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Restoration and Enhancement of Aquatic Habitats in Alaska: Project Inventory, Case Study Selection, and Bibliography

By
Betsy L. Parry, Celia M. Rozen, and Glenn A. Seaman

Technical Report No. 93-8

Alaska Department of Fish and Game
Habitat and Restoration Division

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FROM: Betsy Parry B.P.
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The Alaska Department of Fish and Game received funding through the federal Section 309 Enhancement Grant Program to undertake a two-year study of the restoration and enhancement of aquatic habitats in Alaska. Aquatic habitats, as used in this study, includes wetlands, estuaries, streams, lakes, and coastal marine waters.

The overall objectives of this study are to: 1) identify and evaluate the success of aquatic habitat restoration and enhancement in Alaska; 2) develop guidelines for aquatic habitat restoration and enhancement; 3) formulate "model" enforceable policies for coastal districts; and 4) suggest other improvements to the Alaska Coastal Management Program to ensure effective and efficient restoration and enhancement of aquatic habitats.

The first year of this project was devoted to surveying the extent and success of restoration and enhancement efforts in Alaska to date. The first year report is enclosed. The report is composed of an inventory of aquatic habitat restoration and enhancement projects in Alaska, the selection of projects for further evaluation as case studies, and a bibliography of literature on aquatic habitat restoration and enhancement issues in or relevant to Alaskan situations. We are currently conducting case studies on a representative sample of projects. The remainder of the second year of the project will be devoted to developing guidelines and model coastal district policies.

Thanks to all of you who contributed to this first year report. We hope the resulting product is useful. We have distributed approximately 150 copies already. If you have any questions on the study, please contact myself (267-2341) or Glenn Seaman (267-2331).

Enclosure

cc w/o enclosure: Glenn Seaman, ADF&G

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ACKNOWLEDGEMENTS

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A few other individuals assisted in the production of this technical report. Within the Habitat and Restoration Division of the Alaska Department of Fish and Game (ADF&G), Kathrin Sundet provided expertise in formatting reports from R:BASE, Frances Inoue produced the maps, and Mark Fink assisted in formatting the index to the database reports and other sections. Other graphics and general clerical work were supplied by Jamie Simmons, Division of Commercial Fish Management and Rehabilitation, ADF&G.

This study was financed in part by the Alaska Coastal Management Program (ACMP) which is funded by the State of Alaska and the Office of Oceans and Coastal Resource Management, National Oceanic and Atmospheric Administration, U.S. Department of Commerce. Specific federal funding for this project was disbursed to the ACMP through the Section 309 Enhancement Grant Program. ACMP funds are administered by the Alaska Division of Governmental Coordination, Office of Management and Budget.

Chapter 1

Introduction

CHAPTER 1: INTRODUCTION

The Habitat and Restoration Division of the Alaska Department of Fish and Game (ADF&G) received federal funding to undertake an evaluation of aquatic habitat restoration and enhancement efforts in Alaska. This funding was provided by the Section 309 Enhancement Grant Program under the Coastal Zone Management Act (CZMA). Wetlands protection, restoration, and enhancement is listed as a national objective in Section 309, and as a priority in Alaska's Section 309 strategy. Impacts to coastal habitats are a key issue in Alaska because the state's communities are centered along the rivers and coastline where few upland alternatives exist for development. Wetlands in these areas serve important functions such as flood control, water purification, and habitat for fish and waterfowl.

Restoration and enhancement options are considered during the review of proposed developments in wetlands as part of the requirements of local coastal management plans, the National Environmental Policy Act, and other state or federal permits. However, little information has been available on the extent and success of such efforts undertaken to date in Alaska. The state felt that there was a need to evaluate restoration and enhancement projects in Alaska in order to develop guidelines and enforceable policies that could be applied by local coastal districts, agencies, and permit applicants. This Section 309 grant was awarded to ADF&G to address these issues.

The project's scope includes all aquatic habitats in Alaska, including wetlands, estuaries, streams, lakes, wet tundra and coastal marine waters. The overall project objectives are to: 1) identify and evaluate the success of restoration and enhancement in aquatic habitats in Alaska; 2) develop guidelines for aquatic habitat restoration and enhancement projects in Alaska; and 3) formulate "model" enforceable policies for coastal districts within the state; or 4) suggest other improvements to Alaska's coastal management program to assure effective and efficient restoration and enhancement requirements.

The first year of this project was devoted to surveying the extent and success of restoration and enhancement efforts undertaken in Alaska. The first grant products (contained in this report) include: an inventory of aquatic habitat restoration and enhancement projects in Alaska, selection of projects which will be developed as case histories during the second year, and a bibliography of pertinent literature.

Chapter 2 of this report presents the inventory of Alaskan aquatic habitat restoration and enhancement projects. This inventory was compiled by requesting information and/or contact referrals from a network of government agencies (local, state, and federal), private companies, consultants, and established interest groups. An effort was made to document the "failures" as well as the "successes" in aquatic habitat restoration, so as to retain the knowledge gained from any attempts and therefore prevent others from repeating the same mistakes. The inventory was compiled on an R:BASE database, and presently contains information on 172 Alaskan restoration or enhancement projects. Inventory methods and results are detailed in Chapter 2. It is anticipated that this compilation of the restoration and enhancement techniques that have been

utilized in the state, and their relative outcomes, will prove a valuable reference for land use managers, local planners, private industry, and regulatory agency staff.

Chapter 3 discusses the process of selecting several Alaskan restoration and enhancement projects to be developed as case histories during the second year of the project.

The project bibliography (Chapter 4) is composed of books, journal articles, conference papers, and reports that address restoration and enhancement efforts within Alaska. Certain publications from outside the state that appeared to pertain to the 309 project issues, such as identifying criteria to evaluate the effectiveness of aquatic habitat projects, conducting case studies, etc., were also included in the bibliography, though clearly distinguished from the Alaskan citations. This bibliography was produced using ProCite Software.

This grant project has benefited greatly from the participation of state and federal agencies, local governments, and organizations having knowledge of aquatic habitat enhancement or restoration efforts. An interagency advisory group was formed which includes representatives from the Alaska Department of Fish and Game (ADF&G), National Marine Fisheries Service (NMFS), U.S. Forest Service (USFS), Army Corps of Engineers (ACOE), University of Alaska, U.S. Fish and Wildlife Service (USFWS), U.S. Soil Conservation Service (SCS), and the Alaska Plant Materials Center. Group members provided guidance on several aspects of the project, such as the manner in which projects are documented on the database, selection of case study projects, and identification of evaluation criteria. Members also provided comments on draft products.

The second year of the grant project will be devoted to conducting the case studies and developing recommendations and model coastal district policies. Guidelines will be drafted for specific types of aquatic habitat restoration and enhancement projects that have proven successful. The project will also attempt to develop standard permit approvals for certain routine restoration and enhancement activities within the coastal zone. These recommendations and proposals will be reviewed first by the project's interagency advisory group and later by the public. At Alaska's annual coastal district conference in Juneau (April, 1994), a workshop will be held to present the project results and discuss opportunities for implementing the guidelines and amending coastal district plans based on project recommendations.

Chapter 2

Project Inventory

CHAPTER 2. PROJECT INVENTORY

A. METHODS

From initial correspondence to final product, the inventory of aquatic habitat restoration and enhancement projects in Alaska was conducted in approximately 10 months. During this period, numerous contacts, interviews, computer decisions, and data revisions were made. Although any assessment made at a single point in time has the misfortune of becoming immediately out-of-date (e.g., the restoration and enhancement projects to be constructed in summer 1993 are not documented in this inventory), the resulting inventory represents a large step forward in communicating possibilities for feasible restoration and enhancement methods in the state.

Locating Information Sources

In the absence of written references or information networks on this topic in Alaska, the first step in developing the project inventory was to disseminate inquiries to a variety of potential information sources within the state. Project information and/or contact referrals were requested from local, state, and federal agencies, private companies, consultants, and relevant interest groups across Alaska. These inquiries yielded numerous suggestions for the project inventory, and an expanding network of contact people was established. Restoration and enhancement projects suggested for the inventory were compiled on a chart by geographic region to organize further research. To obtain more detailed information for the database, those individuals with the most knowledge of each particular project were systematically contacted and interviewed either over the phone or in person. When available, follow-up project reports were also used as primary information sources (and added to the project bibliography). This method was slow and labor-intensive, but appeared to be the only way to obtain an accurate representation of the breadth of aquatic habitat restoration and enhancement work conducted in the state. Detailed information on the methods, objectives, and effectiveness of past restoration and enhancement efforts were then catalogued onto the database from the information gathered in office files, reports, and personal interviews.

Defining the Scope of the Inventory

Parameters were established to delineate which types of aquatic habitat work would and would not be included in the database:

- All projects must have been conducted within the state of Alaska.
- Projects had to involve active manipulation to enhance or restore aquatic habitat. For example, studies that monitored existing conditions in aquatic habitats or evaluated the impacts of development were not included.

- Projects that were not primarily concerned with improving habitat, such as the simple addition of fish stock (often termed "stock enhancement"), were not included.

- Cases in which aquatic habitat was greatly enhanced as a byproduct of other landscape manipulation rather than by design (e.g., railroad construction resulting in the creation of Potter Marsh in Anchorage) were included where appropriate. It was felt that much could be learned from these examples.

- Because projected methods and timetables often change during the preliminary planning stage, those projects that had not begun implementation by the time of research (winter 1992/93) were given less attention in database documentation.

Due to limited research time, projects were also prioritized for database documentation based on whether adequate information was available, and whether they provided a good representation of the breadth of restoration activities that have been undertaken throughout the state. Numerous similar projects conducted at the same point in time were sometimes grouped into a single entry in the database, and detailed in the narrative section of the entry.

The resulting inventory is substantial, but less than exhaustive. Subsampling was inevitable. Research was limited by the responsiveness of the individuals contacted, staff turnovers since the work was done, and time. For example, fish stream habitat projects (particularly in Southeast Alaska), proved to be too numerous to document in entirety. We were able to include only those projects for which adequate information was received.

Establishing the Database Fields

Deciding which facts about the restoration or enhancement projects should be recorded onto the database, and the manner in which they would be recorded, was based both on a U.S. Fish and Wildlife Service example of wetland project categories (Schneller-McDonald et al. 1990), and through consultation with the Alaskan interagency advisory group for this project. The resulting database fields (i.e., individual facts) and standardized answer categories are represented in full in Appendix A. In all, 60 possible bits of information were recorded for each project. To better illustrate the database contents, an example of a complete data record for an actual project is displayed in Appendix B. In sum, the recorded information included project name, brief statement of project type, year, lead organization, location, habitat types, objectives, implementation actions, amount of response or follow-through, information sources (including contact people), and additional project description (text). In the interest of space and ease of use, the inventory reports in this document only display selected facts about each project (although the full data record in Appendix B illustrates the amount of potential information available for each project in the database). The interagency advisory group assisted in evaluating which facts were most important to display in the accompanying database reports.

The majority of the specific computer codes for field names, abbreviations for category choices, etc., are explained in the data field descriptions (Appendices A and C), although additional information will be available for those ordering the database itself.

B. RESULTS/DISCUSSION

The inventory of aquatic habitat restoration and enhancement projects in Alaska was compiled using R:BASE 4.0 software. Our project inventory is presented in two formats. Section D displays the projects in a summary table, sorted into three geographic regions of the state: Southeast Alaska, Southcentral/Southwest, and Northern/Interior (see Figure 1). Column headings selected from the database for the summary table include: project name, identification code (for database reference), short description, lead organization, year work began, current status, nearest town, project size, target species and habitat use (where appropriate), actions performed, habitat type being restored/enhanced, and the assessment of success. Section E contains additional text information for each project, such as further project description, contact people, written references (if any) for the project, and other sources of information. Both report formats are sorted alphabetically by project name within the three geographic regions of the state. Further explanation is found in Section C, "How to Use These Database Reports."

The R:BASE database currently contains 172 projects. These projects encompass efforts to rehabilitate gravel pits into fish habitat, adding nutrients and cover to aquatic habitats, installing various fish passage structures on streams, excavating fish rearing and overwintering areas, reconnecting side waterways, revegetating in wetlands (including moist tundra) and aquatic littoral zones, facilitating recovery after fill removal in wetlands, adding nesting structures for waterfowl, and attempts to re-establish a functioning riverine system after placer mining. Over 30 additional projects were identified but were not entered into the database inventory due to one of the following reasons: 1) no response to inquiries; 2) brought to our attention too late in the process to properly research; 3) not exactly within the project scope; 4) work had not yet begun by winter 1992/93; or 5) low priority for the research time available (i.e., a minor project). The information known about these remaining projects is listed in Appendix D to provide additional assistance to readers.

The following discussion summarizes the record information in the database. The reader should keep in mind that the information collected is biased because it is not all-inclusive. Although all the database response categories and abbreviations are presented in Appendix A, those pertinent to the following discussion and reports are presented in Table 1 for quick reference.

Lead Organization

One lead organization was listed for each restoration or enhancement project in the inventory. The most common lead organizations in Alaska were: 27%--the U.S. Forest Service, which were usually fish habitat enhancement projects; 20%--various private companies or organizations, including those motivated by permit requirements or violations as well as the private regional aquaculture associations; 13%--the Alaska Dept. of Fish and Game; and 12%--the Alaska Dept. of Transportation and Public Facilities. The remainder were an assortment of other federal government agencies, a few research projects led by University staff or the Alaska Plant Materials Center, and a handful led by local government bodies (e.g., the Municipality of Anchorage or City of Seward). In all, 39% of the projects were led by federal agencies (27% of which was the USFS alone), 36% were led by Alaska state government affiliates, 20% private, and 5% local governmental bodies.

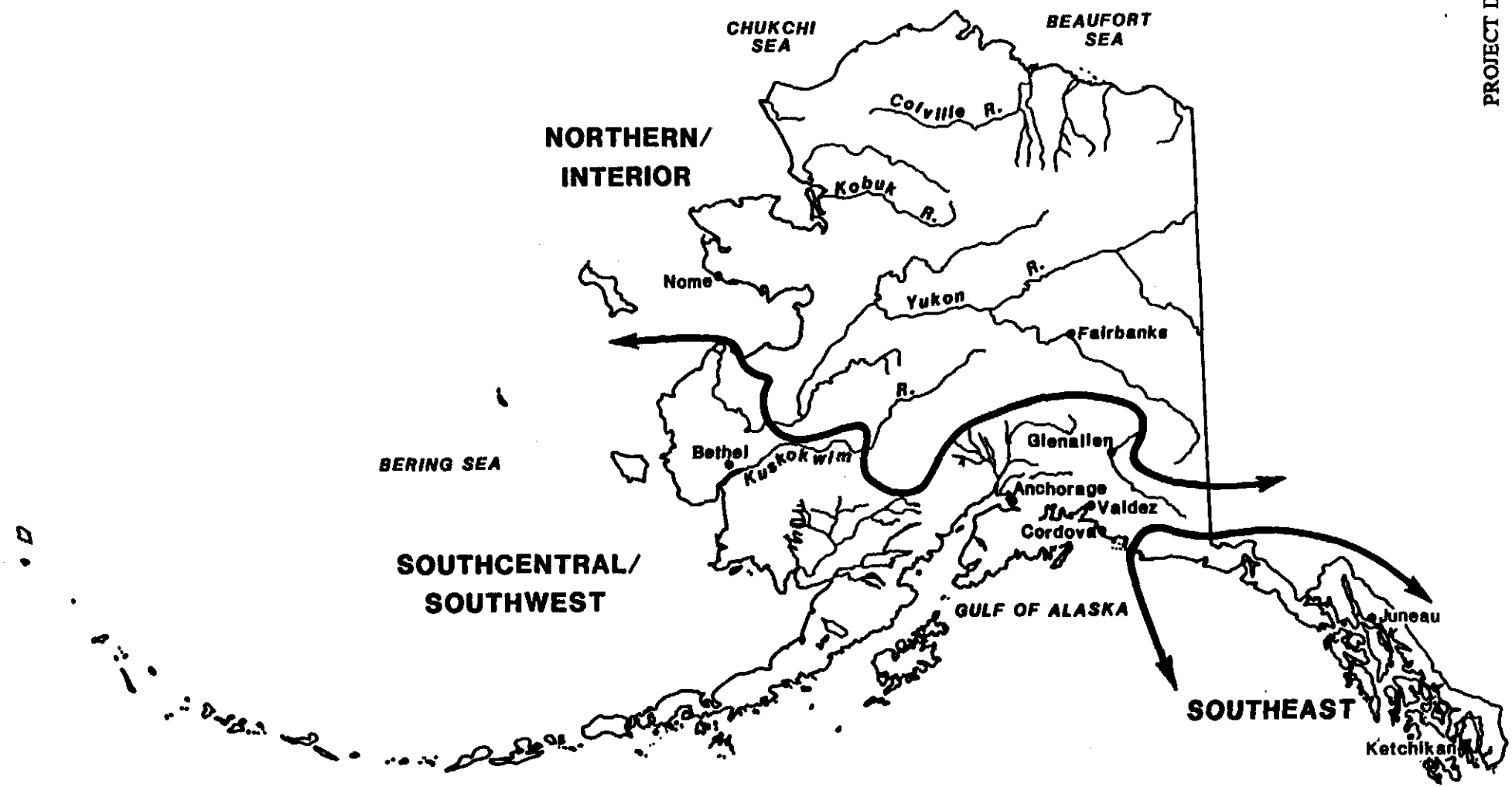


Figure 1. Boundaries of the Three State Regions Used To Sort the Project Inventory Data.

Table 1: Description of Selected Data Fields Used in Reports and Discussion

FIELD NAME (& abbreviation)	FIELD MEANING	POSSIBLE RESPONSES (if standardized)	RESPONSE CODE MEANINGS
Lead Organization (Lead Org.)	Group that served as the lead for the restoration/ enhancement attempt	ACOE USFS BLM ADF&G ADOT/PF AEA DNR-PMC MOA Etc. PRIVATE	U.S. Army Corps of Engineers U.S. Forest Service U.S. Bureau of Land Management Alaska Dept. of Fish and Game Alaska Dept. of Transportation & Public Facilities Alaska Energy Authority Alaska Dept. of Natural Resources-Plant Materials Center Municipality of Anchorage Private Company or organization (named in separate field)
Status (Status)	Current Status of Project	Preliminary Implementation Monitoring Completed w/M Completed w/o M	Preliminary Stage Implementation Stage Monitoring Stage Completed, with some monitoring Completed, no monitoring done
AK Geographic Region (Region)	Used for sorting data into three state regions	SoEast SCenSW NorInt	Southeast Alaska Southcentral/Southwest Northern & Interior
Objectives (Objective)	Category of project objectives. (List up to 4)	HABITAT EROSION HYDROLOGY WATER QUALITY EXPERIMENT INCIDENTAL RECREATION/ HERITAGE HARVEST GENERAL	For birds, fish, inverts, etc. To control erosion or stabilize sediments or shoreline e.g., flood control, water quantity, in-stream flow, groundwater recharge, or stormwater retention Via filtration, sediment trapping, wastewater treatment, or reducing pollutant load from urban or agricultural runoff Work done as part of an experiment If aquatic habitat was created w/o intention or calculation as a consequence of some other action or project, such as construction of a highway Aesthetics, recreation, education, etc. Of commercial fish, shellfish, etc. When specific objectives not clearly identified

Table 1 (continued): Description of Selected Data Fields Used in Reports and Discussion

FIELD NAME (& abbreviation)	FIELD MEANING	POSSIBLE RESPONSES (if standardized)	RESPONSE CODE MEANINGS
Implementation Actions (Action Type)	Type of actions performed at site (list up to 5)	Landform (LFORM)	Modifying topography by earth-moving, e.g., channel construction, breaching or blockage, constructing ponds or nesting sites, grading, etc.
		Spoil (SPOIL)	Special case wherein restoration is attempted using dredged material (diking or filling)
		Seeding (SEED)	Using and disseminating seed sources
		Planting (PLANT)	Introducing planted seedlings, transplants, or cuttings
		Soil Work (SOIL)	Adding soil or peat to site, including surface preparation such as disking
		Stocking (STOCK)	Introducing animals to the site
		Hydrology (HYDRO)	Actively manipulating water levels, such as draining, pumping, stop-log spillways.
		Cutting (CUT)	Cutting, thinning, or mowing vegetation to encourage desired species
		Plant fertilization (PFERT)	For establishment of plants
		Stabilization (STABL)	Using rip rap, wave breaks, or mesh to stabilize stream banks or substrate. Includes containment materials such as concrete revetments, bulkheads, gabions, sod and burlap to stabilize planted areas.
		Contaminants (CONTM)	Removing contaminants as part of restoration, such as following an oil spill
		Models (MODEL)	Using explicit spatial or temporal models for planning, designing, or evaluating projects.
Reference Type (Reference Type)	Type of reference article	Book	Book
		Journal	Journal article
		AgReport	Agency or Company Report
		Dissert	Dissertation
		ConfPro	Conference Proceedings
		NewsLtr	Newsletter
Assessment of Success (Successful?)	Do biologists involved feel that this project was successful at improving aquatic habitat to meet the objectives?	Yes	Yes, for the most part
		No	No, largely a failure
		Partially	Partial Success (<50% effective)
		Too Soon	Too soon to tell
		Inconclus.	Inconclusive Results
		Unknown	Unknown--no follow up

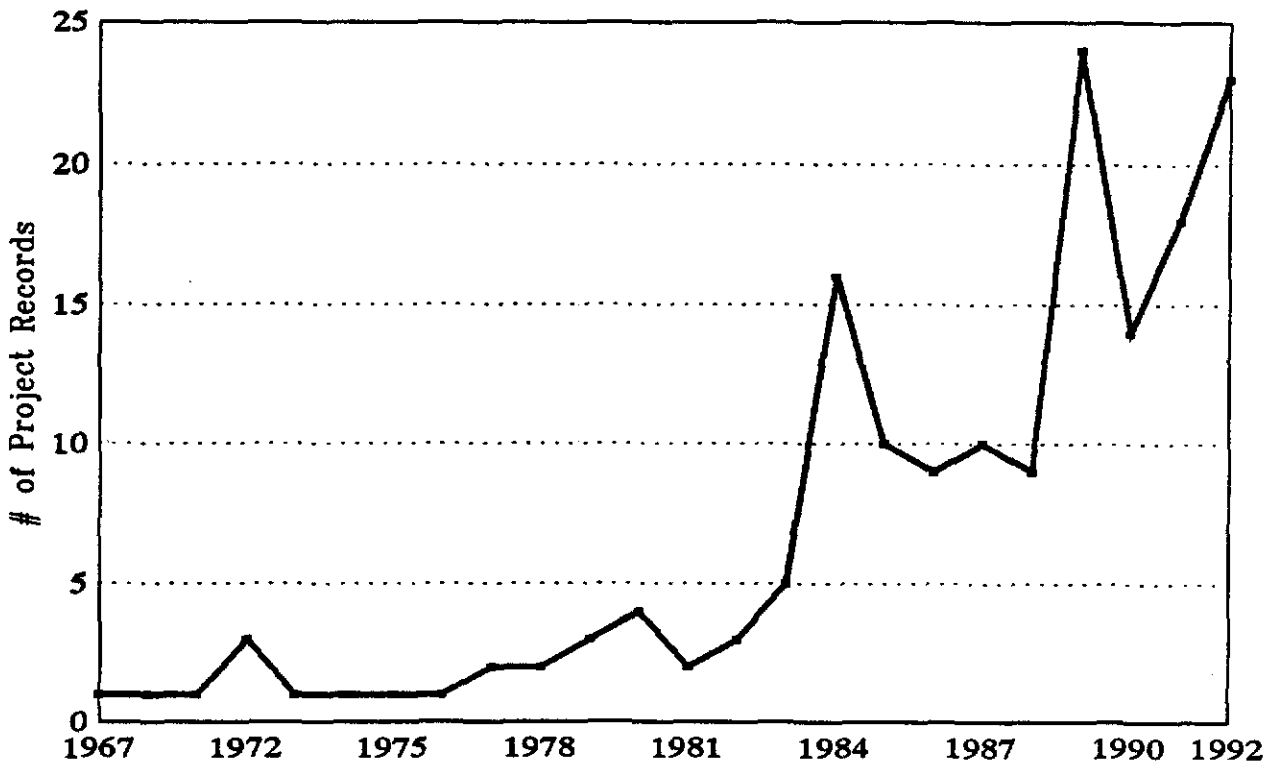
Trends Over Time

Although this database is not all-inclusive, results indicate that work in the field of aquatic habitat restoration and enhancement began to increase in Alaska in the 1980's, and much more activity is evident in the most recent years (1989-92) (Figure 2). These results correspond with trends nationwide.

Geographic Distribution of Records

The project records are divided into three regions of the state in the accompanying reports. Approximately half those recorded were from the most populous region (Southcentral/ Southwest, 48%) with the remainder divided more or less equally between the Northern/Interior (25%) and the Southeastern regions (27%). The areas represented by these projects are more specifically delineated in Figure 3, where the number and percent of total project records is listed within "ecoregion boundaries" of the state (adapted from those proposed by Cowardin et al. 1979 and Bailey 1976). Once again, the most populated areas contain the highest number of reported projects--the Southcentral Forest area (containing Anchorage, Prince William Sound, and the Kenai Peninsula, at 42%), followed by the Southeastern portion of the state (26%). The only region which does not follow this trend is the Arctic Tundra, where the amount of restoration and enhancement projects (12%) reflects work by the oil field industry rather than the amount of population activity.

Figure 2: Years in which Restoration/Enhancement Projects were Begun



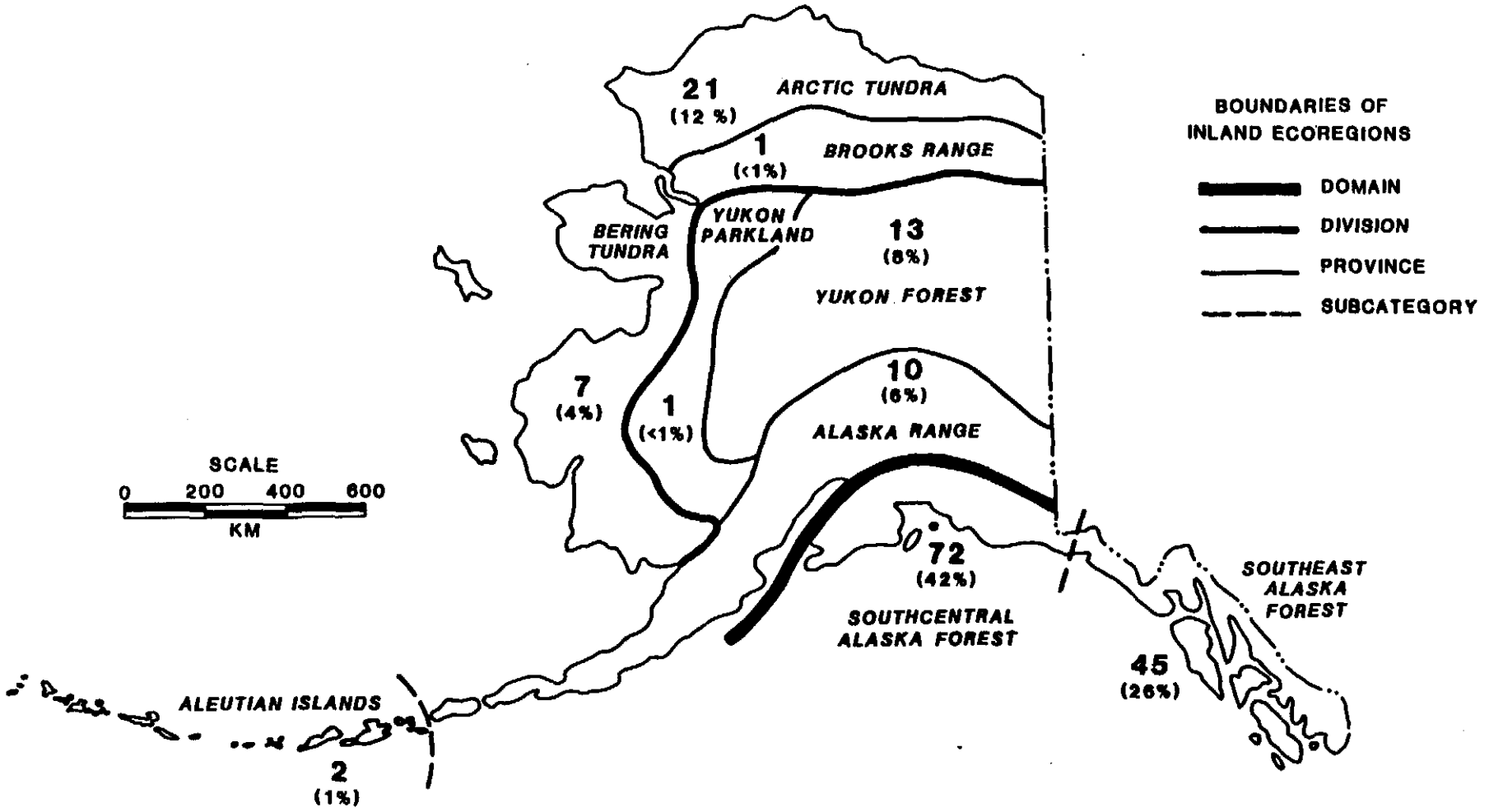


Figure 3. Geographic Distribution of Aquatic Habitat Restoration or Enhancement Projects on Database, Number and Percent of Total Project Records Per Area (Ecoregion Boundaries Adapted from Cowardin et al., 1979)

Type of Aquatic Habitat

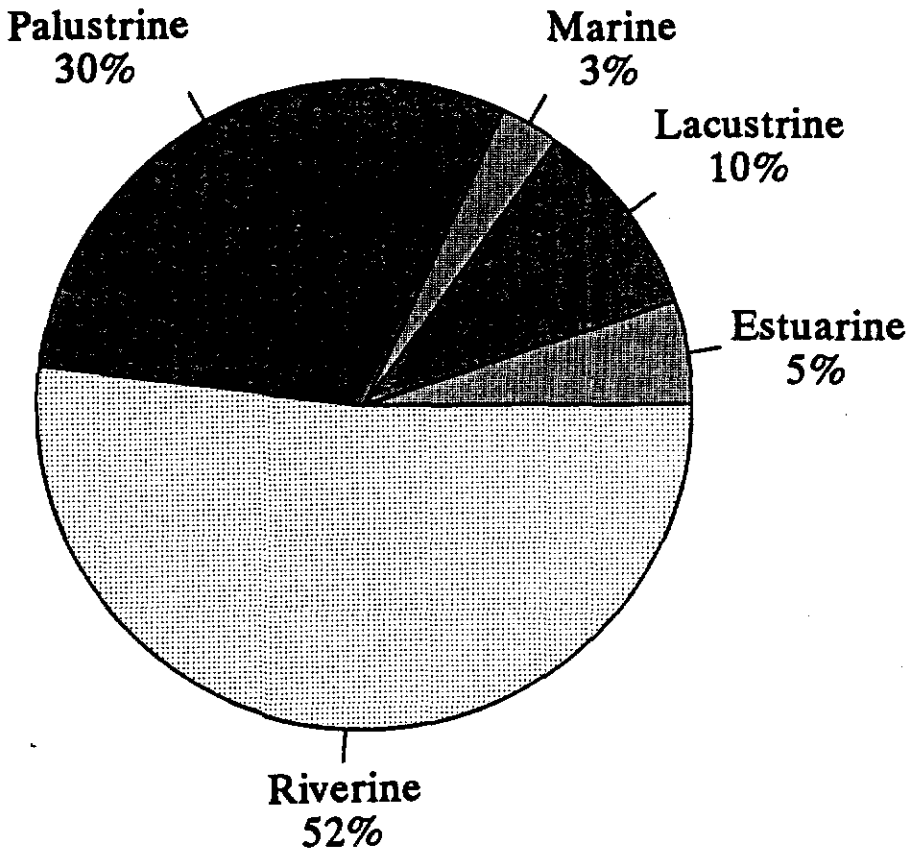
The Alaskan restoration and enhancement database records are presented by type of aquatic habitat in Figure 4, using the classification system of the National Wetland Inventory (Cowardin et al. 1979). These percentages are based on the "primary" habitat type reported for each project.

Results indicate that interest in aquatic habitat in Alaska is centered on fish resources. Work on rivers, creeks and streams (all within the "riverine" system of the classification) was by far the best represented in the database (52%). Palustrine habitats (many of which also serve as rearing areas for fish) received the next highest amount of effort (30%). Marine habitats (3%) were the least reported for restoration and enhancement work in Alaska, composed primarily of restoration experiments in the area impacted by the Exxon Valdex Oil Spill. Many projects also listed a "secondary" habitat type for the work undertaken. These projects were listed under both habitat headings in the index to database reports.

Project Objectives

The project objective categories (adapted from Schneller-McDonald et al. 1990) illustrate the other functions of aquatic habitat which may also be the aim of attempted restoration or

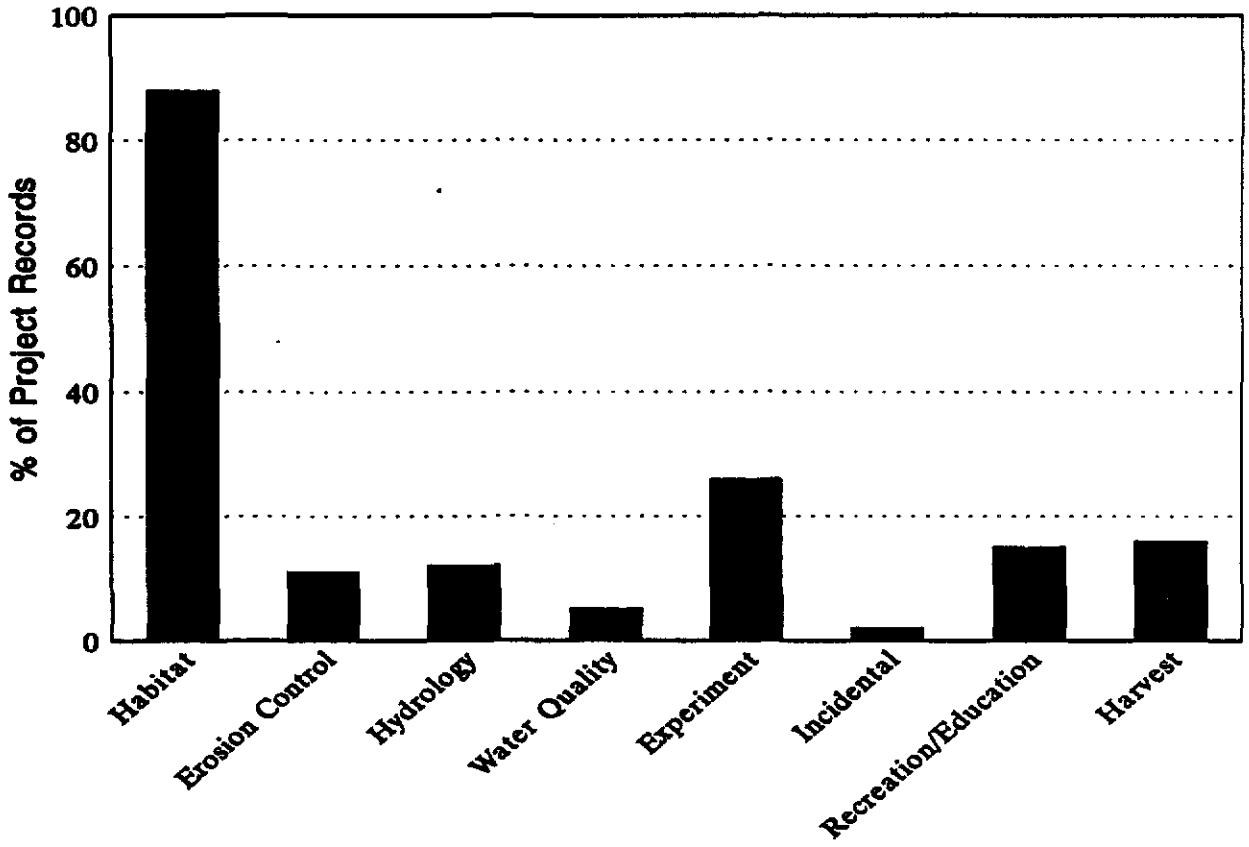
Figure 4: Types of Aquatic Habitat Being Restored or Enhanced (Percent of Project Records)



enhancement (See Figure 5, terms defined in Table 1). Several objectives could be listed per project record. As is not surprising within an inventory of "aquatic habitat" projects, the "habitat" objective appeared most consistently within the stated objectives (88% of the time); it would seem that most every project documented within this particular inventory should be undertaken with habitat concerns in mind. The next most common objective stated was "experiment" (i.e. experimental attempts at habitat restoration and enhancement, 26%), which is also reasonable considering that efforts at restoration and enhancement are a new field in general, and very new in Alaska. In fact, many of the projects in the inventory could be considered experiments, whether or not they were identified as such by those involved. Harvest objectives (16%, usually for commercial or recreational fishing) was the next most frequently stated objective, which is much higher than nationwide percentages, followed by recreation/educational use (15%), hydrological objectives (12%), and erosion control (11%). Only nine projects (5%) mentioned improving water quality as an objective for undertaking the aquatic habitat work.

In at least four instances documented in Alaska, unrelated construction actions or projects resulted in the formation of an area of productive aquatic habitat (those defined as "incidental" in the database objectives). Potter Marsh in Anchorage is a good example; it is a productive freshwater marsh formed when water was impounded behind a railroad dike constructed in 1916. These "incidental" examples serve to demonstrate the possible results over time as a product of active restoration or enhancement efforts.

Figure 5: Objectives of Restoration/Enhancement Projects (Percent of Project Records)

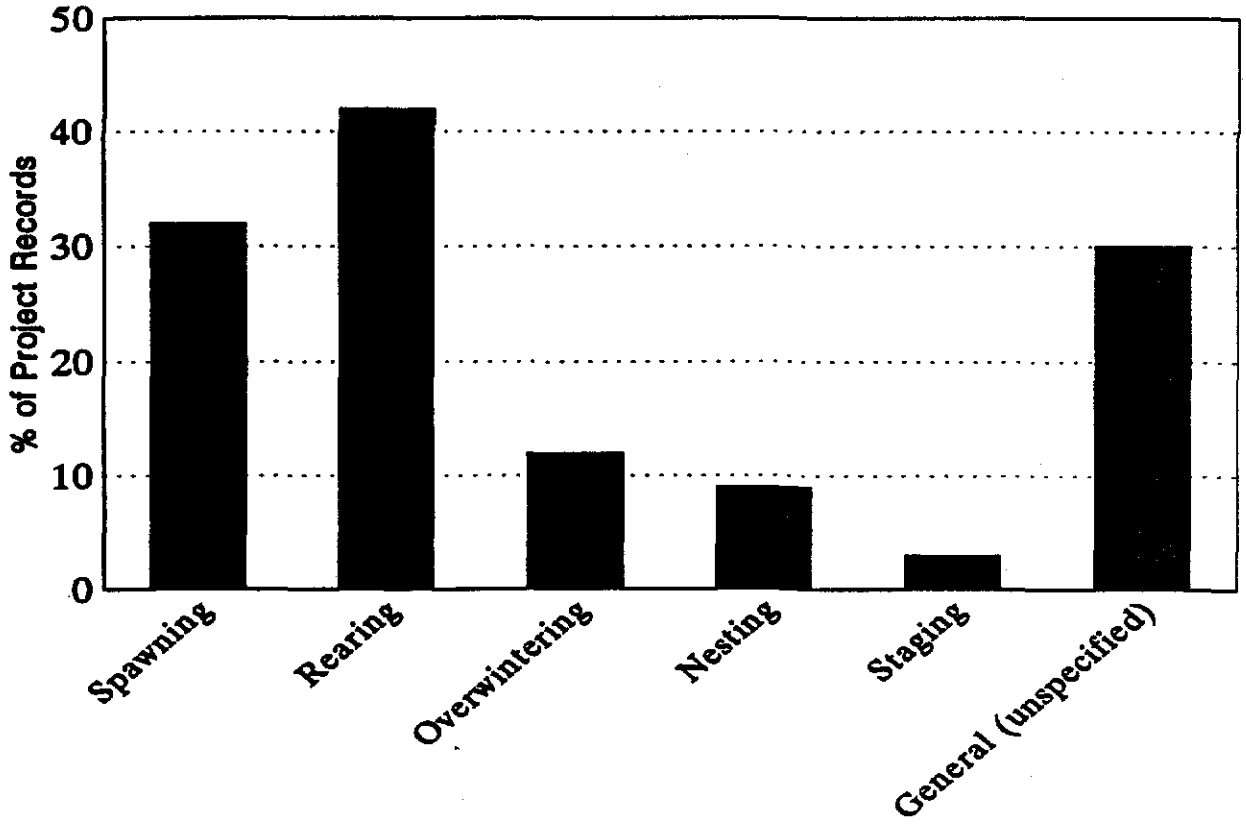


Target Animal Group and Habitat Use

The targeted animal group for a restoration or enhancement project was most often listed as fish (59%), followed by birds (16%) and invertebrates (4%). In 20% of the projects recorded, the targeted group was listed as "General". Many smaller wetland mitigation projects, as well as tundra projects on the north slope, fall into the "general" category.

