volunteers, store them behind the Soldotna Sports Complex, and keep them dormant by covering them with snow and ice; he also donated a large format sign illustrating the bioengineering technique of brush layering; the sign will be installed in Silverking Campground.	Participating staff: • Andrew Carmichael, Parks and Recreation Director, Soldotna, 907.714.1212, acarmichael@soldotna.org
10	**Anchor Point Senior Center** Cindy Burns made available at no cost the Anchor Point Senior Center dining room, which was used for the May 14, 2018, community public information meeting and the classroom portion of the June 7, 2019, streambank restoration workshop and demonstration.	Participating staff: • Cindy Burns, Manager, Anchor Point Senior Center, 907.235.7786, apsci@acsalaska.net
11	**Anchor River Inn** Kyle Akee made available at no cost the dining room at the Anchor River Inn, which was used for the April 9, 2019, community public information meeting.	Participating staff: • Kyle Akee, Owner and Manager, Anchor River Inn, 907.299.8242, kyleakee@yahoo.com
12	**Coal Point Trading Company and Seafood** Nancy Hillstrand provided transportation to and from Soldotna and helped collect and bring to Homer the willow cuttings being stored by Soldotna Parks and Recreation behind the Soldotna Sports Complex; she then stored these cuttings at no cost in a refrigerated unit at Coal Point Seafood until the June 7 workshop and demonstration.	Participating staff: • Nancy Hillstrand, Owner and Manager, Coal Point Trading Company and Seafood, Homer, 907.235.3877, bear@alaska.net

Appendix B – Anchor River articles from Homer Soil and Water Conservation District 2018 and 2019 newsletters

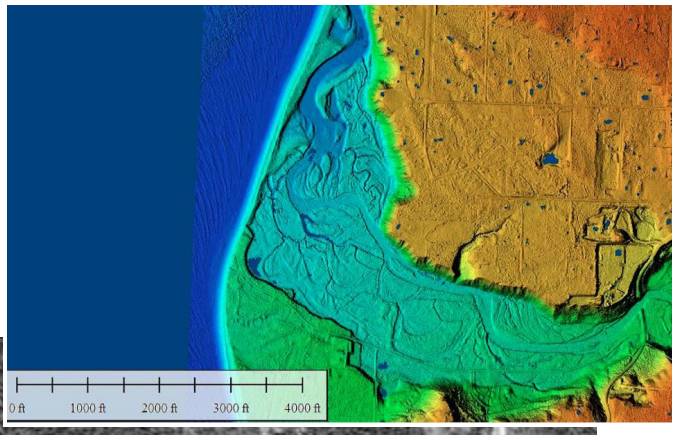
What's up with the Anchor River?