When broken down into the intended uses of the restored or enhanced habitat, the most commonly cited use was rearing and spawning habitats for fish (42% and 32% of project records, respectively), followed by "general" (i.e., not specified uses, 30%), overwintering (12%), and nesting and staging for birds (9% and 3%, respectively, See Figure 6). More than one intended habitat use could be listed per project. A "migrating" category of habitat use (e.g., allowing fish to migrate upstream to spawning grounds) also appears in 9% of the project records in the Summary Table (Section D), but this category was removed from analysis and from the inventory index because it was not applied consistently to all project records. However, even the usage in the remaining categories could be confusing because in some cases where the overall intention was to open up additional spawning or rearing areas (via a fish ladder, for instance), those were sometimes listed as the target habitat use even though no work was conducted in intended "spawning" or "rearing" habitat areas. The true use at the exact project site in that example would have been "migration".

Figure 6: Target Habitat Use of Restoration/Enhancement Projects (Percent of Project Records)



Motivation for Restoration/Enhancement Work

The motivation for improving aquatic habitat was accessed through a series of three "Yes or No" questions, which were not mutually exclusive. Project motivation was categorized as either: mitigation for another action involving habitat loss (e.g., a wetland fill for development), restoration for damage caused by previous actions or a natural disaster (e.g., a washed-out culvert, or placer mining), or enhancement of the habitat potential of a relatively undisturbed area (e.g., a fish ladder). In some cases, it was difficult to determine the difference, such as actions taken to correct violations of a development permit (e.g., removing fill for an unauthorized access road and restoring the area). In those cases, both the mitigation and restoration categories were recorded affirmatively. Most often habitat improvement actions in Alaska are undertaken to restore habitat previously damaged (in 51% of the records). Opportunities to enhance the habitat potential of an undisturbed area (46% of records) is often the motivator for fish habitat improvement projects such as those conducted by the U.S. Forest Service, ADF&G, and the commercial aquaculture associations. Contrary to statistics in other parts of the nation, in Alaska mitigation measures for developments account for only 35% of the total number of aquatic habitat restoration or enhancement projects.

Action Type

Many records contained multiple listing of implementation actions (see definitions in Table 1). These actions are listed per project in the Summary Table, Section D. The most frequently employed action in Alaskan restoration and enhancement was landforming; only 11% of project records did not list this action. Revegetation was the next most common activity: 30% of projects involved seeding in vegetation, and 29% involved introducing live transplants or cuttings. According to the project database, the next most frequently employed actions were manipulating water levels ("hydrology", 23%) and installing stabilization materials (20%). Thirteen percent involved "stocking," that is, introducing animals to the site, usually in the form of fish.

Improving fish habitat involves a specific set of commonly employed methods (e.g., installing fish ladders, large woody debris, etc.); these more specific actions were recorded in a separate field in the database, and appear as subheadings to "Fish Habitat Improvement Actions" in the index to the project inventory.

Amount of Evaluation

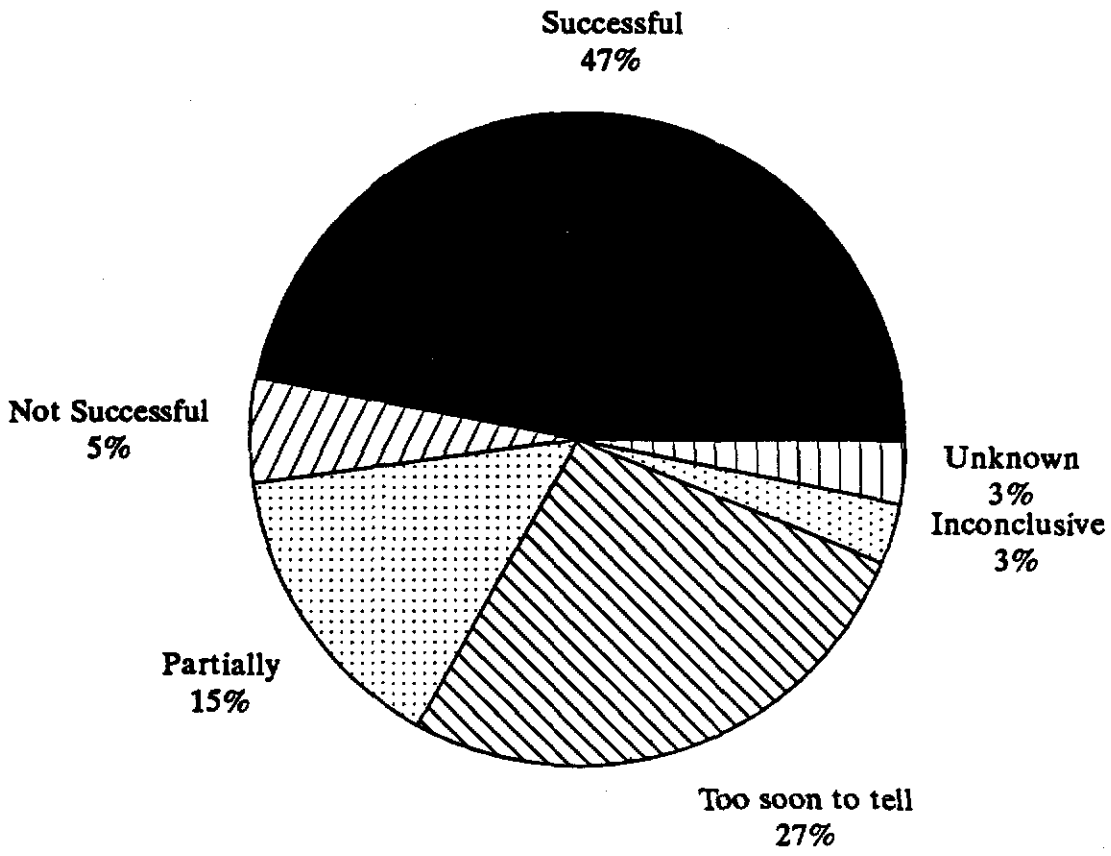
According to the database, 60% of projects included some type of quantitative follow-up measurement. The type of measurement ranged from subsequent presence/absence determinations, to counts of adult fish returns, to detailed water quality measurements (rarely). Most of the time, the quality of habitat features was subsequently inspected (69%) and the amount of animal inhabitation or use of the site was observed (75%). Seldom was any economic evaluation of the effort conducted (15%), and this was usually in conjunction with those projects that listed commercial or recreational fish harvest as one of the objectives.

Written follow-up reports were available for only a few projects. Although 38% of records state that some form of report was written, these often were in the form of file documents that are not widely available, or reports written during early stages of the project that were never updated to show longer term results. This lack of reliable written information is one reason why interviews were the most fruitful source of information for the aquatic habitat inventory database. The best documented projects (in report form) consisted of research conducted by University staff, the Alaska Plant Materials Center, or consultants for the oil companies on Alaska's north slope. ADF&G's FRED division and the U.S. Forest Service often give brief project overviews on an annual report basis, but it can be difficult to ascertain from these materials the project objectives, evolution and lessons learned over time.

Assessment of Success

Almost half of the database projects stated that they were "successful" (defined as over 50% effective) at improving aquatic habitat to meet the objectives (Figure 7). Not surprisingly, many of these are the simplest actions, such as reseeding native plants on disturbed tundra, or modifying a stream barrier to allow fish to pass. The more complicated tasks, such as creating new spawning habitat, have had less reliable results. These attempts (e.g., spawning channel projects) illustrate the fact that although a project may appear successful in the first few seasons

Figure 7: Assessment of Success at Meeting Restoration/Enhancement Objectives (Percent of Project Records)



after implementation, it may not be self-sustaining over time. Many spawning channel projects encounter sedimentation problems after a few years which are difficult to remedy. Since the majority of projects in the database are relatively new (less than 10 or even 5 years old) , it is hard to determine whether those currently reported as "successful" will continue to be over time. As revealed in the project narratives in Section E, continued maintenance is critical when using any kind of artificial structures, but is often neglected, causing the entire investment to fail. Twenty-seven percent of the projects surveyed were so new that the information source (person or report) was not yet able to state whether the primary objectives would be met.

We were equally as interested in documenting the "failures" as well as the "successes" in this inventory, so as to retain the knowledge gained from any attempts. Often the most useful information to pass on to others is learned from a project that "almost worked", where the critical elements for success can be clearly identified.

C. HOW TO USE THESE DATABASE REPORTS

The following reports illustrate the information compiled on the R:BASE inventory of restoration and enhancement projects on aquatic habitats in Alaska. Database records are presented in two formats: a summary table which briefly lists the projects by geographic region (Section D) and project narratives which display additional project description and contact information (Section E). An index to the inventory entries is also included in this report (Section F) to facilitate some usage of the information from this printout alone, though information searches would be much more efficient and successful if conducted on-line using R:BASE software. Anyone using the R:BASE Aquatic Habitat database itself could sort and query the project information innumerable ways to suit given needs.

In order to review the types of projects that have occurred in a given area of the state, refer to the summary table (Section D). Both the summary table and project narratives (Section E) are sorted into three geographic regions of the state (Southeast, Southcentral/Southwest, and Northern/Interior, Figure 1), and then listed alphabetically by project name. When scanning the summary table within the region of interest, the "Nearest Town" column indicates more specific locations. To obtain additional description of a project listed in the summary table, look for the project name under the correct region in the project narratives, Section E.

However, if the goal is to find information on a given type of project or topic statewide, spawning channels for example, it would be best to start with the subject index, under "Spawning channels". The project names and their region are listed under each subject category, which can then be researched by looking for the project name in either the summary table or the project narratives. In this particular case, another avenue to the same information might be to scan the summary table for entries containing the word "Spawning" under the "Target Habitat Use" column in that table.

In some cases the number of entries under a given index subject were so numerous that instead of listing them in the index, the reader is referred to the relevent column heading in the summary table. For example, "rearing" was listed as the target habitat use in 72 projects records. Rather than individually looking up all 72 projects from the index, it would be best to scan for entries listing "Rearing" under the "Target Habitat Use" column within the few pages of summary table, because the table presents much more information at a glance to help the reader quickly identify those projects of real interest.

All category headings in the inventory index should be interpreted within the context of the overall topic of aquatic habitat restoration and enhancement projects. The subject index headings for the project inventory are presented on the first page of the index, to direct the reader to the most appropriate heading for a given area of interest.

It is anticipated that this compilation of the aquatic habitat restoration and enhancement techniques that have been attempted in the state, and their relative outcomes, will prove a valuable reference for Alaskan land use managers, local planners, private industry, and regulatory agency staff.

Disk copies of the R:BASE 4.0 database will be available by request from the Habitat and Restoration Division of the Alaska Department of Fish and Game, 333 Raspberry Road, Anchorage, AK 99518, Phone: 267-2283.

Summary Table

SECTION D: SUMMARY TABLE
AQUATIC HABITAT RESTORATION AND ENHANCEMENT PROJECT INVENTORY
JULY 1993 DATABASE REPORT

(sorted by Region and alphabetically by Project Name; See Section E for additional project information)

Region: SOUTHEAST ALASKA

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
24 Mile Spawning Channel P0105	NSRAA groundwater-fed spawning channel on Chilkat River at Mile 24, Haines Hwy	Private 1982	Completed w/M Haines	1500' long x 20' wide	Chum, coho salmon	Spawning, Rearing	LFORM, STABL	Riverine Partially
ADOT Hoonah Airport Expansion P0009	Port Fredrick 44. Many-faceted mit. package for fill: spawning, rearing, reveg	ADOT/PF 1992	Monitoring Hoonah	in the end, many acres	Anadromous fish	Rearing, Spawning	LFORM, SEED, STABL, PLANT?	Riverine Yes
Bayhead Ck Barrier Modific. P0129	Step pools blasted into 3 coho barriers	USFS 1992	Monitoring Tenakee Springs	Access to 3 stream miles	Coho, Cutthroat, D.Varden	Spawning, Rearing	LFORM	Riverine Too soon
Bennett Creek P0098	Torcana Airport South, Prince of Wales Island. Restore logged stream.	ADF&G 1991	Implementation Klawock	0.9 mile of stream	Coho salmon	Rearing	LFORM, SEED, PFERT, STABL	Riverine Too soon
Big Boulder Creek P0037	Mitigation & Enhancement in association w/ bridge work on Haines Highway	ADOT/PF 1991	Monitoring Haines	50m-300m of stream (diff.work)	Chinook salmon	Spawning, Rearing	LFORM, STOCK	Riverine Too soon
Bryce Creek Coho Rearing Area P0103	Connecting Rearing sloughs in Salmon River Valley	USFS 1989	Monitoring Hyder	23,100 m2	Coho Salmon	Rearing, Overwinter	LFORM, HYDRO	Riverine Too soon
Chilkat River Pond Access P0041	Channels to connect river to potential rearing ponds in the upper Chilkat Valley	ADF&G 1980	Completed w/M Haines	616'of chnls to 103ac. rearng hab	Coho salmon	Rearing	LFORM	Palustrine Yes
Dean Creek Fishway P0118	Alaska Steeppass project by USFS.	USFS 1983	Completed w/M Kake	access to 30 acres upstream	Coho salmon	Spawning, Rearing	LFORM	Riverine Yes
Dog Salmon Creek, Site #1 P0100	Reducing habitat loss resulting from bank erosion and sedimentation	ADF&G 1992	Implementation Craig	125' of stream		General	HYDRO, LFORM, STABL	Riverine Too soon

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHEAST ALASKA (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Dog Salmon Creek, Site #2 P0101	Stabilizing a slide north of Port St. Nicholas	ADF&G 1992	Implementation Craig	80' reach of stream		General	STABL, SEED	Riverine Too soon
Gastineau Channel 302 P0042	Restoration for intertidal gravel extraction, with ACOE enforcement action.	Private 1992	Monitoring Juneau	estimated 1/2 - 3/4 acre	probably waterfowl	General	LFORM	Palustrine Too soon
Glacier Highway Reconstruction P0039	1984 work done in Jordan and Duck Creeks in Juneau. AKA Gastineau Channel 386.	ADOT/PF 1984	Completed w/M Juneau	300-400' of Jordan; 500'of Duck	Coho Salmon	Spawning, Rearing	LFORM, SEED, PLANT, STABL	Riverine Yes
Green's Creek Fish Pass P0055	Fish Pass over barrier falls as mitigation for habitat loss in Tributary.	USFS 1988	Completed w/M Juneau/Hoonah	100 ft of creek	Coho salmon	Rearing, Overwinter	LFORM	Riverine Yes
Haines Airport Mitigation P0018	Chilkat River 6. Created fish rearing ponds and wetlands, monitoring req'd.	ADOT/PF 1990	Monitoring Haines	19 acs (tot. wtlnd, ponds, chnnl)	Coho salmon, trout	Rearing	PLANT, SEED, LFORM, SOIL	Riverine Too soon
Herman Creek P0104	Spawning Channel near Haines	Private 1989	Completed w/M Haines	1500' long x 20' wide	Chum, coho salmon	Spawning, Rearing	LFORM, STABL	Riverine Yes
Indian River Log Dump P0109	Restoring former Log Dump by removing bark debris.	USFWS 1984	Monitoring Tenakee Springs	1500 sq yds	crabs, clams	General	LFORM, CONTM	Estuarine Too soon
Jordan Creek 8 P0049	Enforcement action will ensure restoration/protection of remaining wetland area	Private 1993	Preliminary Juneau	approx. 1/2 acre wetlands	Cohos, Dolly Varden	Rearing	LFORM	Riverine Too soon
Juneau Airport Dike P0047	Nice freshwater marsh complex was created incidentally by new dike in the 1940's	DOD 1942	Completed w/M Juneau	4-5 acres of sloughs			LFORM	Palustrine Yes
Juneau Airport Taxiway/GC 341 P0054	Gastineau Channel 341 and other concurrent permits, involving Jordan Creek	CBJ 1991	Monitoring Juneau	many separate areas	General	Rearing, General	LFORM, SEED	Estuarine Yes
Kennel Crk Large Woody Debris P0128	Felling trees into creek to enhance cover for rearing coho.	USFS 1986	Monitoring Tenakee Springs	8 acres of habitat	Coho salmon	Rearing, Overwinter	LFORM	Riverine Too soon

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHEAST ALASKA (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Kwatahein Fishway P0120	Concrete weir & step pool passage for pink salmon	USFS 1989	Completed w/M Kake	Access to 40 acres	Pink Salmon	Spawning, Rearing	LFORM	Riverine Yes
Lake Rearing Cover Enhancement P0131	Creating rearing cover by felling trees along lakeshore.	USFS 1982	Completed w/M Hoonah	4 lakes each approx 30 acres	Coho, Cutthroat, D.Varden	Rearing	LFORM	Lacustrine Inconclus.
Lemon Creek 1-4 P0043	Required to restabilize and replant creek banks after gravel extraction	Private 1989	Monitoring Juneau	3/4 mile length of stream	Chums, cohos, D.Varden	Spawning	LFORM, PLANT, STABL	Riverine Yes
Lemon Creek 9 P0052	Create aquatic littoral habitat (shallow shelf) as rehab gravel mining operation	Private 1993	Preliminary Juneau	5.25 acres whole surface area	Coho salmon	Rearing	LFORM, PLANT	Estuarine Too soon
Man Made Hole P0117	Blind Slough Gravel Pit Rearing Area	USFS 1992	Completed w/M Petersburg	2 acre lake	coho, stlhd, king, cuthrt	Spawning, Rearing	LFORM	Palustrine Yes
Marx Creek Spawning Channel P0102	USFS/ADF&G spawning channel (& tagging) in formerly logged Salmon River Valley	USFS 1985	Monitoring Hyder	2.2 km long x 6m wide	Chum Salmon	Spawning, General	LFORM, SPOIL, PLANT, STOCK,	Riverine Yes
Mendenhall Dredge Islands P0048	Sand islands created from Mendenhall Bar Navigation Channel	ACOE 1959	Completed w/M Juneau	5-10 acres of dredge spoil island	shorebirds, waterfowl	Nesting, General	LFORM, SPOIL	Marine Yes
Mitchell Creek Fish Pass P0121	Concrete weir and pool structure for coho and steelhead passage	USFS 1992	Completed w/M Petersburg	Access to 45 acres	Cohos, Steelhead trout	Spawning, Rearing	LFORM	Riverine Too soon
Mitchell Pool Enhancement P0122	Pools for spawning and rearing blasted into bedrock	USFS 1992	Completed w/M Petersburg	Adds 1 acre of rearing habitat	coho, steelhead, cutthrt	Spawning, Rearing	LFORM	Riverine Yes
Mitkof Highway Reconstruction P0038	Removing fish barriers at 25 crossings along 6.4 mile section of highway.	ADOT/PF 1992	Completed w/o M Petersburg	6.4 miles	Coho and cutthroat	General	LFORM, SEED, HYDRO	Riverine Yes
Mud Bay River LG Woody Debris P0130	Felling trees into creek to enhance coho rearing cover	USFS 1984	Completed w/M Hoonah	one stream mile	Coho Salmon	Rearing	LFORM	Riverine Unknown

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHEAST ALASKA (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
N.F. Game Ck Barrier Modif. P0127	Step pools created by blasting for coho migration	USFS 1988	Monitoring Hoonah	3.5 acres of habitat	Coho salmon	Spawning, Rearing	LFORM, STOCK	Riverine *Too soon*
North Three Mile Creek P0097	ADF&G Educational Project on Prince of Wales Island	ADF&G 1992	Implementation Klawock	180 ft of stream	Pink Salmon	Spawning, Migrating	LFORM, SEED, HYDRO, CUT	Riverine Too soon
Ophir Creek Flow Improvement P0045	Trying to improve low flow in a degraded stream system. Much community interest.	ADF&G 1989	Implementation Yakutat	7 kilometers is entire reach	Coho, Sockeye	General	LFORM	Riverine Too soon
Pavlof River Upper Fishpass P0123	Ladder for pink, chum and coho salmon. Fish use will be determined by tagging.	USFS 1987	Monitoring Tenakee Springs	13 acres of habitat	Coho salmon	Spawning, Rearing	LFORM	Riverine Too soon
Pavlov Marsh Wildlife Viewing P0107	USFS project for "watchable wildlife"; nesting platforms for Canada geese	USFS 1991	Monitoring Hoonah	100 acre marsh, 10 platforms	Vancouver Canada Goose	Nesting	LFORM	*Palustrine* Too soon
Slippery Creek Fishway P0116	Tunneled fishpass through rock	USFS 1987	Completed w/M Kake	Access to 50 acres rearing	Coho salmon	Spawning, Rearing	LFORM	Riverine Yes
Starrigavin Creek P0170	Large woody debris structures placed in stream	USFS 1986	Monitoring Sitka	210 m	Juvenile coho	Rearing, Overwinter	LFORM	Riverine Yes
Suntaheen Ck Pink Slmn Barrier P0126	Step pools blasted into falls for pink & chum spawning access.	USFS 1991	Monitoring Hoonah	2 stream miles	Pink salmon	Spawning, Migrating	LFORM, HYDRO	Riverine Yes
Suntaheen Crk Lg Woody Debris P0125	Reducing stream gradient and velocity with log structures.	USFS 1989	Preliminary Hoonah	One mile	Coho salmon	Rearing, Overwinter	LFORM	Riverine Too soon
Suntaheen Fishpasses I & II P0124	Cooperative USFS, NSRAA and ADF&G FRED Division project for new coho run.	USFS 1989	Monitoring Hoonah	15 acres above fishpasses	Coho salmon	Spawning, Rearing	LFORM, STOCK	Riverine Too soon
Switzer Creek Restoration P0046	An ongoing community project to improve the ability of the creek to support fish	ADF&G 1992	Implementation Juneau	4 kilometers	Coho,chum, pink, D.Varden	General	LFORM	Riverine Too soon

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHEAST ALASKA (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Tyee Hydroelectric Spa P0069	Tried to create tidal spawning channel in tailrace as mit for other dewatering.	AEA 1984	Completed w/M Wrangell	28,500 sq.ft. avail. for spawning	salmon-- chum & pink	Spawning	LFORM, STABL	Riverine Partially
Virginia Lake Fert. & Fishpass P0096	Virginia Lake (Mill Creek) fish ladder, lake stocking and fertilization	USFS 1989	Monitoring Wrangell	659 acres above ladder	Sockeye Salmon	Spawning, Rearing	LFORM, STOCK, PFERT	Lacustrine Too soon
West Camden Egg Boxes P0119	NSRAA introducing chum run into spring-fed creek	Private 1989	Completed w/M Kake	3 acres	Chum Salmon	Spawning, Overwinter	LFORM	Riverine Yes

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHCENTRAL/SOUTHWEST

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
4th of July Creek Mitigation P0141	Spawning channel as mitigation for Seward Marine Industrial Ctr (in Spring Crk).	CitySew 1981	Completed w/o M Seward	600 ft. of streambank	Chum Salmon	Spawning, Rearing	LFORM, HYDRO	Riverine No
Abbott Loop Sch Crk Realignmnt P0176	MOA Rechannelization of S. Fork Little Campbell Crk at Abbott Loop School	MOA 1987	Completed w/M Anchorage	restored reach totals 725 feet	Coho, Dolly Varden	Rearing, General	LFORM, STABL, SEED, PLANT	Riverine Yes
Anton Larsen Bay P0026	Eelgrass restoration for illegal fill in intertidal lagoon, Kodiak Island.	Private 1984	Completed w/M Larsen Bay	A lagoon of apprx. 2 acres	birds, fish, inverts..	General	LFORM, PLANT	Marine No
Bayshore Ponds & Berms P0172	Attempt to create freshwater nesting ponds along the tideflats	ADF&G 1971	Completed w/o M Anchorage	9 ponds along 1.3 mile stretch	primarily ducks	Nesting, General	LFORM, SEED, PLANT	Estuarine No
Bear Lake Fertilization P0111	Ongoing lake stocking and fertilization program, with flow control dam.	Private 1981	Implementation Seward	180 ha. lake	Sockeye & coho salmon	Spawning, Rearing	LFORM, STOCK, HYDRO	Lacustrine Too soon
Beaver Dam Blockages P0112	Ongoing CIAA project to allow fish passage during runs.	Private 1980	Implementation Kenai & Tyonek	6 streams	Sockeye	Migrating, Spawning	LFORM	Riverine Yes
Beaver Pond Access Structures P0076	USFS prgm to let juv. fish cross beaver dams into productive rearing ponds.	USFS 1989	Monitoring Cordova	6 fry pipes, access to 25 acres	coho salmon	Migrating, Rearing	LFORM	Riverine Partially
Bethel Small Boat Harbor P0081	Tidal river bank revegetation program	DNR-PMC 1984	Completed w/M Bethel	2 acres		General	SEED, PLANT, SOIL	Riverine Partially
Box Canyon Creek P0144	Series of rearing ponds as mitigation for coal loading facility.	ADOT/PF 1986	Completed w/M Seward	1000 ft of stream	Coho and chinook	Spawning, Rearing	LFORM	Riverine Partially
Bradley Lake Waterfowl Nesting P0067	Tidal/freshwater waterfowl nesting area as mitigation for AEA's Hydropower Plant	AEA 1991	Monitoring Homer	40 acres	ducks	Nesting, Staging	LFORM, SEED, PLANT, HYDRO, PFERT	Estuarine Too soon
Brooks River Fish Ladder P0062	Installed at Brooks Falls in 1940's by federal Bureau of Commercial Fisheries	BurComF 1949	Completed w/M King Salmon	80'long, 10' wide fish ladder	Sockeye	Migrating	LFORM, HYDRO	Riverine Inconclus.

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHCENTRAL/SOUTHWEST (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
California Creek Culvert&Pools P0058	ADOT/PF culvert, fish pools, reveg at Alyeska Highway in Girdwood	ADOT/PF 1992	Implementation Girdwood	500 ft. of streambed	Coho & King Salmon	Spawning, Migrating	LFORM, SEED, PLANT, STABL	Riverine Too soon
Campbell Lake Outlet P0114	Rehabilitation of a sedge wetland (extreme high intertidal)	MOA 1989	Completed w/o M Anchorage	Approximately 1/2 acre	Pink, coho, king, red	Spawning, Rearing	LFORM, PLANT, HYDRO	Palustrine Yes
Canada Geese Nest Island Prgm P0070	USFS program creating artificial nest islands for Dusky Canada Geese in Cordova	USFS 1983	Monitoring Cordova	800 islands over a wide area	Dusky Canada Goose	Nesting	LFORM, SOIL	Palustrine Partially
Canada Geese Peninsula Cutoffs P0071	USFS program of converting peninsulas into nest islands for Dusky Canada Geese	USFS 1992	Monitoring Cordova	new islands: 0.625 and 1.25 acres	Dusky Canada Goose	Nesting	LFORM	Palustrine Too soon
Canyon Slough P0108	Realignment of slough to accommodate Pipeline route	ADF&G 1975	Completed w/M Valdez	4000' of channel	Coho, pink salmon	Spawning, Rearing	LFORM	Riverine Yes
Captains Bay 14;Unalaska Crk P0178	Correcting a perched culvert as offsite mitgn for tideland fill, Unalaska	ACOE 1989	Completed w/M Unalaska	1/2 mile stream reach	pink salmon	Spawning, Migrating	LFORM	Riverine Partially
Chester Creek Realignment P0147	Rerouting Chester Creek into University Lake to allow Tudor Centre Devlmt.	ADF&G 1983	Completed w/o M Anchorage	800 ft of new stream bed	rainbow trout, D.Varden	Rearing, General	LFORM, SEED	Riverine Yes
CIAA Fish Passes P0183	Three step-pool fishpasses for sockeye installed by Cook Inlet Aqua.Assn.	Private 1984	Monitoring varies--see desc	affects several miles of streams	sockeye salmon	Spawning, Rearing	LFORM, HYDRO	Riverine Partially
CIAA Flow Control Structure P0185	Flow-control dams at lake outlets to ensure sufficient flow during sockeye runs	Private 1979	Implementation Kenai, AK	Marten Lk, 24 ha; Daniels, 286 ha	Sockeye salmon	Spawning, Rearing	LFORM, HYDRO	Riverine Yes
Coghill Lake Fertilization P0168	USFS, PWSAC, & ADF&G project to restore historical sockeye levels via lake fert.	USFS 1993	Implementation Whittier	3128 acre lake	Sockeye	Spawning, Rearing	LAKEFERT ONLY	Lacustrine Too soon
Concord Hills/ Klatt Bog Mitg. P0182	Klatt Bog 6. Preservation/enhancmnt of 10-12 acres as mitg for subdivi	Private 1984	Completed w/M Anchorage	10-12 acres, including presv area	waterfowl	Nesting, Staging	LFORM, HYDRO	Palustrine Partially

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHCENTRAL/SOUTHWEST (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Copper R. Delta Drawdown Ponds P0138	USFS efforts to manage uplifted ponds for waterfowl using H20 control structures	USFS 1973	Completed w/o M Cordova	11 water control structures	Waterfowl	General	LFORM, PLANT, HYDRO, PFERT,	Palustrine No
Cordova Dstr Gravel Pit Rehabs P0080	USFS Cordova District has rehabilitated 4 ponds into rearing areas to date	USFS 1978	Monitoring Cordova	10.5 acres total for 4 ponds	Coho, cutthroat, D.Varden	Rearing, Overwinter	LFORM, SEED, PLANT	Riverine Yes
Dave's Creek P0148	Spawning channel, Sterling Highway area, near Tern Lake campground	USFS 1983	Completed w/M Cooper Landing	200 meters	chinook	Spawning	LFORM, HYDRO	Riverine Yes
DEC Oiled Mussel Bed Experimnt P0044	Various techniques tried to treat mussel beds with high oil content. Pr.Wm.Sound	ADEC 1992	Monitoring sites spread out	experimental plots of 1x1m or2x2m	mussels, birds, otters	General	LFORM, CONTM	Marine Yes
Explorer Creek & Ponds P0187	USFS educational project to enhance spawning, rearing & overwintering habitat	USFS 1989	Monitoring Portage	21 acre pond; 3 miles of channel	sockeye, coho & chum	Spawning, Overwinter	LFORM, HYDRO	Riverine Inconclus.
Fill Removal-- Potter Marsh P0166	Weigh station fill removal as enforcement action for other Corps violation	ACOE 1984	Completed w/M Anchorage	1/5 ac.fill rem; <1 ac.tot. w/veg	waterfowl	General	LFORM, PLANT	Palustrine Yes
Fish Creek Coastal Wetland R P0035	Mouth of Fish Cr, Anch. To date, only attempt at coastal wetland rest. in AK.	DNR-PMC 1990	Monitoring Anchorage	3 1/2 to 4 acres at mouth	Waterfowl	Nesting	PLANT, SEED	Estuarine Too soon
Fish Creek Mouth Waterfowl Enh P0179	Required to restore/enhance area after damage from sewer line installation	MOA 1986	Completed w/M Anchorage	corridor 300' wide x 1000' long	waterfowl, shorebirds	Nesting, General	LFORM, SEED	Estuarine No
FRED projects on Campbell Ck P0032	Many fish habitat improvements: drop structure, revetments, etc.	ADF&G 1990	Monitoring Anchorage	appx. 1/3 mi. of crk + sloughs	Coho Salmon	Rearing	LFORM, STABL	Riverine Yes
FS Cordova Dstr.Spawning Chn P0078	USFS (Cordova) spawning channel construction in Copper River area	USFS 1984	Monitoring Cordova	One (Mi.25) channl is 22,500sq.ft	Coho, sockeye salmon	Spawning	LFORM, STABL, PLANT, SEED,	Riverine Partially
FS Stream Cover/ Brush Bundles P0077	USFS (Cordova) prgm to add cover to barren streams for fish spawning	USFS 1986	Completed w/o M Cordova	close to 100 structures in all	Coho, Dolly Varden	Spawning, Overwinter	LFORM, PLANT	Palustrine Unknown

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHCENTRAL/SOUTHWEST (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Fucus Recruitment Exper P0133	Post oil spill seaweed recruitment study by Moss Landing Marine Labs	Univ. 1990	Completed w/M Whittier	approx. 480 m2		General	PLANT	Marine Partially
Glacier Dtrict PWS Fishpasses P0167	USFS fishpasses in Western Prince Wm Sound, managed by Glacier Ranger District	USFS 1972	Completed w/M Western PWS	12 sites in all--see description	mostly sockeye &pink	Migrating, General	LFORM, HYDRO, STABL	Riverine Yes
Glenn Highway Mitigation Proj. P0177	Eklutna to Parks Highway reconstruction mitigation project	ADOT/PF 1990	Monitoring Palmer	211 acres	pintails	General	LFORM, HYDRO	Palustrine Too soon
Goodnews Platinum Mine P0171	Reopening fish passage through placer mine tailings to spawn/rearing habitat	ADF&G 1991	Completed w/M Platinum	total distance of 4 to 5 miles	Coho	Rearing, Overwinter	LFORM, SPOIL, HYDRO	Riverine Too soon
Gulkana River 5 P0017	Revegetating around new facilities at Sourdough Campground, Gulkana River	BLM 1992	Implementation Glennallen	<12 acres		General	LFORM, SEED, PLANT, PFERT, SOIL	Riverine Yes
Harrison Lagoon Creek P0173	USFS creek diversion into Harrison Lagoon for chum & pink spawning channel, PWS	USFS 1972	Monitoring Whittier	112500 sq. ft. spawning channel	chums & pinks	Spawning	LFORM, PLANT, HYDRO, STABL	Riverine Yes
Herring Bay Experimental Stud P0132	UAF's Fucus (seaweed) restoration study in Prince William Sound	UAF 1990	Implementation Whittier	200m of beach			PLANT	Marine Too soon
Huffman Hills Conserv.Easement P0003	Anch.Wetlands Mgmt Plan req'rd conservation easement for dev.in preservtn wetlds	Private 1991	Monitoring Anchorage	1.9 acres (of compensation)		General	SEED	Palustrine Unknown
Ingram Pond Coho Rearing Enhc P0188	Tried to create recr. coho fishery by connecting crk to rearing pond & stocking	USFS 1985	Completed w/M Portage	access to 78 acre rearing pond	coho & pink salmon	Rearing, General	LFORM, HYDRO, STOCK	Lacustrine No
Jap Creek Mitigation P0143	Spawning channel as mit for Seward Marine Ind. Ctr. in Spring Creek	CitySew 1985	Completed w/M Seward	6300 square yards	Pink and Chum Salmon	Spawning	LFORM, SEED	Riverine Partially
Johns Creek P0193	Diversion of channel to new location in close proximity, due to placer mining	ADF&G 1984	Completed w/M Talkeetna	2 miles of stream	king & coho	Spawning, Rearing	LFORM, STABL	Palustrine Yes

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHCENTRAL/SOUTHWEST (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Kenai River Wetland P0088	Kenai wetland revegetation for illegal fill; Kenai River Slough	DNR-PMC 1989	Completed w/M Soldotna	.04 ha		General	SEED, PFERT	Palustrine Yes
Larson Lake Fertilization P0184	CIAA lake fertilization project near Talkeetna, currently inactive	Private 1982	Monitoring Talkeetna	176.9 ha. lake	Sockeye salmon	Spawning, Rearing	LAKEFERT, STOCK (proposed)	Lacustrine Inconclus.
Little Campbell Crk. Enhancmt. P0195	Enhancement/ realignment downstream of Lake Otis Pky during Phase IV constrctn.	ADF&G 1988	Completed w/M Anchorage	apprx. 120 yards	juv.coho, Dolly Vardan	Rearing	LFORM, SEED, PLANT, PFERT, STABL	Palustrine Yes
Lyon Creek Ponds P0186	USFS converted gravel pits into rearing ponds & spawning channel, Turnagain Pass	USFS 1985	Monitoring Portage	5 tot.acr. ponds, 7800 sq.ft.chnl	Chinook, coho	Spawning, Rearing	LFORM, STOCK, HYDRO, PLANT	Riverine No
Martin River Delta Fish Ponds P0068	Former borrow pits for AEA's hydroelec. plant were rehab'd for spawning &rearing	AEA 1991	Completed w/o M Homer	30 acres ponds + spawning chann	Coho Salmon	Spawning, Rearing	LFORM, HYDRO, PFERT, STABL	Palustrine Too soon
MOA Sedimentation Pon P0181	Anchorage Public Works Dept. created several ponds for water quality purposes	MOA 1988	Implementation Anchorage	5 acre ponds now; 3 more planned	waterfowl	General	LFORM, SEED, PLANT, SOIL	Palustrine Yes
New Chenega Road Construction P0061	LaTouche Passage 8. Fill removed & spawning gravel replaced (enforcemt action)	ADOT/PF 1984	Completed w/M New Chenega Vill	300'of crk; 2000'of road rehab	pink salmon	Spawning, General	LFORM, SOIL	Riverine Yes
North Eagle River Interchange P0059	Involved new channels and pond for coho/ grayling at Carrol & Fire Creeks	ADOT/PF 1991	Monitoring Eagle River	A total of 3 acres of improvemnts	Coho, grayling	Rearing, Overwinter	LFORM, SEED, PLANT, HYDRO, STABL	Riverine Yes
Nulbay Park Mitigation Proj. P0022	Cook Inlet 317. Create intertidal wetland as mitig. for other intertidal fill.	MOA 1988	Completed w/M Anchorage	500' long oblong area, below RR	waterfowl, shorebirds	Staging	LFORM, SEED, STABL	Estuarine Partially
Oiled Mussel Bed Manipulation P0040	Experiment to put a small trench through beds to see if oil escapes. Pr.Wm.Sound	NMFS 1992	Implementation Too spread out	Beds are 50m2, 100m2, and 800m2	mussels, birds, otters	General	LFORM, CONTM	Marine Too soon
Otter Lake Recreation Area P0196	Impounded water for waterfowl habitat on Army Base; stocked area with goslings	DOD 1979	Completed w/o M Fort Richardson	100s of acres	Canada geese	Nesting	LFORM, SEED, SOIL, SPOIL, STOCK	Lacustrine Yes

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHCENTRAL/SOUTHWEST (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Packers Lake Fertilization P0110	Ongoing lake fertilization & sockeye stocking program, with flow control dam	Private 1983	Implementation Kenai	280.4 ha lake	Sockeye salmon	Spawning, Rearing	LFORM, STOCK, HYDRO	Lacustrine Yes
Paint River Fish Ladder P0113	CIAA project to develop a new sockeye run with a cement fish ladder	Private 1993	Implementation McNeil Sanctuary	access to 27 miles of stream	All salmon species	Migrating	LFORM, STOCK, HYDRO	Riverine Too soon
Palmer Hay Flats Waterfowl Enc P0050	DU/ADF&G project to increase nesting and rearing habitat for waterfowl	ADF&G 1986	Implementation Palmer/Wasilla	135 acres whole project area	mallards, pintails	Nesting, Rearing	LFORM, SPOIL, SEED, PLANT, PFERT	Palustrine Yes
Pigot Bay Spawning Channel P0175	USFS chum spawning channel to replace habitat lost during 1964 earthquake	USFS 1991	Implementation Whittier	2500' channel	Chum salmon	Spawning	LFORM, STOCK	Riverine Partially
Portage Airstrip Ponds P0189	Rehabilitation of former gravel pits into a put-and-take fishery	USFS 1992	Implementation Portage	15 acres total	grayling, chinook	Overwinter, General	LFORM, SEED, PLANT, STOCK	Palustrine Too soon
Portage Alder Pond P0190	Gravel pit rehab into a groundwater-fed put-and-take fishery	USFS 1987	Implementation Portage	3 1/2 acre pond	rainbow trout	Overwinter, General	LFORM, STOCK, HYDRO	Palustrine Yes
Potter Creek Rechannel P0165	Rebuilding a spawning reach of Potter Creek that had breached & was flooding	ADOT/PF 1980	Completed w/M Anchorage	100 yds of spawning channel	Pink Salmon	Spawning	LFORM	Riverine Yes
Potter Marsh Creation P0056	The unintentional creation of a freshwater marsh by railroad fill in 1916	Fed. RR 1916	Completed w/o M Anchorage	564 Acres			LFORM, HYDRO	Palustrine Yes
Potter Marsh Waterfowl Enhcmnt P0057	Habitat enhancement projects undertaken in Potter Marsh over the years.	ADF&G 1978	Completed w/M Anchorage	a few acres	Waterfowl	Nesting, General	LFORM, SOIL, SEED	Palustrine No
Rabbit Creek Fishpass P0115	Step pools and riparian revegetation	ADOT/PF 1988	Completed w/M Anchorage	Roughly 150'	coho, pink, chinook	Spawning, Migrating	LFORM, SEED, PLANT, HYDRO	Riverine Yes
Rabbit Crk Step Pools Below RR P0164	Rock weirs placed below perched culvert for fish access to Potter Marsh	AK RR 1990	Completed w/o M Anchorage	50'reach; access to large marsh	pinks, kings, cohos	Spawning, Rearing	LFORM	Riverine Yes