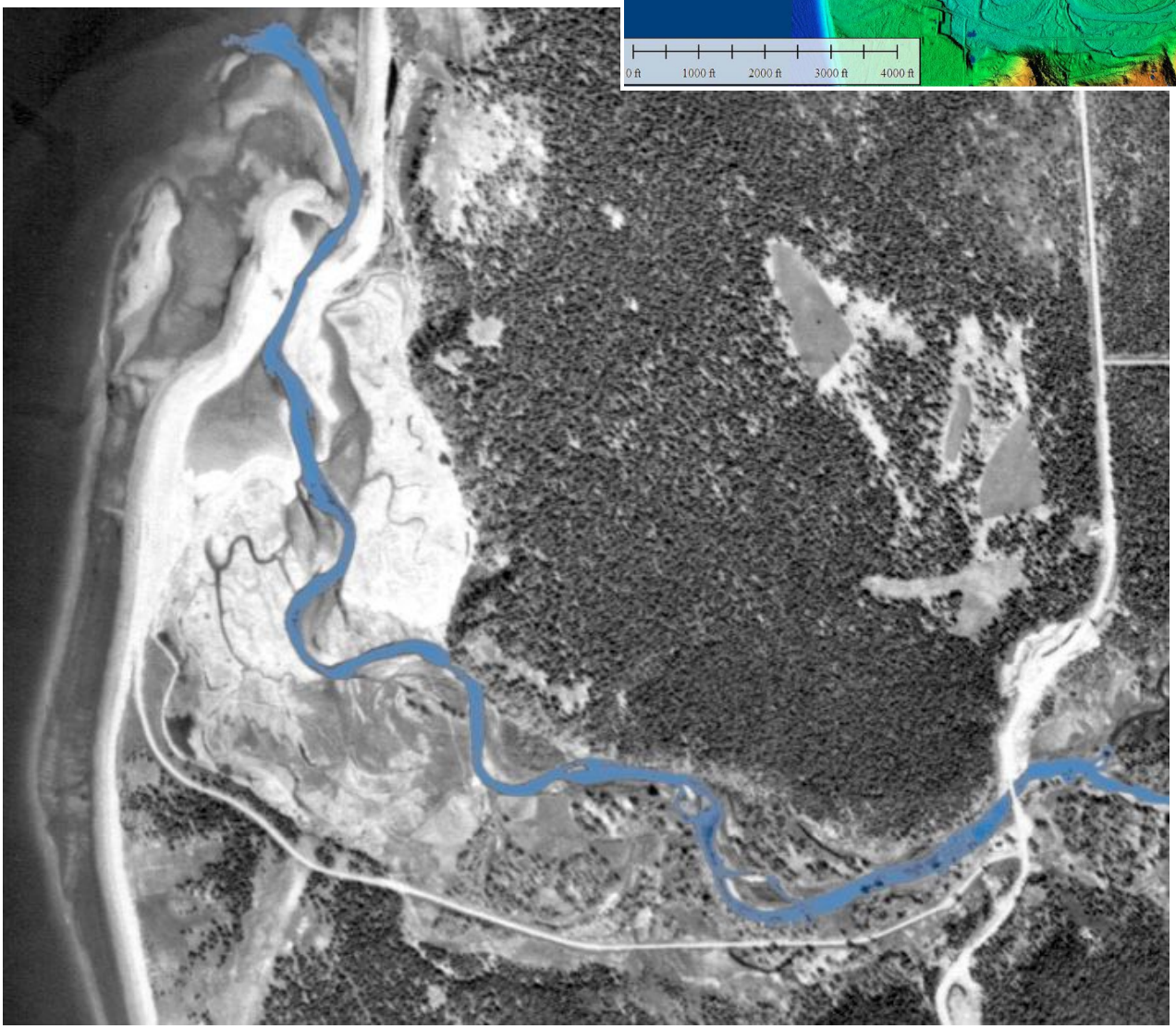
Since April of this year, Homer Soil and Water has been collecting, compiling, and organizing information about the Anchor River below the Old Sterling Highway bridge. For example, they've met with the Anchor Point community and collected a ridiculous number of photos along the river. Why? Well, this stretch of river is within the Anchor River State Recreation Area (SRA), so it gets lots of attention from visitors and locals, sometimes, in fact, too much. The result is that some stretches of streambank that should look like the photo at right instead look like the photo below. This creates problems for juvenile salmon that use the area.

As a result, Homer Soil and Water has been working in partnership with local community members and resource managers—like the Alaska Division of Parks and Outdoor Recreation (which manages the SRA) and the Kachemak Bay National Estuarine Research Reserve and Alaska Department of Fish and Game (which look at ways to protect and improve local salmon habitats)—to identify appropriate ways to help restore damaged streambanks. Funding for Homer Soil and Water's participation in these efforts has come from the Alaska Department of Environmental Conservation, Division of Water's Alaska Clean Water Actions Program.

The result so far has been to compile information in the SRA that helps us understand the conditions of Anchor River streambanks and the processes affecting them—from ice dams to high and low streamflows to campsites on the water's edge. Most recently, Homer Soil and Water has identified dozens of actions—big and small—that could be taken to start helping damaged streambanks revegetate, become more stable and resistant to the dynamic processes occurring along the Anchor River, and—most importantly—provide better places for juvenile salmon to find food, hide from predators, rest out of the river's currents, find backwaters in which to overwinter, and all in all, be able to find what they need to get ready for their epic journey out to sea and then back to spawn.

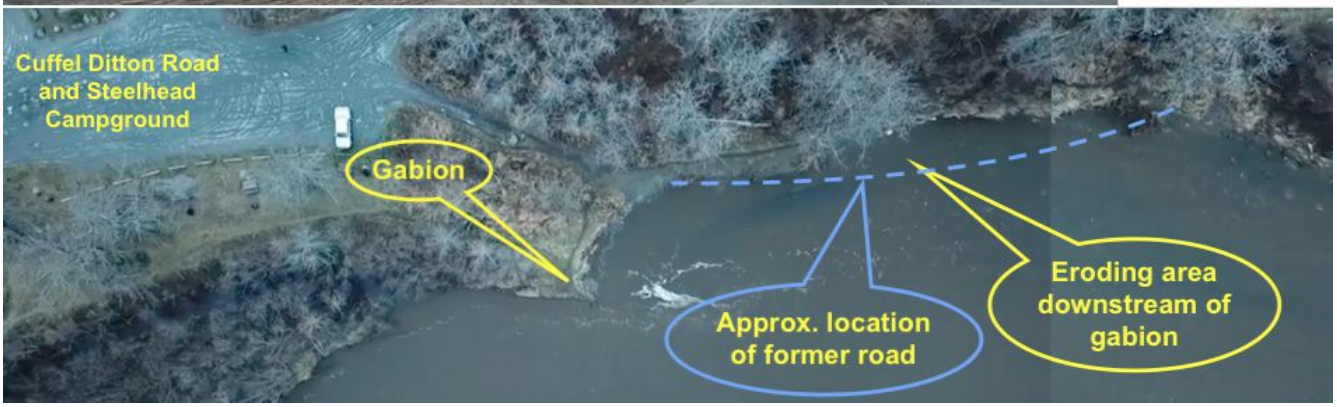
For more information, check the “Anchor River Updates” Facebook page where various steps along this process are shared with anyone who's interested. And just because it's fascinating to take a look back into the past as we work towards preparing for the future, here's an image of what the lower Anchor River looked like in 1951 (NRCS photograph) and a dramatic view of the contours of the floodplain that the lower Anchor River creates (thank you, Ed Berg)..





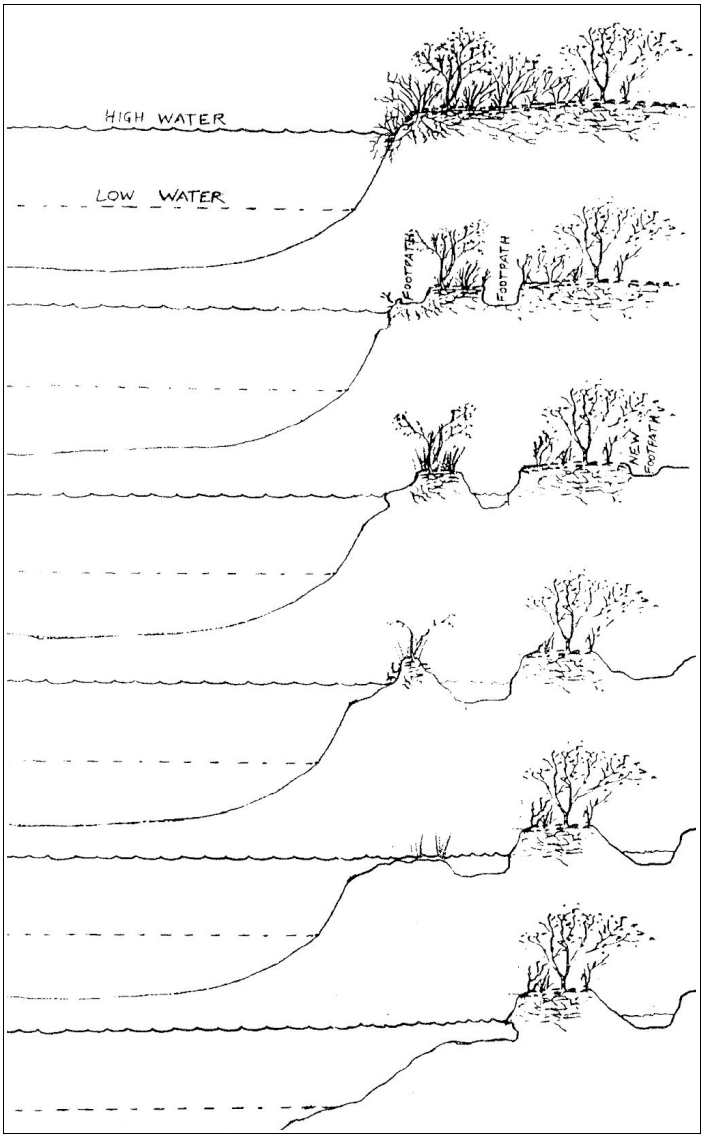
Anchor River slated for streambank revegetation demonstration