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHCENTRAL/SOUTHWEST (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Resurrection Crk Fish Habitat P0033	USFS instream structures, reveg, rearing ponds, to restore placer-mined reaches	USFS 1990	Implementation Hope	3 miles	Coho Salmon	Rearing, Overwinter	LFORM, PLANT, SEED	Riverine Yes
Shaishnikof River fish pass P0029	Removal of fish barriers as offsite mit for intertidal fill (Unalaska Bay 12)	Private 1985	Completed w/M Unalaska	3 berriers btn mi. 1.5 and 2.0	Pink & coho salmon	Migrating, General	LFORM	Riverine Yes
Soldotna Creek Culvert P0140	Steep Culvert With Baffles for Fish Passage	ADOT/PF 1992	Completed w/o M Soldotna	250 ft. of streambank	Coho and Chinook	Rearing, Overwinter	SEED, PLANT, PFERT, STABL	Riverine Yes
Solomon Gulch Tail Race P0106	AEA effort to convert the hydropower tailrace to pink & chum spawning area	AEA 1988	Completed w/M Valdez	150' long x 30-60' wide	Pink and chum salmon	Spawning	LFORM, STABL	Riverine Yes
Stump Lake H2O Control Structr P0075	USFS's attempt to arrest the draining of Stump Lake after 1964 earthquake damage	USFS 1991	Completed w/M Cordova	50 acres	cutthroat, coho, D.Varden	Rearing	LFORM, STABL, HYDRO, SEED,	Lacustrine Yes
Tangle Ponds in Portage Valley P0191	USFS gravel pit rehab for recreational trout fishing; also called "Pond 3.93"	USFS 1991	Implementation Portage	13 acres combined	rainbows, grayling	Overwinter, General	LFORM, PLANT, SOIL, STOCK	Palustrine Too soon
Tokun Lake Fertilization P0079	A joint USFS (Cordova) & ADF&G effort to increase food available for sockeye	USFS 1984	Completed w/o M Cordova	lake is 600 acres surface area	sockeye salmon	Rearing, General	LFERT	Lacustrine Inconclus.
Trapper Creek Step Pools P0060	Step pools for fish passage through culverts on 4 streams along Parks Hwy	ADOT/PF 1990	Completed w/M Trapper Creek	250 ft of each creek	Coho, king salmon	Rearing, Migrating	LFORM, SEED, PLANT, HYDRO, STABL	Riverine Yes
Tributary "A" Rearing Enhancmt P0034	Tributary "A" goes to East Fork Crk, off Six Mile Crk in Turnagain Pass area	USFS 1987	Completed w/o M Hope	one-half mile	Coho & Chinook Salmn	Rearing	LFORM	Riverine Partially
Twentymile R. Waterfowl Imprvt P0197	Blasting (pothole) project for waterfowl enhancement near Portage	BLM 1977	Completed w/M Portage	apx. 3 acres	White-fronted geese	Nesting	LFORM	Riverine Unknown
Ugashik River 8 P0028	Becharof State Well #1. Revegetation of abandoned airstrip on Alaska Peninsula	Private 1985	Completed w/M Pilot Point	25 acres; runway 5500' long		General	LFORM, PFERT, SEED	Palustrine Yes

SECTION D: SUMMARY TABLE (CONTINUED)

Region: SOUTHCENTRAL/SOUTHWEST (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Unocal Fuel Spill P0094	Lewis River Freshwater Wetland Rehabilitation	DNR-PHC 1990	Monitoring Beluga	apprx. 1 acre		General	SEED, PFERT, CONTM	Palustrine Yes
USFS 1964 Earthquake Stream P0072	Attempting to repair stream mouths uplifted during earthquake in Pr.Wm.Sound	USFS 1967	Completed w/M Cordova	A dozen or so streams	Salmon-- pink & chum	Spawning, Migrating	LFORM, STABL	Riverine Inconclus.
USFS Cordova Distr. Fishpasses P0074	4 fishpasses constructed within USFS's Cordova Ranger District, Pr.Wm.Sound	USFS 1974	Completed w/M Cordova	4 streams, many acres of habitat	Salmon-- pink, coho, red	Migrating	LFORM, STABL	Riverine Partially
USFS Log/Debris Removal Progrm P0073	1960-70's misguided removal of logs to aid fish passage, increase spawning area	USFS 1968	Completed w/o M Cordova	16-20 streams, Pr.Wm.Sound ar		Spawning, Migrating	LOG/DEBRIS REMOVAL	Riverine No
Westchester Lagoon Formation P0174	Urban freshwater lake formed using tidegates at outlet of Chester Creek	MOA 1972	Completed w/M Anchorage	lagoon is roughly 100 acres	waterfowl	Nesting, General	LFORM, HYDRO, SEED, STABL	Lacustrine Yes
Westchester Lagoon Offsite Mi P0180	Fish Creek 6 (Zamarello's fill) led to wetland construction as offsite mitgn	ACOE 1984	Completed w/M Anchorage	area 600' long (uphill) x 80'wide	waterfowl, shorebirds	Staging, General	LFORM, SEED, PLANT	Palustrine Yes
Williwaw Ponds & Spawning Chl P0142	USFS rehab of gravel pit for coho rearing and a chum spawning channel in Portage	USFS 1984	Implementation Portage	13.7 ac. ponds, 1.2 ac. channel	Chum & Red Salmon	Spawning, Rearing	LFORM, SEED, PLANT, SOIL, PFERT	Palustrine Partially

SECTION D: SUMMARY TABLE (CONTINUED)

Region: NORTHERN/INTERIOR

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Arco Kuparuk Photo-Trend Plots P0137	Permanent plots to monitor success of tundra revegetation methods over time	Private 1987	Monitoring Kuparuk Camp	Eight 4m x 10m sites		General	SEED, PFERT	Palustrine Partially
ARCO Sag Site C P0149	Gravel Pit Rehabilitation on Sag River Floodplain	Private 1986	Completed w/M Deadhorse	38.2 acres	Grayling	Rearing, Overwinter	LFORM	Lacustrine Partially
Atigun Pass Riparian Rehab P0084	Establishing willows & ponds on sites (Sten Crk) where Pipeline was replaced	DNR-PMC 1992	Implementation Atigun Pass	16 sites (for reveg work)	Grayling, DV, whitefish	Rearing, General	LFORM, PLANT, SEED	Palustrine Yes
Banner Ck Material Site P0152	Gravel site rehab with interconnecting channels for coho rearing.	ADOT/PF 1984	Implementation Nome	Approximately 20 acres of ponds	coho, grayling	Rearing, Overwinter	LFORM, PLANT, STABL	Lacustrine Too soon
Bearing Tree Creek P0157	Series of step pools created within culvert using rebar and boulders	ADOT/PF 1985	Completed w/M Beaver Ck, Yukon	180' long culvert	grayling, suckers, pike	Rearing	LFORM, HYDRO, STABL	Riverine Partially
BP & Arco Cross Drainage Projs P0194	Rehabilitation of North Slope streams affected by roads for oil development	ADF&G 1989	Completed w/M Deadhorse	404,076 sq. ft. (BP only)	Arctic grayling	General	LFORM	Palustrine Yes
BP Pad #22-33-11-13, Pru P0064	Revegetation Project on abandoned gravel drilling pad, an experiment by BP.	Private 1988	Monitoring Deadhorse	24 acres were treated		General	LFORM, SEED, SOIL, PFERT	Palustrine Yes
BP Put River #1 Pad Experiment P0030	A many-factored revegetation experiment on an abandoned gravel pad.	UAF 1989	Monitoring Prudhoe Bay	5 expr.blocks of 100' x 125' each			LFORM, SOIL, SEED, PFERT	Palustrine Too soon
BP's Arctophila reveg research P0083	BP studied arctic pendant grass for reveg use on artificial water impoundments	USFWS 1985	Completed w/M Deadhorse	100 sites	Waterbirds	General	PLANT	Palustrine Yes
Chena Lakes (Kutscheid Lake) P0163	Gravel pits rehab'd for fish & recreational use; Chena Lakes Flood Ctrl Proj	ACOE 1979	Completed w/o M North Pole	294 Acres	Rainbow trout, coho	General	LFORM, STOCK	Lacustrine Yes
Chena River Gravel Pit, Fbx P0006	Mitigation included a buffer & contouring the pit's littoral zone	Private 1991	Unknown Fairbanks	10 acres (of compensation)	Waterfowl, Shorebirds	General	LFORM, SPOIL, PLANT	Riverine Unknown

SECTION D: SUMMARY TABLE (CONTINUED)

Region: NORTHERN/INTERIOR (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Cominco Port Disposal Pit P0092	Red Dog Port Site. Revegetation experiments in dune communities of Chukchi Sea	DNR-PMC 1987	Completed w/M Noatak	1.5 ha (4 acres)		General	PLANT, PFERT, LFORM	Palustrine Yes
Creamer's Field Crane Project P0053	Creamer's Field Crane Habitat Project, by ADF&G, funded by Fairbanks Airport	ADF&G 1989	Completed w/M Fairbanks	about 5 acres	Sandhill Cranes	Staging, General	LFORM	Palustrine Yes
Creamer's Field Waterfowl Proj P0051	Creamer's Field Waterfowl Nesting Project, by ADF&G & Ducks Unlimited	ADF&G 1987	Implementation Fairbanks	103 acres? (1/2 mi. x 1/4 mile)	waterfowl	Nesting, General	LFORM, SEED, PFERT	Palustrine Yes
Darling Creek P0154	Retrofit of an existing highway culvert	ADOT/PF 1986	Monitoring Nome	60 ft.	Pink salmon, D.Varden	Migrating	LFORM, HYDRO, STABL, MODEL	Riverine Yes
Delong Highway Stream Crossing P0093	Red Dog Road riparian herbaceous rehabilitation; river crossing seedings	DNR-PMC 1989	Monitoring Noatak	< one acre			SEED, PFERT	Riverine Yes
Denali Clearwater Creek P0158	Gabion weir placed below perched culvert to back up water level	ADOT/PF 1987	Completed w/M Paxson	Two 70' culverts	Grayling	Spawning, Rearing	LFORM, HYDRO, STABL	Riverine Yes
East Fork Chena River P0159	Diversion to conduct placer mining at East (also called Middle) Fork Chena River	Private 1989	Monitoring Fairbanks	4800 ft. channel	Grayling	Spawning, Rearing	LFORM, HYDRO	Riverine Unknown
East Fork Solomon River P0153	Re-established floodplain after moving the Nome-Council Highway out of creek	ADOT/PF 1986	Completed w/M Nome	9 miles of stream		General	LFORM	Riverine Partially
Eielson mit for illegal fill P0014	French Creek 4--Enforcement action for illegal asbestos fill by US Air Force	DOD 1992	Unknown Fairbanks	0.6 acres	Waterfowl	General		Palustrine Too soon
Fishing & Aquatic Ed Pond P P0156	Trout Unlimited/ ADF&G Cooperative Education Project	ADF&G 1992	Implementation Fairbanks	56 x 60'ft, 8' deep	Rainbow trout, grayling	General	LFORM, PLANT, STOCK	Palustrine Too soon
Glen Creek in Denali Natl Park P0001	Pilot study to research techniques to stabilize placer-mined streams	NPS 1991	Implementation Kantishna	1400'reach, more soon		General	LFORM, PLANT, MODEL	Riverine Too soon

SECTION D: SUMMARY TABLE (CONTINUED)

Region: NORTHERN/INTERIOR (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Goose Green Gulch P0169	Fish & wildlife habitat in a former gravel mine site, North Slope	ADF&G 1977	Completed w/M Deadhorse	40 acres	grayling	Rearing	LFORM, SEED, PLANT, PFERT	Palustrine Yes
Graveled Tundra Remediation P0066	BP's program to restore areas where gravel was deposited incidentally on tundra	Private 1990	Implementation Deadhorse	649 sites ttlng 88.7 acres so far		General	LFORM	Palustrine Yes
Independence Crk Revegetation P0146	Slope stabilization on placer mine tailings using dormant willows	BLM 1989	Completed w/M Fairbanks	500' by 35' of planted bank	None	General	LFORM, PLANT	Riverine Yes
Kink Corner Gravel Pit P0150	Mile 22.4 of Nome-Taylor Hwy; Nome River 1. Gravel pit rehab for rearing & ovrwt	ADOT/PF 1992	Implementation Nome	5 acres	Coho, Dolly Varden	Rearing, Overwinter	LFORM, SOIL	Riverine Too soon
Koppenberg Mine P0155	Reclamation of disturbed floodplain after placer mining	Private 1987	Implementation Fairbanks	2000 ft of creek; 15 acres	grylg, king, rd.whitefish	Rearing	LFORM	Riverine Yes
Kuparuk Arctophila reveg P0082	PMC & ARCO's study of Arctophila transplanting for waterfowl in Kuparuk Oilfield	DNR-PMC 1985	Completed w/M Deadhorse	11 sites	Waterfowl	General	PLANT, PFERT	Palustrine Partially
Kuparuk Mine Site B P0161	Aanaaliq Lakes. Convert gravel pits to overwintering areas for fish in arctic.	Private 1989	Monitoring Kuparuk Camp	9.1 acre lake	grayling, whitefish	Rearing, Overwinter	LFORM, SEED, STOCK, PFERT	Lacustrine Yes
Kuparuk Mine Site D, Part 1 P0134	Perched wetland creation & reveg on an overburden stockpile at Kuparuk grvl pit	Private 1990	Monitoring Kuparuk Camp	23 ha pit & 29 ha.overburden	shorebirds, waterfowl	General	SEED, PFERT, LFORM, STOCK	Palustrine Yes
Kuparuk Mine Site D, Part 2 P0139	Fish Habitat Rehab of Gravel Pit (see also Proj# 0134 for other work at site)	Private 1990	Implementation Kuparuk Camp	80 acres total	grayling, etc.	General	LFORM, STOCK, SOIL	Lacustrine Partially
Kuparuk River 119 P0012	Rehab 3.5 gravel pad as compensation for 5 acre high value wetland fill	Private 1992	Unknown Deadhorse	3.5 acres ?		General	PLANT, LFORM	Palustrine Too soon
Kuskokwim Streambank Bioeng P0063	SCS Streambank bioengineering trial at Upper Kalskag, Kuskokwim River	SCS 1991	Monitoring Upper Kalskag	4000 sq. ft. treatment area			LFORM, PLANT, STABL	Riverine Partially

SECTION D: SUMMARY TABLE (CONTINUED)

Region: NORTHERN/INTERIOR (Continued)

PROJECT NAME IDENTIFICATION CODE	SHORT DESCRIPTION	LEAD ORG. START YR.	STATUS NEAREST TOWN	PROJECT SIZE	TARGET SPECIES (IF ANY)	HABITAT USE	ACTION TYPE	HABITAT TYPE SUCCESSFUL?
Nome Creek Riparian Project P0162	Re-establishing floodplain community in placer mine tailings, BLM.	BLM 1991	Implementation Fairbanks	3/4 mile of river, 30 acres	Fish, inverts	General	LFORM, PLANT, HYDRO, STABL	Riverine Too soon
Pebble Creek P0192	Gravel removal & stream & lake rehabilitation at Kuparuk R. tributary	ADF&G 1989	Completed w/M Deadhorse	1000 ft.	Arctic grayling	General	LFORM, STABL	Palustrine Yes
Pile Driver & 23 Mile Sloughs P0160	Conversion from glacial to clear water as part of Chena Lakes Flood Ctrl Project	ACOE 1976	Completed w/o M North Pole	16 mile channel, put together			LFORM, STOCK	Riverine Yes
Pile Driver Slough wetland rs P0091	Eielson wetland restoration following damage from construction activities	DNR-PMC 1985	Completed w/M Eielson	< 0.5 acre		General	SEED, PFERT, LFORM	Riverine Yes
Pilgrim River @Nome-Taylor Hwy P0151	Re-established access to rearing channels	ADOT/PF 1991	Completed w/M Nome	access to 1 mile of channels	Coho salmon	Rearing	LFORM	Palustrine Yes
Prudhoe Airport Wetland Rest. P0136	Experimental techniques to reveg. gravel access roads on tundra at ARCO Airport	Private 1988	Monitoring Deadhorse	5 x 0.34 acre blocks		General	SEED, LFORM, PFERT, PLANT	Palustrine Too soon
Put 27 Mine Site P0145	BP's rehab of gravel mining site, Prudhoe Bay Unit.	Private 1990	Monitoring Deadhorse	35 acre lake	Grayling, Arc.char, cisco	Rearing, Overwinter	LFORM	Lacustrine Too soon
Reserve Pit Remediation P0135	Drill site 30 Kuparuk; Reveg on overburden cap overlying drill cuttings	Private 1989	Monitoring Deadhorse	Approx. 10 acres	Waterbirds, Caribou	General	LFORM, SEED, PFERT, CONTM	Palustrine Yes
Revegetation of X-Pad, Prudhoe P0065	Revegetation on abandoned gravel drilling pad by BP.	Private 1989	Monitoring Deadhorse	17,000 sq. ft. total		General	LFORM, SEED, SOIL, PFERT, CONTM	Palustrine Partially
Tunalik Test Wellsite No. 1 P0031	Long-term study of tundra vegetation on gravel pads	UAF 1980	Completed w/M Prudhoe Bay?	appx. 1.2ac.pad +1.7 ac. of ro			SEED, PFERT	Palustrine Yes

Project Narratives

E. PROJECT NARRATIVES

(sorted by Region and alphabetically by Project Name)

REGION: SOUTHEAST ALASKA

24 Mile Spawning Channel Identification Code: P0105

Short Description: NSRAA groundwater-fed spawning channel on Chilkat River at Mile 24, Haines Hwy

Nearest Town: Haines Year Began: 1982 Status: Completed w/M Successful: Partially

Additional Information:
Shortly after construction, this project appeared to meet its goals. Monitoring was conducted immediately before and after construction. Results included: chum and coho spawning in the channel, coho & Dolly Varden rearing there, increased water flow, and higher water temperatures in the winter. However, the short-term "success" of the project was dampened by problems encountered over time. The following summary is taken from the fall, 1992 board reports to the NSRAA: Chum returns to the 24-mile spawning channel have been dismal this year with a total of approximately 100 spawners anticipated to have returned to the original spawning channel. In general, the chum return to the Chilkat River appears to be very weak at this point and significant numbers of additional spawners are not likely. The second, smaller channel excavated last year by Klukwan Forest Products has also had very few spawners utilizing it, approximately 150 adult chum. This channel has suffered flood damage from the Klehini River and now has less than half its constructed area is available for spawning. The 24-mile spawning channel continues to suffer from a backwatering and siltation problem due to its proximity to the Chilkat River. Insufficient elevation and flow prevent the channel from flushing away silts deposited during backwater events when the Chilkat River rises quickly. Approximately two weeks worth of work with high pressure pumps used to clean spawning gravel proved to be fruitless as silt was deposited during the course of the summer on the cleaned gravel. Alternatives for either controlling these backwater events using some type of outlet structure, or modifications to the channel itself are being investigated. Presently 50 percent of the available spawning habitat in the channel lies buried under 6 to 7 inches of silt.

Contacts:
Lon Garrison, NSRAA, Haines, 766-3110; and Steve Reifenstuhl and Bruce Bachen, both NSRAA in Sitka, 747-6850

References: Publication Date: 1984 Reference Type: ConfPro
Author: Bachen, Bruce
Title: Development of salmonid spawning & rearing habitat with groundwater-fed chnls

Other Information Sources:
Lon Garrison, NSRAA, sent info including a summary of their spawning channel activity for the current year (1992). Bruce Bachen's earlier report (1984, above) describes site selection, construction, and monitoring immediately before and after. His report is from the Proceedings of the Pacific NW Stream Habitat Mgmt Workshop, held Oct. 10-12, 1984, edited by Thomas Hassler, and available from the Calif. Coop. Fish. Research Unit, Humboldt State Univ., Arcata, CA. 95521. Bruce says they have also many slides of the construction.

ADOT Hoonah Airport Expansion Identification Code: P0009

Short Description: Port Fredrick 44. Many-faceted mit. package for fill: spawning, rearing, reveg
Nearest Town: Hoonah Year Began: 1992 Status: Monitoring Successful: Yes

Additional Information:
Airport expansion project. They filled 11.5 acres. The whole mitigation package included several components: 1) Forming intertidal pools near small coho streams at the seaward end of the runway. 2) Widening and recontouring Gartina Creek for spawning habitat (chum salmon started using this the first season, 1992). 3) an abandoned borrow pit area of 1.2 acres had previously been flooded for a rearing area. This area was enhanced by adding boulder clusters and cable-anchored trees. Coho and trout species were observed moving into this area the first season as well (1992). 4) Spawning area and rearing pool created while re-routing a 200' section of Coho Creek. 5) Upstream in Coho Creek, 4 ponds were created for rearing and migrating, and the stream was put through it, as well as a potential spawning area for pink salmon. This section of the work looks very promising. 6) Two new culverts were bedded and sized in Coho Creek so that they could be used for rearing. 7) A crossing at Shotter Creek was given an open arch configuration so that the spawning area would be unchanged. The whole area was revegetated using a native seed mix from the Plant Materials Center in Palmer. One unique feature of this project was that all the fish were seined and relocated (placed elsewhere in the same system) before any work was done in that particular section of the waterway. As stated in previous field, Van Sundberg expects to finish a "summary report" sometime in spring, 1993. Dave Hardy expects to do site visits in summer 1993.

Contacts:
At the time, the primary contact person was Art Dunn, ADOT/PF, Juneau. Current contacts include Van Sundberg, ADOT/PF, Juneau (465-4505), and Dave Hardy, ADF&G, Habitat Division, in Sitka (747-5828).

References: Report Expected

Other Information Sources:
This project involved a long unwieldy permitting process, but the outcome appears positive. Dave Hardy, ADF&G, Sitka and Van Sundberg, ADOT/PF, Douglas, were interviewed on 2/9/93 to obtain most of the information contained here. In spring, 1993, Van Sundberg expects to complete a "summary report" of the project to date which may be more complete than what was assembled here.

Bayhead Ck Barrier Modific. Identification Code: P0129

Short Description: Step pools blasted into 3 coho barriers

Nearest Town: Tenakee Springs Year Began: 1992 Status: Monitoring Successful: Too soon

Additional Information:
Three barriers to coho salmon were modified by blasting a series of step-pools in each one. Spawning surveys were conducted to note any escapement above barriers. Pink salmon were observed spawning up to the barrier but made no effort to ascend the modified cascades. Coho were observed passing through the lowest cascade during a high flow event on 10 September 1992, as were Dolly Varden trout. It was apparent that the shorter Dolly Varden easily passed through the smaller jump pools, quite likely past the entire barrier. Coho salmon were seen to wallow in pools that barely provided one body length. This information will be valuable when work continues to complete this project next summer. Tissue samples were taken from Dolly Varden and Cutthroat Trout above and below barrier modification to monitor the effect, if any, of barrier removal upon an isolated population. Samples were taken by PNW/Oregon state crew and examined in Corvallis, OR. Results of tissue analysis not yet completed.

Contacts:
Christopher Riley and Christopher James, both USFS, Hoonah Ranger District, Hoonah, 945-3631.

References: None

Other Information Sources:
Chris James, USFS, Hoonah, sent in this info 3/16/93. More info in the 1992 Program Accomplishment Report of the Chatham Area of Tongass National Forest.

Bennett Creek Identification Code: P0098

Short Description: Torcana Airport South, Prince of Wales Island. Restore logged stream.

Nearest Town: Klawock Year Began: 1991 Status: Implementation Successful: Too soon
Additional Information:
Bennett Creek flows through a clearcut area on native-owned land on Prince of Wales Island. The lower 1.2 miles of stream was destabilized and diverted from its original channel in several places. The project objectives were to increase and stabilize coho salmon rearing habitat throughout the lower reaches of the stream, and to maintain old trees and rootwads. A total of 25 log structures or tree revetments were placed in the channel at 17 sites. Wind-thrown debris was removed from one site, and an inactive beaver dam was breached at another to allow the stream to flow in its original channel. City of Klawock Summer Youth Interns, volunteers, and FRED Division personnel worked cooperatively to develop access along the stream, prepare the site, and breach the beaver dam. Although pink and chum salmon were found in initial escapement surveys, the increase in rearing habitat is expected to improve coho salmon production. The purpose of this project was two-fold: first to breach a beaver dam to allow flow in the original channel, and second to add large woody debris along 0.9 mile of the channel. Breaching of the beaver dam is a continuing success as the stream is still flowing in the appropriate channel. Addition of large woody debris is not a success at this time. There was high water starting shortly after stringing the logs along the stream, therefore at most sites, the logs were cabled to the bank and were not placed into position. Skip Gish is determining what direction to take on this project, as the landowner is going to log in the watershed again this year. Skip wants to see where and how much logging will take place before deciding the best approach to finishing the project.

Contacts:
Skip Gish, ADF&G, Klawock, 755-2331

References: None

Other Information Sources:
Skip Gish (ADF&G, FRED, Klawock) sent this info on 3/8/93. Some info also in the FRED Annual Reports to Alaska State Legislature (e.g., Jan 1991).

Big Boulder Creek Identification Code: P0037

Short Description: Mitigation & Enhancement in association w/ bridge work on Haines Highway

Nearest Town: Haines Year Began: 1991 Status: Monitoring Successful: Too soon

Additional Information:
Big Boulder Creek provides spawning habitat for a subpopulation of Chilkat River system chinook salmon. Habitat quality was degraded partially as a result of highway construction dating back to the 1940's. A hydrologic study was completed in February, 1991, by Environaid (Dan Bishop and Ben Pollard). This study provided information used to evaluate the design of the bridge reconstruction. Methods for instream-habitat enhancement described in the study were included in the design of structures installed in 1991. The structures consisted of 11 clusters of 3 boulders each, placed along 50 meters of the stream. These are designed to improve spawning habitat available to

chinook salmon. These boulder clusters and some incubation boxes (and a water-intake structure and pipeline to supply the boxes) were part of the 1991 work done as bridge mitigation (funded by ADOT/PF). Eggs collected from spawners returning to the system will be placed in the boxes in 1992/93. A runoff event in June 1992 scoured and deposited sediments in the streambed around the installed boulder clusters. The clusters near the bridge were covered with streambed material or transported a short distance downstream. The downstream clusters were retained. Plunge pools formed behind each cluster, with gravel deposited below the pools. All this will be monitored over time. In 1992, ADF&G (FRED) did additional enhancement work, consisting of installing cabled logs along 300m of the stream, to increase large woody debris elements and prevent them from immediately washing downstream. This latter work has not yet been evaluated/monitored.

Contacts:
Nate Johnson, ADOT, Douglas (465-4498); Kevin Brownlee, FRED, ADF&G (465-4230)

References: Report Expected

Other Information Sources:
Description and progress reports will continu in various FRED publications, including annual FRED DJ (Dingle-Johnson) Reports, 1991, 1992, etc.; and FRED annual reports to the Alaska State Legislature (e.g., 1991). Also, ADOT/PF had hired consultants to examine the restoration options ahead of time. Their feasibility analysis and "before-hand" discussion are found in "Chinook Salmon Enhancement Methods for Big Boulder Creek", by Dan Bishop and Ben Pollard, February 4, 1991. For this data entry, the project was discussed with Nate Johnson, ADOT/PF, Douglas, and Kevin Brownlee, FRED, ADF&G, Douglas.

Bryce Creek Coho Rearing Area

Identification Code: P0103

Short Description: Connecting Rearing sloughs in Salmon River Valley

Nearest Town: Hyder Year Began: 1989 Status: Monitoring Successful: Too soon

Additional Information:
The upper end of this project is located within a mile of Marx Creek. Habitat modification caused in part by annual outburst flooding from Summit Lake had resulted in an area of isolated off-channel sloughs and ponds. The objective of this project was to re-connect this aquatic habitat to Fish Creek, to allow access for juvenile salmonids. Project goal was to "...improve sportfishing in the Hyder area" (USFS). A pre-project rearing trial was conducted in 1991. Approx. 500 juvenile cohos were freeze-branded and moved into the isolated habitat to test its suitability for growth and overwintering. Results were encouraging. Preproject monitoring of a series of groundwater tubes in the area also occurred. Two short, 3-ft. wide channels were excavated in 1992 which allowed access from Fish Creek and also connected two major sloughs in the Bryce Creek area. This allows intermittent fish movement throughout all parts of the aquatic habitat. Three wooden water weirs were installed in an attempt to regulate water levels; these are ineffective because of the low water velocity and fluctuating groundwater levels. The newly accessible rearing habitat was readily colonized by coho juveniles during the summer of 1992. A growth study conducted by a USFS Co-op Student began comparing coho juvenile growth in Bryce Creek with two control areas in Fish Creek; the study will continue in 1993; monitoring will continue for several years, depending on funding.

Contacts:
Carol Denton, ADF&G, FRED Division, Ketchikan, 225-9677; Mark Jaqua, USFS, Misty Fiords National Monument, Ketchikan, 225-2148

References: Publication Date: 1992 Reference Type: Report
Author: Denton, C.
Title: Bryce Creek Coho Rearing Area Colonization Monitoring, 1992 unpublished

Other Information Sources:
Jaqua, M. Misty Fiords National Monument Fisheries Report 1992, 1993 unpublished report, USFS, MFNM files, Ketchikan. Also ADF&G, FRED Division files, Ketchikan and more info in FRED annual reports to the Alaska State Legislature.

Chilkat River Pond Access Identification Code: P0041

Short Description: Channels to connect river to potential rearing ponds in the upper Chilkat Valley

Nearest Town: Haines Year Began: 1980 Status: Completed w/M Successful: Yes

Additional Information:
Based on surveys conducted in both summer and winter (identifying ponds with low O2 in winter), several ponds were selected for channel access in 1982. In May 1982 they connected the ponds to the river by hand dug channels. As the river rose that spring, coho started using those ponds. In July 1982, coho were tagged with coded wire in seven ponds, only some of which were the artificially connected ponds. These adults returned in 1984, and demonstrated the immediate success of the connected ponds. Another tagging operation was begun in 1984 to further evaluate the ponds, especially their winter conditions. As of the January 1986 report the second tagging study had not yet been evaluated. Overall, however, Ron Josephson says that 1,000 adults a year are estimated to result from the increased rearing area made available by the new channel connections. A total of 616' of channels provided access to 103 acres of rearing habitat for coho salmon. Monitoring continued through 1986. Many tables, including comparisons of natural and artificially connected ponds, were included in Ron's 1986 Project Update.

Contacts:
Ron Josephson, FRED, ADF&G, Douglas, 465-4233.

References: Publication Date: January, 1986 Reference Type: Report
Author: Josephson, Ron
Title: Chilkat Ponds Project Update

Other Information Sources:
Discussion with Ron Josephson and Kevin Brownlee, both of ADF&G, FRED, Douglas, on 2/11/93.

Dean Creek Fishway Identification Code: P0118

Short Description: Alaska Steeppass project by USFS.

Nearest Town: Kake Year Began: 1983 Status: Completed w/M Successful: Yes

Additional Information:
"Alaska Steeppass" design anchored into rock walls. Provides passage over 20' falls. Ladder is functioning well. Coho are expanding through upstream area.

Contacts:
John Edgington, USFS, Petersburg, 772-3871
References: None

Other Information Sources:
John Edgington, USFS, sent in this info 2/16/93.

Dog Salmon Creek, Site #1 Identification Code: P0100

Short Description: Reducing habitat loss resulting from bank erosion and sedimentation

Nearest Town: Craig Year Began: 1992 Status: Implementation Successful: Too soon

Additional Information:
The objective of this project was to reduce further habitat loss by sedimentation due to bank erosion. This was accomplished by removal of an old debris dam to allow the water to flow in the original channel, and to install two instream log structures to function as sill logs. It was justified by the amount of habitat which could be lost if the project was not done. It will be evaluated on the basis of structure integrity over time; for example, is the structure functional in 1996? It was originally to be contracted out, but it was done in house and by hand. Heavy equipment would have done a better job, and should be used in the future whenever possible.

Contacts:
Skip Gish, ADF&G, FRED Division, Klawock, 755-2331

References: Publication Date: 1992 Reference Type: Report
Author: Gish, Robert K.
Title: Dog Salmon Creek Project Report

Other Information Sources:
Skip Gish (ADF&G, FRED) sent in this info on 3/8/93.

Dog Salmon Creek, Site #2 Identification Code: P0101

Short Description: Stabilizing a slide north of Port St. Nicholas

Nearest Town: Craig Year Began: 1992 Status: Implementation Successful: Too soon

Additional Information:
This project entailed the stabilization of a slide area. The toe of the slide was the stream bank, which totaled 80 feet in linear distance. The slide was in two parts; first covered 57' X 36' and the second was 23' X 15'. The slide area was covered with jute net and seeded initially with annual ryeand fireweed; in 1993 it will be reseeded with perennial grasses and/or native vegetation. Spruce tree revetments were used at the toe of the slide; five trees, all 25' to 30' in length, were anchored to bedrock or the streambank with the trunk above bankfull stage and the tips below base flow level. Evaluation will consist of the integrity of the structures through 1996.

Contacts:
Skip Gish, ADF&G, FRED Division, Klawock, 755-2331

References: Publication Date: 1992 Reference Type: Report
Author: Gish, Robert K.
Title: Dog Salmon Creek Project Report 1992
Other Information Sources:
Skip Gish (ADF&G) sent info 3/8/93

Gastineau Channel 302 Identification Code: P0042

Short Description: Restoration for intertidal gravel extraction, with ACOE enforcement action.

Nearest Town: Juneau Year Began: 1992 Status: Monitoring Successful: Too soon

Additional Information:
A 1987 Corps permit to expand a former intertidal borrow site included restoration conditions for after they were finished mining gravel. The old borrow site had restabilized very nicely as a pond, with vegetation and nesting waterfowl, before mining recommenced in approx. January of 1992. When finished excavating later that year, the fill they used to recontour the area was composed largely of organic material of various sizes. The agencies called the use of tree stumps, etc. in the pit "solid waste disposal" rather than site rehabilitation. It was also contrary to the original Corps conditions. They then removed as much of the fill containing coarse organic matter as they could (i.e. stumps), while continuing to use the finer-textured organic fill. This finer organic fill was not against Corps conditions for the permit, but ADEC (and others) voiced concerns about the biological oxygen demands generated by filling with organic material. The gravel pit shelf edge was graded to just below water level (mean high water or just below, so that it would be saturated periodically). They considered using a seed mix but the Corps wanted to see what vegetation would come in naturally. They were successful at obtaining the right fill elevations for water saturation, and some sparse vegetation is already coming in (Juncus, after one season), but it will be hard to determine success until they conclude all mining and breach the dikes, which will return the area to tidal inundation. The long range plan is for this area to grow into an intertidal emergent marsh. There is not yet fish access to the area. The effect of the organic fill on water quality has not been monitored.

Contacts:
Ralph Thompson, ACOE Enforcement, Juneau, is monitoring (790-4490). Andy Grossman, USFWS, Juneau, is also tracking (586-7243).

References: None

Other Information Sources:
Andy Grossman (USFWS) provided a short description. Interviewed Rick Reed (ADF&G) on 2/11/92. Talked to Ralph Thompson (ACOE) on 2/17 for follow-up information. Talked again to Andy Grossman on 5/21/93.

Glacier Highway Reconstruction Identification Code: P0039

Short Description: 1984 work done in Jordan and Duck Creeks in Juneau. AKA Gastineau Channel 386.

Nearest Town: Juneau Year Began: 1984 Status: Completed w/M Successful: Yes

Additional Information:
To mitigate for loss of habitat from installing two culverts in place of an existing bridge on Jordan Creek, several measures were taken. One was to provide access to two ponds downstream, allowing more rearing area for cohos. The work was monitored for two years by ADOT and ADF&G (Sport Fish). All culverts were properly bedded (20% burial) and backfilled with spawning gravel. Effectiveness of this spawning gravel in the culverts is questionable. Approx. 300 to 400 feet of Duck Creek was realigned, and pools were excavated for low water periods ("low water refuges"). This last aspect appears to have been quite successful. Along Duck Creek, the natural brush/shrubs were retained as much as possible, and willows were transplanted in. ADOT also installed oil/water separators in the storm drainage system at the road crossings. The seed mixture used in this project was a standard highway mix.

Contacts:
Van Sundberg, ADOT, Douglas, 465-4505. And Janet Hall Schempf, ADF&G, Douglas, 465-4289.

References: None

Other Information Sources:
Interview with Van Sundberg, ADOT/PF, Juneau, on 2/9/93, and info from some of his files.

Green's Creek Fish Pass — Identification Code: P0055

Short Description: Fish Pass over barrier falls as mitigation for habitat loss in Tributary.

Nearest Town: Juneau/Hoonah Year Began: 1988 Status: Completed w/M Successful: Yes

Additional Information:
This project was proposed in the EIS for this zinc/lead/silver mine. The fish pass over barrier falls would serve as mitigation for loss of coho habitat in nearby Tributary Creek, caused by the mine's tailing pond. The falls in Greens Creek served as a fish barrier both because of the steepness (a 30' drop) and the velocity. In 1988-89, they used explosives to blast an area at the falls and installed concrete baffles there. These concrete baffles were chosen because they were not expected to require much maintenance in the future. However, there was no evidence of fish use after the baffles were in place. So in 1991 they removed several perceived log barriers at the head of the falls. This seems to have worked: in 1992, coho, chinook, and chum yearlings were observed above the falls. This fish pass project opened up access to about 2 miles of spawning and rearing habitat above the falls. Green's Creek Mine has to survey the situation every spring, and file a report to the Forest Service. By summer of 1993, they have to demonstrate that at least 200 coho juveniles have successfully over-wintered in the newly accessible reach of the creek (above the falls). If these numbers are not demonstrated, they may try "bio-enhancement" by means of out-planting hatchery-incubated fry from local stock.

Contacts:
Ken Post or Vivian Hoffman, US Forest Service employees at the Admiralty Monument office in Juneau: 586-8790. Also Duane Peterson (NMFS) and Andy Grossman (FWS) in Juneau.

References: None

Other Information Sources:
Talked to Duane Peterson (NMFS, Juneau) on 2/22/93. Ken Post (USFS, Juneau) sent a copy of a October 1992 Memo from the Mine's hired fishery consultant, J.W. Buell (Beaverton, OR), spelling out the intent of the project and what the mine is obligated to monitor/demonstrate by 1993.

Haines Airport Mitigation — Identification Code: P0018

Short Description: Chilkat River 6. Created fish rearing ponds and wetlands, monitoring req'd.

Nearest Town: Haines Year Began: 1990 Status: Monitoring Successful: Too soon

Additional Information:
Wetlands and fish rearing ponds were to be created as mitigation for expansion of Haines Airport, to create habitat diversity in Yindastuki Creek and other waterways of the project area through a variety of channel profile designs, placement of boulders and large organic debris in the stream channel and along the stream banks, and the provision of riparian and wetland vegetation on stream and pond margins. Wetlands restoration: Two areas which had been filled were to be returned to natural conditions. The easterly 600+ feet of the old runway will be removed and restored to an emergent/scrub shrub wetland; an unauthorized parking lot fill behind the terminal building will be restored to riparian wetland. The total area of wetlands being restored is apx. 2.8 acres. Topsoil and overburden from the new runway site will be placed in the wetland restoration areas in order to expedite revegetation by

indigenous species. The sites will also be seeded with Beckmania in order to minimize short-term erosion impacts. Apx. 14 acres of emergent wetland and a 1.7 acre drainage slough will be created between the two runways. The drainage slough will intersect Yindastuki Creek at apx. the midpoint of the new runway. Stockpiled topsoil & overburden material from the site of the new runway will be used as a material source. The emergent wetland will be seeded with Beckmania. Fisheries ponds: Five coho rearing pond/slough complexes totalling 2.5 acres will be excavated in the Sawmill Wetlands to a depth of 8'. Document entitled "Haines Airport Mitigation Efforts: Parameters of Success" included in file 3 of 4. Monitoring was a condition on the permit.

Contacts:
Art Dunn (then) and Nate Johnson (now) at ADOT/PF, Douglas, 465-4498. Also Steve Meyers at the Corps (753-2712) and consultants from Haines who helped write the EA and monitoring plans-- Daniel & Gretchen Bishop and Richard Carstensen. Kevin Brownlee (FRED, ADF&G, Douglas) is doing the monitoring as of 1992.

References: Report Expected

Other Information Sources:
Objectives and implementation plans exist in the ACOE files. ADOT/PF has a monitoring plan and DGC has details of project objectives in its conclusive consistency determination, located in file 3 of 4 in the ACOE files. ACOE has done preliminary monitoring inspections (last documented 2/92), located in file 4 of 4. Kevin Brownlee (FRED, ADF&G, Douglas) will be monitoring fish results and will be writing up reports. ADOT/PF, Douglas (Nate Johnson), provided numerous preliminary documents by the consultants of Daniel and Gretchen Bishop and Richard Carstensen, including "A Report on Environmental Studies at Haines Airport, Second Phase", October 12, 1989; and "A Plan for the Monitoring of Environmental Protection and Mitigation, Haines Airport Reconstruction", Sept. 26, 1990.

Herman Creek — Identification Code: P0104

Short Description: Spawning Channel near Haines

Nearest Town: Haines — Year Began: 1989 — Status: Completed w/M — Successful: Yes

Additional Information:
The spawning channels continue to offer fair to excellent spawning habitat for chum salmon returning to the Chilkat and Klehini rivers. An exceptionally strong return of chum to Herman Creek in fall 1992 boosted the numbers of spawners to a new historical high for chums utilizing the newer Herman Creek spawning channel. As of 11 October 1992 a total of 3,308 spawners had used the channel and 2,159 chum were still spawning. It appears highly likely that up to 5,500 chum used the Herman Creek channel. A small weir was used to trap and enumerate all chum fry leaving the Herman Creek spawning channel in spring 1992. The weir was erected in early March and operated until early June for a total of 92 days. A total of 1,139,002 chum fry were counted which translates to an egg-to-fry survival of 23%. This survival is slightly higher than anticipated, and higher than the estimated 21% survival in 1991.

Contacts:
Lon Garrison, NSRAA, Haines, 766-3110; Steve Reifenstuhl, NSRAA, Sitka, 747-6850

References: None

Other Information Sources:
Lon Garrison, NSRAA, provided info including a summary of their spawning channel activity. This summary was taken from their autumn 1992 board reports to NSRAA.

Indian River Log Dump Identification Code: P0109

Short Description: Restoring former Log Dump by removing bark debris.

Nearest Town: Tenakee Springs Year Began: 1984 Status: Monitoring Successful: Too soon

Additional Information:
This cove, adjacent to Indian River, was a former log transfer facility (LTF). Bark deposition on the cove bottom was as much as 2' deep in places. Many studies have indicated that benthic fauna suffer from this bark layer. Their concerns for this study included toxins produced during decomposition of the bark, and the bark's effects on bottom-dwellers (crabs, clams, polychaetes). They made biomass measurements in 1984-85 by weighing bark layer samples (0.22 m2) from the bottom. In 1987, they marked off an area of the cove bottom (about 1500 sq. yds), and removed the bark layer with a dredge. Then they waited a few seasons to allow the area to recolonize. In 1993, they plan to return and repeat the biomass measurements and assess species diversity in the test plot area. Their objective was to determine whether bark debris removal was a feasible technique for restoring former log dumps. At this point, Andy feels it is feasible. They may return and inspect the area in another 10 years, if possible.

Contacts:
Andy Grossman, USFS, Juneau, 586-7240

References: Publication Date: 1986 Reference Type: Journal
Author: Jackson, Rod. G.
Title: Effects of Bark Accumulation on Benthic Infauna

Other Information Sources:
Robinson-Wilson, Everett. Effects of Log Bark Debris on Subtidal Bivalves, 1987, Report. Also talked to Andy Grossman, USFS, on 3/31/93. Results of this summer's inspection will be written up in late 1993.

Jordan Creek 8 Identification Code: P0049

Short Description: Enforcement action will ensure restoration/protection of remaining wetland area

Nearest Town: Juneau Year Began: 1993 Status: Preliminary Successful: Too soon

Additional Information:
This was an enforcement action for unpermitted fill for roads. Andy Grossman (USFWS) reports: "Early violations involving fill and roading of Jordan Creek wetlands went unresolved, despite compliance orders from the Corps in 1986. Recent agreements by the violator will allow retention of roads and some additional fill in exchange for restoration and deeded protection of most valuable remaining wetland area. Restoration will be monitored by ADF&G (Rick Reed) and the Corps (Ralph Thompson)." The Corps wants the Smiths to connect a side pond area to Jordan Creek with a channel to allow access to additional rearing area. ADF&G said to make sure the channel drains properly if the creek level drops, so that no fish are stranded in the pond. The Smiths will also dedicate (deed protection of) some remaining wetlands. Some aspects of this project are completed, others will be implemented in 1993. Also, separate from the work on the "main stem' of Switzer Creek, channel excavation and restoration will be conducted on some 200 meters of a tributary (combination of ADF&G/CBJ effort). They will monitor the physical land form, water quality, and salmonid response of these measures.

Contacts:
Rick Reed (ADF&G, Habitat, Douglas), Andy Grossman (USFWS, Juneau), Duane Peterson (NMFS, Juneau).

References: None

Other Information Sources:
Andy Grossman (USFWS) provided a short description. Rick Reed, ADF&G, was interviewed on 2/11/93.

Juneau Airport Dike Identification Code: P0047

Short Description: Nice freshwater marsh complex was created incidentally by new dike in the 1940's

Nearest Town: Juneau Year Began: 1942 Status: Completed w/M Successful: Yes

Additional Information:
The dike changed the character of the area from intertidal wetlands to a more protected area with more variety--freshwater and uplands. A forest fringe and brush element now provides good cover for waterfowl. The area supports feeding and nesting ducks and geese, and raptors use the trees for hunting. Small mammals (martins, etc.) are also present. After 50 years it is now a wetland complex of marsh, open water and upland.

Contacts:
Andy Grossman (USFWS), Mary Lee Plumb-Mentjes (ACOE), and Rick Reed also recommends Bob Armstrong, a retired ADF&G Sport Fish person who knows a lot about the value of this area.

References: None

Other Information Sources:
Rick Reed (ADF&G, Douglas) was interviewed for the historical overview. Many individuals would know what now inhabits the site. Sport fish staff have found mostly marine fishes (no salmon). Local birders could provide bird use info.

Juneau Airport Taxiway/GC 341 Identification Code: P0054

Short Description: Gastineau Channel 341 and other concurrent permits, involving Jordan Creek

Nearest Town: Juneau Year Began: 1991 Status: Monitoring Successful: Yes

Additional Information:
There were 3 or 4 Corps permits going on at about the same place and time. In a rather unique move, they were treated as one for mitigation. The developers involved (ADOT/PF, City & Borough of Juneau, a few privates) set up a mitigation "fund" for the whole complex of work. Contributions to the fund totaled $35,000. The agencies set up priorities for the money. Work included the following components: 1) 1991-92, Replaced a perched culvert on Jordan Creek with an arched culvert. Nice rearing habitat was right above. They watched the area for a year to assess any ill effects on stream morphology. There was concern about the creek cutting above the lowered (arched) culvert level. To prevent it from unravelling anymore, in 1992 they installed boulders above the culvert to slow the flow and make some pools. This seems to be working well. They also laid trees (w/ limbs) across the creek in the upper rearing area to provide cover. The trees did not impede flow. 2) 1991 on the Juneau side of Temsco property. Attempted to replace some upper intertidal slough area as an experiment. They dug out the slough area and made it sand-bottomed, hoping to attract sand lance as prey for salmon. The wetland functions are being monitored by FWS and NMFS. After two years, the area appears stable and doing well. Geese are feeding in the hydroseeded grasses. 3) Some of the fund money was used for interpretive purposes. In 1992 a 1/8 mi. long trail was constructed on public (CBJ) property along Jordan Creek in a "dedicated greenbelt." This trail included 3 foot bridge crossings over Jordan Creek, and passed along the creek and some ponds (former borrow pits). The agencies have suggested some interpretive signage to be installed in 1993. 4) Money remains in the 'fund' at this point; not sure if all will be used. Seems to have been a very constructive pooling of resources.

Contacts:
Rick Reed (ADF&G, Douglas), Nevin Holmberg (FWS, Juneau), Duane Peterson (NMFS, Juneau), Ralph Thompson (ACOE, Juneau).

References: None

Other Information Sources:
Interviewed Rick Reed (ADF&G) and Duane Peterson (NMFS) about the project. Many agency people have materials in their files.

Kennel Crk Large Woody Debris Identification Code: P0128

Short Description: Felling trees into creek to enhance cover for rearing coho.

Nearest Town: Tenakee Springs Year Began: 1986 Status: Monitoring Successful: Too soon

Additional Information:
Six conifers were blasted into creek in 1986. Twenty more digger logs, made mostly of large red alder, were cabled into place. In 1992, two attempts to construct log weirs in a side channel met with failure as either the crew or tools could not handle logs large enough to stay in place, or the streambanks, composed of loosely combined gravels and cobbles, washed out. Further weir construction was cancelled. Nine structures located in a side channel were monitored for numbers of fish and depths. Snorkel counts were made on 15 October 1992 of habitat encompassing each individual structure. The majority of fish counted were juvenile coho salmon and a few Dolly Varden trout. Monitoring will include fish habitat preference and fish density, and channel cross sections to monitor scour and deposition around structures.

Contacts:
Christopher Riley and Chris James, USFS, Hoonah, 945-3631

References: None

Other Information Sources:
Chris James, USFS, Hoonah, sent in this info on 3/16/93. More info in the 1992 Program Accomplishment Report of the Chatham Area of the Tongass National Forest.

Kwatahein Fishway Identification Code: P0120

Short Description: Concrete weir & step pool passage for pink salmon

Nearest Town: Kake Year Began: 1989 Status: Completed w/M Successful: Yes

Additional Information:
A concrete weir and step pool structure. Fish ladder opened upstream watershed area to pink salmon. Production increasing annually.

Contacts:
John Edgington, USFS, Petersburg, 772-3871

References: None

Other Information Sources:
John Edgington, USFS, sent in this info 2/16/93.

Lake Rearing Cover Enhancement Identification Code: P0131

Short Description: Creating rearing cover by felling trees along lakeshore.

Nearest Town: Hoonah Year Began: 1982 Status: Completed w/M Successful: Inconclus.

Additional Information:
The four lakes selected to develop cover for rearing salmonid fry were generally small (<50 ac.) and shallow (<100 ft.). Three of the 4 lack significant epilemnetic zones with emergent vegetation or cover. All are accessible to anadromous fish and have sportfishing potential. Overnight fry trapping was conducted before enhancement. Trees were then felled into the lakes. Any limbs that remained out of water were removed and thrown into the lake at the end of each structure. After a month the structures were trapped again to assess fish use of the new cover. The pre-project hypothesis that there would be no noticeable benefit to rearing fry or parr cover was generally confirmed. This can be attributed to the minuscule cover added in contrast to available shoreline, and budget and time constraints on monitoring. However, *anoticeable* use of the structures by catchable fish was also confirmed. At Bearpaw Lake, cutthroat were using the structures where they had not previously been present, and the catch rate increased 50% for the area adjacent to the structure vs. open shoreline. Although no evidence of benefit to fry or parr was found, enhancement of recreational opportunities was accomplished.

Contacts:
Christopher Riley and Chris James, both USFS Hoonah Ranger District, Hoonah, 945-3631

References: Publication Date: 1983 Reference Type: Report
Author: Perkinson, Ray D.
Title: Habitat Enhancement Project, Hoonah R.D., Lake Rearing Cover

Other Information Sources:
Chris James, USFS, Hoonah, sent in info including the 1983 report listed above.

Lemon Creek 1-4 Identification Code: P0043

Short Description: Required to restabilize and replant creek banks after gravel extraction

Nearest Town: Juneau Year Began: 1989 Status: Monitoring Successful: Yes

Additional Information:
This was a phased rehabilitation of a gravel mining site, as they completed operations in each reach of creek. In approx. 1989 they put in rock groins (big boulders, to promote creek meander) and armoring in one section of the creek, but it all blew out with rains the very next season. In approx. 1991 they armored the lower creek area with shot rock, and on the upper creek banks they planted alders and placed boulder clusters in-stream. The boulders just seemed to silt in (now creating "islands" of sorts) but the alders are doing very well, and were 6 or 8 feet high by 1992 (from Ralph Thompson). They appear to be helping stabilize the bank and creating good songbird habitat. Additional stabilization work may be required in other sections of the creek, but Rick Reed thinks the creek will reestablish itself well enough once extraction operations cease.

Contacts:
Ralph Thompson, ACOE Enforcement, Juneau 790-4490. Also Andy Grossman (USFWS, 586-7243) and Duane Peterson (NMFS, 586-7235).

References: None

Other Information Sources:
Andy Grossman (USFWS) wrote a short description. Rick Reed (ADF&G) and Ralph Thompson (ACOE Enforcement) were also interviewed.

Lemon Creek 9 Identification Code: P0052

Short Description: Create aquatic littoral habitat (shallow shelf) as rehab gravel mining operation

Nearest Town: Juneau Year Began: 1993 Status: Preliminary Successful: Too soon

Additional Information:
In this situation of a deep pit in a tidal area, the agencies felt the best direction for rehabilitation would be to encourage the establishment of vegetation, for cover and food sources for fish, and of some minor benefits to waterfowl as well. Once the gravel operations are completed, the agencies requested that the pit be bordered by a shallow gravel shelf 20 ft wide, set at the elevation of the inlet channel. This shelf will be covered with a top layer of fine-textured material, no thinner than one foot, and then be recovered with the original vegetative mat that had been rolled up and stockpiled in the interim. If after two seasons after the cessation of gravel excavation, the vegetative mat is not showing signs of active growth (defined as 50% cover over 50% of the area), the back-up plan is that the applicant must sprig Carex lyngbyei every 18 inches and use 20-20-10 fertilizer in the amount of 300-350 lbs/acre. If erosion is considered a problem, they would use something like jute mesh (that would be expected to deteriorate within 5 yrs) to stabilize the surface during plant establishment. This is one of the first "shelf" type rehabilitation plans for gravel mining in Alaska. In the past agencies just requested that the edges be graded on a shallow incline rather than a steep slope.

Contacts:
Mary Lee Plumb-Mentjes at the Corps, Anchorage, 753-2716. For fish habitat aspects: Rick Reed, Habitat Division., ADF&G, Douglas, 465-4287. For plant methods: Nancy Moore, DNR Plant Materials Center, 745-4469. For follow-up information, Ralph Thompson of ACOE compliance in Juneau: 790-4490.

References: None

Other Information Sources:
Talked to Rick Reed, ADF&G and Mary Lee Plumb-Mentjes, ACOE about the project, and consulted the ACOE permit language itself (dated 2/2/93). All players would have numerous records. Ralph Thompson, ACOE, Juneau will be follow-up person.

Man Made Hole Identification Code: P0117

Short Description: Blind Slough Gravel Pit Rearing Area

Nearest Town: Petersburg Year Began: 1992 Status: Completed w/M Successful: Yes Additional Information:
Originally, the gravel pit was created during road construction in the 1950's. A worker at that time decided to connect the no-longer-needed gravel pit to the nearby creek. After 40 years, the area has become a nice lake/rearing area for fish. Repair work was conducted in 1992 because an upstream landslide had blocked the channel with gravel. They re-opened the channel to the lake to maintain water source and salmonid migration. Objectives have been met. Annual maintenance needed. Nice populations of cutthroats rearing there now!

Contacts:
John Edgington, USFS, Petersburg, 772-3871

References: None

Other Information Sources:
John Edgington, USFS, sent in this info on 2/16/93.

Marx Creek Spawning Channel Identification Code: P0102

Short Description: USFS/ADF&G spawning channel (& tagging) in formerly logged Salmon River Valley

Nearest Town: Hyder Year Began: 1985 Status: Monitoring Successful: Yes

Additional Information:
The Salmon River valley was logged at some time in the past (1930s - 1950s), destabilizing the riparian areas. The Salmon River originates in Summit Lake, above the Salmon Glacier; the river has been subject to annual outburst floods from Summit Lake almost annually for the last 20 years. These floods are extremely destructive to salmonid habitat along the river, threatening the Fish Creek chum salmon population as well as other species present. Three flood control dikes have been built in the lower Salmon River; 2 to protect fish habitat (Marx Creek is behind one of these) and 1 to protect the town of Hyder. The objective of this project was to increase available spawning habitat for the Fish Creek chum salmon, identified as a Sensitive Species by the USFS. A team approach was used in planning: USFS hydrologists, engineers and biologists led the bioenhancement effort. The project was implemented in two stages: 1) the lower 1700m of the channel was excavated in 1985, and 2) a 500m extension was added in 1989. It was colonized by broodstock transfer from Fish Creek, over a 4-year period. Transferring known numbers of spawners to each "cell" in the channel allowed an accurate evaluation of production. Representative portions of emergent fry were coded-wire tagged; the last CWT adult return will occur in 1993. The area between Salmon River Road and the Marx Creek Spawning Channel was revegetated to provide a screen to keep road dust out of the spawning gravel and to help shade the channel. Approximately 400 willow cuttings were planted along the streambank, and 60 bundles of scions were planted on the slope of the road.
Contacts:
Carol Denton, ADF&G, FRED Division, Ketchikan, AK, 225-9677; Mark Jaqua, USFS, Misty Fiords National Monument, Ketchikan, 225-2148

References: Publication Date: March 1989 Reference Type: Report
Author: Novak, Paul and Carol Denton
Title: Progress Report, Marx Creek Spawning Channel, 1985-87, FRED Report #94, ADF&G

Other Information Sources:
Documentation and blueprints in files of the USFS Misty Fiords Nat'l Monument and the FRED Division of ADF&G, Ketchikan. Adult returns through 1992 summarized in presentation to AFS Habitat Workshop in Haines, AK, October, 1992, by Carol Denton.

Mendenhall Dredge Islands Identification Code: P0048

Short Description: Sand islands created from Mendenhall Bar Navigation Channel

Nearest Town: Juneau Year Began: 1959 Status: Completed w/M Successful: Yes

Additional Information:
Seven sand islands were created with the dredge spoils for the channel dredging operation by the Army Corps of Engineers in 1959-60. This is a good example of some positive actions that can be taken during such a procedure. The islands appear very natural now, 30 years later. The islands are protected from most disturbances. Arctic terns are nesting there. It was successful at increasing the diversity of the habitat mosaic in the area (now has beach

fringe). The State Refuge Plan says that "By 1971 the channel had silted in and a natural equilibrium between decomposition and erosion had been re-established, and the Mendenhall wetlands were again navigable only at high tide by small craft, similar to 90 years earlier." The sand islands created by the dredging are sparsely vegetated with alder, cottonwood, willow, and young spruce bordered by thick mats of beach rye.

Contacts:
Rick Reed (ADF&G, Habitat Div., Douglas, just retired), Andy Grossman (USFWS, Juneau, 586-7240), Bruce Dinneeford (ADF&G, Div. Wildlife Conservation, Douglas, 465-4265), Marilyn Sigman (Same), Nate Johnson (ADOT, Douglas, 465-4498).

References: Publication Date: March 1990 Reference Type: Report
Author: Divisions of Habitat and Wildlife Conservation
Title: Mendenhall Refuge State Game Management Plan

Other Information Sources:
Interviewed Rick Reed, ADF&G. Some info from the above reference (pp.A-2 and A-3 of the Mendenhall Refuge State Game Management Plan). The U.S. Fish and Wildlife Service also did bird observations in "Bird Use of the Mendenhall Wetlands in Juneau, AK." by Steven Cain, John Hodges, and Everett Robinson-Wilson, 1988.

Mitchell Creek Fish Pass Identification Code: P0121

Short Description: Concrete weir and pool structure for coho and steelhead passage

Nearest Town: Petersburg Year Began: 1992 Status: Completed w/M Successful: Too soon

Additional Information:
A concrete weir and pool structure, about 1 mile above tidewater. Beginning monitoring phase.

Contacts:
John Edgington, USFS, Petersburg, 772-3871.

References: None

Other Information Sources:
John Edgington, USFS, sent in this info on 2/16/93.

Mitchell Pool Enhancement Identification Code: P0122

Short Description: Pools for spawning and rearing blasted into bedrock

Nearest Town: Petersburg Year Began: 1992 Status: Completed w/M Successful: Yes

Additional Information:
They blasted pools and placed log drop structures above the pools to prevent too much deposition in the pools. Other pools are now being formed above the drop structures as well. The project has created rearing and spawning habitat in a poor (deficient) bedrock-confined channel type. Monitoring is continuing.

Contacts:
John Edgington, USFS, Petersburg, 772-3871

References: None

Other Information Sources:
John Edgington, USFS, sent in this info on 2/16/93.

Mitkof Highway Reconstruction Identification Code: P0038

Short Description: Removing fish barriers at 25 crossings along 6.4 mile section of highway.

Nearest Town: Petersburg Year Began: 1992 Status: Completed w/o M Successful: Yes

Additional Information:
During the course of highway improvements, fish passage was reestablished or improved at 25 different crossings using improved culverts, backwater control structures (cabled logs and boulders to make step pools), stream reconfigurations, and grading. Fish now have access to miles and miles of streams that had been blocked or nearly so for years. Each fish culvert was individually designed to achieve the proper gradient. A success story for which both ADOT and ADF&G staff were awarded employee recognition.

Contacts:
Van Sundberg, ADOT, Douglas, 465-4505, and Don Cornelius, ADF&G, Habitat, Petersburg, 772-3801.

References: None

Other Information Sources:
Interview with Van Sundberg, ADOT/PF, Juneau, on 2/9/93. Don Cornelius (Habitat Division, ADF&G, Petersburg) may have more info on current working status.

Mud Bay River LG Woody Debris Identification Code: P0130

Short Description: Felling trees into creek to enhance coho rearing cover

Nearest Town: Hoonah Year Began: 1984 Status: Completed w/M Successful: Unknown

Additional Information:
Large woody debris was introduced to Mud Bay River on July 9-11, 1985, in a long homogeneous section of the stream channel that was generally devoid of juvenile coho rearing habitat. The one mile study section is located 4 miles upstream from tidewater. Pre-project mapping and measurements were taken for 30 m sections around each targeted live tree. Explosives were used to fell standing live conifers, with root wads attached, into the stream channel in six locations. Habitat parameters were measured before and after project implementation to quantify changes in habitat type as a result of the structure. Repeated sampling was planned for 5 years after work completed, but no data exists past 1985. Expectations were that as the channel changed to accommodate the influx of debris, they would see more stream sections of slower velocity, as well as increased cover and deposition of spawning gravels. Increased utilization by juvenile coho was already observed during the first year's post-mapping.

Contacts:
Christopher Riley and Chris James, both USFS, Hoonah Ranger District, Hoonah, 945-3631.

References: Publication Date: 1985 Reference Type: Report
Author: Stein, Karl
Title: Mud Bay River Large Woody Debris Fisheries Enhancement Project

Other Information Sources:
Chris James, Hoonah, USFS, sent in this info on 3/16/93, including the report listed above.

N.F. Game Ck Barrier Modif. Identification Code: P0127

Short Description: Step pools created by blasting for coho migration

Nearest Town: Hoonah Year Began: 1988 Status: Monitoring Successful: Too soon

Additional Information:
A 13' vertical falls was blasted into a series of step-pools to allow adult coho migration to existing habitat above. 1000 fry were taken from below falls and distributed into adequate rearing habitat above falls. Spawning surveys are being used to monitor escapement above falls and to chart new spawning grounds used.

Contacts:
Christopher Riley, USFS, Hoonah, 945-3631, Christopher James, USFS, Hoonah, 945-3631

References: None

Other Information Sources:
Chris James, USFS, Hoonah, sent in this info 3/16/93

North Three Mile Creek Identification Code: P0097

Short Description: ADF&G Educational Project on Prince of Wales Island

Nearest Town: Klawock Year Began: 1992 Status: Implementation Successful: Too soon

Additional Information:
This was a small educational and cooperative project which opened a culvert to fish passage. At the culvert inlet it included debris removal, pool excavation and installation of a sill log. Elevation of the tailwater pool below the culvert was raised by a second sill log. The disturbed area was seeded with a mixture of commercial grass varieties. Prescribed alder thinning in the riparian zone will occur this season. Work on the project will be completed by August 1993. Evaluation of the project will continue through the fall of 1995. Monitoring consists of fyke net operations for the outmigrants, and escapement surveys for the adults. Skip Gish, ADF&G, will probably extend the outmigrant monitoring (possibly alternate years) due to poor escapement to the system in 1992.

Contacts:
Skip Gish, ADF&G, Klawock, 755-2331

References: Publication Date: 1992 Reference Type: Report
Author: Gish, Robert K
Title: North Threemile Creek Project Report 1992

Other Information Sources:
Skip Gish (ADF&G, FRED, Klawock) sent info on 3/8/93.

Ophir Creek Flow Improvement Identification Code: P0045

Short Description: Trying to improve low flow in a degraded stream system. Much community interest.

Nearest Town: Yakutat Year Began: 1989 Status: Implementation Successful: Too soon

Additional Information:
Over time, three components are included for the creek project: 1) Pond excavation, in a pilot effort to establish refuge sites for spawning coho, sockeye, and juveniles during low-flow periods. 2) Removal of perceived blockages caused by blow-downs from clearcuts. This was an impromptu action conducted by Koncor in 1988. 3) Still in proposal stage, excavating a 900 ft. reach of stream to an elevation allowing groundwater interception. the natural gradient of most of the excavated part of the stream will be maintained. Large woody debris will be placed back in the excavated channel, and waste material will be sidecast along the channel. Flows in the stream have not yet been low enough along the project reach to allow the excavation procedure as contracted (specified as "during low or absent flow"). This work will proceed as water conditions permit. The entire stream work encompasses estuarine, lower and upper riverine, and palustrine sections.

Contacts:
Kevin Brownlee, FRED, ADF&G, Douglas, 465-4230.

References: Report Expected

Other Information Sources:
Kevin Brownlee's (ADF&G, FRED Division, Douglas) annual Dingle-Johnson/Wallup-Breaux reports, titled Federal Aid in Sport Fish Restoration.

Pavlof River Upper Fishpass Identification Code: P0123

Short Description: Ladder for pink, chum and coho salmon. Fish use will be determined by tagging.

Nearest Town: Tenakee Springs Year Began: 1987 Status: Monitoring Successful: Too soon
Additional Information:
The Hoonah Ranger District installed a fishpass in 1987 over a cascade on upper Pavlof River that was considered a complete barrier to pink and chum salmon and a partial barrier to summer-run coho salmon. In mid-September of 1992, a cursory survey of spawning gravels 400 feet upstream of the fishpass located numerous coho spawning in the area. Pink, chum, and sockeye salmon were absent at this time as could be expected. Earlier in the summer, pink and sockeye salmon were observed spawning approximately one-half mile downstream of the fishpass, however no timely surveys were made to determine whether either species migrated above the fishpass. In an effort to determine how many pink, chum, coho, and sockeye ascend the fishpass, fish weirs (ADF&G tripod-style) were prepared and helicoptered to the vicinity of the upper fishpass for erection in FY93. Current objectives are to quantify coho use of fish ladder vs. adjacent falls and to search for any genetic or morphological variation between fish using fishpass vs. falls. Fish going through fishpass will be tagged to quantify fishpass use.

Contacts:
Christopher Riley, USFS, Hoonah, 945-3631; Christoper James, USFS, Hoonah, 945-3631

References: None

Other Information Sources:
Chris James, USFS, Hoonah, sent in info on 3/16/93. Also some info in the 1992 Program Accomplishment Report of the Chatham Area of Tongass National Forest.

Pavlov Marsh Wildlife Viewing Identification Code: P0107

Short Description: USFS project for "watchable wildlife"; nesting platforms for Canada geese

Nearest Town: Hoonah Year Began: 1991 Status: Monitoring Successful: Too soon

Additional Information:
A unique marsh system (avg. 3' depth) near road. Logging had occurred within the watershed. Some migratory waterfowl pass through. USFS wanted to enhance the habitat for Vancouver Canada Geese nesting - to make a "Watchable Wildlife" area. In 1991 they put out 9 raised wooden platforms, placed in various margins of the marsh - forest, shrubs, and open areas. These platforms collapsed after a season due to snow load and bear use. In 1992, they put out 5 galvanized metal wash buckets up into trees (Sitka Spruce) facing the marsh area. They were placed 10-15' up in trees, and moss was placed inside. 1993 will be the first observation year. They plan to build a wildlife viewing blind there, as money allows. A trail has already been built. They may possibly try some floating platforms in the future.

Contacts:
Kris Rutledge, USFS, Hoonah, 945-3631

References: None

Other Information Sources:
Write-up in USFS's Watchable Wildlife brochure, about to be published. Also, talked to Kris Rutledge, USFS, Hoonah on 3/30/92.

Slippery Creek Fishway — Identification Code: P0116

Short Description: Tunneled fishpass through rock

Nearest Town: Kake Year Began: 1987 Status: Completed w/M Successful: Yes

Additional Information:
Tunneled fish pass through rock to provide access over 30' falls. Fish ladder was evaluated, including an indepth study of fish interaction. It has been a very successful ladder. Coho, pink and chum salmon, and cutthroat and steelhead trout all use upstream habitat.

Contacts:
John Edgington, USFS, Petersburg, 772-3871

References: Report Expected

Other Information Sources:
This info sent in by John Edgington, USFS on 2/16/93. More info at Forest Sciences Laboratory (Juneau), where Pam Porter is writing up a USFS report by 1994.

Starrigavin Creek — Identification Code: P0170

Short Description: Large woody debris structures placed in stream

Nearest Town: Sitka Year Began: 1986 Status: Monitoring Successful: Yes

Additional Information:
Monitoring has been completed annually since 1986. Five instream log structures were placed in a tributary stream which had been logged to both banks. The structures dam up the water, creating a varied habitat of shallow & deep pools. During the winter, juvenile coho salmon move to deeper water, closer to instream woody debris and undercut banks. Data indicates that total stream area in the project reach increased 28% after the structures were constructed. Population estimates indicate coho are seeking out the habitat created by the structures, and that the overwinter carrying capacity has substantially increased in the project reach. Most fish were caught in pools just above structure, and very few downstream of these structures. When developing instream structures, high priority

should be given to complex cover in the form of large & small woody debris, root wads, leaf litter & undercut banks just above new structures. Coho densities were twice as high in the structured section as in the control section, and three times higher in the individual stream sections directly above the 4 dam type log structures. Bedload material is gradually filling the pool area & needs closer monitoring.

Contacts:
Gregory Killinger or Bill Lorenz, USFS Sitka Ranger District, 204 Siginaka Way, Sitka 99835, 747-6671

References: Publication Date: October 5, 1992 Reference Type: Report
Author: Killinger, Gregory M.
Title: 1992 Annual Report - Starrigavin Creek

Other Information Sources:
Just the report.

Suntaheen Ck Pink Slmn Barrier Identification Code: P0126

Short Description: Step pools blasted into falls for pink & chum spawning access.

Nearest Town: Hoonah Year Began: 1991 Status: Monitoring Successful: Yes

Additional Information:
Step pools were blasted into a small (5 ft.) bedrock falls opening up spawning habitat previously inaccessible to pink and chum salmon. Spawning surveys were taken during peak migration to determine escapement above falls and to map spawning areas. In August 1992 above the cascade, 885 pink salmon, zero chum salmon, and 119 redds were counted.

Contacts:
Christopher Riley and Chris James, USFS, Hoonah, 945-3631
References: None

Other Information Sources:
Chris James, USFS, Hoonah, sent in this info on 3/16/93.

Suntaheen Crk Lg Woody Debris Identification Code: P0125

Short Description: Reducing stream gradient and velocity with log structures.

Nearest Town: Hoonah Year Began: 1989 Status: Preliminary Successful: Too soon

Additional Information:
In 1989 log weirs were placed in the creek to reduce the stream gradient and velocity. A larger project is scheduled to start in July of 1993 with structure placement. They're planning to fell substantial-sized trees (e.g., 36" dbh) and cable them to shore. Also, see description of other work being done on Suntaheen Creek.

Contacts:
Christopher Riley and Chris James, USFS, Hoonah, 945-3631

References: None

Other Information Sources:
Chris James, USFS, Hoonah, sent in this info 3/16/93.

Suntaheen Fishpasses I & II Identification Code: P0124

Short Description: Cooperative USFS, NSRAA and ADF&G FRED Division project for new coho run.

Nearest Town: Hoonah Year Began: 1989 Status: Monitoring Successful: Too soon

Additional Information:
This project has been a combined effort of USFS, NSRAA, and ADF&G FRED Division. Engineers, hydrologists, and fish biologists were consulted in the design and placement of the fishpass. The 15 acres of stream habitat above the fishpasses entail excellent spawning and rearing habitat. Habitat above the upper fishpass, primarily beaver ponds, has been stocked each year from 1990-93 to expedite establishment of a naturally reproducing coho population. These fry were released above the upper fishpass. A smolt trap placed below the first fishpass in 1992 indicated that coho had spawned the previous fall above the lower fishpass. A tripod-design fish weir was placed 500 ft above the lower fishpass in 1992, which to date has not caught any adult coho. However, adult coho have been observed spawning in gravels below the lower barrier and in the pool below the falls. Adults gathered at the entrance of the fishpass during low flow refused to enter the fishpass even when aggravated by snorkelers. Their refusal to use the pass has been blamed on lack of depth leading up to the fish entrance and attraction flows associated with the concrete barrier. Reconstruction in 1993 will incorporate a taller barrier wall designed to attract fish to the entrance. Project evaluation is inconclusive at this time. Fry were tagged with coded wire to assess the cost-benefit of the project.

Contacts:
Christopher Riley and Chris James, USFS, Hoonah, 945-3631; Ron Josephson, FRED Division, Douglas, 465-4233; and Steve Reifenstuhl, Northern Southeast Regional Aquaculture Assn., Sitka, 747-6850.

References: None

Other Information Sources:
Chris James, USFS, Hoonah, sent in info 3/16/93. Some info also contained in the 1992 Program Accomplishment Report of the Chatham Area of Tongass National Forest.

Switzer Creek Restoration Identification Code: P0046

Short Description: An ongoing community project to improve the ability of the creek to support fish

Nearest Town: Juneau Year Began: 1992 Status: Implementation Successful: Too soon

Additional Information:
The stream is valuable as a recreational area, and an educational boardwalk trail was recently completed in one section. The goal of this project was to restore the ability of the creek to support greater numbers of fish. A great deal of fine sediments had accumulated in certain areas (up to 2 meters). Natural logs ("digger logs", cabled to earth-anchor barbs in the banks) were placed in the stream to create hydraulic conditions allowing accumulated silt to be scoured and transported downstream. Debris, such as trash and wood-cutting slash, was removed by hand from the main large pool. This will allow spawning salmon to have access to streambed substrates. The natural process of nest digging will serve to scour accumulated fine sediments from the pool to be carried downstream. High school students and neighborhood volunteers were recruited to assist on the project.

Contacts:
Kevin Brownlee, FRED, ADF&G, Douglas, 465-4230.

References: Report Expected

Other Information Sources:
Much of the description of this project was taken from pp. 11-12 of Kevin Brownlee's annual D-J Report, "Federal Aid in Sport Fish Restoration", Vol. 7 No. 9. Sept. 1992. Kevin was also consulted directly. Updates will continue to appear in annual FRED Division reports.

Tyee Hydroelectric Spawning Ch Identification Code: P0069

Short Description: Tried to create tidal spawning channel in tailrace as mit for other dewatering.

Nearest Town: Wrangell Year Began: 1984 Status: Completed w/M Successful: Partially

Additional Information:
For the power plant, water is diverted from Tyee Lake, an alpine lake near the head of Bradfield Canal, and is eventually discharged into Bradfield Canal via a tailrace. The tailrace carries the water approx. 1,150 feet across a tidally influenced meadow. Its dimensions are: 75 wide from bank to bank, and 30 ft wide at the channel bed. Large riprap provide stability near the powerhouse and along the banks where small streams enter the channel. Approx. 18 inches of gravel were originally deposited over the banks and channel bottom. About 950 linear ft or 28,500 sq. ft. of channel bed are available for spawning. Under the current Tyee powerhouse operating load, the channel is normally about one foot deep, with an average velocity of 1.5 fps and a discharge of between 30 to 40 cfs at low tide. Successful spawning of pink salmon in the tailrace has been confirmed by monitoring, but to a much lower extent than the potential area would indicate. Several problems may be involved: 1) sand deposition in the tailrace is evident, and though not yet a high concern when the report was written (1987), it may eventually plug up the spawning gravels. 2) the water temperature in the tailrace is much colder during the spawning season than in the nearby natural Tyee Creek. The water for the tailrace is drawn from the bottom of an alpine lake (Tyee Lake) and its temperature remains at about 4 C year- round, whereas the temperature of Tyee Creek goes up to 15 C in summer. As long as the warmer, more preferred Tyee Creek habitat is available, the tailrace area will probably never be utilized to full potential. 3) Some observers have said that the water depth in the tailrace should have been deeper than 1 ft. 4) Others suspect that more gravel would have helped. Of these limitations, probably the temperature is the primary factor in under- utilization of the spawning gravels. If the hydro plant expands to use all three turbines (only 2 have been in use so far), the natural Tyee Creek will receive less water, which would reduce not only the amount of preferred spawning area, but also rearing. The tailrace does not provide rearing habitat. No reports or evaluations have been conducted since the 1987 report, which was submitted to fulfill a 4-year monitoring obligation to FERC.

Contacts:
Tom Arminski, AEA, Anchorage, 561-7877. For current situation at site, try Dennis Reed, Fisheries Biologist for USFS, Wrangell Ranger District, 874-2323. Also Don Cornelius, ADF&G, Habitat Division, Petersburg, 772-3801.

References: Publication Date: June, 1987 Reference Type: Report
Author: Kelly, Michael D.
Title: Tyee Hydroelectric Year-End Spawning Tailrace Monitoring Report

Other Information Sources:
Talked to Don Cornelius (ADF&G, Petersburg) to verify some information after looking at report.

Virginia Lake Fert. & Fishpass Identification Code: P0096

Short Description: Virginia Lake (Mill Creek) fish ladder, lake stocking and fertilization

Nearest Town: Wrangell Year Began: 1989 Status: Monitoring Successful: Too soon

Additional Information:
The project involved a fish ladder on Mill Creek to allow fish into Virginia Lake, and lake stocking and fertilization. The original stocking of sockeye fry was before annual spring zoo plankton bloom. Fry feeding depressed the zoo plankton population. Fertilization was initiated in the 3rd year to stimulate plankton production and stocking was delayed. The ladder passes various salmonid species. The first stocked sockeye are due to return in 1993.

Contacts:
Dennis Reed, US Forest Service, Wrangell, 874-2323. Richard Aho, US Forest Service, Petersburg, 772-3841

References: Publication Date: May 1991 Reference Type: Report
Author: Edmundson, J.A. et al
Title: The Development of Natural Sockeye run into Virginia Lake, Southeast Alaska

Other Information Sources:
Wrangell Sentinel, Enhancement - Cooperative effort at Virginia Lake, May 28 1992, Newspaper. Dick Aho (USFS) provided project info on 3/5/93.

West Camden Egg Boxes

Identification Code: P0119

Short Description: NSRAA introducing chum run into spring-fed creek

Nearest Town: Kake Year Began: 1989 Status: Completed w/M Successful: Yes

Additional Information:
This is an artesian upwelling (spring) that runs into the ocean after about 500' of creek. The spring provides a consistent flow of water. The work consists of transporting chum eggs and planting them into boxes. Also, older abandoned beaver dams were cleaned out to provide access to spawning gravels. About 6,000,000 chum eggs are hatched annually. Commercial and subsistence chum harvest is occurring. Last year, about 50,000 chum salmon returned.

Contacts:
John Edgington, USFS, Petersburg, 772-3871

References: None

Other Information Sources:
John Edgington, USFS, sent in this info on 2/16/93.

4th of July Creek Mitigation Identification Code: P0141

Short Description: Spawning channel as mitigation for Seward Marine Industrial Ctr (in Spring Crk).

Nearest Town: Seward Year Began: 1981 Status: Completed w/o M Successful: No

Additional Information:
This spawning channel was undertaken as mitigation for the diversion and channelization of lower 4th of July Creek and loss of Spring Creek spawning habitat, as a result of the construction of Seward Marine Industrial Center. ADF&G gave the City of Seward the design standards, based on Canadian work on spawning channels (Lister, Marshall, & Hickey, October 1980, "Chum salmon survival and production at seven improved ground-fed spawning areas", Canadian Manuscript Report of Fisheries and Aquatic Sciences 1595.). The 4th of July Crk project exemplifies the difficulty of recreating fish habitat. Chum salmon used the channel the first few years for spawning, but waves in Resurrection Bay created a beach berm which cut off access from saltwater. The flow in the channel was inadequate to maintain flushing so algae bloomed and accumulated in the channel. 4th of July Creek flows irratically depending on precipitation, and is prone to flooding in the fall. This impacts the Resurrection Bay and 4th of July Creek convergence, causing a large bedload that may have exacerbated the berming of the channel. In the future, spawning channels should not be placed in close proximity to saltwater exposed to wave action. Better to tie it into the river. Also, groundwater in this area is prone to flooding and groundwater fluctuations are hard on spawning channels. Moderate flow is preferable. Phil Brna would add these take-home lessons from this project: Always design channels and structures for the highest possible flood conditions (especially in such an unstable system). Also, the spawning and rubbing actions of the fish tend to erode the edges of the channel, which lowers the water level and increases sedimentation. He would recommend protecting the edges of the spawning channel with riprap.

Contacts:
Don McKay, ADF&G, Habitat, Anchorage, 267-2284, and Phil Brna, ADF&G, State Pipeline Office, Anchorage, 278-8594. Paul Deimer, City of Seward, 224-3331.

References: Publication Date: May 1984 Reference Type: Report
Author: ADF&G,USFWS
Title: Mitig. altern. for Seward Marine Indust. Center & Coal Loading Facil., Seward,AK

Other Information Sources:
Interviews with Stewart Seaberg and Don McKay, ADF&G, on 4/5/93. Also talked to Phil Brna, ADF&G, now at State Pipeline Coordinator's Office, on 4/29/93.

Abbott Loop Sch Crk Realignmnt Identification Code: P0176

Short Description: MOA Rechannelization of S. Fork Little Campbell Crk at Abbott Loop School

Nearest Town: Anchorage Year Began: 1987 Status: Completed w/M Successful: Yes
Additional Information: 1986-87
Bad glaciation in winter ~~1976-77~~ led to flooding of the school's playground so the children couldn't play outside all winter. The water quality was also bad. The solution was to realign the stream to a more natural meander, eliminating the two 90 degree bends around the school. The MOA bought out property across the creek from the school with state funds. This area had been a trailer park. They removed all structures, septic tanks, etc., and realigned the stream in a more gentle bend through the property, moving as much older vegetation as possible (e.g., willow clumps). The old 90 degree bend right next to the school was filled in. The new channel banks were sloped

at a 2:1 angle, with one or more benches for flood conveyance and stability. Pools and riffles were created throughout the restored stream channel. The following year, a variety of vegetation was planted, including raspberries, willows, wildflowers, etc. A landscape architect was consulted. It became a small municipal park. This was a major community project, involving the Municipality, ADF&G, the school, engineering consultants (Ott Engineers), etc. Many community meetings were held. The school used the project as an opportunity for aquatic education. Problems encountered: when they first redirected the stream into the new channel, the flow went subsurface through the gravels. The contractor ended up re-excavating the whole channel and placing bentonite (a clay liner) in the bottom, then replacing the rock cover. Phil Brna feels the rocks they used were too coarse--more like sewer-sized river rock. Fish need smaller gravels. The stream may be accreting these gravels naturally over time. The project has been successful in that it has now survived high water without icing problems. It is also very popular with the school and community. Tom Bacon adds that they'll probably never have the money and time to try a solution on that scale again--with land acquisition, extensive consultation and community involvement. It was nice to have that opportunity, as a learning experience for future reference.