Over the last year, Homer Soil and Water has tracked erosion of Anchor River streambanks below the Old Sterling Highway Bridge. The goal is to understand river processes and identify ways to slow erosion and improve habitat for juvenile salmon. The area of most interest is known as "the Picnic Hole," which is accessed from Cuffel Ditton Road. Erosion there is caused by a back eddy downstream of a gabion installed in 1978[2] and by foot traffic along the top and down the face of the bank. At right is a photo of the Picnic Hole area from 2002, and below are photos from 2018. You can see how much the bank has eroded in 16 years.



2 Homer Soil and Water has since been told the gabions were originally installed in 1984. An ADF&G/USFWS biologist familiar with the river provided the following comment: The gabions were installed by State Parks to protect the road loop, so people coming into the [Steelhead] campground could turnaround. (There may have been gabions placed earlier than the current ones but I don't remember them.) When they were installed in 2001 (I think), I spoke with someone from State Parks. My concern was that the downstream extent of the gabions was designed for failure... [T]he downstream end was not properly tied into the river bank, and the entire installation would be subject to failure. I suggested the gabions be extended downstream another 40 feet... I think the gabions were funded with federal money from USFWS under an ADF&G program. The gabions failed during the fall floods in 2002 (https://pubs.usgs.gov/fs/2004/3023/) just as I predicted." (Phil Brna, personal communication).

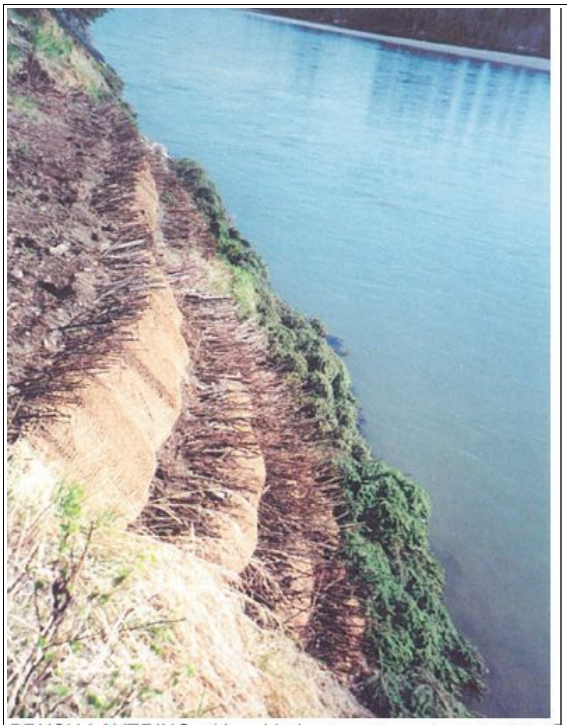
The drawing and photo below show how streambanks recede in response to foot traffic. Devegetated and compacted footpaths are more vulnerable to erosion. Erosion along footpaths gradually "unzips" sections of streambank, which then collapse into the river. Receding streambanks eliminate salmon habitat and cause stream channels to become wider, which in turn makes them shallower. Shallower water warms faster, and warming temperatures in the Anchor River cause stress on salmon—particularly juveniles.