Contacts:
Phil Brna, Habitat Biologist, ADF&G, now at the State Pipeline Coordinator's Office, 278-8594. Tom Bacon (Public Works, 786-8187) and Mark Dalton (then MOA Planning Office, now at HDR/Ott Consultants, 562-2514) were involved from the Municipality. Meredith Sandler (then at Ott Engineering, now at SW Alaska Municipal Conference, 562-7380) was involved in the design/ planning, and coordinated all community meetings, etc.

References: Publication Date: 1987 Reference Type: ConfPro
Author: Bacon, Thomas and Meredith Sandler
Title: Mediating water quality: turning a ditch back into a creek (IWR-109, UAF)

Other Information Sources:
Interviewed Phil Brna (ADF&G), Tom Bacon (MOA, Public Works) and Meredith Sandler (now at SW Cities Conference) in May 1993. A substantial text description (several pages) of the original problem and proposed actions is in the permit application materials at ADF&G.

Anton Larsen Bay Identification Code: P0026

Short Description: Eelgrass restoration for illegal fill in intertidal lagoon, Kodiak Island.

Nearest Town: Larsen Bay Year Began: 1984 Status: Completed w/M Successful: No

Additional Information:
Brechan Enterprises, under contract to the Corps of Engineers, was quarrying rock in the environs. Brechan illegally placed waste rock fill in the lagoon (20,000 cu.yds) in 1983. Agencies objected, and Brechan & the Corps were required to restore the lagoon by removing the waste rock, which they attempted in Feb.1984, and replanting the eelgrass, which they attempted in June 1984. Most of the waste rock was removed. 1,000 (1.5' diameter) "plugs" of eelgrass (Zostera marina) were transplanted from other areas. They were supposed to have an eelgrass expert supervise the planting; instead they used a written reference and their efforts failed. The lagoon at this point had silted in to become an upper intertidal mudflat, not the previous lower intertidal hole that had water in it in all but minus tides. Hence, the lagoon had not been restored to its original physical configuration and could not support the original diverse and productive biological community of eelgrass, waterfowl, shellfish, and rearing salmon. According to ADF&G inspectors, 90% of the eelgrass plugs had died by September 1984(because they were too high in the tidal zone and exposed), and none were expected to survive long-term. The Corps had pre-project photos of the area as well. The last inspection report by Denby Lloyd (ADF&G) is dated 9/11/84. Apparently no further action was taken to remedy the situation.

Contacts:
Originally Denby Lloyd documented this at ADF&G (with many photos). Jack Ferrise from the Corps was involved. Currently, Wayne Dolezal (ADF&G) is the best contact--267-2333.

References: None

Other Information Sources:
Several memos, transect map illustrations, and photographs in the ADF&G files. File #0583-IV-104

Bayshore Ponds & Berms Identification Code: P0172

Short Description: Attempt to create freshwater nesting ponds along the tideflats

Nearest Town: Anchorage Year Began: 1971 Status: Completed w/o M Successful: No

Additional Information:
The Municipality was in the process of installing a new sewer line under the tideflats along the base of the bluff. ADF&G (Dimitri Bader) decided to take advantage of the presence of the heavy equipment there by trying to create some nesting ponds for waterfowl. Several ponds (nine total) were excavated on either side of the sewer line as it was installed. These ponds were laid out linearly along the route of the sewer line. Pond sizes range from 150' to 800' long, and from 100' to 200' wide. They are irregularly shaped, and some contain islands. The pond designs were more or less "guess work" at that time. The ponds were constructed by dredging out an area to the specified depth, depositing the material in a berm around the pond perimeter to contain the water, then revegetating the berms and islands. The ponds filled mostly with freshwater, although the saltwater intrusion at very high tides reduces the nesting potential of the ponds. A variety of species was used for the revegetation-- sedges, marestail, Triglocum, arrow grass, goosetongue, etc., but these did not establish adequate cover. Both sprigging and seeding methods were used. The arrow grass has been most successful. These ponds and berms are still in place after 20 years, and ducks do use them for feeding and loafing, but not nesting. The area of intersection of the sedge margin, mudflat, and ponds receives the most bird use. Reasons for the very limited success include the exposed location of the ponds, very little available cover and upland edge for nesting, and salt water intrusion. The ponds were excavated to 12" -18" depth (which is the preferred depth for dabbling ducks) but they are shallower now due to silting in. The design of this project-- separated small ponds, rectangular in shape-- would probably be modified today into a series of interconnecting shallow swales.

Contacts:
Dimitri Bader, then of ADF&G, now retired, worked on this project. Current contacts would include Bruce Campbell & Dave Harkness, Wildlife Conservation Division, ADF&G, Anchorage, 267-2179.

References: Publication Date: early 1970's Reference Type: Report
Author: Bader, Dimitri
Title: [Draft report of project]

Other Information Sources:
Talked with Dave Harkness, ADF&G, Wildlife Conservation Division, on 5/20/93, and Thede Tobish of the Municipality on 5/25/93. Dimitri Bader wrote a draft report on this project in the early 1970's which may still be available in files.

Bear Lake Fertilization Identification Code: P0111

Short Description: Ongoing lake stocking and fertilization program, with flow control dam.

Nearest Town: Seward Year Began: 1981 Status: Implementation Successful: Too soon

Additional Information:
In the 1960's ADF&G "rotenoned" everything off so as to clear out the sockeyes to make a rearing area for coho. The lake was fertilized beginning in 1981 for cohos. In 1986, ADF&G began stocking coho in the lake. CIAA took over implementation of the ADF&G lake fertilization project in 1989. They felt the lake could also support sockeye salmon, so they began stocking sockeye in 1990. The lake has been fertilized every year since 1981. As of now, the project is successful for coho; not yet known for sockeye. In 1963, a flow control structure was installed by ADF&G to prevent reinvasion of the lake by other species. The structure/dam creates a 6' falls. Salmon can go up a ladder with a chute when a person is present to operate the winch. CIAA only allows passage of enough fish for the spawning capacity of the lake.
Outmigrating smolt are released from the lake into Bear Creek the same way, directly by a person operating the same ladder.

Contacts:
Gary Fandrei, CIAA, Soldotna, 283-5761

References: Publication Date: January, 1993 Reference Type: Report
Author: Cook Inlet Aquaculture Association
Title: Bear Lake Sockeye and Coho Salmon Enhancement Report 1992

Other Information Sources:
Talked to & received info from Gary Fandrei in April, 1993. CIAA also has a "Bear Lake Procedures" manual.

Beaver Dam Blockages Identification Code: P0112

Short Description: Ongoing CIAA project to allow fish passage during runs.

Nearest Town: Kenai & Tyonek Year Began: 1980 Status: Implementation Successful: Yes

Additional Information:
CIAA conducts helicopter survey of streams every year. They fly over the entire length of stream while doing fish counts. If beaver dams appear to be blocking passage for sockeye salmon, they land and open fish access. This is accomplished by taking a pick and pulling out a notch in the dam, water then flows out and the fish below the dam immediately pass through the opening. Within a day or two, the beavers will have repaired the dam and fish can no longer enter. But, if they time it right, about 90% of the sockeye salmon run can pass through the dam during the open period. This method of fish access is routinely performed on Blue Creek and Bishop Creek near Kenai on the Kenai Peninsula; and on Shell, Trinity, Coal Creek Lake, and Three Mile Creeks, all on the west side of Cook Inlet near Tyonek.

Contacts:
Gary Fandrei, CIAA, Soldotna, 283-5761

References: None

Other Information Sources:
Talked to & received info from Gary Fandrei in April, 1993. More info in CIAA files.

Beaver Pond Access Structures Identification Code: P0076

Short Description: USFS prgm to let juv. fish cross beaver dams into productive rearing ponds.

Nearest Town: Cordova Year Began: 1989 Status: Monitoring Successful: Partially

Additional Information:
The following description was taken from Ken Hodges' 3/1/93 memo. The Cordova Ranger District has installed six mini-fish ladders (fry pipes) to allow coho juveniles to migrate over large beaver dams and gain access to the productive rearing habitat found in the ponds. The dams are all on sloughs in the Copper River Delta which have no spawning area upstream, so there is no natural utilization. The ponds must be deep enough and have sufficient flow so there are adequate oxygen levels throughout the year. The program has been partially successful. The fish readily use the structures, but there has been inadequate pond evaluation in some instances. Winter monitoring is difficult and personnel and funding levels have not been adequate in the past. This winter we have found that one of the ponds which has performed poorly in the past has low oxygen levels. The structure should probably be removed. This monitoring should have been done before installation. The project could be more cost effective now that certain maintenance problems have been resolved and less time is required for summer monitoring. The population estimates combined with production models in the literature indicate that the structures could produce 200 or more adults. This does not translate into a lot of money for the commercial fishery, but it is more valuable if sportfishing is considered. These fish return to small creeks along the Copper River Highway, which are popular for families and older people because of the easy access. These creeks were closed to sportfishing last year because of low escapement numbers (although the commercial fishery continued) and there has been talk of closing these creeks permanently. If one considers the value these structures may have in helping to preserve the stocks and maintain the sportfishery in these small creeks, this project may be worthwhile.

Contacts:
Dave Schmid and Ken Hodges, Fisheries Biologists, USFS, Cordova Ranger District, 424-7661.

References: None

Other Information Sources:
Ken Hodges (USFS, Cordova) provided an informative 6 page memorandum (3/1/93) summarizing the fish habitat activities that have taken place out of the Cordova Ranger District over time. He says that there are unpublished reports on most of these projects in their files.

Bethel Small Boat Harbor Identification Code: P0081

Short Description: Tidal river bank revegetation program

Nearest Town: Bethel Year Began: 1984 Status: Completed w/M Successful: Partially

Additional Information:
Adapted from Moore report: Three major goals: 1) to enhance the usability & appearance of shoreline by stabilizing it with vegetation; 2) to demonstrate the erosion control potential of three native grass species: Deschampsia beringensis (Bering hairgrass var. 'Norcoast', Beckmannia syzigachne, American Sloughgrass var. 'Egan,' and Elymus arenarius, Beach wildrye; and 3) to evaluate the suitability of approximately 36 species for use in the revegetation of water resource development projects in Alaska. Bethel residents began using the small boat harbor two weeks after the planting was completed. Although much of the planting was destroyed, some information was gained from the revegetation work. The most valuable lesson to be learned...is that an area must be revegetated and the plants allowed to become well established before the area is opened to public use...or revegetation should occur in sections with each newly revegetated area blocked from public access until the plants have become well established. ... Broadcast seeding and sprigging appeared to be most suitable for the small boat

harbor. ...Planting springs of a fast-growing species at relatively high densities, one to two feet on centers, may be the preferred method for planting a site that needs to be revegetated quickly. In addition to planting sprigs of Beach wildrye...a native rhizomatous sedge, Carex sp. was found growing at the end of one of the fingers. It would have also been a good candidate for the revegetation plan. 'Egan' American Sloughgrass and 'Norcoast' Bering Hairgrass were excellent choices for the broadcast seeding portion [and] are well adapted for the site. The wetter areas favored the establishment of Sloughgrass, while the drier areas favored Hairgrass. If a revegetation project were conducted again, Sloughgrass and Hairgrass would be selected for broadcast seeding, in addition to sprigging with native rhizomatous sedge.

Contacts:
Nancy Moore, Alaska Plant Materials Center, DNR, Palmer, 745-4469

References: Publication Date: Oct. 20, 1986 Reference Type: Report
Author: Moore, Nancy
Title: Final report for the bank revegetation program Bethel Small Boat Harbor

Other Information Sources:
Just the report.

Box Canyon Creek Identification Code: P0144

Short Description: Series of rearing ponds as mitigation for coal loading facility.

Nearest Town: Seward Year Began: 1986 Status: Completed w/M Successful: Partially

Additional Information:
An existing pond (1980), previously connected to Box Canyon Crk with a headgate, was deepened to 6 ft for possible overwintering use by coho salmon. As part of the 1986 mitigation project, the original outlet of this pond was diverted into a series of newly constructed ponds for rearing coho. The 7 ponds in a series are each about 10' X 50' long. Chinook, sockeye, and coho salmon spawn in the channel riffles between the ponds. Adult fish use the ponds as rest areas. Beaver have moved into the first pond and dammed the outlet, causing a partial obstruction to adult fish passage. Lack of large organic debris and/or overhanging vegetation is a problem. The project will be more successful when more cover grows in for the juvenile fish. Alders are just beginning to re-establish in the area. Revegetation has been slow due to lack of organic fine soil. The gravel substrate at the site is good for spawning habitat, but not the most favorable for revegetation. In some riffle areas, spawning has caused erosion. Debris & littering in this easily accessible area have caused problems as well. The headgate between Box Canyon Crk and the first pond works fine, but there are signs of snaggers using the area. Monitoring was an inadequate aspect of the original plan; no provision was made for monitoring responsibilities.

Contacts:
Don McKay and Stewart Seaberg, ADF&G Anchorage, 267-2284.

References: Publication Date: May 1984 Reference Type: Report
Author: ADF&G and USFWS
Title: Mitig. altern. for Marine Industrial Center & Coal Loading Facil.,Seward,AK

Other Information Sources:
Interview with Stewart Seaberg ADF&G on 4/1/93.

Bradley Lake Waterfowl Nesting Identification Code: P0067

Short Description: Tidal/freshwater waterfowl nesting area as mitigation for AEA's Hydropower Plant

Nearest Town: Homer Year Began: 1991 Status: Monitoring Successful: Too soon

Additional Information:
Bradley Lake Hydroelectric Plant is the biggest public works project built in Alaska to date. The waterfowl nesting area was mitigation for the plant's access road, which traversed the former tidal flats. Stop-log water control structures were installed under the road to impound freshwater run-off from the hillside above to create marsh habitat (approx. 40 acres). These water control structures would maintain some tidal influence. Waste rock from tunnel construction formed the core of the new nest islands. The tideflat mud was then scooped up by backhoe and mounded onto the island areas, building them up until they were about 2 ft above the controlled water level. There are about nine islands in all, each one laid out in finger-like configurations, separated by deeper water left by the backhoe. Dan Rosenberg, ADF&G, Anchorage, contributed to the design. A topsoil layer was placed onto some of the islands, taken from the alluvial fan area which they had to clear for camp construction. Grasses, willows, shrubs, and some spruce were planted on the islands. Water depths were designed deeper around the islands to act as predator deterrence --2 ft depth was preferable. All monitoring will be done in-house by AEA, though ADF&G may assist, and they must submit a report to FERC after 5 years (1996/97). The first season following installation (1992) turned out to be a very low rainfall year, so the amount of freshwater runoff was not enough to flood the area. First they tightened the seal of the out-flow structures (i.e., culvert covers under the road), so as not to lose any freshwater, but eventually they had to fill it by flooding with tidal water. This tidal water is not too salty, however, because the location is not far from the mouth of the Bradley River. Some loafing and feeding of ducks was observed, and a couple broods of mallards were spotted, but they are not sure if they nested in the project area or nearby. No conclusions can be drawn until a few seasons of regular rainfall are observed.

Contacts:
Tom Arminski, Alaska Energy Authority, Anchorage, 261-7267. Dan Rosenberg, ADF&G, Anchorage, helped with design and may be involved with future surveys there.

References: Report Expected

Other Information Sources:
Talked to Tom Arminski 3/10/93. Some description on pages 5-35 to 5-38 of the Bradley Lake Hydroelectric Project Mitigation Plan, Nov. 1985. Dan Rosenberg also provided comments. AEA must submit a report to FERC after 5 years (1996/97).

Brooks River Fish Ladder Identification Code: P0062

Short Description: Installed at Brooks Falls in 1940's by federal Bureau of Commercial Fisheries

Nearest Town: King Salmon Year Began: 1949 Status: Completed w/M Successful: Inconclus.
Additional Information:
The 8' falls were perceived as a barrier to salmon migration during seasons of low flow. Eicher reported that some pre-1949 migrating salmon died below the falls without spawning, presumably due to injuries when jumping. The ladder was cut into the left side of the river bank, and composed entirely of reinforced concrete, 85'long by 10' wide. The channel was blasted from solid rock in order to make it as natural-appearing as possible. The design is 7-step pools and weirs with orifices in the headgate, through which the fish normally ascend rather than jumping the steps. Although much data exists on fish counts before and after the ladder, results are contested because of inconsistencies in the manner the upstream weir counts were conducted over the years. A May 1987 letter illustrates the NMFS position that it is impossible to know exactly what effect the ladder may have had on sockeye salmon, though it appears to have no negative effects, and may provide some benefit. At the same time, weir counts of pink

and chum salmon appear to have increased since the ladder (AEIDC, 1978). ADF&G feels the ladder serves a good purpose.

Contacts:
Historically, George Eicher was the person in charge of the federal Bristol Bay Fishing Investigations during the ladder construction period, and authored a 1971 NMFS technical report on the effects of the ladder. However, views on the original need for the ladder (in the 1940's) and its proposed removal by the National Parks Service (1986-present) have become widely divided, often pitting the state and fishing interests against NPS. Lance Trasky (Habitat, ADF&G) was involved in the state's side of the dispute in the 1980's. Contact individuals at NPS have changed over time with staff turnovers.

References: Publication Date: 1971 Reference Type: Report
Author: Eicher, George L.
Title: The effects of laddering a falls in a salmon stream.NMFS Auke Bay Manuscr Rep 84

Other Information Sources:
There are many other sources: Bibliography, Synthesis, and Modeling of Naknek River Aquatic System Information, a September 1978 report prepared by the A.E.I.D.C. for the National Park Service, discusses the effect of the fish ladder on pp. 218-233. A 1985 report called "Biological and Hydrological Evaluations of the Fish Ladder at Brooks River Falls, Alaska," was prepared by USFWS staff for the NPS. In April 1986, the draft Brooks Falls Fish Ladder Environmental Assessment was completed (assessing the impacts of its proposed removal). The state's view about its proposed removal is presented in many memos and letters, as well as in a written testimony (4/87) presented by Bruce Baker (ADF&G) in support of congressional bills that would have NPS retain the fish ladder.

California Creek Culvert&Pools Identification Code: P0058

Short Description: ADOT/PF culvert, fish pools, reveg at Alyeska Highway in Girdwood

Nearest Town: Girdwood Year Began: 1992 Status: Implementation Successful: Too soon
Additional Information:
ADOT/PF replaced a culvert having inadequate fish passage with a bigger culvert that could handle flood events. Rip rap was used to protect the culvert area from scour. Upstream of the culvert, boulders were placed into the stream to create some pools for fish habitat. This appears to have worked well. The riparian zone around the work was reseeded with a hydroseed mix in 1992, and willow bundles were planted on the upstream and downstream banks in May, 1993.

Contacts:
Carol Sanner, ADOT/PF, Anchorage, 266-1509.

References: None

Other Information Sources:
Carol Sanner, ADOT/PF, has records and photo files. She was interviewed on 2/24/93.

Campbell Lake Outlet Identification Code: P0114

Short Description: Rehabilitation of a sedge wetland (extreme high intertidal)

Nearest Town: Anchorage Year Began: 1989 Status: Completed w/o M Successful: Yes

Additional Information:
A flood in the fall of 1988 caused the dam at outlet of Campbell Lake to fail. In 1989 the old earth-filled dam was replaced by a sheetpile dam with a fishpass of step pools constructed with sheetpile gabions and boulders. The lake provides good overwintering habitat for coho salmon. At the same time, the Municipality (MOA) took advantage of the opportunity to replace the sewer lines in that area, all of which lies within the Anchorage Coastal Wildlife Refuge. The new sewer line route crossed the lower end of the outlet creek from Campbell Lake. After sewer line installation, erosion at the creek crossing eventually destroyed approx. 3 1/2 acres of sedge wetland, due both to direct erosion and the draining of adjacent wetlands. They returned and stabilized the crossing area with rock. ADF&G required the MOA (actually AWWU) to do a revegetation plan. They introduced plugs from nearby thickets of sedge into the lower areas. The upper areas were hydroseeded, and willow and birch were planted. ADF&G (Don McKay) plans to inspect the site this year, 1993.

Contacts:
Don McKay, ADF&G, Anchorage, 267-2279, and Phil Brna, ADF&G, now at State Pipeline Coordinators Office, Anchorage, 278-8594.

References: None

Other Information Sources:
Talked to Don McKay 4/1/93 and Phil Brna on 4/29/93, both of ADF&G. Lots of info in ADF&G files, including photo records.

Canada Geese Nest Island Prgm — Identification Code: P0070

Short Description: USFS program creating artificial nest islands for Dusky Canada Geese in Cordova

Nearest Town: Cordova Year Began: 1983 Status: Monitoring Successful: Partially

Additional Information:
Their objective was to maintain 20,000 birds on the only known breeding grounds for the Dusky Canada Goose. To date, they have put in over 800 artificial nest islands of six types: 500 were sandbag-type islands; 200 were fiberglass floating platforms, and lesser amounts of four other structures which haven't worked as well and will be discontinued (innertube donuts, barrels, simple platforms, cups). All island structures have approx. 5' x 5' surface area for nesting. All were placed in freshwater pond areas on the Copper River Delta; predominant vegetation on the delta is sedge, alder and willow. The artificial islands were installed in ponds, and covered with sod material from adjacent areas, to take advantage of existing plant propagules in the soil. These islands are monitored and maintained yearly. Common maintenance problems involve erosion of the sod mat and un-anchoring due to wind, wave action, and ice movement during storms and spring break-up. As of 1992, their emphasis has been to install new fiberglass floating islands (30) in beaver sloughs. It is hoped that beaver slough sites will require less maintenance, because they provide less surface area for wave action, and the shrub cover on the banks provides protection from wind. Beaver sloughs provide the deepest, non-tidally influenced habitat on the Delta. Average depth of a beaver slough is 7 feet, rather than the 2.5 - 3 ft average pond depth that islands were anchored at in the past. Of the 800 installed over time, only 600 still exist and are available for use. At the start of the project, it was stated that it would be considered a success if 10-15% of the structures were utilized for nesting. As it is, an avg. of 16-19% are used, so by that criteria it is successful but Steve Babler does not consider it an impressive return for the effort expended. Geese used the islands for activities other than nesting, and other bird species (terns, ducks, grebes, gulls, swans) used the islands for loafing and nesting. The fiberglass floaters appear to have somewhat higher selection rates by geese, so installing these structures in the beaver slough sites should yield higher percentages of nesting use with less maintenance.

Contacts:
Steve Babler and John Crouse, Wildlife biologists, USFS, Cordova. 424-7661.

References: Publication Date: November, 1992 Reference Type: Report Author: Babler, Steve, John Crouse, Amy Stephenson
Title: Artificial Nest Island Program for Dusky Canada Geese

Other Information Sources:
Talked to Steve Babler on 3/3/93. He has extensive photo records. Updated reports will be issued in the future; this project will continue indefinitely.

Canada Geese Peninsula Cutoffs

Identification Code: P0071

Short Description: USFS program of converting peninsulas into nest islands for Dusky Canada Geese

Nearest Town: Cordova Year Began: 1992 Status: Monitoring Successful: Too soon

Additional Information:
In 1989, a feasibility report identified 23 peninsulas and 8 large ponds in the west Copper River delta that had potential to be converted into islands by blasting methods. Canada geese exhibit a distinct preference to nest on islands, and achieve the highest nest success in island situations because of less mammalian predation. After 4 years of monitoring, two of these sites were selected for the experimental first attempt. In October, 1992, USFS staff converted two peninsulas extending into ponds into islands through the use of explosives. Channels 15-20 ft in width and 4.5-6.0 ft in depth were created at the base of each peninsula, effectively separating it from the mainland. These minimum channel widths and depths are expected to deter large predators, such as wolves. The area of the islands created were 0.625 and 1.25. Implementation went very well. The explosives used were ammonium-nitrate fuel-oil mixture (ANFO), administered by Forest Service personnel who are certified blasters. Holes were drilled with an auger every 15 feet to place charges. Due to small sample size, data showing increased production and/or reduced predation on the peninsula cutoff islands will probably not be possible. They do now have the basis for making cost benefit analyses between two forms of nest island enhancement techniques, and have proof that this technique will work and is feasible on the Delta. Monitoring will continue in 1993 to determine the fate of dusky nesting attempts on all peninsulas. Willow cuttings will be planted on the disturbed areas on pond B and will be monitored to assess recovery and erosion. Natural vegetation on the Copper River delta includes sedge, alder and willow.

Contacts:
Steve Babler and Dan Logan, Wildlife biologists, USFS, Cordova. 424-7661.

References: Publication Date: November, 1992 Reference Type: Report Author: Babler, Steve
Title: Peninsula Cutoff Program Progress Report

Other Information Sources:
Talked to Steve Babler, USFS, Cordova, on 3/3/93. He has extensive photo records. Updated reports will be issued as he monitors use of the areas in the future; this project will continue indefinitely.

Canyon Slough

Identification Code: P0108

Short Description: Realignment of slough to accommodate Pipeline route

Nearest Town: Valdez Year Began: 1975 Status: Completed w/M Successful: Yes

Additional Information:
Canyon Slough was done in mid-1970's involving extensive rechanneling (roughly 4000') to accommodate the pipeline route. Once construction was over, habitat loss was relatively minor. Rearing habitat for coho was improved in old channel, though the spawning characteristics were reduced. In the new channel, it dramatically increased pink salmon spawning habitat. The area is historical flood plain with some standing and some fallen spruce, alder, cottonwood. Now the former construction area is covered with ferns, alders, and willows - it's very difficult to tell that it is an artificial channel. After construction (involving diverting flows, some dewatering, silty flows) the culverts were installed between the old and new channels, which run roughly parallel. The culverts reconnect water flow to the old channel which has good rearing habitat characteristics. The disruption to the creek was relatively short-term and the river system immediately restabilized. In the end, they broke even on the amount of coho habitat, and gained a lot of spawning area for pink salmon by digging down to expose the , gravels. It's now a very lively, productive fish habitat area hosting many species. The area immediately downstream consists of multiple interconnecting channels.

Contacts:
Ken Roberson, ADF&G, FRED Division, Glennallen, 822-5521

References: Publication Date: 1978; Rev. 1988 Reference Type: Report
Author: Roberson, Ken
Title: Canyon Slough Technical Report

Other Information Sources:
Talked to Ken Roberson, ADF&G, on 3/30/93.

Captains Bay 14;Unalaska Crk Identification Code: P0178

Short Description: Correcting a perched culvert as offsite mitgn for tideland fill, Unalaska

Nearest Town: Unalaska Year Began: 1989 Status: Completed w/M Successful: Partially

Additional Information:
This project was an offsite mitigation resulting from a tideland fill for a marine industrial park. Although coho and pink salmon were present in nearby streams, little opportunity existed for onsite, in-kind subtidal/intertidal mitigation. The nearshore area in Captain's Bay is a productive area used by juvenile salmon as they head for ocean migration. Mitigation in this case consisted of reopening fish access to spawning habitat in a stream that feeds into Captain's Bay, thereby increasing the potential number of juveniles in the bay. A steep, perched culvert existed on Broadway Street in Unalaska which blocked fish passage up Unalaska Creek (to spawning sites). This culvert had been installed during World War II. An original fishpass design was created for this perched culvert, consisting of a steel and wood weir structure (intended to raise the water level within the steep culvert barrel and to back up water at the culvert outlet), and a fish ladder (Alaska Model C steeppass) to provide fish access to the culvert opening. The weir structure created a pool of higher elevation where water exits the culvert, which was called the "transition pool," and the weir structure was called the "transition box". This weir contains a wooden blowout panel which can be removed in highwater events to avoid damaging either the structure or the road. After its completion in the winter of 1989/90, pink salmon successfully used the fish pass the following summer (1990). By spring 1992, however, occasional flood waters had deposited so much gravel at the base of the fish ladder that fish could no longer enter the steeppass. This illustrates a recurring problem: when an artificial structure is placed in a stream, a long-term commitment to maintaining the structure is necessary (in this case, to periodically scoop out gravel at the entrance pool to the fish ladder), or else it may soon become unusable. One drawback discovered with the new fishpass design at this site is that removing the wooden blowout panel can be very difficult due to the weight and swelling of wood. In hindsight, it would have been expedient to mount a structure over the blowout panel, to assist in mechanically lifting it. Continued maintenance is crucial to prevent gravel from refilling the entrance pool to the fish ladder.

Contacts:
Wayne Dolezal, ADF&G Habitat Division, 267-2284

References: None

Other Information Sources:
Interviewed Wayne Dolezal, ADF&G Habitat Division, Anchorage.

Chester Creek Realignment Identification Code: P0147

Short Description: Rerouting Chester Creek into University Lake to allow Tudor Centre Devlmt.

Nearest Town: Anchorage Year Began: 1983 Status: Completed w/o M Successful: Yes

Additional Information:
The primary objective of this project was to move the creek channel so the Tudor Centre development could go in. The secondary objective was an opportunity to increase fish habitat by rerouting the creek through the Alaska Pacific University Lake (a former gravel pit). The possibility of creating an onsite fish-related teaching facility at the lake was also discussed but never pursued. The file mentions a proposed spawning channel as well, but that plan must have been abandoned (individuals have no recollection of it). There were very good-sized Dolly Varden (24") and rainbow trout (20") in the creek before this project. Tryck, Nyman & Hayes did the engineering plan for Packwood Co. (developer of Tudor Centre). Phil Brna said that on the job site it was a classic case of biologists and engineers not communicating well. Each was used to their own vocabularies, and did not realize that they were not always being understood correctly by the other. (Phil said this improved on later projects with the same engineers.). A new channel was cut for the stream away from the Tudor Centre property into the lake, and an outlet was built below the lake back into Chester Creek. The new channel above the lake was excavated. Boulders were placed in the bed to slow the flow. Spruce trees were added for cover in one location. The banks were revegetated with grass & willows. Brna said they should have paid more attention to stream gradient here--the new channel is too steep in sections. A stair-step rock configuration would have addressed this problem. Also they were restricted by property lines to confine the creek within a narrow band, and this resulted in very steep banks. A more gradual bank with a small floodplain terrace-type formation at the bottom would have yielded a more satisfactory result. Erosion has been an ongoing problem that the Municipality has tried to fix, though the potential for problems is high due to steep banks and accessibility to foot traffic. Fritz Kraus says this creek reach is now cutting down the bed because of the steep gradient. He knows that rainbows, D. Varden, and a few coho salmon (in the fall) are passing through this area, though this reach of channel does not offer any spawning or rearing potential. It does provide access to upstream habitats. The Sport Fish Division of ADF&G has stocked catchable-sized rainbow trout into University Lake for several years.

Contacts:
Phil Brna, Habitat Biologist, ADF&G, now at State Pipeline Coordinator's Office, Anchorage, 278-8594. Also Bill Hauser and Fritz Kraus, FRED Division, ADF&G, Anchorage, 267-2172.

References: None

Other Information Sources:
Talked to Phil Brna on 5/4/93, and followed up with Fritz Kraus of ADF&G's FRED Division. Info also obtained from file NPACO 071-OYD-4-780301 (ADF&G's Corps files) for Chester Creek 2 --Packwood Company. A report was written by Curt L. Kerns (UAA) for the developer (Packwood Co.) before the project, called "Chester Crk Diversion: Ecological Implications & Fisheries Resource Development Potentials," in 1983(?).

CIAA Fish Passes

Identification Code: P0183

Short Description: Three step-pool fishpasses for sockeye installed by Cook Inlet Aqua.Assn.

Nearest Town: varies--see desc Year Began: 1984 Status: Monitoring Successful: Partially

Additional Information:
In each of these creeks, step pools were blasted into rock to allow passage of sockeye salmon to upstream habitats. The creeks were: Coffee Crk (constructed 1984-86, near Tyonek), Chenik Crk (1985-88, near Iliamna), and Scurvy Crk (1980-presently on hold, includes spawning channel for pink salmon, near Port Graham). CIAA reports the that Coffee Crk sockeye fishpass ($7,000) was not successful because it had been constructed across a coal seam, and the structure eroded out. Chenik Crk fishpass ($21,000) was successful. The fishpass for Scurvy Crk ($130,000) was successful but the associated pink salmon spawning channel has not-- a gravel bar forms at the mouth to the channel, preventing access. Work at Scurvy Crk is presently on hold due to funding. Monitoring information is available for Chenik & Scurvyrks, but not Coffee Crk. Fishermen often inspect the CIAA structures when they are in the area, and report information back to CIAA. The new Paint River fish ladder (also CIAA) is described separately in the database ("Paint River Fish Ladder", #P0113).

Contacts:
Gary Fandrei, Cook Inlet Aquaculture Association, Soldotna, 283-5761.

References: None

Other Information Sources:
Gary Fandrei provided this info. More in CIAA project files. An evaluation of the Chenik Crk Fishpass was completed by ADF&G.

CIAA Flow Control Structures

Identification Code: P0185

Short Description: Flow-control dams at lake outlets to ensure sufficient flow during sockeye runs

Nearest Town: Kenai, AK Year Began: 1979 Status: Implementation Successful: Yes

Additional Information:
Before installation of the flow control structures at the outlet of the lakes, the water level in the creeks below was not reliably sufficient to ensure passage of sockeye during their migration. The fish may only have been able to make it into the lakes every 3 years or so, depending on water levels. CIAA installed these flow control dams to retain more spring melt water, and release it in a controlled manner during the sockeye migration. The structure at Daniels Lake (installed 1979) has been successful; the flow control dam at Marten Lake (1980) was successful (though evaluation is incomplete), but the planned additional enhancement actions at Marten Lake (fertilization and/or stocking) were dropped when determined not feasible. ADF&G/CIAA installed flow control structures at two other lakes that were fertilized as well. These two projects are described elsewhere in the database under Bear Lake (near Seward, project ID #P0111) and Packers Lake (near Kenai, #P0110).

Contacts:
Gary Fandrei (for Marten Lake) and Tom Mears (for Daniels Lake), both of Cook Inlet Aquaculture Association, Soldotna, 283-5761.

References: None

Other Information Sources:
Gary Fandrei, CIAA, sent in this information. More in CIAA files. Marten Lake is discussed in the "Big River Lakes Pre-Enhancement Investigations 1981, 1982, & 1983," CIAA, Soldotna, AK 99669.

Coghill Lake Fertilization Identification Code: P0168

Short Description: USFS, PWSAC, & ADF&G project to restore historical sockeye levels via lake fert.

Nearest Town: Whittier Year Began: 1993 Status: Implementation Successful: Too soon

Additional Information:
Coghill Lake has historically provided a significant contribution to the commercial, subsistence, and sport fisheries for sockeye salmon in Port Wells, Prince William Sound. Coghill Lake is a large 3128 acre lake which in past years supported an average return of 200,000 to 300,000 sockeye salmon. In the 1980's commercial catch quotas were lowered so fewer adults were intercepted at sea. Over one million salmon were allowed to return to the lake to spawn. It is believed that this amount of salmon fry and smolt decimated their zooplankton food source. During 1988-90 escapements have varied from 7,000 to 187,000, averaging only 68,000. A controlled lake fertilization project is beginning in Coghill Lake in 1993 to restore the rearing environment. Lake fertilization is recommended for five continuous years, to encompass one life cycle of red salmon returning to Coghill Lake. In addition to fertilization, efforts to stabilize the sockeye population may include adjustments to the commercial escapement goals, and possible stocking of sockeye salmon to achieve production at a level consistent with the increased rearing capacity of Coghill Lake.

Contacts:
Many people (Kate Wedemeyer, Cliff Fox, Dan Gillikin, JoEllen Lottsfeldt) at Glacier Ranger District of Chugach National Forest, Girdwood, 783-3242.

References: None

Other Information Sources:
Talked to Dan Gillikin, USFS, on 4/30/93. More info on the one page information sheet for this project in the Chugach National Forest's 5-year plan. The Coghill Environmental Assessment goes into this project in detail.

Concord Hills/ Klatt Bog Mitg. Identification Code: P0182

Short Description: Klatt Bog 6. Preservation/enhancmnt of 10-12 acres as mitg for subdivision fill

Nearest Town: Anchorage Year Began: 1984 Status: Completed w/M Successful: Partially

Additional Information:
The objective was to preserve some land and hydrological conditions for the highest value habitat, and to replace the filled habitat. Mitigation for the filled & drained subdivision area of the bog included: 1) retention of 10-12 acres of bog in its natural state; 2) maintaining the hydrological conditions of this area, which meant that it had to be sealed from the subdivision housing area, which was lower in elevation than the bog. This was accomplished with a berm and sealer around the perimeter of the bog/subdivision interface (visible in air photograph); 3) excavation of an open water pond within the preserved bog area; and 4) in the renegotiated Corps permit, the new owners have been requested to install two pumps to stabilize the water level in the pond over the course of the summer. Revegetation of pond edges/ receding water areas with sedge plugs is still being considered. To date, this project has been only a partial success-- the 150 ft. long, L-shaped pond is full only in spring, and has drained

to one-half the area by late June each year. It provides considerable staging habitat, but no nesting. The pond edges remain fairly sterile, though water quality is good. The water pumps and possible revegetation may improve the attractiveness of the area for birds and humans alike. Lesson learned: avoid trying to revegetate on sterile peat substrate.

Contacts:
Thede Tobish, Municipality of Anchorage Planning Dept., 343-4222.

References: None

Other Information Sources:
Talked to Thede Tobish, MOA Planning, on 5/25/93.

Copper R. Delta Drawdown Ponds Identification Code: P0138

Short Description: USFS efforts to manage uplifted ponds for waterfowl using H2O control structures

Nearest Town: Cordova Year Began: 1973 Status: Completed w/o M Successful: No

Additional Information:
The 1964 earthquake uplifted much of the Copper River Delta that had formerly been a tidal marsh. Delta ponds that had been subject to tidal influence became "perched". Without the periodic influx of water, nutrients & oxygen, the ponds were becoming stagnant, and probably would become more acidic over time, leading to a peaty, oxygen-deficient formation in which organic materials would not decay. Such bog formations do not support the invertebrate populations that waterfowl rely on for food. USFS addressed this situation with a solution being used elsewhere in the country. By draining the perched ponds, air would get to the substrate, allowing decomposition to take place. After a period, the ponds could fill again with rain runoff and would provide good habitat for pond invertebrates and hence, waterfowl. The ponds might need to be drained again every few years to stay oxygenated. The Cordova District implemented this method beginning in 1973 by digging ditches from the ponds to the nearest natural drainage channel. They then installed water control structures at the outlet of the ponds. This would allow the ponds to drain, and then fill up again based on the control of the headgates. They intended to monitor the productivity and attractiveness of the drawdown ponds to waterfowl for several years afterward. However, by 1977, the open ditches displayed serious erosion. The original headgates (water control structures) were wooden, and some washed out immediately (1974). Some were subsequently replaced by less-erodible aluminum gates; others were plugged completely. The FS efforts to repair the damaged control gates and ditches began in 1977 and has continued periodically ever since. The points learned from these disappointing efforts include: erosion problems with fine soils and high rainfall were not adequately anticipated when the project began; the trenches were dug to the closest natural drainage without evaluating local relief and erosion potential; siting of some control structures did not make allowances for the effect of wave and ice action on headgates and shorelines; natural vegetation or artificial means were not employed at the start of the project to protect open trenches and exposed sedimentary deposits; even normal rainfall conditions in Cordova necessitate initial annual maintenance of artificial drainage structures until the vegetation is firmly established and soils are stabilized.

Contacts:
Garvan Bucaria, USFS, Chugach National Forest, Supervisor's Office, 271-2516. Garvan worked on this project in Cordova during the 1970's. Steve Babler is the best Cordova contact at this time. He's at Cordova Ranger District, 424-7661.

References: Publication Date: October, 1984 Reference Type: Report
Author: Bucaria, Garvan
Title: A summary &photo documentation of drawdown pond ditch erosion, mitg.& natrl proc

Other Information Sources:
The original work was described in "Waterfowl Habitat Improvement on the Copper River Delta for 1974," by Pete Mickelson, Wetlands Biologist in Cordova, dated 12/4/74. Many lessons were learned later on, however, as documented in G. Bucaria's 1984 report listed above. These materials provided by G. Bucaria on 3/19/93.

Cordova Dstr Gravel Pit Rehabs Identification Code: P0080

Short Description: USFS Cordova District has rehabilitated 4 ponds into rearing areas to date

Nearest Town: Cordova Year Began: 1978 Status: Monitoring Successful: Yes

Additional Information:
The follow information comes from Ken Hodges' 3/1/93 memo. There are four gravel pit ponds on the Cordova District, all in the Mile 18 area. One was created in 1971 and a second in 1978. In 1978 a dike was built to form the second pond, divert the flow of a creek into it, and then channel the flow to the 1971 gravel pit a short distance downstream. With the streamflow going through these ponds, they provide approximately 7.5 acres of good summer rearing and overwintering habitat for coho salmon, cutthroat trout and Dolly Varden char. In 1991 two other gravel pits were dug near the 1971 pond. Both were dug deep enough to provide overwintering habitat once they filled with groundwater. One was connected to the 1971 pond to provide additional habitat for wild fish. The other was left unconnected for use as a put-and-take fishery. Peninsulas and an island were left in the pits to make the ponds more aesthetically pleasing. The banks were revegetated (with willow, alder, spruce, Bering hairgrass) and aquatic vegetation was planted in 1992. These two 1991 ponds total about three acres. No fish have been planted in the sportfishing (put-and-take) pond yet, but winter oxygen levels have been monitored for two years and are sufficient for winter survival. Coho salmon fry have been seen using the other pond.

Contacts:
Dave Schmid and Ken Hodges, Fisheries Biologists, USFS, Cordova Ranger District, 424-7661.

References: None

Other Information Sources:
Ken Hodges (USFS, Cordova) sent in an informative a 6 page memorandum (3/1/93) summarizing the fish habitat activities that have taken place out of the Cordova Ranger District over time. No "reports" are available from USFS on the gravel pit rehabs.

Dave's Creek Identification Code: P0148

Short Description: Spawning channel, Sterling Highway area, near Tern Lake campground

Nearest Town: Cooper Landing Year Began: 1983 Status: Completed w/M Successful: Yes

Additional Information:
The success of this project was mainly in the salmon viewing/interpretive area located at the campground. Another objective was to enhance spawning habitat for king salmon, which was less successful. Due to the low density of kings (about one dozen) that came through the area at the start of the project and the lack of baseline populations, the spawning channel effort was hardly justified, according to a project biologist. Another reason for the lack of success with the spawning channel was the substrate used. Shaly, flat fragmented rock was used rather than gravel. Log weirs were placed from one bank to the next, resulting in a pool upstream and a plunge pool below. USFS biologists were consulted regarding the design and USFS monitored the project. During the summer of 1993, USFS will put up an interpretive sign depicting the life cycle of the salmon.

Contacts:
Mark Wenger, USFS, Seward, 224-3374; Phil Brna (278-8594) and Stewart Seaberg (267-2284), both ADF&G, Anchorage, have some knowledge of the project.

References: None

Other Information Sources:
ADF&G Habitat Division files. There was a pre-project environmental assessment. Both Stewart Seaberg (ADF&G) & Mark Wenger (USFS) were interviewed.

DEC Oiled Mussel Bed Experimnt — Identification Code: P0044

Short Description: Various techniques tried to treat mussel beds with high oil content. Pr.Wm.Sound

Nearest Town: sites spread out Year Began: 1992 Status: Monitoring Successful: Yes

Additional Information:
DEC experimented with a number of methods to release high residual concentrations of oil from mussel beds to determine the feasibility of these methods on a large scale. (One similar NMFS project is described as Project #40 in the database). The continued high oil content cause concern because of impacts to species that prey on the oiled mussels (black oystercatchers, harlequin ducks, river and sea otters). In most of these experimental plots, they removed the surface layer of mussels and cobbles with shovels and trowels, then removed a few centimeters of the oiled sediments beneath, tilled the remaining sediments in an effort to float the remaining oil to the surface, and replaced the mussels on top. On the Disk Island Site, they also experimented with two "trenching" design methods. The trenches were dug in strips through an intact mussel bed, to determine whether this would allow flushing of oil from the underlying sediments. In one plot they used a pattern of alternating strips of trenched and untouched areas, each strip being 20 cm wide. In another plot they used a "hub and spoke" or starfish-type pattern of trenching. They returned 5 days later to the Disk Island site, and relocated mussels appear to be reorienting themselves and healthy. Some invasion of the trenched/treated areas by adult mussels was observed (on 5-10% of area). DEC would like to revisit these sites the next season (1993).

Contacts:
John Bauer, ADEC, Anchorage, 349-7755.

References: Publication Date: July 24, 1992 Reference Type: Report
Author: Bauer, John, Wes Ghormley, Peter Montesano
Title: Oiled Mussel Feasibility Study: Interim Report

Other Information Sources:
Talked to John Bauer briefly on the phone, but relied primarily on the report listed above.

Explorer Creek & Ponds — *Identification Code: P0187*

Short Description: USFS educational project to enhance spawning, rearing & overwintering habitat

Nearest Town: Portage Year Began: 1989 Status: Monitoring Successful: Inconclus.

Additional Information:
In 1989, a flow control structure & spawning channel was developed to imitate a beaver pond complex adj. to the Portage Valley Hwy. The intent was to improve spawning, rearing, and overwintering habitat in Portage Valley, with viewing and interpretive opportunities for Forest Service visitors. The project currently consists of two ponds

(the upper 21 acre pond contains the flow control dam), which are linked by Explorer Crk, and habitat improvements to the creek itself (3 miles total). They originally believed that overwintering habitat was the limiting factor in this stream system. The project has been extensively evaluated since 1989, with measurements including: freezing depth & dissolved oxygen, eutrophic index, winter water levels in the spawning channel, as well as fish & redd counts. Future overwintering habitat improvements may take time to design in consultation w/ hydrologists, engineers, etc. Problems encountered w/ this project to date include: 1) previous gravel mining in the Explorer Creek channel apparently widened the stream, eliminated meanders and degraded the spawning habitat; and 2) not enough water is currently flowing into the main channel of Explorer Crk below the dam. One reason is that an overflow channel (leading to a former stream bed) was installed to maintain the upper pond's elevation at 95 ft. They now conclude that the 95 ft. pond level is too low to have the desired effect. Too much water is going into the flood overflow channel, and not enough is going through the dam to the main channel of Explorer Crk or the spawning channel. Consequently, the creek below the dam is experiencing low flow, which can freeze in winter and undermine the spawning potential in Explorer Crk proper. Overall, project results have been inconclusive because salmon escapement counts have not changed much since the project began in 1989. It is now believed that the limiting factor in this system is spawning habitat. An environmental assessment is currently being prepared to improve the Explorer Crk channel below the dam to improve spawning potential. The preferred method would be to narrow the channel to its original boundaries (before gravel extraction) in order to increase water velocity and scouring, and add log structures or root wads. Brush bundles & other organic cover types were also recently placed in lower Explorer Crk Pond to enhance its rearing potential.

Contacts:

JoEllen Lottsfeldt, Kate Wedemeyer, Cliff Fox, and Dan Gillikin, all of the Chugach National Forest Glacier Ranger District, Girdwood, 783-3242.

References: None

Other Information Sources:

Talked to Dan Gillikin, USFS, on 4/30/93. Older info was described in a summary report by Dave Schmid, dated August, 1989: "Portage Valley Fisheries Projects (Overview)". Info is also in the Chugach National Forest's 5-year Action Plan. Many hydrological reports, etc., are available at USFS. This project has been intensely studied.

Fill Removal-- Potter Marsh Identification Code: P0166

Short Description: Weigh station fill removal as enforcement action for other Corps violation

Nearest Town: Anchorage Year Began: 1984 Status: Completed w/M Successful: Yes

Additional Information:

This project evolved from a wetland fill violation by the developer of Potter Point subdivision. The Corps required them to remove the fill they put in, plus as additional mitigation, the Corps and ADF&G came up with the idea of removing the access way to the old weigh station location at the southern end of Potter Marsh. This would reconnect a small isolated section of the marsh with the whole. In 1984 the fill was scooped out, leaving some "islands" for waterfowl. They excavated to a 12 - 20 inch water depth. The bank by the current turnout (on the Old Seward Highway) was revegetated with willow bundles. Water birds and fish (coho salmon, Dolly Varden) are using the area. Ice skaters also appreciate it because the former fill area is still fairly clear of vegetation (protruding above the ice), as compared to the surroundings, so skating is easier. Emergent vegetation in the former fill is slowly returning. Phil Brna said he would not change much about the way this project was conducted-- it was successful.

Contacts:

Phil Brna, Habitat Biologist, ADF&G, now at the State Pipeline Coordinator's Office in downtown Anchorage, 278-8594.

References: None

Other Information Sources:
Talked to Phil Brna, ADF&G, on 5/4/93.

Fish Creek Coastal Wetland Rst — Identification Code: P0035

Short Description: Mouth of Fish Cr, Anch. To date, only attempt at coastal wetland rest. in AK.

Nearest Town: Anchorage Year Began: 1990 Status: Monitoring Successful: Too soon

Additional Information:
This intertidal wetland was disturbed during the city's installation of a sewer line in 1986-87. Initial attempts at revegetation and creating waterfowl ponds in the area were unsuccessful (see description under "Fish Creek Mouth Waterfowl Enh", #P0179 in this database). Because revegetation was required in the ACOE permits, the Municipality of Anchorage's water utility company (AWWU) then contacted the Plant Materials Center staff in Palmer to assist. In 1990 a study area was established and a demonstration planting occurred. Springs of beach wildrye were transplanted onto the higher elevation portions of the site. Low, flooded areas were planted with indigenous sedges, rush and arrowgrass communities. The areas were examined to determine the best approach for full-scale restoration scheduled for spring 1991. In May 1991, three dikes were planted with beach wildrye springs and seeded with a hairgrass mix, asere additional higher elevation areas off the dikes. In lower areas wetland species including sedges & rushes were transplanted. In June 1992 areas needing additional work were delineated. Areas subject to flooding by high tides were planted with seedlings of greenhouse grown sedges, plantain and arrowgrass. One dike was rototilled to reduce compaction and additional sprigs of beach wildrye were planted. The dike areas received an additional seeding of Norcoast Bering hairgrass. Monitoring and data collection continued through Sept. 1992. Performance of vegetation and the extent of high tides on the site were documented. Evaluation of this site will continue through 1993. This project is important since few coastal wetland rehabilitation projects have been attempted and results from this project will greatly enhance our knowledge regarding revegetating wetlands. Stoney Wright (PMC) feels that problems occurred during seeding and transplanting because elevations (and potential water levels) were not carefully matched with the plant species (Carex, Plantago, Triglocan). Also, they should have timed the planting to better correlate with high tide. They also underestimated the amount of human traffic going through this seemingly mucky area from a nearby trail. At the "duck pond" site previously excavated further up the creek (and up the trail), revegetating to enhance waterfowl nesting proved difficult because the ducks consumed the seeds and transplants.

Contacts:
Stoney Wright and Nancy Moore, Alaska Plant Materials Center, DNR, Palmer, 745-4469.

References: Publication Date: 1992 Reference Type: Report
Author: Wright, Stoney
Title: Fish Creek Wetlands Restoration Project, pp.21-2 in PMC 1992 Annual Report

Other Information Sources:
Talked to Stoney Wright & Nancy Moore, both of the DNR Alaska Plant Materials Center, on 2/3/93.

Fish Creek Mouth Waterfowl Enh — Identification Code: P0179

Short Description: Required to restore/enhance area after damage from sewer line installation

Nearest Town: Anchorage Year Began: 1986 Status: Completed w/M Successful: No

Additional Information:
Although later revegetation efforts (1990-) were conducted by DNR-PMC staff at the same location, the description below pertains to the Municipality (AWWU) activities in 1986-88. The creek corridor near the mouth was originally estuarine with some standing water. AWWU installed a sewer line parallel to the creek at the mouth. Restoration (including revegetation) was required because so much surface area was damaged by heavy equipment during the installation. A series of ponds for waterfowl were included as part of the restoration. The ponds were placed within the corridor east of the creek. The ponds were excavated into disturbed sediments. The soil there is poor-- contains salts, dries out like concrete-- and these original revegetation efforts were unsuccessful. The agencies pointed this out to AWWU, which then hired the Plant Materials Center to begin a revegetation project there starting in 1990 (documented in this database as "Fish Creek Coastal Wetland Rst", project ID #P0035). The AWWU 1986-88 restoration efforts are not considered successful because the area received only limited bird use, and the revegetation was incomplete. The lessons learned from AWWU's attempt include: the "swimming pool" concept of discrete open water bodies is not the best for waterfowl. They might better benefit from a complex of interconnected sedge swales, so that they have enough suitable area for nesting. In cases like this where the substrate is poor, perhaps topsoil additions of some sort should be considered for better revegetation results.
Contacts:
Thede Tobish, Municipality of Anchorage, Planning, 343-4222. Also Bruce Campbell, ADF&G, Wildlife Conservation, Anchorage, 267-2205.

References: None

Other Information Sources:
Talked to Thede Tobish, Municipality of Anchorage, on 5/25/93.

FRED projects on Campbell Ck Identification Code: P0032

Short Description: Many fish habitat improvements: drop structure, revetments, etc.

Nearest Town: Anchorage Year Began: 1990 Status: Monitoring Successful: Yes

Additional Information:
Projects have included: 1) 1991--A drop structure to alleviate erosion on one bank by diverting current after trampling wrecked the natural vegetation cover. This may not have been the best possible solution--getting a bit too much aggradation upstream of drop structure. Perhaps a "vortex rock wier" would have worked better, or just tree revetments on the banks. 2) 1992--Creating overwintering coho habitat in Campbell Slough by using a vertical perforated culvert around a groundwater trap, and recontouring the bottom. Didn't work because too shallow (and ice too thick) at that point in the slough. 3) 1992--Used pallets covered with fabric and sandbags and natural vegetation to create shelf areas that fish could swim in & out of as summer habitat. Fish did not end up using this area much--probably again because the placement was in a stretch of the creek that was too shallow--the lower pallet silted in. 4) 1990 & 1992--Christmas tree revetments. These were anchored to bank to slow down the flow in erosion area from foot traffic, created some coho fry habitat with slow water and some pools. Workers noticed the fry move in right away for the cover. This method is cheap & effective but requires high maintenance because trees much be replaced every 2 years. 5) 1992--Fish ladder installed to allow fry to pass freely between Dimond Slough and main channel. This ladder appears to work well as long as sufficient flow is running through it. He will address this problem in the future. 6) 1993/94?--He plans to use tree root wads and footers, with boulders, to reduce creek bank erosion on CHESTER CHEEK (not Campbell Crk, as above) in a high foot traffic area near the baseball diamond.

Contacts:
Fritz Kraus, Aquatic Education Specialist & Stream Rehabilitation Biologist, ADF&G, 333 Raspberry Road, Anchorage 267-2265

References: None

Other Information Sources:
Information obtained by interviewing Fritz Kraus, ADF&G. By February, 1994, he will have completed a report for the Alaska Science and Technology Foundation, which contributed to these efforts at public involvement & education in stream rehabilitation.

FS Cordova Dstr.Spawning Chnls Identification Code: P0078

Short Description: USFS (Cordova) spawning channel construction in Copper River area

Nearest Town: Cordova Year Began: 1984 Status: Monitoring Successful: Partially
Additional Information:
The channels were built by excavating and adding large riprap to stabilize the sides (which also serve as cover). They added sorted gravel for spawning habitat. A few wooden drop structures were placed along the channel to control the water gradient. Willow and alder were planted on all banks; some areas were also seeded. The Mile 25.25 spawning channel was highly productive for the first several years, but egg-to-fry survival has decreased. Biologists in British Columbia who have worked with a number of similar channels feel that the sorted gravel traps fine sediments more than natural gravels with a variety of sizes. The silt accumulates and blocks the upwelling groundwater. The Canadians have replaced the sorted gravel with gravel in a wide variety of sizes. To do this would probably be expensive. The Forest Service tried flushing out the sediments with a pump, but it is labor intensive. They will find out if this is effective by comparing egg-to-fry survival rates in each of the two branches of the channel, one cleaned and one not. If the channel had produced at its initial levels, the channel construction would have been cost-effective. It is now uncertain how much maintenance will be required. In general, though, spawning channels could be effective for bolstering weak stocks, providing recreational opportunities, and to a lesser degree, contributing to the commercial fishery. The Mile 18 channel was dug in 1984, but there was never sufficient groundwater flow. The gravel was coated with iron oxides and silt after awhile and all that remains is a rather oddly shaped extension of a gravel pit pond. A thorough hydrologic study was needed before embarking on this project.

Contacts:
Dave Schmid and Ken Hodges, Fisheries Biologists, USFS, Cordova Ranger District, 424-7661.

References: None

Other Information Sources:
Ken Hodges (USFS, Cordova) sent in an informative 6 page memorandum (3/1/93) summarizing the fish habitat activities that have taken place out of the Cordova Ranger District over time. Information is available in their files in memo-type format; no "reports" have been written up to date.

FS Stream Cover/ Brush Bundles Identification Code: P0077

Short Description: USFS (Cordova) prgm to add cover to barren streams for fish spawning

Nearest Town: Cordova Year Began: 1986 Status: Completed w/o M Successful: Unknown
Additional Information:
The following description was taken from Ken Hodges' 3/1/93 memo. The cover structures have been built in barren streams to provide cover for spawning fish and protect them from predation. The cover structures are primarily logs cabled into bedrock to simulate undercut banks. These were built next to areas with good spawning gravels so the fish would be encouraged to use areas which would not be used otherwise for lack of cover. We have seen fish hiding under these structures, but have not documented redd construction nearby. Brush bundles have

been placed in gravel pit ponds and other places where there is no aquatic vegetation or logs to provide cover for rearing and overwintering juvenile fish. They are composed of either big brush clumps secured against the banks or small trees that are sunk into the ponds themselves. Fish have been seen utilizing the ones in shallow water, but it is unknown whether the ones in deep water are used except perhaps in winter. Monitoring is needed, but has not been done for lack of time.

Contacts:
Dave Schmid and Ken Hodges, Fisheries Biologists, USFS, Cordova Ranger District, 424-7661.

References: None

Other Information Sources:
Ken Hodges (USFS, Cordova) sent in an informative 6 page memorandum (3/1/93) summarizing the fish habitat activities that have taken place out of the Cordova Ranger District over time. Information was verified with him over the phone. No reports have yet been written up on these structures.

Fucus Recruitment Experiment Identification Code: P0133

Short Description: Post oil spill seaweed recruitment study by Moss Landing Marine Labs

Nearest Town: Whittier Year Began: 1990 Status: Completed w/M Successful: Partially

Additional Information:
Fucus algae are the primary biomass producers for this whole intertidal zone. The highest tidal margin had suffered greatly during the 1989 oil spill and clean up efforts. Based on their 1990 observations of the area where young Fucus plants were coming back in, they guessed at what characteristics the algae needed to successfully colonize a bare area. They looked for patterns to explain the few places where new Fucus recruits were appearing. Then, in 1991, they set up an experiment to test the observed patterns in natural recruitment, consisting of cobble test plots with different treatments –cracked cobbles; some cobbles with artificial canopy simulating an adult cover of Fucus; some with adults left nearby, some with all nearby adults removed. They obtained best results with cracked cobbles. At the same time, they did transplant experiments, using either small or large Fucus individuals, and tried transplanting them within and between tidal zones, and from sheltered to open areas. They found that the Fucus stem cannot re-adjust its orientation to a new direction of water motion. The stems would crack in the water currents and die. They obtained best results in transplanting small individuals from the high intertidal zone. This method of hand transplanting and gluing to rocks was very time intensive. Another idea would be to move entire cobbles (softball-sized) with Fucus already well established on them, and to spread them among the barren areas. They also conducted experiments to determine the effect of different amounts of adult canopy density on new individuals, and the rate of natural weathering of tar patches (i.e., is expensive clean up really necessary?). They only had one season (1992) to obtain data from these experiments before their funding was cut.

Contacts:
Andy DeVogelaere, Research Associate, Moss Landing Marine labs, Moss Landing, CA, .(408) 728-2822.

References: Publication Date: February, 1993 Reference Type: Report
Author: DeVogelaere, Andrew; Foster, Michael
Title: Damage, recovery, & restoration of intertidal Fucus fl the Exxon Valdez Oil Spl

Other Information Sources:
Also talked to Andy DeVogelaere on 4/1/93.

Glacier Dtrict PWS Fishpasses — Identification Code: P0167

Short Description: USFS fishpasses in Western Prince Wm Sound, managed by Glacier Ranger District

Nearest Town: Western PWS Year Began: 1972 Status: Completed w/M Successful: Yes

Additional Information:
The Glacier District of the Chugach National Forest manages 12 fishpasses in western Prince William Sound, including: Otter Creek (Knight Island); Solf Lake (Knight Island); Shrode lake (Long Bay, Culross Passage); Red Creek (Esther Passage); Derickson Creek (Eaglet Bay); Paulsen Creek (Cochrane Bay, Wells Passage); Hobo Creek (Port Wells); Billy's Hole; and Sockeye Lake. A few are located on lands now proposed for state selection. The USFS fish passage for Harrison Lagoon Creek is written up separately in this database. Some of these projects were intended to restore fish passage to lakes and rearing areas that had been cut off by the 1964 earthquake. Others were pure enhancement projects in areas with potential to increase available fish habitat (and production) with a ladder. The types of fish passes in the Sound vary, but generally fall into these categories: step pools created by gabions; Alaska Steeppasses; and rock or poured concrete weirs with cut out slots or tubes to allow passage. Some sites employ combinations of these approaches. The work on several of these sites began as early as 1972 (work on Shrode Creek/Lake was begun in the 1960's with the installation and maintenance of a water control gate above the falls). Maintenance continues on an annual basis. All structures require considerable monitoring and maintenance to correct any debris that may block the system, or the failure of any of the structural elements (i.e., washed out or rusted gabions, etc.). The ability of the Forest Service to provide this level of maintenance may be restricted by budget cuts in the future.

Contacts:
Kate Wedemeyer, Cliff Fox, Dan Gillikin, all of Glacier Ranger District, US Forest Service in Girdwood, 783-3242.
References: None

Other Information Sources:
Kate Wedemeyer sent information printouts (dated 8/31/91 & 7/10/92) on many PWS fishpasses, though these are not included in any citable "reports" to date. Dan Gillikin (USFS, Girdwood) answered some specific questions. Pertinent information may be found in the PWS files on maintenance & monitoring in the Glacier District office. A summary of info may also be in the Chugach NF's 5 year plan. In addition, Glacier District staff write work project plans each year which detail what activities will be conducted on which sites that season.

Glenn Highway Mitigation Proj. — Identification Code: P0177

Short Description: Eklutna to Parks Highway reconstruction mitigation project

Nearest Town: Palmer Year Began: 1990 Status: Monitoring Successful: Too soon

Additional Information:
A HEP analysis was performed by ADF&G & USFWS biologists for the acreage affected by widening the Glenn Hwy. and a conceptual design for an impoundment was developed to mitigate for the loss of habitat for these species. ADOT/PF engineers designed the project based on alternatives developed by USFWS and ADF&G. In 1992, a dike was constructed at the south end of the project between the railroad grades and highway grades. The area naturally gets inundated with water from surface flows by closing drainage outlets from the area. This wetland expansion potentially increases habitat value for pintail ducks, muskrat, & coho salmon. Water control structures with stop-logs (or stop-boards) have been or are being installed. These act as gates to allow for season adjustments of water levels. Theoretically, the boards could be pulled to lower water levels. The dike and stop-log structures are designed to allow water to enter the impoundment when the tidally-influenced Matanuska River approaches full bank stage. However, the Matanuska River has recently changed course so it is not known if there is enough water

to provide water from this source. Until all water control structures are in, questions remain whether the area is holding water or whether there is enough water to attain the desired 18" standing water depth. Data is still being gathered. Another problem is that blocked culverts which keep the water level up cannot provide seasonal access for fish. A three-year monitoring plan is to be completed in 1995, when another HEP analysis will be performed. By fall 1995, it should be known if desired surface water elevation has been attained. Note for clarification: the overtopping contribution by the Matanuska River is not the primary water source, but rather an "opportunity" to capture more water at high flows with high tides. Surface water is the primary water source in the area.

Contacts:
Ed Weiss, ADF&G, Habitat & Restoration Div., 267-2305; Carol Sanner, ADOT/PF, 266-1509; Dan Rosenberg, ADF&G, Wildlife Conservation Division, 267-2453

References: Publication Date: April 6, 1993 Reference Type: Report
Author: Weiss, Edward W.
Title: Glenn Hwy Eklutna-Parks Hy Proj Wetlands Mitign Monitoring Proj 1992 Prog Report

Other Information Sources:
Technical Assistance Report: Glenn Highway Expansion (Eklutna to Parks Highway); prepared for the ADOT/PF by the USFWS & ADF&G, 1988?; Glenn Highway: Eklutna to Parks Highway: Final EIS/Sec. 4(f) Evaluation, by U.S. Federal Highway Admin. & ADOT/PF, FHWA-AK-EIS-88-01-F. Ed Weiss, ADF&G, was also interviewed for this database description.

Goodnews Platinum Mine

Identification Code: P0171

Short Description: Reopening fish passage through placer mine tailings to spawn/rearing habitat

Nearest Town: Platinum Year Began: 1991 Status: Completed w/M Successful: Too soon

Additional Information:
The objective of this project was to provide fish passage through 4 to 5 miles of tailings left by a placer mine bucket line dredge. Pre-mining, the entire river system had 14-15 stream miles of spawning and rearing habitat. Mining activity created cross-channel blockages, leaving only the furthest mile downstream available for fish use. This project was to provide fish passage through the middle section of the river (4 miles long), which would render another 6 - 7 miles of upstream spawning/ rearing habitat available for fish use. ADF&G wanted fish to be able to get into the Medicine Creek drainage. They allowed the applicant to select a channel route through the tailings. It was difficult to get equipment to the work site. The road had to be improved to allow access for the large dragline that would be used to excavate. The dragline worked from upstream to downstream, and many problems were encountered when the water flow went subsurface through the old tailings whenever they breached through a lens of fine sediments to the coarser ones below. Subsurface flow does not achieve fish passage, so several stream sections then had to be re-excavated deeper till the flow reappeared. Lesson learned: when trying to establish surface flow through a porous material, it is best to first establish the water level at a control point downstream, then excavate from that point in an upstream direction. This direction will minimize the amount of excavation necessary to accomplish the job and maintain surface flow. As of June 1992, surface flow was achieved throughout the 4 to 5 mile channel. The river is now beginning to establish pools and riffles in some sections. The area has not yet been surveyed at the appropriate season to detect coho salmon use.

Contacts:
Wayne Dolezal, ADF&G Habitat Div., Anchorage, 267-2284; Mike North, USFWS, Ecological Services, Anchorage, 271-2778

References: None

Other Information Sources:
Talked to Wayne Dolezal in May, 1993. ADF&G files contain a great deal of correspondence over the years.

Gulkana River 5 Identification Code: P0017

Short Description: Revegetating around new facilities at Sourdough Campground, Gulkana River

Nearest Town: Glennallen Year Began: 1992 Status: Implementation Successful: Yes

Additional Information:
BLM was required to restore vegetation in the abandoned campsites, roads, & parking spurs to be replaced by the new facilities. Restoration efforts in 1992 took place at the boat launch parking area (apprx. 50-200 ft back from the river's edge). Techniques included the addition of topsoil, scarification & seeding with grasses recommended by the Alaska Plant Materials Center. Native willow bundles, birch and spruce were also planted. The area was fertilized after seeding, and vehicles were excluded by a physical barrier. After one season (1992), the grasses had come up well. They hope the transplanting of woody materials worked well too, but survivorship is not yet known. Timing is critical for transplanting trees due to permafrost conditions, etc., with only a narrow window of viable planting opportunity. In 1993 they plan to conduct additional revegetation along the new trails and visitor kiosks.

Contacts:
Larry Kajdan or Janelle Eklund, BLM, P.O. Box 147, Glennallen, AK, 99588. PH: 822-3218. Nancy Moore at the Alaska Plant Materials Center (745-4469) had some input on the revegetation design.

References: None

Other Information Sources:
Some info obtained from files at Army Corps of Engineers. Talked to Janelle Eklund, BLM, Glennallen, on 3/31/93.

Harrison Lagoon Creek Identification Code: P0173

Short Description: USFS creek diversion into Harrison Lagoon for chum & pink spawning channel, PWS

Nearest Town: Whittier Year Began: 1972 Status: Monitoring Successful: Yes

Additional Information:
Physical changes from the 1964 earthquake eliminated spawning habitat at the mouth of Lagoon Creek. The potential to increase flow and area of a chum & pink channel was recognized in the early 1970's. A diversion channel was built allowing water to flow from above the falls on Lagoon Creek into the lower intertidal area of Harrison Lagoon where a small spawning channel already existed. A structure was put in Lagoon Creek to divert some flow into the side channel. In 1984, a few thousand pinks were observed spawning. The diversion structure washed out during the 1980's, and was replaced with a gabion structure in 1991. To reduce the amount of flow going into the side channel during high flows, they removed the top layer of gabion baskets from the structure in 1992. This alleviated complications of erosion and scouring in the side channel and spawning bed below. It appears to be a successful project. Ken Holbrook (USFS hydrologist, Anchorage) has suggested using weirs part way across Lagoon Creek to "capture" water into the side channel rather than the present "ricochet" diversion structure which involves much more hydrological energy and erosion potential.

Contacts:
Kate Wedemeyer, Cliff Fox, Dan Gillikin, JoEllen Lottsfeldt, all at U.S. Forest Service Glacier Ranger District, Girdwood, AK: 783-3242.

References: None

Other Information Sources:
Talked to Dan Gillikin, USFS, Glacier Ranger District, on 4/30/93. Some information is in Chugach National Forest's 5 year plan. The one-page information printout sheets previously compiled by Kate Wedemeyer for Prince William Sound contain a chronology of the Harrison Lagoon Project.

Herring Bay Experimental Study Identification Code: P0132

Short Description: UAF's Fucus (seaweed) restoration study in Prince William Sound

Nearest Town: Whittier Year Began: 1990 Status: Implementation Successful: Too soon

Additional Information:
This study was funded by ADF&G and the Trustees in aftermath of the big 1989 oil spill. The study is conducted by the University of Alaska, School of Fisheries and Ocean Sciences. Monitoring of the area (for Damage Assessment) began in 1990. In 1992, they attempted their first reintroduction of Fucus on the upper intertidal rock by chipping a notch and gluing the Fucus plug into it. This method did not work well. Then they tried attaching a biodegradable erosion control cloth to the rock for Fucus to naturally recolonize onto. The idea here is that the former plant life (destroyed by the oil spill and cleaning) had provided some moisture-retention on the rocks. Without the plant cover, the rocks in these sheltered, protected areas (beyond any ocean spray) can dry out and get very hot. They are now experimenting (1993) with different fabrics on the rock surface to see which works best at retaining adequate moisture, allowing Fucus to recolonize. At the end of the 1992 season, they measured survival of the transplants onto bare rock, and density of Fucus in the erosion cloth areas. The objective of this study was to see if it was feasible to enhance Fucus recovery on a large scale. If the test on this 200m stretch of beach appears to be positive, these techniques could potentially be expanded to 11 miles of coastline.

Contacts:
Mike Stekoll, Univ. of AK-Juneau, School of Fisheries and Ocean Studies, 465-6279; Larry Deysher, Carlsbad, CA, (619) 438-0588.

References: Publication Date: Dec. 1992 Reference Type: Report
Author: School of Fisheries and Ocean Studies, UAF, Highsmith, Ray
Title: Herring Bay Experimental and Monitoring Studies

Other Information Sources:
Talked to Mike Stekoll 3/24/93. Also, a report will be produced in January 1994 called "Annual Report, Herring Bay Experimental and Monitoring Studies".

Huffman Hills Conserv.Easement Identification Code: P0003

Short Description: Anch.Wetlands Mgmt Plan req'rd conservation easement for dev.in preservtn wetlds

Nearest Town: Anchorage Year Began: 1991 Status: Monitoring Successful: Unknown

Additional Information:
The following is paraphrased from Don Kohler's summary paper: After consultation with the Mayor's Office, the Alaska District [ACOE] issued a Special Public Notice in January 1986, regarding decision factors associated with development in areas classified as preservation and conservation wetlands under the Anchorage Wetland Management Plan (AWMP). Compensation required to meet the provisions of the Special Public Notice is normally in the form of a preservation easement on wetlands identified in the AWMP as development or mixed development.

General Permits exist for activities in the "development" wetland areas. From this description (from Don Kohler's paper), it appears that the developer, Huffman Hills, planned to fill 0.53 acres of wetlands identified as preservation or conservation in the AWMP, and therefore they were required to create a conservation easement in wetlands identified as developable. The Corps files state that this compensation area was 1.9 acres, and that the permit applicant was required to revegetate slopes with blue joint grass and a grass seed mix and to maintain the area for 2 years.

Contacts:
Army Corps of Engineers, Anchorage, 753-2716. Also Thede Tobish, Planning Office, at the Municipality of Anchorage, 343-4222.

References: None

Other Information Sources:
Information came from the ACOE files, and a one paragraph description in an informal paper summarizing the few instances of ACOE involvement in compensatory wetland actions. This summary paper was prepared by Don Kohler, ACOE, Anchorage, in late 1992.

Ingram Pond Coho Rearing Enhc Identification Code: P0188

Short Description: Tried to create recr. coho fishery by connecting crk to rearing pond & stocking
Nearest Town: Portage Year Began: 1985 Status: Completed w/M Successful: No

Additional Information:
The intention was to create a clear water coho sport fishery in Ingram Creek by excavating an access channel between a productive 78 acre pond and Ingram Creek, and stocking the pond. The channel was excavated by ADOT/PF in August 1985 during the reconstruction of the Seward Hwy at a cost of $6,000. A water control structure/ weir was constructed in the outlet of Ingram Pond in September 1985. ADF&G stocked the pond with coho and pink fry in 1987, 1988, & 1990. However, the expected returns of pink & coho salmon never materialized, and the stocking was discontinued. Why was it unsuccessful? It appears that other outlets to Ingram Creek were not adequately secured. Up to 50% of the smolts may have exited the pond into the Placer River rather than Ingram Creek. Since the intention was to create a sport fishery in the highly accessible (and clearer water) Ingram Creek, this is a problem. Virtually all of the stocked smolts may be returning to the Placer River. This project has been shelved, although Ingram Pond is very productive and still supports rearing fish (they appear to enter and exit out of the Placer River). The effort was not completely in vain, however, because some of the stocked pink salmon are returning and providing increased fishing opportunities in the Placer River, although it is not very accessible except to airboat fishermen.

Contacts:
Dan Gillikin, JoEllen Lottsfeldt, Cliff Fox and Kate Wedemeyer, all of the Chugach National Forest Glacier Ranger District, Girdwood, 783-3242.

References: None

Other Information Sources:
Talked to Dan Gillikin, USFS, on 4/30/93. Dave Schmid's 1989 summary of USFS work done in Portage Valley contains some information, as well as their 1993 District Fisheries Program.

Jap Creek Mitigation Identification Code: P0143

Short Description: Spawning channel as mit for Seward Marine Ind. Ctr. in Spring Creek

Nearest Town: Seward Year Began: 1985 Status: Completed w/M Successful: Partially

Additional Information:
This spawning channel was undertaken as offsite mitigation for the loss of a healthy population of pink and chum salmon in Spring Creek as a result of the construction of the Seward Marine Industrial Center. They had a target number of 700 fish to mitigate for loss of spawning habitat. Apparently the project was very successful for pinks salmon in the first few years, as many were observed. Water intake has been a problem and the headgate washed out in the cold winter of 1989. Two separate attempts have been made to fix it, causing even more erosion. Another attempt may be made in spring 1993. The water is still flowing through the spawning channel, but it's flowing around and not through the floodgate. The Seward Harbormaster (Foster Singleton) is in charge of maintaining the spawning channel, including the floodgate. Part of the problem with erosion in the headgate is that fine organic material (sand, silt) is deposited in the spawning gravel. The original (natural) channel seemed to have more chinook spawning.

Contacts:
Don McKay, Habitat Division ADF&G, Anchorage, 267-2284. Paul Diemer, City of Seward, 224-3331. Foster Singleton, City of Seward Harbormaster, 224-3138.

References: Publication Date: May 1984 Reference Type: Report
Author: ADF&G and USFWS
Title: Mitig. Altern. for Marine Industrial Center & Coal Loading Facility,Seward,AK

Other Information Sources:
Interviews with Stewart Seaberg and Don McKay ADF&G on 4/5/93.

Johns Creek Identification Code: P0193

Short Description: Diversion of channel to new location in close proximity, due to placer mining

Nearest Town: Talkeetna Year Began: 1984 Status: Completed w/M Successful: Yes

Additional Information:
Placer mining occurred on private property at the headwaters of Clear Creek, miring the creek bottom, which was a spawning area. The original creek was controlled by bedrock and meandered. ADF&G hired a hydrologist, Giles McDonald & Associates, to assist with the realignment. The resulting design was intended to match the original stream. ADF&G instructed them that the restored creek should continually meander within the canyon walls, and have a bottom stream width of between 20 and 50 ft. Clusters of very large boulders, amounting to at least 15 percent of the bed, were put in to prevent streambed erosion, provide roughness, and facilitate fish passage. Stream diversions were carried out in phases in order to allow accomplishment of the mining claims, and in some cases they were then rediverted back to their original locations. Small portions of the creek were diverted one at a time during high water. The new stream channel was often so close that many fish were actually moved by hand. All realignment channels were isolated from the water of Johns Creek by natural plugs (unaltered streambank) left in place at both the upstream and downstream ends during excavation. Large woody debris (numerous logs, branches, etc.) was placed in and along the realigned stream to increase available cover for fish. Natural vegetative buffers of at least 10 feet in width were a requirement of the permit, and all tailing piles were leveled to encourage revegetation. Phil Brna, ADF&G project biologist, remarked that if the project was done today, more emphasis would be placed on baseline fish data and monitoring fish response.

Contacts:
Phil Brna, ADF&G, at Joint State/Federal Pipeline Coordinator's Office (formerly worked for Habitat Div.), Anchorage, 278-8594. Hired consultant was Giles McDonald & Associates, 13300 Crestview Drive, Anchorage, 345-2665.

References: None
Other Information Sources:
Interview with Phil Brna, ADF&G, May 1993. More info in ADF&G permit files.

Kenai River Wetland — Identification Code: P0088

Short Description: Kenai wetland revegetation for illegal fill; Kenai River Slough

Nearest Town: Soldotna Year Began: 1989 Status: Completed w/M Successful: Yes

Additional Information:
In 1989, the Alaska Plant Materials Center was asked by an engineering company to assist in restoring a wetland disturbance covering approximately .04 ha. This disturbance was the result of an illegal fill. A plan was prepared and accepted by the U.S. Army Corps of Engineers. The plan relied entirely on species native to the area and adapted to saturated soil on sites where prolonged seasonal flooding may occur. The area was seeded with a mix of Egan American Sloughgrass (50% by weight), Sourdough Bluejoint (25%) and Norcoast Bering Hairgrass (25%) at a rate of 22.4 kg ha-1 and fertilized at a rate of 560 kg ha-1 20-20-10. Seeding evaluations of the site occurred on Sept. 1989, Aug. 1991, and June 1992. During the 1989 visit the entire site was under one meter of water due to flooding of the Kenai River. This condition lasted for roughly 30 days. At the time of the final evaluation, a well established and flourishing wetland community was present. Sloughgrass and hairgrass were performing exceptionally well. Bluegrass was performing fair.

Contacts:
Stoney Wright, Alaska Plant Materials Center, Palmer, 745-4469

References: Publication Date: 1992 Reference Type: Report
Author: Wright, Stoney
Title: pp. 21 in: Alaska Plant Materials Center Annual Report 1992.

Other Information Sources:
Wright, Stoney. 1992. Three case studies of successful wetland rehabilitation in Alaska using newly developed wetland cultivars, in: Land reclamation: advances in research & technology: Proceedings of the intl. symposium, 14-15 Dec. 1992, pp. 151-159

Larson Lake Fertilization — Identification Code: P0184

Short Description: CIAA lake fertilization project near Talkeetna, currently inactive

Nearest Town: Talkeetna Year Began: 1982 Status: Monitoring Successful: Inconclus.

Additional Information:
This was a joint project of ADF&G and CIAA. Larson lake was fertilized to promote plankton and algae growth in 1986 and 1987, for the benefit of rearing sockeye salmon. The lake fertilization was successful, and stocking the lake with sockeye fry was proposed. However, the entire enhancement plan was not fully implemented due to

the hostile reaction of local residents, who did not want any "government" presence (vandalism of structures, etc). The project is currently on hold.

Contacts:
Gary Fandrei, Cook Inlet Aquaculture Association, Soldotna, 283-5761.

References: Publication Date: 1985 - 1987 Reference Type: Report
Author: Cook Inlet Aquaculture Association
Title: A series of technical reports, Larson Lake Project, 1984 through 1987.

Other Information Sources:
Gary Fandrei, CIAA, provided this information. ADF&G-FRED has more information; this was a cooperative project between the two groups.

Little Campbell Crk. Enhancmt. Identification Code: P0195

Short Description: Enhancement/ realignment downstream of Lake Otis Pky during Phase IV constrctn.

Nearest Town: Anchorage Year Began: 1988 Status: Completed w/M Successful: Yes
Additional Information:
Little Campbell Creek was on the property line of a large newly developed industrial park, so the creek was realigned. DOWL did the design, emphasizing fish habitat. ADF&G endeavored to match the gradient and width of the natural stream. Boulders were hauled in to further constrict the streamflow as deflectors, to undercut banks, and to get a deeper channel to form. Drop structures, placed every 10 feet, consisted of a single line of at least 5 rocks, 12 to 18 inches in diameter, placed directly on the stream bottom in a "V" configuration with the point upstream. The rocks were keyed into the streambanks to prevent erosion. A problem with the project was that the gradient was too shallow and too wide, leading to silting in of the many rocks that were placed in the stream. High flows would come down and deposit silt on the boulder deflects, so willows were later planted on top of the silted boulders. The disturbed area within 25 feet of the creek was extensively revegetated using native herbaceous and woody plants at a density of at least 33 percent of the natural surrounding density, creating a pleasant park-like area. In areas without adjoining natural vegetation, poplars and willows were planted on two foot centers. The new stream area was given to the Municipality for a park. Additional work was conducted at this site by ADOT/PF as offsite mitigation for a very large culvert routing under Lake Otis Parkway.