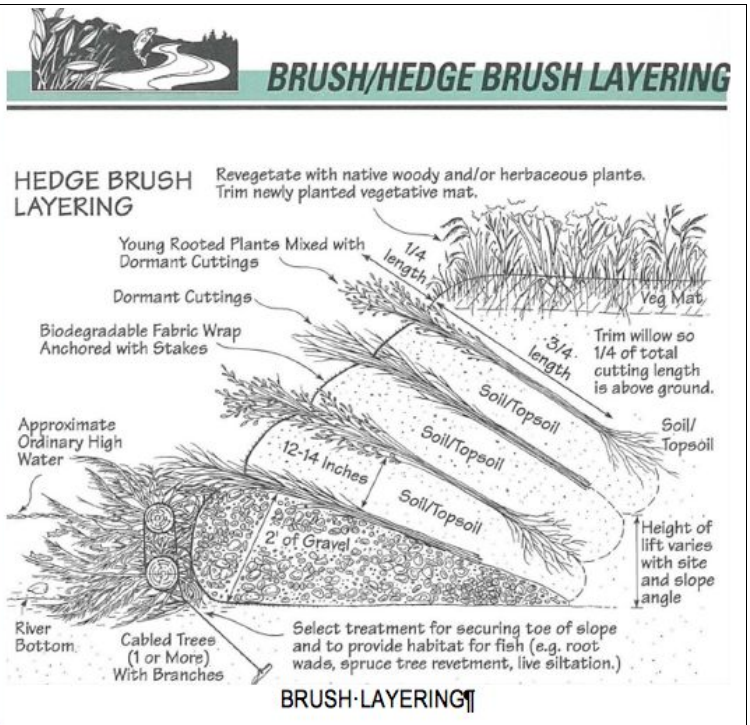
Drawing at left: How streambanks erode along footpaths, causing the stream to become wider and shallower. Photo below: Streambanks eroding along footpaths in the Picnic Hole area of the Anchor River.

The Picnic Hole area is a challenging situation for streambank stabilization. This summer, HSWCD will try out bank stabilizing techniques in two less

challenging sites in Silverking Campground. These will show how well soil bioengineering plantings—common along the Kenai River—might work on the Anchor. The pictures below show "brush layering," one of the techniques to be tried. Soil "lifts" wrapped in biotextile replace eroded bank, and willow cuttings are sandwiched between them to provide streamside vegetation. Spruce tree revetments are used to protect the toe of the healing streambank. As the photo below left shows, brush layering can be used to repair and stabilize even relatively tall and steep eroding streambanks.



BRUSH·LAYERING·with·cabled·spruce·trees·to·protect·toe¶



BRUSH·LAYERING¶

The public is invited to learn more about these techniques and help with installation in a free 1-day workshop scheduled June 7 in Anchor Point. For more information, contact Homer Soil and Water. In addition, Homer Soil and Water maintains a Facebook page called "Anchor River Updates" (www.facebook.com/groups/181853742641179/). HSWCD and its partners—like ADF&G, Alaska State Parks, Kenai Watershed Forum, Kachemak Bay National Estuarine Research Reserve, and Cook Inletkeeper—use Anchor River Updates to post information about their activities on the river. Information about Anchor River activities planned for this summer was presented by these and other organizations at a public community meeting in Anchor Point on April 9. Find out more on "Anchor River Updates."