Contacts:
Phil Brna, ADF&G, Pipeline Coordinator's Office (formerly at Habitat Division), Anchorage, 278-8594; Mark Dalton, HDR Engineering, Inc. (formerly at Municipality of Anchorage), Anchorage, 562-2514; Carl Bassler, DOWL Engineers, Anchorage, 562-2000.
References: None

Other Information Sources:
Interview with Phil Brna, May 1993; minimal information in ADF&G files; see also ADF&G file #FG 90-II-0390 for continuation of FG 88-II-182.

Lyon Creek Ponds Identification Code: P0186

Short Description: USFS converted gravel pits into rearing ponds & spawning channel, Turnagain Pass

Nearest Town: Portage Year Began: 1985 Status: Monitoring Successful: No

Additional Information:
A series of 3 ponds (totalling 5 acres) were created from former gravel pits in 1985, along with a 390' long x 20' wide spawning channel for coho and chinook salmon. The ponds were intended as rearing habitat for coho salmon. The entire project was to provide opportunities for sport fishing and salmon viewing in the Six-mile river drainage. In 1987, the pond area was revegetated with grass, willow, and black cottonwood cuttings. ADF&G stocked the ponds with coho fry in 1986 and 1987, and coho, chinook, and steelhead were stocked in the vicinity in 1988. Winter monitoring for dissolved oxygen and minnow trap sampling for presence, size and condition were conducted over several seasons. So far, it appears that few adults have returned. Productivity could be limited by the sterility of the ponds or lack of hiding cover, which may have caused the fry to leave. At present, funding may limit any more work at this site, although monitoring the returning adults and adding brush bundles for cover and organic matter have been proposed.

Contacts:
Kate Wedemeyer, Cliff Fox, JoEllen Lottsfeldt, and Dan Gillikin, Glacier Ranger District, USFS, Girdwood, 783-3242.

References: None

Other Information Sources:
Talked to Dan Gillikin, USFS, 4/30/93. Some details (e.g., project chronology) contained in a set of project summary sheets previously compiled by Kate Wedemeyer.

Martin River Delta Fish Ponds — Identification Code: P0068

Short Description: Former borrow pits for AEA's hydroelec. plant were rehab'd for spawning & rearing

Nearest Town: Homer — Year Began: 1991 — Status: Completed w/o M — Successful: Too soon

Additional Information:
This project is part of the overall Bradley Lake development, which is the biggest public works project built in Alaska to date. The materials borrow site was originally excavated with future fish habitat uses in mind, so they contoured the pit areas accordingly (depths, slopes, etc.). The fish habitat area is composed of two sizable rearing ponds (totalling close to 30 acres) and a spawning channel. Although built on one side of the Martin River floodplain, the fish access to these areas is only from Katchemak Bay, not via the Martin River. When the gravel pits were converted for fish habitat, large woody debris (e.g., stumps) were placed on the banks to provide cover, and all exposed banks and surrounding ares were fertilized to encourage plant growth. Groundwater level is close to the surface. In the spawning channel (approx. 1500'long x 20'wide), notched weirs were placed at intervals to maintain the water depth in separate reaches of the channel. Riprap was placed on the sides of the spawning channel to stabilize the banks. Although AEA has no obligation to monitor this area (it was not a mitigation action in the strict sense), they do have some observations. Coho have been spotted in the area since 1991. Also, a strong indication that fish will take advantage of the area comes from observations in 1986 when they first constructed the ditch that would later become the spawning channel. Adult and coho salmon showed up everywhere then, and became quite a problem for the construction activities going on at the time.
Contacts:
Tom Arminski, Alaska Energy Authority, Anchorage, 261-7267. Don McKay & Gay Muhlberg were involved from ADF&G, Anchorage, 267-2284.

References: None

Other Information Sources:
Talked to Tom Arminski, AEA, 3/11/93. His info was mostly written in letters to/from ADF&G, so much may also be in their files. In addition, the description of proposed fish rehabilitation efforts in the original EIS for the whole project turned out to be fairly accurate as to what actually took place.

MOA Sedimentation Ponds — Identification Code: P0181

Short Description: Anchorage Public Works Dept. created several ponds for water quality purposes

Nearest Town: Anchorage Year Began: 1988 Status: Implementation Successful: Yes

Additional Information:
Five sedimentation basins have been installed to date within the Municipality of Anchorage; three more are planned. The idea is to remove sediments and heavy metals from major storm drainage areas before dumping the water into the creeks. The ponds were excavated as basins, with gentle 4:1 or 5:1 side slopes, and the surface topped with mineral soils. The shallow grade allows for greater settling area and zone of vegetation growth. The revegetation is extensive, as they attempt to match seed, seedlings, and plugs to various water elevations (consulting firms were employed). Although the main purpose of the ponds is for their water quality function, the MOA also wanted to make them attractive for birds and residents alike. At the Meadow Street sedimentation pond (the biggest and most successful), the outlet channel from the basin to Little Campbell Creek is a rock-lined swale, about 150 ft. long. This basin has been deemed successful because measurements of water quality at a point entering versus exiting the basin show that 88% of the sediments have been removed, and 60-70% of the heavy metals have been removed. Any bird use of these areas is just "extra"; they have observed geese and ducks.

Contacts:
Tom Bacon, MOA Dept. of Public Works, 786-8187. Also, Thede Tobish, MOA Planning Dept., 343-4222.

References: Report Expected

Other Information Sources:
Talked to Tom Bacon, MOA Public Works, on 5/26/93, and Thede Tobish, MOA Planning, on 5/25/93. Tom said a report is expected; the design criteria have been researched and finalized (for future ponds).

New Chenega Road Construction — Identification Code: P0061

Short Description: LaTouche Passage 8. Fill removed & spawning gravel replaced (enforcemt action)

Nearest Town: New Chenega Vill Year Began: 1984 Status: Completed w/M Successful: Yes

Additional Information:
ADOT/PF's contractor departed from the work plan as approved and permitted (by ADF&G and COE) by constructing an unauthorized access road across approx. 2000' of wetlands. This access road was constructed in 1983 by placing gravel fill in the wetlands. The gravel was illegally extracted from a pink salmon spawning area of nearby Anderson Creek, a catalogued anadromous stream. An ADF&G Notice of Violation was issued. Remedial action in 1984 included: 1) ADF&G required replacing gravel in the former spawning area in Anderson Creek. This was accomplished by transporting gravel overburden from an adjacent cobbled stream bar, and contouring the gravel in the channel for spawning uses (Approx. 300' length of stream by 100' wide area was affected). 2) COE required them to remove the gravel fill used for the equipment road (40' wide x 2000' long) across the wetlands. Most of the gravel from the wetlands was successfully removed, and subsequent aerial inspections by Rich Randall of the Commercial Fish Division

of ADF&G showed that pink salmon were again spawning in the intertidal area of Anderson Creek once the gravels were re-established. Rich flew over the stream annually as part of their annual count of indicator streams into Prince William Sound. Several year's data on stream counts should be available from that division.

Contacts:
Gary Liepitz, Habitat Division, ADF&G, 267-2281. Also Rich Randall, formerly of ADF&G's Commercial Fish Division in Cordova.

References: None

Other Information Sources:
Gary Leipitz has files in the archives at ADF&G, including photos and a video of the restoration efforts.

North Eagle River Interchange — Identification Code: P0059

Short Description: Involved new channels and pond for coho/ grayling at Carrol & Fire Creeks

Nearest Town: Eagle River Year Began: 1991 Status: Monitoring Successful: Yes

Additional Information:
This project involved work on three different culverts--two on Carrol Creek, and one on Fire Creek. Carrol Creek is a small tributary of Fire Creek. They used a series of structures to raise the water level on the downstream side of the culverts to ensure better fish passage. The techniques included V-notch weirs (using rocks) and random boulder placement. Channel banks were stabilized with grass seed and willow sprigs. ADOT/PF has observed grayling above the uppermost culvert so they know their goals for fish passage have been achieved. A pond was also constructed downstream of all the culverts, intended to serve as a sediment trap and also to provide fish and waterfowl habitat. Bill Hauser (FRED, ADF&G) contributed to the pond design. Dredged material was used to contour the pond banks. Fallen logs were placed with root wads extending into the pond. Cottonwood and willow sprigs were planted, then the whole project area was seeded with a hydroseed mixture of grasses, clover, and various wildflowers (Arctic poppies, Nemophila, daisies, etc.), and fertilized. The willow bundles were intended to increase moose browse. The area has been a big success aesthetically. People have been very attracted to the pond area, which may lead to its detriment if there is too much foot traffic before the vegetation gets well established. (The area is very assessible for people to stop and camp or fish.) In the spring and fall, geese and ducks stopped to feed at the pond. One objective of the pond was to provide overwintering habitat for fish, but winter measurements of dissolved oxygen levels, etc., have not yet been taken to establish whether or not it is able to support overwintering fish. However, spring and summer use by coho fry, stocked grayling, and resident Dolly Varden has been observed.

Contacts:
Carol Sanner, ADOT/PF, Anchorage, 266-1509. (Al Brooks was the designer at ADOT/PF).
References: None

Other Information Sources:
Talked to Carol Sanner (ADOT/PF, Anchorage) on 2/24/93. She has photo records and design plans.

Nulbay Park Mitigation Proj. Identification Code: P0022

Short Description: Cook Inlet 317. Create intertidal wetland as mitig. for other intertidal fill.

Nearest Town: Anchorage Year Began: 1988 Status: Completed w/M Successful: Partially

Additional Information:
The intention was to build a berm on the mudflats that would trap freshwater exiting the storm drain culvert, creating an intertidal wetland below the park. This project was devised as mitigation for a nearby intertidal wetland fill for the Coastal Trail construction. The storm water would be regulated through a chamber to control flow before leaving the outlet outside the railroad track embankment, into the new intertidal area. The impoundment area was graded with differences in elevation, for some shallow and some deeper water. The original design was never completely installed, and so nothing worked to plan until 1991, when the Corps of Engineers required the MOA to complete the original design and to do additional work to rectify problems that had arisen. In 1991, the outlet culvert was replaced, the stormwater hook up was completed, the berm was rehabilitated and armored (against ice damage, etc.) with big riprap. This area does occasionally get bird use during migration, and as a refuge at high tide. Lessons learned: the are was too small overall to support much bird use, and too close to human foot traffic because of the coastal trail. The physical design has been successful in that the design has held up against ice, etc., but biologically it has been disappointing. The soils here are very poor to support vegetation; some groundcover has established. Eventually, this area may become more viable as suitable invertebrates and cover establish themselves, creating a more attractive area for birds. The area is at least potentially better now than what was there before (mudflat).

Contacts:
Thede Tobish, Planning Dept, Municipality of Anchorage, 343-4222.

References: None

Other Information Sources:
Talked to Thede Tobish, Municipality of Anchorage Planning Dept., on 5/25/93. Some info also derived from the Corps of Engineers files.

Oiled Mussel Bed Manipulation Identification Code: P0040

Short Description: Experiment to put a small trench through beds to see if oil escapes. Pr.Wm.Sound

Nearest Town: Too spread out Year Began: 1992 Status: Implementation Successful: Too soon

Additional Information:
This project was funded the Exxon Valdez Oil Spill Trustees. The project was to dug vertical trenches 30 cm wide through mussel beds with high residual oil concentrations to see if the hydrocarbon level would go down--if these trenches would allow flushing and dissipate the oil. They were concerned about the continued high oil content because of impacts to species that prey on the oiled mussels (black oystercatchers, harlequin ducks, river and sea otters).

Contacts:
Malin Babcock (789-6018) and Pat Brown (789-6022), both Auke Bay Lab, NMFS.

References: Report Expected

Other Information Sources:
Description on pp. 154-157 in Exxon Valdez Oil Spill Restoration, 1993 Draft Work Plan. Project Proposal # 93036. Phone interview w/ Malin Babcock, 2/11/93. She'll write a status report by the end of March 1993.

Otter Lake Recreation Area

Identification Code: P0196

Short Description: Impounded water for waterfowl habitat on Army Base; stocked area with goslings

Nearest Town: Fort Richardson Year Began: 1979 Status: Completed w/o M Successful: Yes

Additional Information:
This waterfowl enhancement project was funded by a grant through the Department of the Army to establish additional waterfowl habitat near the base. Otter Lake is now considered a prime recreational area, offering lake fishing for rainbow trout and viewing of many bird species, including ring necks, red-necked grebes, mallards, loons & Canada geese. The project began with channel digging in the wetland area around March 1, 1979, resulting in snaking canals, islands, and raised ground. Potholes were detonated to create more diverse waterfowl habitat. The spoil was smoothed out and seeded, and level ditches were constructed through it. Flat areas remained on the southwest & northeast portions. The area was inundated with water by damming Otter Crk. No material was hauled in, only onsite materials were used. Observation shelters were built on the southwest and northeast portions, as well as trails. DOD & ADF&G staff captured Canada Goose goslings from Palmer Hay Flats (before they were ready to fly in July or August) & introduced them to Otter Lake. Success with returning geese has been good, with 4-8 pairs nesting there every year since. ADF&G continues to stock the lake with rainbow trout.

Contacts:
Bill Gossweiler or Bill Quirk, U.S. Army, Fort Richardson, Anchorage, 384-3017 or 384-3021; Dave Harkness, Alaska Dept. of Fish & Game, Wildlife Conservation Division, Anchorage, 267-2179

References: None

Other Information Sources:
Interviews with Bill Gossweiler and Bill Quirk (Fort Richardson), and Dave Harkness (ADF&G); DOD files regarding project are archived & inaccessible except through special arrangement.

Packers Lake Fertilization

Identification Code: P0110

Short Description: Ongoing lake fertilization & sockeye stocking program, with flow control dam

Nearest Town: Kenai Year Began: 1983 Status: Implementation Successful: Yes

Additional Information:
In 1973, ADF&G rotenoned the lake to develop a stronger sockeye program. They also put in a flow control dam below the lake to prevent re-invasion by sticklebacks. The flow control structure is maintained now by CIAA to provide supplemental flows during the adult return. Between 1983 and 1988 the lake was fertilized. Beginning in 1988 they began stocking the lake with sockeye fry as well. (Incubation boxes were tried but were not successful.) Overall, this is a highly successful sockeye enhancement project which increased smolts going out from 200,000 to 700,000; and increased adults returning to Cook Inlet from 50,000 to 130,000. They intend to fertilize and stock every year ahead.

Contacts:
Gary Fandrei, CIAA, Soldotna, 283-5761

References: Publication Date: March, 1993 Reference Type: Report
Author: CIAA
Title: Packers Lake Sockeye Salmon Enhancement Progress Report 1992

Other Information Sources:
Talked to & received info from Gary Fandrei, April, 1993. Other sources include: Kyle, G.B., "A summary of fishery investigations at Packers Lake 1973-82", an agency report dated 1983; and "Packers Lake Procedures, 1993", by CIAA.

Paint River Fish Ladder Identification Code: P0113

Short Description: CIAA project to develop a new sockeye run with a cement fish ladder

Nearest Town: McNeil Sanctuary Year Began: 1993 Status: Implementation Successful: Too soon

Additional Information:
In 1992, CIAA/ADF&G blasted out bedrock and built a cement fish ladder in the blasted-out channel. The 25' fall over bedrock at the mouth of the river was previously a complete impasse to fish migration. Another set of falls approx. two miles upstream may or may not serve as a barrier. If those falls are proven to be a barrier, CIAA will probably provide access by rearranging boulders or using an Alaska steeppass at that spot. ADF&G has been stocking the river with sockeye fry since 1986. Other species will be introduced as funds become available. ADF&G also has collected water chemistry and zooplankton data from the upstream lakes which will serve as spawning/rearing habitat.

Contacts:
Tom Walker, CIAA, Soldotna, 283-5761

References: None

Other Information Sources:
Talked to & received info from Gary Fandrei in April, 1993. More info in CIAA project files.

Palmer Hay Flats Waterfowl Enc Identification Code: P0050

Short Description: DU/ADF&G project to increase nesting and rearing habitat for waterfowl

Nearest Town: Palmer/Wasilla Year Began: 1986 Status: Implementation Successful: Yes
Additional Information:
Both a 1986 enhancement project (w/ DU) and a 1992-93 mitigation project (Glenn Hwy) have taken place at the site. The following describes the 1986 project, which was designed to increase nesting and brood rearing habitat for mallards and pintails. In spring 1986, 13 ponds totaling 18 acres and averaging 1.4 acres each were connected by almost 3 miles of level-ditches. The depth of 12 of these ponds avg. between 1.5 and 2 feet, rarely exceeding 3 ft. Each pond is about 250' across, and contains from 1-3 islands (24 total) that vary in size from 0.1 to 0.5 acres. The level-ditches connecting the ponds are 3' deep and 18' wide at the surface, and alter direction every 75 ft. Spoils from excavating the ditches were placed along the edges for potential nest sites and loafing mounds. Six ponds are located east of the Glenn Highway; 7 are on the west. One of the eastern ponds is deeper (12 ft) for approx. half its surface area. This pond was designed to provide overwintering habitat for juvenile coho salmon as mitigation for

lost salmon rearing habitat due to placement of spoil piles. The project was seeded and fertilized in June 1986, including over 11 acres of spoil deposits. Grass seed (25 lbs/acre) and fertilizer (20-20-10, 450 lbs/acre) were applied. Fertilization and seeding treatments varied in different areas (some only seeded, some adj. areas only fertilized, some both, some neither) to assess the effectiveness of different treatments. The seed mix used on the majority of the project included: Beckmania syzigachne var. Egan, Bering hair grass var. norcoast (Deschampsia beringensis), red fescue var. arcta red (Festuca rubra), polar grass (Arctagrostis latifolia), and bluejoint var. sourdough (Calamagrostis canadensis). Weal barley (Hordeum vulgare) and Bebral rye (Lolium multiflora) were seeded over half the SE portion of the project. Over 200 willow sprigs were planted on each side of the project. The 1986 project was modified from the original design for permitting reasons, and thus may have lost some effectiveness for waterfowl. There are a few more nesting pairs there, however, and the project was valuable as an experiment. In 1992-93, ADOT/PF began mitigation work on some of the same areas for the adjacent Glenn Hwy project. Their idea is to increase the amount of river water on the east side between the Hwy and railroad track by installing dikes and wiers. See #P0177 (Glenn Hwy Mitg Project) for related info.

Contacts:
Dan Rosenberg, ADF&G Wildlife Conservation Division, Anchorage, 267-2453.

References: Publication Date: July 1987 Reference Type: Report
Author: Campbell, Bruce H.; Rosenberg, Daniel H.
Title: Palmer Hay Flats Waterfowl Enhancement Project (in Annual Game Division Report)

Other Information Sources:
Talked with Dan Rosenberg on 2/22/93. He has extensive notes, photo files, etc.

Pigot Bay Spawning Channel Identification Code: P0175

Short Description: USFS chum spawning channel to replace habitat lost during 1964 earthquake

Nearest Town: Whittier Year Began: 1991 Status: Implementation Successful: Partially

Additional Information:
Many stocks of chum salmon were devastated from the 1964 earthquake, often due to loss of spawning gravels. A 2500 ft. spawning channel was built in 1991 that emptied directly into Pigot Bay. A series of "step pools" was created with rock gabion weirs along the length of the channel. Unfortunately, the upper 1000 ft of the spawning channel does not appear to be receiving enough groundwater flow for overwintering salmon eggs. The Forest Service at one point proposed extending the length of the channel to correct this situation (because a longer channel would augment the amount of groundwater available), but this option was reconsidered. The lower 1500 ft reach of the spawning channel is successful, and chums were already observed spawning there in 1992. The project's flood protection berm will be completed in 1993 or 1994, which will protect the channel from flooding and consequent erosion damage from the neighboring Pigot River. Stocking chums in the channel was planned, but may not be necessary since they are already present. Although measures were incorporated in the project's design to prevent siltation in the gravels and erosion around the gabion weirs during high flows, these aspects have still proved somewhat troublesome. In all, this project has been mostly successful since chums are utilizing the channel, and resident black bears appreciate it as well.

Contacts:
Kate Wedemeyer, Cliff Fox, Dan Gillikin, JoEllen Lottsfeldt, all of USFS Glacier Ranger District, Girdwood, AK 783-3242.

References: None

Other Information Sources:
Talked to Dan Gillikin, USFS, on 4/30/93. There's a one page description in the Chugach National Forest 5-year Action Schedule.

Portage Airstrip Ponds Identification Code: P0189

Short Description: Rehabilitation of former gravel pits into a put-and-take fishery

Nearest Town: Portage Year Began: 1992 Status: Implementation Successful: Too soon

Additional Information:
The airstrip was abandoned in the 1960's. Gravel extraction at this site began in 1985 and will be completed in 1993, resulting in connected ponds totalling approx. 10 acres. Brush bundles will be added for fish cover when gravel operations cease. In 1994, organic overburden will be replaced in the shallow pond areas to optimize productivity. Revegetation (willow cuttings) and possible stocking of land-locked chinook (from ADF&G) will take place in 1994. The intention of USFS is to create a put-and-take recreational fishing opportunity in a park-like setting accessible to the public for day outings. Handicapped-accessible facilities will include one trail, two fishing piers, and covered picnic shelters, to be built by 1996. This will be the primary day use site developed in Portage Valley. The land-locked chinook will also support ice-fishing outside of the avalanche area of the valley.

Contacts:
Cliff Fox, Kate Wedemeyer, JoEllen Lottsfeldt, Dan Gillikin, all of Chugach National Forest's Glacier Ranger District, Girdwood, 783-3242.

References: None

Other Information Sources:
Talked to Dan Gillikin, USFS, on 4/30/93. Some info in the Chugach National Forest's 5-year Action Schedule. Much more info in USFS files.

Portage Alder Pond Identification Code: P0190

Short Description: Gravel pit rehab into a groundwater-fed put-and-take fishery

Nearest Town: Portage Year Began: 1987 Status: Implementation Successful: Yes

Additional Information:
This project has been highly successful at providing "catchable size" put-and-take rainbow trout fishing in the highly visited Portage Valley. Alder Pond was a former gravel extraction site; now it is a clear water pond fed by ground water. ADF&G provided the stocked trout. Improvements at the site have included: a trickle dam to keep stocked fish in (1987); two fishing piers and other handicapped access structures (1988-92); addition of brush bundles for cover (1993); possibly, the bottom of the pond may be deepened to improve overwintering habitat (1993-94); revegetation was not considered necessary-- natural vegetation is coming back in; a trailhead sign and kiosk signboard will be erected when the Portage Valley Trail is connected to Alder Pond, planned for 1996. Alder Pond has been one of Glacier Ranger District's most successful projects. It has received considerable public use.

Contacts:
Cliff Fox, Kate Wedemeyer, JoEllen Lottsfeldt, Dan Gillikin, all of Chugach National Forest's Glacier Ranger District, Girdwood, 783-3242.

References: None

Other Information Sources:
Talked to Dan Gillikin, USFS, on 4/30/93. Some info in the Chugach National Forest's 5-year Action Schedule. Much more info in USFS files.

Potter Creek Rechannel — Identification Code: P0165

Short Description: Rebuilding a spawning reach of Potter Creek that had breached & was flooding

Nearest Town: Anchorage Year Began: 1980 Status: Completed w/M Successful: Yes

Additional Information:
Silt from an unknown source upstream was depositing on the channel bottom, raising the water level to the point where it broke through the downhill bank and dispersed across a wooded area. This dropped the water level in the creek channel and stranded fish. It also eliminated a section of spawning habitat for pink salmon. ADOT/PF went in with a very small backhoe through the trees, along the small creek channel, and dug out the original channel. The material was deposited on the downstream bank to build it up and repair the breaches. Fish were counted in the improved reach for 3-4 years afterwards. The new bank revegetated naturally. This work restored approximately 100 yards of prime spawning habitat for pink salmon, which were observed to use it afterwards. (In related work, 2 rock weir step pools were installed further downstream near the mouth to Cook Inlet, below the Seward Highway. These step pools were built to ensure access to Potter Creek for returning pink & chum salmon, Dolly Varden, and rearing coho salmon.) Don McKay says that over time the spawning channel may have silted up again.

Contacts:
Phil Brna, Habitat Biologist, ADF&G, now at the State Pipeline Coordinator's Office, 278-8594.

References: None
Other Information Sources:
Talked with Phil Brna on 4/29/93. No permits were involved so not much in ADF&G files.

Potter Marsh Creation — Identification Code: P0056

Short Description: The unintentional creation of a freshwater marsh by railroad fill in 1916

Nearest Town: Anchorage Year Began: 1916 Status: Completed w/o M Successful: Yes

Additional Information:
Potter Marsh was formed in 1916-17 when construction of the Alaska Railroad embankment across the existing tideflats limited tidal ingress to a sole bridge over Rabbit Creek. Although Rabbit Creek flowed through the opening, freshwater from other sources was impounded forming a freshwater marsh. The shallow excavations along the inside of the embankment (that supplied fill material) added diversity to the marsh, becoming some of the deeper ponds. The permanent ponds and marsh vegetation of Potter Marsh began to attract more migrating waterfowl and shorebirds in spring and fall and nesting wetland birds through the summer. Potter Marsh has become one of Cook Inlet's largest coastal freshwater marshes in an area where mountainous terrain, coastal bluffs, ice scour, and glacial silt-laden waters have limited

their natural extent. It probably has one of the highest densities of breeding ducks in upper Cook Inlet, and is an important rearing and overwintering area for juvenile fish. Chinook, coho, and pink salmon and Dolly Varden trout inhabit the marsh and associated creeks. The vegetation has been studied in detail.

Contacts:
Debbie Clausen (ADF&G, Habitat, Anchorage) has researched the area for the Anchorage Coastal Wildlife Refuge Management Plan, and includes a historical overview in the plan. The Alaska Railroad may have specific historical records. Many local birders, as well as members of the Wildlife Conservation Division of ADF&G (Rick Sinnott, Dave Harkness, Dan Rosenberg) also have extensive knowledge of the area as it is today, with some historical perspective.

References: Publication Date: February 1991 Reference Type: Report
Author: ADF&G, Divisions of Habitat and Wildlife Conservation
Title: Anchorage Coastal Wildlife Refuge Management Plan

Other Information Sources:
The Resource Inventory of the Refuge Management Plan contains a History section discussing the origins of the marsh. Information was also obtained from Dan Rosenberg, ADF&G, Wildlife Conservation Division.

Potter Marsh Waterfowl Enhcmnt Identification Code: P0057

Short Description: Habitat enhancement projects undertaken in Potter Marsh over the years.

Nearest Town: Anchorage Year Began: 1978 Status: Completed w/M Successful: No

Additional Information:
Approximately 6 or 7 potholes were blasted with fuel-soaked ammonium nitrate in early 1978. These were intended to create open water areas in dense sedge vegetation and also mounds attractive to waterfowl for feeding, nesting, resting, and brood-rearing. The potholes, on the western edge of the marsh about 200 feet from the new Seward Highway, did create some open water, but the experimental effort was discontinued due to public comments. Two small floating nest platforms were constructed about the same time, filled with peat and mud, and seeded with ryegrass. These looked good for a few seasons, but were appropriated by nesting gulls, rather than the desired waterfowl. In 1979-80, an attempt was made to add geese nesting mounds to the marsh matrix. Sand and topsoil was loaded onto specific sites (from a pickup truck) on the frozen marsh in late March. When the ice melted, the soil placed itself down on the bottom with still plenty of surface area exposed for nesting. But by the end of the summer, the mounds were gone. Apparently the marsh bottom was not the firm silt expected, but a spongy substrate. Dave Harkness has photos of all these efforts.

Contacts:
Dimitri Bader (ADF&G, Habitat, Anchorage) was involved in the pothole blasting efforts, but has retired. A paragraph was included on past habitat enhancement efforts in the Anchorage Coastal Wildlife Refuge Management Plan (1991). Dave Harkness (ADF&G, Div. of Wildlife Conservation) was lead on the nesting platform and mound experiments at the marsh.

References: Publication Date: February 1991 Reference Type: Report
Author: ADF&G, Divisions of Habitat and Wildlife Conservation
Title: Anchorage Coastal Wildlife Refuge Management Plan

Other Information Sources:
The Resource Inventory of the Refuge Management Plan contains a brief discussion of habitat enhancement under Existing Human Uses, but does not include mention of the mound introduction efforts. Information also came from Dave Harkness, ADF&G, Wildlife Conservation Division. He has photos of all these efforts.

Rabbit Creek Fishpass Identification Code: P0115

Short Description: Step pools and riparian revegetation

Nearest Town: Anchorage Year Began: 1988 Status: Completed w/M Successful: Yes

Additional Information:
Fishpass was designed by ADOT/PF with help from George Cunningham, then with ADF&G, FRED Division. It consists of a series of 4 or 5 step pools built with rock-filled gabions serving as weirs, to allow fish passage into perched culverts. Construction was difficult because of the size of the gabions and poor substrate for foundations. Several problems were encountered with the gabions: they began sinking after construction; they were deformed by logs that washed down; the gabion weirs did not impound enough water-- the openings were not set properly. Later that same summer, large rocks were added to the openings to impound more water and slow the velocity. The adjacent area was revegetated w/willows, alders, and dogwood, and hydroseeded with grass mixtures. It is still providing access to upstream habitat and so far, the structure has not failed. However, due to the problems encountered, Phil Brna would not recommend gabions in the future; using big boulders from the start would be preferable.

Contacts:
Don McKay, ADF&G, Anchorage, 267-2279, and Phil Brna, ADF&G, now at State Pipeline Coordinators Office, Anchorage, 278-8594.

References: None

Other Information Sources:
Talked to Don McKay, 4/1/93, and Phil Brna on 4/29/93. Stream surveys from ADF&G Sport Fish, other info in ADF&G Habitat files.

Rabbit Crk Step Pools Below RR Identification Code: P0164

Short Description: Rock weirs placed below perched culvert for fish access to Potter Marsh

Nearest Town: Anchorage Year Began: 1990 Status: Completed w/o M Successful: Yes

Additional Information:
Members of ADF&G's Sport Fish Division had observed hundreds of pink salmon spawning in the approx. 200 yd. channel below the railroad crossing before the creek empties into Cook Inlet. The channel has a hard gravel bottom and tidal muck on the banks. Many of the pink salmon, as well as chinook & coho salmon, were also trying to go through the perched culvert & tidegates, but only succeeded in bashing themselves against the objects, several fatally. ADF&G issued a notice of violation to the Alaska Railroad due to blockage of fish passage. The railroad put in a series of step pools below the culvert to raise the
water level the approx. 18" necessary. The step pools were created with a series of rock weirs,
constructed of local rocks piled by hand. The results were that the culvert was no longer perched.
Tidegates are permanently affixed to the culverts, originally installed with the intention of maintaining

the proper water level in the upstream marsh (Potter Marsh). However, when closed the gates hindered fish passage. The tidegates have been blocked part way open with rocks for a few years now, and appear to allow fish passage. Phil Brna says that the rock weirs put in summer 1990 were considered a temporary solution and were supposed to be replaced with more substantial rocks that would hold up over time. Stewart Seaberg says no subsequent work was conducted, as far as he knows. Pink and other salmon have been observed upstream of this passage in subsequent years.

Contacts:
Phil Brna (278-8594) and Stewart Seaberg (267-2284), both ADF&G, Habitat Division, Anchorage. Phil is now a Habitat Biologist at the State Pipeline Coordinator's Office in downtown Anchorage (at the phone number above).

References: None

Other Information Sources:
Talked to Phil Brna, ADF&G, on 4/29/93. Info available in ADF&G files.

Resurrection Crk Fish Habitat Identification Code: P0033

Short Description: USFS instream structures, reveg, rearing ponds, to restore placer-mined reaches

Nearest Town: Hope Year Began: 1990 Status: Implementation Successful: Yes

Additional Information:
Intermittent placer gold mining (since 1895) has affected instream and riparian habitat in the lower 7 miles of the Resurrection Crk drainage. Impacts have included: stream diversion, channelization, elimination or isolation of side channels, removal of instream boulders and streamside vegetation, and construction of settling ponds. Between 1990 & 1992 the USFS and CIAA conducted an evaluation of anadromous fish habitat in Resurrection Crk. This study indicated that the amount of rearing habitat is limited in all portions of the drainage. A long term fisheries & watershed restoration project was initiated in May 1992 to: 1) increase pool habitat using instream structures, 2) provide access for juvenile salmon to isolated side channels and inactive settling ponds as rearing habitat, 3) incorporate habitat features into future mining stream diversions, and 4) revegetate disturbed streamside areas (using willows, cottonwoods, alders, & other seeding). To date, 36 structures have been placed in the mainstem of placer mined reaches of the creek. These were designed by a fisheries biologist and hydrologist using techniques developed by Dave Rosgen. Logs, rootwad, and boulder structures are placed using heavy equipment during low water conditions in early May. The effectiveness of different structures for creating juvenile salmon rearing habitat will be evaluated. Although instream structures will help, the greatest potential for improving available rearing habitat lies in reconnecting access to side channels & ponds that were isolated during mining. Plans are now underway to provide access to side channels & ponds on the St. Louis and Pearson mining claims, creating over 10 acres of rearing habitat. The greatest opportunity for off channel rearing improvements lies within the Hope Mining Company claim. Unfortunately, the claimholder's current plan of operation prevents reconnecting access to ponds & side channels on the claim.

Contacts:
Mark Wenger, U.S. Forest Service, Seward Ranger District, PO Box 390, Seward, AK, 99664. PH 224-3374

References: Report Expected

Other Information Sources:
Mark Wenger, USFS Fish Biologist, Seward, sent in this information. A progress report is being prepared.

Shaishnikof River fish pass — Identification Code: P0029

Short Description: Removal of fish barriers as offsite mit for intertidal fill (Unalaska Bay 12)

Nearest Town: Unalaska Year Began: 1985 Status: Completed w/M Successful: Yes

Additional Information:
Three blockages to fish passage were identified along this reach. The intention of this offsite mitigation was to remove the rock ledge falls by blasting, thereby creating a series of pools & riffles. Blasting with drill holes & dynamite was conducted in September 1985. Pink and coho salmon and Dolly Varden had been observed downstream in earlier ADF&G and consultant visits, but no fish mortality was observed during blasting. Rock fragments were re-blasted until they could be moved by hand. The consultant now believes that pink salmon could negotiate the three former barriers, and cohos may not have had trouble to begin with. The consultant extensively analyzed darting speeds and jump heights after completion in the addendum (Nov.1, 1985) to his Completion Report (Oct.15, 1985). Wayne Dolezal reports that salmon have been observed above the fish passes on a couple occasions since the work was done (e.g., 1986 aerial observation). No post-project inspections have been conducted or written up besides those of the consultant. Mike Ward (ADF&G, Comm.Fish, Dutch Harbor) has observed adult fish at a point well upstream of this project area in recent years.

Contacts:
Denby Lloyd was ADF&G contact person at the time; Wayne Dolezal is present contact. Jack G. Fisher (J.G. Fisher & Associates) was hired as a consultant by Offshore Systems, Inc., to orchestrate the mitigation and write up the reports. He was also listed as the stream permit applicant. Mike Ward (ADF&G, Comm. Fish., Dutch Harbor, 561-1219) has visited the site in the last few years.

References: Publication Date: 1984 & 1985 Reference Type: Report
Author: Fisher, Jack G.
Title: Mit Plan& Completion Rpts. Removal of Upstream Migrant Fish Barriers, Shaish.Riv

Other Information Sources:
ADF&G File #0584-IV-86 includes these reports from the hired consultant, J.G. Fisher & Associates. Lots of good photos on file too, showing the before and after. Nothing written up in the file past the first season (1985), however. One document is called "Completion report: Removal of Upstream Migrant Fish Barriers, Shaishnikof River, Unalaska Island, Alaska," October 15, 1985. See also addendum dated Nov. 1, 1985.

Soldotna Creek Culvert — Identification Code: P0140

Short Description: Steep Culvert With Baffles for Fish Passage

Nearest Town: Soldotna Year Began: 1992 Status: Completed w/o M Successful: Yes

Additional Information:
The objective of repairing the perched culvert on the Sterling Highway was to allow free upstream passage of juvenile fish, thereby gaining access to important rearing habitat upstream of the culvert. The culvert utilized a unique design incorporating baffles, which were needed due to the steep slope of the culvert and its long length. Phil Brna was involved in the design and Stewart Seaberg monitored the construction. The project itself was noteworthy because it involved two diversions of Soldotna Creek during culvert installation. Stream diversion allowed construction installation to occur outside the flowing waters of the creek. Numerous (100's) of juvenile coho and chinook salmonids were observed at the outlet of the culvert during construction. Monitoring was not planned as a part of the project and

that is its biggest short-fall. Monitoring is necessary to know how well the culvert is performing and whether juvenile fish are continuing to pass through the culvert.

Contacts:
Stewart Seaberg, ADF&G, Habitat, Anchorage,267-2284. Diana Rigg, ADOT, Anchorage, 266-1448.

References: None

Other Information Sources:
Interview with Stewart Seaberg, ADF&G, on 4/1/93.

Solomon Gulch Tail Race Identification Code: P0106

Short Description: AEA effort to convert the hydropower tailrace to pink & chum spawning area

Nearest Town: Valdez Year Began: 1988 Status: Completed w/M Successful: Yes

Additional Information:
After construction of the hydroelectric plant and tailrace channel, this area contained small shot rock, class I, ranging from basketball-sized to softball-sized rocks. The "holes" were then filled in with river run gravel, a total of 100 cu. yd., to a 6" depth. The goal was to improve spawning habitat. The resulting spawning habitat has worked well, but over the years the current is washing out the gravels. To remain effective, it would need maintenance and/or gravel additions every 2-3 years. No one is obligated to do maintenance in this case. Pinks are spawning there profusely, also chums and coho spawning. Juvenile Dolly varden and coho are using it for rearing year-round.

Contacts:
Ken Roberson, ADF&G, FRED Division, Glennallen, 822-5521

References: None

Other Information Sources:
Ken Roberson, ADF&G, has numerous field reports in his office. He was interviewed on 3/30/93. He wrote a pre-project evaluation in January 1987 which summarized the pre-existing conditions and included recommendations.

Stump Lake H2O Control Structr Identification Code: P0075

Short Description: USFS's attempt to arrest the draining of Stump Lake after 1964 earthquake damage

Nearest Town: Cordova Year Began: 1991 Status: Completed w/M Successful: Yes

Additional Information:
The following description was taken from Ken Hodges' 3/1/93 memo. The 1964 earthquake uplifted the area around Stump Lake approx. 20 ft. This changed the gradient of the outlet stream of the lake, causing the stream to downcut and drain the lake. A similar process happened at San Juan Bay, and now there is a meadow instead of a lake. Since there are two heavily used recreation cabins on the lake, and there are large populations of cutthroat trout, coho salmon, and Dolly Varden char utilizing the shallow areas of the lake for rearing habitat, it was decided to halt the draining of the lake. A small gabion dam was built across the outlet stream in 1991 (made of 3'x3'x12' gabion baskets). Riprap was placed beside the gabion for erosion control. Additional log (3 log barbs) and rock structures were placed downstream to

prevent bank erosion and to back up water to decrease the drop over the dam. The dam raised the water level in the lake about two feet, restoring approximately 50 acres of productive shallow habitat. The downstream structures reduced the drop to about one foot, so there was no problem with fish passage. The banks were seeded with a native grass seed mix from Anchorage, and some woody plants (about 40 small alders and spruces) were transplanted onto the banks from the surrounding areas. The gabion dam structure settled a bit after the first high water event, but remained functional and did not result in any lost habitat. Subsequent inspections in 1992 showed no further settling and no indication that the structure would fail. Revegetation efforts were highly successful and erosion control efforts appear adequate. This project appears to have met all of its goals and at a low cost ($11,000). Although the inspection flights are costly, these can be combined with cabin maintenance trips to spread the costs. The structure should not need much maintenance.

Contacts:
Dave Schmid and Ken Hodges, Fisheries Biologists, USFS, Cordova Ranger District, 424-7661.

References: None

Other Information Sources:
Ken Hodges (USFS, Cordova) sent in an informative 6 page memorandum (3/1/93) summarizing the fish habitat activities that have taken place out of the Cordova Ranger District over time. For this project, not much more has been written up than seasonal reports on work progress.

Tangle Ponds in Portage Valley Identification Code: P0191

Short Description: USFS gravel pit rehab for recreational trout fishing; also called "Pond 3.93"

Nearest Town: Portage Year Began: 1991 Status: Implementation Successful: Too soon

Additional Information:
Gravel was extracted to form ponds between 1990 and 1992. USFS worked with the contractors so that the resulting ponds would provide 13 acres of fish habitat. Tangle Pond (9 acres) will be developed as a put-and-take recreational fishing site for rainbow trout. Large woody debris (logs, brush) was added to the pond in abundance in 1991 (hence the name "Tangle Pond"). A dike was also built in 1991 to protect it from neighboring Portage Creek during flood events. The pond was deepened for overwintering habitat needs, the side slopes were recontoured, and organic matter was placed in shallow pond areas. In 1993, USFS plans to revegetate the sides with willow cuttings, and to inoculate the pond with invertebrates from neighboring ponds. They will begin stocking the pond with rainbow trout and grayling in 1994 (from ADF&G). In 1994 they will also construct a trail and interpretive kiosk. It is expected that Tangle Pond will provide very successful trout habitat, as long as it is stocked. This project was designed to be a destination for family day outings. Five Fingers Pond (approx. 4 acres) is adjacent to Tangle Pond, although there is no longer any surface water connections between them. Five Fingers Pond was excavated for gravel in 1992 and is connected to an ephemeral stream, thus providing potential for year-round salmon rearing habitat. Its outlet is on Portage Creek. Wild salmon are expected to stray into this pond and stream. The Forest Service plans to monitor fish use of the pond beginning in 1993. Five Fingers Pond contains a small amount of vegetation and cover already.

Contacts:
Cliff Fox, Kate Wedemeyer, JoEllen Lottsfeldt, and Dan Gillikin, all of Chugach National Forest's Glacier Ranger District, Girdwood, 783-3242.

References: None

Other Information Sources:
Talked to Dan Gillikin, USFS, on 4/30/93. Some info in the Chugach National Forest's 5-year Action Schedule. Much more info in USFS files.

Tokun Lake Fertilization Identification Code: P0079

Short Description: A joint USFS (Cordova) & ADF&G effort to increase food available for sockeye

Nearest Town: Cordova Year Began: 1984 Status: Completed w/o M Successful: Inconclus.

Additional Information:
The following description was taken from Ken Hodges' 3/1/93 memo. This was a joint project between ADF&G and the Forest Service, but ADF&G did all of the work from what Ken understands. The idea was to use fertilizer to bolster plankton production and, in turn, to increase sockeye juvenile growth and survival. This method has been used successfully in other areas. The lake was fertilized from 1984-1988, but the project was halted by ADF&G because the results were not clear and funding was limited. A change in fertilizer in 1987 resulted in "tentative responses" to the treatment, but it was decided to cease operations. Another concern was that there was no way to control the escapement numbers, which could lead to too many fry being produced. This happened in a lake in British Columbia, resulting in the decimation of the favored zooplankton species, which never recovered. The sockeye population then crashed.

Contacts:
Dave Schmid and Ken Hodges, Fisheries Biologists, USFS, Cordova Ranger District, 424-7661. As for ADF&G, contact the FRED linmologists in Soldotna, 262-5042.

References: None

Other Information Sources:
Should be mentioned in annual ADF&G FRED reports for the appropriate years. The information here is from Ken Hodges (USFS, Cordova), who provided a 6 page memorandum (3/1/93) summarizing the fish habitat activities that have taken place out of the Cordova Ranger District over time. USFS has no reports on this project; ADF&G should have more information.

Trapper Creek Step Pools Identification Code: P0060

Short Description: Step pools for fish passage through culverts on 4 streams along Parks Hwy

Nearest Town: Trapper Creek Year Began: 1990 Status: Completed w/M Successful: Yes

Additional Information:
Four different creeks with perched culverts under the Parks Highway were addressed in this project. This is the only example of this method of retrofitting culverts for fish passage that they have done to date, says Carol Sanner. She believes that although these are not permanent structures, and will have to be maintained/replaced every 5-10 years, they are still more economical than complete culvert replacement. They addressed the perched culverts by creating a series of step pools on the downstream side, made with boulders and cottonwood logs with notches to serve as weirs. This raised the water level in the approach to the culverts. Geotextile liners were placed under the new rocks on the banks to reduce scouring. Carol feels this liner increases the probability of success for the project. In the riparian zone, the organic overburden was preserved and replaced after construction, then seeded with grasses and planted with willow bundles. The vegetation appears to be working well. The techniques used in this project

were derived from USFS methods used successfully in Oregon and Washington.

Contacts:
Carol Sanner, ADOT/PF, Anchorage, 266-1509. (Frank Lombardo, ADOT/PF, did the technical design).

References: None

Other Information Sources:
Talked to Carol Sanner, ADOT/PF, Anchorage, on 2/24/93. She has records and photo files.

Tributary "A" Rearing Enhancmt — Identification Code: P0034

Short Description: Tributary "A" goes to East Fork Crk, off Six Mile Crk in Turnagain Pass area

Nearest Town: Hope Year Began: 1987 Status: Completed w/o M Successful: Partially

Additional Information:
Pre-evaluation was completed; post-evaluation needs to be done, but it would be hard to compare with pre-conditions due to poor study design. Mark's opinion is that the project was partially successful.

Contacts:
Mark Wenger, U.S. Forest Service, Seward Ranger District, P.O. Box 390, Seward, AK 99664. Phone: 224-3374

References: None

Other Information Sources:
"Six Mile Tributary 'A' Rearing Habitat Enhancement: Study Plan", and "An Evaluation of Pre-Structure Stream Morphometry", both available in Seward Ranger District files, USFS.

Twentymile R. Waterfowl Imprvt — Identification Code: P0197

Short Description: Blasting (pothole) project for waterfowl enhancement near Portage

Nearest Town: Portage Year Began: 1977 Status: Completed w/M Successful: Unknown

Additional Information:
Portage is a significant staging area and provides nesting habitat for resident and migratory species of waterfowl. To increase the interspersion of land and water at the mouth of Twentymile River, a series of potholes were blasted. The first season, waterfowl were observed loafing and bathing in the holes. White-fronted geese were observed feeding on sedge roots exposed by the blasting. Low utilization density was probably due to the depth of the ponds being greater than the reaching ability of the dabbling ducks and the lack of fauna and flora. These problems were expected (in 1977) to correct themselves via slumping of the margins of the ponds. Height of the shore rise from the surface of the water & the size of the clods surrounding the ponds may have reduced the "attractiveness" of the ponds to waterfowl. Twelve nesting boxes and twelve nesting islands were also created in 1977. The nesting boxes were placed 12-20 feet above water level in standing dead trees in flooded regions of the study area. The nesting islands were anchored by 4 one-gallon cans of cement attached by steel cable to the islands. Clumps of sedges, beach rye and/or sweet gale were placed on each raft for nesting cover. It was too soon to know if the boxes and islands were successful at the time of the 1977 report. All blasting and

construction procedures are described in some detail in the 1977 report.

Contacts:
Dave Harkness or Dan Rosenberg, Alaska Department of Fish & Game, Wildlife Conservation Division, Anchorage, 267-2179.

References: Publication Date: 1977 Reference Type: Report
Author: Seguin, Randolph
Title: Portage wildlife habitat inventory and analysis

Other Information Sources:
Most information obtained from report; project referred by Dave Harkness, ADF&G, Anchorage.

Ugashik River 8 Identification Code: P0028

Short Description: Becharof State Well #1. Revegetation of abandoned airstrip on Alaska Peninsula

Nearest Town: Pilot Point Year Began: 1985 Status: Completed w/M Successful: Yes

Additional Information:
A temporary oil/gas well pad, solid waste disposal site, and Hercules runway were constructed at the site on state land in 1984 (Becharof State No. 1 oil well), and the site was reclaimed in early 1985. The tundra cover was supposed to be cut below the root line, and the tundra layer and topsoil stockpiled separately. Reclamation then consisted of recontouring the side slopes, borrow areas and pads; respreading the removed topsoil and tundra; and reseeding and fertilizing all previously vegetated areas. The DNR Plant Materials Center provided guidance for the latter procedures, and provided the seed mixtures. On June 11, 1985 fertilizer was applied at the rate of apprx. 450+ lbs/acre of a 20-20-10 fertilizer mixture. Aerial seeding of a mixture of 5 types of grasses (mostly 'Norcoast' Bering Hairgrass; two types of Red Fescue--'Boreal' and 'Actared'; and two types of Kentucky Bluegrass--'Nugget' and 'Park') was applied at the rate of 30+ lbs per acre. The site was inspected Sept.4, 1985 by Kim Sundberg, ADF&G and Stoney Wright, Plant Materials Center. Their reports are in the file. Later aerial photos have been taken and are on file as well. The reclamation appears to have been successful, with the exception of the materials borrow pit on the southside of the runway and a road leading away to a lake. Overall coverage of the seeded grasses was good, along with some weeds. The respreading of stockpiled organic topsoil created an irregular hummock landscape that may provide islands of native vegetation and habitat diversity in the future. Caribou and fox tracks were prevalent. The reseeding of the borrow pit area was unsuccessful, probably because the grading and recontouring was inadequate. The sides were too steep and continuing to erode, and the seed was probably washed off the slopes and buried in sediment. Both inspectors requested that in the future, all reclamation grading and contouring should be inspected and approved while heavy equipment is still on site to make adjustments.

Contacts:
Kim Sundberg, ADF&G; He made a presentation on this project at an Arctic Revegetation Conference in Iceland. Stoney Wright, DNR Plant Materials Center; he was consulted and was the source of seeding mixes and techniques.

References: None

Other Information Sources:
ADF&G file # 0784-IV-201 contains many photos and background info.

Unocal Fuel Spill Identification Code: P0094

Short Description: Lewis River Freshwater Wetland Rehabilitation

Nearest Town: Beluga Year Began: 1990 Status: Monitoring Successful: Yes

Additional Information:
The Alaska Dept. of Fish & Game and Unocal requested PMC assistance in restoring a site adjacent to the Lewis River damaged during cleanup of a fuel site. In July 1990 a rehabilitation plan was developed. Damage to the site was superficial and a result of surface excavation from the cleanup activities. The site was fall seeded in August 1990 at a rate of 30 lbs. per acre with a mixture of 'Egan' American Sloughgrass (33%), 'Norcoast' Bering Hairgrass (50%), 'Sourdough' Bluejoint (4%) & 'Gruening' Alpine Bluegrass (13%). The area was then fertilized with 450 lbs. of 20-20-10 fertilizer per acre. This was evaluated in Sept. 1991 & August 1992. By 1992, the area was supporting nearly 100% vegetation cover and very good vigor. Based on a cursory evaluation, the cover was estimated as being roughly 80% hairgrass, 15% sloughgrass, & less than 3% bluejoint. The remainder consisted of invading species. The stand appeared vigorous & healthy. The original grass shrub communities but the seeded species appear quite natural, with some reinvasion of sedges & willows occurring on the site.

Contacts:
Stoney Wright, Alaska Plant Materials Center, Palmer, 745-4469. Ed Weiss, AK Dept. of Fish & Game, Habitat & Restoration Div., Anchorage, 267-2284

References: Publication Date: 1993 Reference Type: Report
Author: Wright, Stoney
Title: Wetland Revegetation Projs in AK Using Adapted Species Having Comm. Avail. Seed
Other Information Sources:
Talked to Ed Weiss, ADF&G, and Carol Sanner, ADOT/PF, both in Anchorage.

USFS 1964 Earthquake Streamwrk Identification Code: P0072

Short Description: Attempting to repair stream mouths uplifted during earthquake in Pr.Wm.Sound

Nearest Town: Cordova Year Began: 1967 Status: Completed w/M Successful: Inconclus.

Additional Information:
During the 1964 earthquake, Montague, Hinchinbrook, and Hawkins Islands were uplifted. Some biologists felt the change in gradient caused the streams to deposit alluvial materials in the newly uplifted areas, creating shallow braided networks instead of single stream channels. The braided channels would often go dry at low tides or periods of low water and so were not suitable for pink and chum salmon spawning. The biologists thought that if a single channel were created, there would be continuous flow and spawning area would be restored. Between 1967-1972 a number of streams were channelized and some had log revetments placed along the banks to keep them from eroding. The one at Constantine Creek on Hinchinbrook Island is said to have worked well and was well-utilized by spawning salmon, according to local sources. However, the high rainfall & geology of the area results in high bedload movement in almost all of the streams on these islands. All channels were filled with sediments, and there is now no evidence of past work at any of the streams. It is not known how long the structures lasted. No formal monitoring was done, just casual observations in passing. Reports in 1979 indicate the structures at Wilby, Etches, and Nuchek creeks had failed (12 yrs after construction). The structures at Wild & Constantine Crks were still intact, though requiring maintenance. In 1984, $9,000 was spent on maintenance at Constantine Ck. It is uncertain whether these structures were worth the money and time invested. Although they provided stable spawning area for awhile, it was never demonstrated that the

treated creeks produced more salmon than others. ADF&G pink & chum salmon escapement data for Montague Island does not indicate any difference. In addition, there is some question as to whether braided channels were a problem to begin with. Many streams on Montague are still braided (or always were) & produce large numbers of pink salmon. In the future, careful analysis should be conducted before placing any structures in these streams, given the high flows and bedload movement.

Contacts:
Dave Schmid and Ken Hodges, Fisheries Biologists, USFS, Cordova Ranger District, 424-7661.

References: None
Other Information Sources:
Ken Hodges (USFS, Cordova) sent in an informative 6 page memorandum (3/1/93) summarizing the fish habitat activities that have taken place out of the Cordova Ranger District over time. He says that there are unpublished reports on most of these projects in their files.

USFS Cordova Distr. Fishpasses Identification Code: P0074

Short Description: 4 fishpasses constructed within USFS's Cordova Ranger District, Pr.Wm.Sound

Nearest Town: Cordova Year Began: 1974 Status: Completed w/M Successful: Partially

Additional Information:
The following description was taken from Ken Hodges' 3/1/93 memo. Four fishpasses have been constructed on the Cordova Ranger District (many more within the Glacier Ranger District, in western Pr.William Sound). From the somewhat spotty data that they do have, they know that some of the fishpasses have met their goals. The Control Creek pass has had as many as 13,000 pink salmon above the structure, which indicates that there were probably far more than the targeted 2,400 fish available for commercial harvest. At Canoe Pass and Rocky Bay, the presence of large numbers of coho salmon juveniles suggests that these passes are being well-utilized by coho. However, since the coho run is October to December when the weather is bad, no actual adult counts have been made. On the other hand, other targets have not been made. The Boswell Bay pass has had a maximum escapement of 500 sockeye, and fewer in other years. This would not produce the goal of 4,200 harvestable fish. There is also no evidence that sockeye use the Rocky Bay pass, although they were the primary target species. the data for this is limited, however, due to the remote location of the pass. Pink production has also been limited at Rocky Bay and Canoe Pass. Although fishpasses have worked well in Southeast Alaska, the results here are somewhat disappointing so far. Increased monitoring may show better use. If additional fishpasses are planned, the costs of maintenance, adequate monitoring, and the possibility of smaller returns must be considered more fully. The impact on resident fish is also a subject that has only been addressed recently. It would be wise to locate passes where they are easily accessible to sportfishermen. The economic value generated by sportfishing is much greater per fish than commercial fishing, and the pass could serve a segment of the public which has been somewhat neglected in this area.

Contacts:
Dave Schmid and Ken Hodges, Fisheries Biologists, USFS, Cordova Ranger District, 424-7661.

References: None

Other Information Sources:
Ken Hodges (USFS, Cordova) sent in an informative 6 page memorandum (3/1/93) summarizing the fish habitat activities that have taken place out of the Cordova Ranger District over time. He says that there is information on fishpasses in their files, in memo-style format, but monitoring was very spotty (due to short staff) until the last couple years.

USFS Log/Debris Removal Progrm Identification Code: P0073

Short Description: 1960-70's misguided removal of logs to aid fish passage, increase spawning area

Nearest Town: Cordova Year Began: 1968 Status: Completed w/o M Successful: No

Additional Information:
In the 1960's and 1970's it was believed that log removal from streams would aid fish passage and increase spawning area. The importance of large woody debris for juvenile rearing area was not understood. Thus, many streams both in logged and unlogged areas were cleared of debris. It is uncertain how much damage this caused, but in Hanning Creek (Montague), for example, there is a serious need to add some debris to recreate pools and the associated habitat. The streams cleared between 1968-72 included: Hartney Crk, Rogue Crk, Fish Crk, Kirkwood Crk, Cannery Crk, Meacham Crk, Swanson River, Squirrel Crk, Hanning Crk, Russel Crk, Shad Crk, Udall Crk, Etches Crk, Cook Crk, Double Crk, Hawkins Crk, etc. Ken Hodges of USFS, Cordova, provided tables showing the "fish habitat improvement projects between 1962 and 1984", broken down by PWS Fishing District, creek names, years, and work accomplished at each one.

Contacts:
Dave Schmid and Ken Hodges, Fisheries Biologists, USFS, Cordova Ranger District, 424-7661.

References: None

Other Information Sources:
Ken Hodges (USFS, Cordova) sent in an informative 6 page memorandum (3/1/93) summarizing the fish habitat activities that have taken place out of the Cordova Ranger District over time. This woody debris removal is probably the most regrettable activity they have engaged in. He says that there are unpublished reports on most of these projects in their files.

Westchester Lagoon Formation Identification Code: P0174

Short Description: Urban freshwater lake formed using tidegates at outlet of Chester Creek

Nearest Town: Anchorage Year Began: 1972 Status: Completed w/M Successful: Yes

Additional Information:
The Municipality (primarily Parks & Recreation) was behind the project, for the purpose of creating a recreational area. They flooded the area by installing floodgates on Chester Creek at its mouth under the railroad tracks. ADOT was also involved because Minnesota Drive was under construction in that area, and the Alaska Railroad felt the new lagoon and floodgates might decrease the potential creek damage/erosion to the railroad bridge. The flood gates & culvert were installed under the original open tressle RR bridge. [Later, the RR filled this in to make a permanent railroad embankment there.] Previously, the Westchester Lagoon area had been a marginally productive salt marsh of primarily sedges, with very little open water except Chester Crk running through it. The flood gates at the creek mouth allow fresh water to exit but do not allow much salt water to enter the lagoon. Dimitri Bader (then ADF&G) felt that if they were going to flood the area, it could become productive waterfowl habitat so they might consider adding some nesting islands in the lagoon. Dimitri designed the size and configuration of the islands that were installed in the section east of Minnesota Drive. He put log booms around the edges of the newly-piled dirt islands, to protect them from wave action and erosion during the first couple of years. (The log booms were observable for years.) He revegetated initially with ryegrass. The tide gates are still a problem for fish passage. Some fish are able to enter Chester Crk (and Westchester Lagoon) from Cook Inlet at high tide including Dolly Varden, coho, pink and chum

salmon. People have been known to catch coho upstream in Chester Creek, around University Lake, so they must be able to enter to some extent. Rainbow trout are stocked upstream, and inhabit the lagoon as well. Westchester Lagoon has become a tremendously successful waterfowl spot. Almost all waterfowl species that pass through Anchorage are represented there. The area is also very popular with people due to the bike trails, birds, and other aesthetics (the primary objective). People go to the lagoon to learn to windsurf and canoe as well.

Contacts:
Dimitri Bader was the ADF&G person involved with this project at the time. He has retired. Dave Harkness at ADF&G provided most of the information here (267-2196), with some information from Thede Tobish at the planning office of the Municipality of Anchorage (343-4222), and Tom Bacon of the Anchorage Dept. of Pubic Works (786-8187).

References: None

Other Information Sources:
Talked to: Dave Harkness, Wildlife Conservation, ADF&G (5/24/93); Tom Bacon (Dept. of Public Works, 5/26) & Thede Tobish (Planning, 5/25), both of the Municipality of Anchorage. Dimitri Bader (now retired) may have done informal reports in the older files at ADF&G.

Westchester Lagoon Offsite Mit Identification Code: P0180

Short Description: Fish Creek 6 (Zamarello's fill) led to wetland construction as offsite mitgn

Nearest Town: Anchorage Year Began: 1984 Status: Completed w/M Successful: Yes

Additional Information:
This was the first example of offsite mitigation in Anchorage. A wetland fill on Fish Creek at Lake Otis & Tudor (Fish Crk 6) precipitated this mitigation project, which consisted of constructing a wetland adjacent to Westchester Lagoon on a former upland area. The mitigation parcel was already disturbed; it contained a parking area, dirt road and AWWU lift station. Zamarello (the developer) agreed to remove all structures and dig out the remaining material to create a gentle slope (approx. 6:1) that then connects to an already existing series of ponds and outlets to the lagoon. The shallow slope allows for varying water levels over different seasons. Only minor revegetation efforts were made at the time, although in 1988 some willow bundles and water lilies left over from another project were introduced to this site and have established. Although originally estimated at $20,000, the mitigation ended up costing 2-3 times that amount due to difficulties in removing the structures and transporting out materials. Results: because the site is so close to Westchester Lagoon, natural plant colonization (emergents, etc.) has worked well. The area receives bird use during migration. The shallow grade of the slope has worked well also-- about half the slope has permanent water; shorebirds use the upper part; ducks use the deeper water; and the middle section of the slope is flooded and exposed seasonally. Lessons learned: natural revegetation works well on good soil with adjacent seed sources. The site was too small for what the design could offer; this site has had some success probably only because it is continuous with large adjacent wetlands.

Contacts:
Thede Tobish, Municipality of Anchorage Planning Dept., 343-4222. Also, Phil Brna, ADF&G had some involvement (now at State Pipeline Coordinator's office, 278-8594).

References: None

Other Information Sources:
Talked to Thede Tobish, Municipality of Anchorage, on 5/25/96.

Williwaw Ponds & Spawning Chl Identification Code: P0142

Short Description: USFS rehab of gravel pit for coho rearing and a chum spawning channel in Portage

Nearest Town: Portage Year Began: 1984 Status: Implementation Successful: Partially

Additional Information:
The 4 interconnecting ponds were excavated between 1984 and 1987, totalling 13.7 acres. The associated spawning channel, completed in 1986, is basically an 2900 ft long X 18 ft wide extension of Williwaw Creek. In all, 250,000 cu. yds of gravel were extracted for highway construction. Brush bundles were placed in the ponds in 1986-1988 and again in 1992. Revegetation in 1987-1988 included grass seeding (4 kinds, including annual rye grass), fertilizing, and planting willows. The ponds were stocked with approx. 60,000 coho fry in early June 1988. After completion of the spawning channel, use of the system by chum salmon jumped markedly. About 40 chums spawn in the new channel each year, and only a few spawn downstream in the creek. About 1/3 of each year's sockeye escapement spawn in the new channel; the majority spawn in Williwaw Creek. Only a few coho have been seen using the new spawning channel.
Problems that have arisen with the Williwaw project include: a) lack of cover around and within the ponds, b) predation of salmon fry by resident Dolly Varden, c) loss of planted willow stock, probably due to competition with the seeded annual rye grass as well as beaver activity, d) low water temperatures, and e) intrusion of fine suspended sediments from Portage Crk into the ponds. During the summer of 1988, predation by DV on stocked coho fry was severe (up to 50%). Problems with predation may diminish as more vegetation develops around the ponds. To improve pit recovery, organic overburden (topsoil) was spread and contoured to a shallow slope along the margin of one pond during 1991-92. Brush bundles in the form of two 70' long "reefs" of spruce trees were also added to the lower pond in 1992. Problems with cold water temperatures and fine sediment intrusion will continue as set features of the Portage Valley groundwater system. These conditions slow growth rates for both eggs and rearing fry.

Contacts:
Kate Wedemeyer and JoEllen Lottsfeldt, USFS Glacier Ranger District, Girdwood, 783-3242.

References: Publication Date: 1987 Reference Type: Report
Author: U.S. Forest Service
Title: Final Construction Report Williwaw Rearing Ponds and Spawning Channel

Other Information Sources:
Talked to JoEllen Lottsfeldt, USFS on 4/2/93. Much more monitoring data, photos and information in their files. This project is described in an undated paper written by Dave Blanchet, Hydrologist, Chugach National Forest, called "Developing Groundwater fed spawning and rearing habitat for anadromous fish on the Chugach National Forest." Dave provided a copy of this paper.

Arco Kuparuk Photo-Trend Plots Identification Code: P0137

Short Description: Permanent plots to monitor success of tundra revegetation methods over time

Nearest Town: Kuparuk Camp Year Began: 1987 Status: Monitoring Successful: Partially

Additional Information:
Eight permanent photo-trend plots have been located since 1987 on a variety of disturbed sites throughout the Kuparkuk Unit. Photo-trend plots provide a visual record of revegetation of disturbed sites, and are a quick, simple, and less-invasive quantitative means of monitoring these sites. Oblique photos were taken from the ends of each plot & vertical photos were taken of two permanent quadrants from a 60 cm stepladder. These sites were resurveyed in 1991. As found at other sites in the Kuparuk Oilfield, natural revegetation of soil with properties favorable to plant growth can yield results similar to areas that have been seeded & fertilized. The most rapid method of achieving revegetation was fertilizing & seeding. Sites that were less disturbed had higher moisture availability & had higher cover values.

Contacts:
Torre Jorgenson and Timothy C. Cater, Alaska Biological Research, Fairbanks, 455-6777. These are the consultants on contract to ARCO. Mike Joyce, ARCO, Anchorage, is the overall contact person, 265-6534.

References: Publication Date: July 31, 1992 Reference Type: Report
Author: Jorgenson, M. Torre; Cater, Timothy C.
Title: Land Rehabilitation Studies in the Kuparuk Oilfield, Alaska, 1991

Other Information Sources:
All information taken from the above report.

ARCO Sag Site C Identification Code: P0149

Short Description: Gravel Pit Rehabilitation on Sag River Floodplain

Nearest Town: Deadhorse Year Began: 1986 Status: Completed w/M Successful: Partially

Additional Information:
Sag Site C is a 15.5 has (38.2 acre), deep mined gravel site that was flooded in 1986 when the perimeter berm was breached allowing the Sag River to fill the excavated area. Efforts to establish littoral areas were conducted in autumn 1987, by excavating shallower zones along the lake's edge, to increase lake productivity and provide rearing areas. These shallows (approx. 5 acres) proved to be more productive, as shown by higher catch rates in subsequent fish sampling. Unfortunately, spring flood waters deposited sediments in these shallows and gradually filled them back up. Now it is once again a deep lake with little edge habitat, still suitable for overwintering but not rearing fish. Fish continue to use the lake, but since it is only connected to the river during high water periods, the lake's fish do not have access to productive summer rearing areas and spawning sites. A permanent channel between the site and the river would provide continuous access to both riverine and overwintering habitat.

Contacts:
Carl Hemming, ADF&G, Fairbanks, 451-6192, Mike Joyce, ARCO, Anchorage, 265-6534

References: Publication Date: 1988 Reference Type: Report
Author: Hemming, Carl R., Phyllis Weber, and Jack Winters
Title: Limnological and Fisheries Investigs. of Flooded N. Slope Gravel Mine Sites.

Other Information Sources:
Talked to Carl Hemming, ADF&G, on 4/5/93. The report above provides the best overall description, but some more recent info is also in Technical Report 91-3, "Fish and Habitat Investigations of Flooded North Slope Gravel Mine Sites, 1990," by Carl Hemming.

Atigun Pass Riparian Rehab Identification Code: P0084

Short Description: Establishing willows & ponds on sites (Sten Crk) where Pipeline was replaced

Nearest Town: Atigun Pass Year Began: 1992 Status: Implementation Successful: Yes

Additional Information:
In 1990-91, a 9-mile section of the Trans-Alaska Pipeline was replaced due to corrosion. Work described below was performed by Alyeska Pipeline Service Company as mitigation for the large amount of site disturbance incurred. Fish habitat mitigation included: installing a larger culvert at the Dalton Hwy crossing of Sten Crk (previously a fish barrier); enlarging an existing pond by double the surface area (now 0.75 ha.) at a materials site below the hwy; and creating 2 more ponds (0.6 & 0.3 ha.) upstream of the Dalton Hwy. The shoreline of the existing pond was re-shaped irregularly, with finger projections, to create more littoral habitat. Depths for all 3 ponds vary from 0.5 to 1.2m, and banks were shallowly graded btn 3:1 and 10:1 slopes. Within a month of pond completion in June 1991, fish were observed in the new ponds, partly due to the improved access culvert. In 1992, partially to provide cover for fish, the disturbed sites were scarified, seeded with grasses & Artemisia, and planted w/ willow sprigs. Performance of plant materials, especially willows, was better than expected on all sites. Slightly over 75% of the plantings at the north tie-in areas have initiated growth. Initial projections suggested only a 15-20% survival rate could be expected. The Sten Creek Pond Complex first-year willow survival rate was 85%, exceeding the projected rate of 40%. Herbaceous cover is performing adequately, and is equal to similar sites elsewhere in Alaska. A percent cover of less than 10% can be expected when very light seeding rates are used. The ponds do not presently contain any emergent vegetation; PMC may attempt transplanting emergents (e.g., Arctophila) in the future. Jack Winters (ADF&G) will again monitor fish use of the area by electroshocking in 1993. He is also interested in the recovery & fish use of an adjacent 2-mile section of the Atigun River that was totally reconstructed after pipeline replacement.

Contacts:
For revegetation work, contact Stoney Wright, Alaska Plant Materials Center, Palmer, 745-4469. For fish habitat, contact Jack Winters, ADF&G, Habitat & Restoration Div., Fairbanks, 451-6192.

References: Publication Date: Oct. 13, 1992 Reference Type: Report
Author: Wright, Stoney J.
Title: Atigun Pass Reroute rehabilition plan interim report 1992

Other Information Sources:
The above-referenced report was consulted for revegetation information. Fish habitat work was discussed with Jack Winters of ADF&G on 6/1/93. More info in his report: "Fisheries Investigations in the Upper Atigun River Drainage in Relation to the Alyeska Atigun Mainline Pipe Replacement Project," Tech. Report #92-2, by Jack F. Winters, ADF&G, June 1992.

Banner Ck Material Site Identification Code: P0152

Short Description: Gravel site rehab with interconnecting channels for coho rearing.

Nearest Town: Nome Year Began: 1984 Status: Implementation Successful: Too soon

Additional Information:
This project was constructed as a gravel material site for highway construction, with future fish rearing habitat in mind. Original excavation took place in 1984-85, with numerous subsequent expansions. The configuration was laid out as numerous intersecting channels (fingers or spurs) with remaining gravel bars interspersed, rather than one open lake surface. The narrow channels allow maximum of shoreline fringe for cover for rearing coho. Organic topsoil was replaced along the "fingers", and willows were planted on the banks. Water flows into the shallow lake through gravel from the Nome River (no surface connection), and an outlet was constructed via a culvert on the downstream side of the river bend. Little pools in this area (adj. to Nome River) have been known to hold very high densities of juvenile cohos. In fall 1992, a spawning pair of sockeye (in spawning coloration) were observed in the constructed lake. It is not known yet whether they spawned or not, but the lake is large enough to support rearing sockeye, though it was designed for coho. The possibility exists for developing chum spawning areas in the groundwater-upwelling sections at the head of the constructed lake system (north end). Fine materials would have to be flushed from the gravels in this area to make them optimum for spawning. This area looks to be shaping up well. They will continue photo documentation over time, and electroshocking on an annual basis.

Contacts:
Mac McLean, ADF&G, Fairbanks, 451-6192; Randy Horner, ADOT, Fairbanks.

References: Report Expected

Other Information Sources:
Talked to Mac McLean, ADF&G, on 4/6/93. Follow up reports will be written after future inspections.

Bearing Tree Creek Identification Code: P0157

Short Description: Series of step pools created within culvert using rebar and boulders

Nearest Town: Beaver Ck, Yukon Year Began: 1985 Status: Completed w/M Successful: Partially

Additional Information:
In conjunction with highway construction, ADOT replaced a bad culvert with a bigger, longer culvert. The gradient was too steep (3.7%) and velocities too high for fish passage. To slow flow, every 25' within the new culvert barrel, rebar was placed horizontal to the flow, with a 12" boulder placed on the upstream side of the rebar. Basically, this was an experimental attempt to create a series of step pools within the culvert. What has happened is that debris (branches, etc) have gotten caught in the rebar and boulders within the culvert, causing some bedload and fine sediments to deposit behind the debris, creating a stairstep effect throughout the culvert. The rebar is no longer visible. It now has the appearance of a natural, stepped streambed, although inside the culvert. Fish have passed through, but total effectiveness for fish passage is not known. In hindsight, the spacing between the rebar rods should have been shorter, closer to the equivalent of one culvert diameter (which was 7ft diameter in this case). ADF&G plans to monitor every few years.

Contacts:
Mac McLean, ADF&G, Fairbanks, 451-6192

References: Publication Date: 1991 Reference Type: Report
Author: Behlke, Charles E. et al.
Title: Fundamentals of culvert design for passage of weak-swimming fish

Other Information Sources:
Talked to Mac McLean, ADF&G, on 4/6/93. Design diagrams, videos, and file information are available.

BP & Arco Cross Drainage Projs Identification Code: P0194

Short Description: Rehabilitation of North Slope streams affected by oil & gas development

Nearest Town: Deadhorse Year Began: 1989 Status: Completed w/M Successful: Yes

Additional Information:
North Slope tundra streams affected by oil and gas development tend to have relatively flat gradients, minimal bed load movement, minor scour associated with breakup due to frozen soils & substrate, and very high flows of short duration at breakup. ADF&G came up with recommendations regarding design, construction & installation of cross drainage structures (for road crossings over streams) based specifically on this type of stream. Several existing cross drainage structures in this area did not provide for fish passage and were not consistent with the proper protection of anadromous fish habitat. Many of these problem structures had been installed during 1970's before current engineering practices and the current regulatory system were in place. Road failures caused ponding of water upstream, excessive scour near bridge piles, and deposition of gravel onto acres of tundra within the flooded zones. In some cases, the failure of cross drainage structures would isolate fish from suitable overwintering areas. EPA funded ADF&G (w/ an EPA 319 grant) to survey 10 stream crossings and to evaluate the success of remedial actions taken by BP & ARCO. Scope of work at the 16 documented sites included vacuuming up spilled gravel from tundra streams, correcting and replacing culverts, removing debris, stabilizing slopes above culverts, and improving road grading to prevent spillover of fill material or erosion onto the sandbag armouring. Riprap is not generally available in the north coast region due to lack of rock, so sandbags were most often used. However, sandbags often fail to protect banks adequately (for instance, at Kuparuk River at Spine Road crossing). A supersucker industrial vacuum was effective in removing washed out gravel during the ice-free season and caused virtually no damage to underlying vegetation. Fish passage was effectively corrected by placing at least one oversized culvert in the natural stream channel with the invert (bottom) buried below the stream thalweg. One of the more elaborate rehabilitation projects occurred at Pebble Creek (see description under "Pebble Creek", #P0192 in database). The oil and gas industry has been tasked with preparing a cross drainage structure design manual with standardized criteria for fish stream crossings.

Contacts:
Al Ott, Alaska Dept. of Fish & Game, Habitat Division, Fairbanks, 451-6192; Tom Barnes, BP Exploration, Anchorage, 561-5111

References: Publication Date: 1993 Reference Type: Report
Author: Ott, Alvin
Title: An eval.of the effectiveness of rehab. at selected streams in N.Slope oilfields

Other Information Sources:
BP Exploration (Tom Barnes) provided the "1992 BPX cross drainage update: restoration of identified washouts at cross drainages". Feb. 1993. BP has only a few copies, each containing affixed photos.

BP Pad #22-33-11-13, Prudhoe Identification Code: P0064

Short Description: Revegetation Project on abandoned gravel drilling pad, an experiment by BP.

Nearest Town: Deadhorse Year Began: 1988 Status: Monitoring Successful: Yes

Additional Information:
This well was completed in May, 1969, and plugged and abandoned in March, 1989. This project was undertaken as part of BP's research for long-term reclamation projects in the arctic. Extensive photo records are available. Site rehabilitation included: removing all surface debris, plugging the well, removing the gravel from an original thickness of four feet down to approx. 6 inches, placing 6 inches of local topsoil over the remaining gravel, "dormant seeding" with indigenous grasses, fertilizing, and installing snow fencing to trap sufficient moisture for plant establishment. The seed mixture included three grasses: Alyeska Polargrass (Arctagrostis latifolia), Tundra Bluegrass (Poa glauca), and Arctared fescue (Festuca rubra). Dry granular fertilizer (20-20-10) was applied at 300 lbs/acre. The soil surface was scarified prior to dormant seeding. Temporary (3 year) snow fencing was installed on the north side of the site. Vegetation and monitoring plots (1 m. x 1 m.) were established every 100 ft. along the base line transect. The initial seeding covered 6.3 acres in May, 1989. Additional areas were seeded and fertilized in late June, 1990. A drought summer led to little germination, but the following year (1991), these previously seeded areas were irrigated during a critical dry period to increase germination (65% was obtained). Fertilizer was applied to certain revegetated areas in Sept., 1991. After 3 growing seasons, the 1991 progress report states that the veget. cover was increasing, seedhead production was excellent, and new invasion by native plants was evident. Due to disappointments in very similar projects, Steve Lombard feels the success of this particular project was in part due to luck: the temperatures and precipitation were favorable for germination during the first season of seeding (1989), and the seed was highly viable.

Contacts:
Steve Lombard, BP exploration, Environmental and Regulatory Affairs, Anchorage, 564-5081, is the primary contact. Philip Smith, of PSA, Inc., Anchorage, worked on the seeding. Lloyd Fanter, ACOE, Anchorage, 753-2720, was the compliance person to whom all reports were submitted. He attended site visits as well.

References: None

Other Information Sources:
Steve Lombard (BPX) provided two pertinent items: "Abstract" (dated August 17, 1989), on the "Exploration Well Pad Abandonment, Prudhoe Bay, Alaska, Revegetation and Rehabilitation Photography" (4 pgs); and the "1991 BP Pad #22-33-11-13 Restoration Progress Report" submitted from BP to Lloyd Fanter, ACOE, on December 10, 1991.

BP Put River #1 Pad Experiment Identification Code: P0030

Short Description: A many-factored revegetation experiment on an abandoned gravel pad.

Nearest Town: Prudhoe Bay Year Began: 1989 Status: Monitoring Successful: Too soon
Additional Information:
They collected native tundra seeds in 1989, 1990, and 1991 and planted them the following years on the drill pad, which was laid out in blocks for various treatments and repetitions, with a total of 144 plots. In 1990, 31 plant species were seeded. In 1991, 28 species of primarily forbes and shrubs were seeded. The source article was published before the third planting in 1992. The treatments included: three different thicknesses of gravel, two amounts of "overburden" (tundra top soil that is spread on the surface), two tillage techniques in the existing gravel pad (to increase aeration), two levels of snow

fencing (to increase moisture availability), and two levels of grass in the seeding mixture. Each experimental unit was replicated three times, and will receive three mixtures of native plant seeds. Initial observations show that snow fencing provides a significant snow trap and increases the moisture available to seedlings trying to establish. The significance of the project/experiment is: what to do with gravel pads once they are abandoned, and how to we get something to grow on them? No matter the specifics of the outcome after a few years, a lot will be learned from these efforts. Much more detail is included in the reference article cited above. BP states it is the first long-term study ever undertaken on environmental rehabilitation in the Alaskan arctic.

Contacts:
Jay McKendrick, Professor at UAF, did this research funded by BP Exploration and the US Geological Survey. Jay is based at the UAF Agriculture & Forestry Experimental Station in Palmer, 746-9450.

References: Publication Date: January 1992 Reference Type: Journal
Author: McKendrick, Jay D., Peter C. Scorup, Warren E. Fiscus, etc.
Title: Gravel Vegetation Experiments--Alaska North Slope

Other Information Sources:
Jay McKendrick probably has more recent observations available. This multi-factored experiment will be monitored for 10 years.

BP's Arctophila reveg research Identification Code: P0083

Short Description: BP studied arctic pendant grass for reveg use on artificial water impoundments

Nearest Town: Deadhorse Year Began: 1985 Status: Completed w/M Successful: Yes

Additional Information:
The project was a cooperative research effort between BP & U.S. Fish & Wildlife Service to restore and mitigate habitat alterations resulting from the construction of the 10-mile Endicott Road. They investigated the feasibility of using Arctophila fulva (arctic pendant grass) to restore waterbird habitats. From 1985-89, researchers studied the life history & assessed habitat requirements of Arctophila fulva at over 100 sites across the North Slope. Transplants were used to test the feasibility of establishing new stands, and the habitat requirements for successful growth were assessed. Transplants were considered very successful to vegetating disturbed aquatic sites, such as impoundements, caused by gravel roads and pads. A single addition of phosphorus fertilizer markedly increased vegetative reproduction 3 to 4 years later. Several unfavorable site conditions were identified for Arctophila: where high competition with other species exists, in cloudy water, and shorelines subjected to wave action. Highly organic and acidic muds and unstable substrates were considered marginal sites. Future work will focus on tangible objectives that can enhance habitat features for arctic wildlife.
NOTE: This work differs from the ARCO/Plant Materials Center work on Arctophila in that this study addressed Arctophila use in impoundments and involved many sites and a large staff. The ARCO/PMC study (to date, 1993) addressed open and moving water sites, and was a smaller study in scale with fewer staff.
Contacts:
BP Environmental (Alaska) Inc., Environmental & Regulatory Affairs, P.O. Box 196612, Anchorage

References: Publication Date: July 1991 Reference Type: NewsLtr
Author:
Title: North Slope Research Notes: Arctophila fulva revegetation feasibility study

Other Information Sources:
Information verified with BP staff.

Chena Lakes (Kutscheid Lake) Identification Code: P0163

Short Description: Gravel pits rehab'd for fish & recreational use; Chena Lakes Flood Ctrl Proj

Nearest Town: North Pole Year Began: 1979 Status: Completed w/o M Successful: Yes

Additional Information:
ACOE needed a gravel source for their dam at the Chena River and the levee along 15 miles of the Tanana River. They excavated a series of 30-40' deep gravel pits near the Chena River, finishing in the late 1970's. ACOE then asked ADF&G what could be done to rehabilitate these areas, and ADF&G recommended connecting the lakes (which had already refilled with groundwater) with 25' deep connecting channels, and making the shorelines irregular with shallow bays, coves, etc. Four islands, totalling 35 acres, were retained in place when they connected the lakes. The resulting lakes have a mean depth of 18.7 ft, and a littoral zone totalling 88 acres, which did not exist before the lake rehabilitation. Vegetation was allowed to recolonize naturally. Starting in 1982, a put-and-take fishery was established by introducing rainbow trout and coho salmon (by Sport Fish Division, ADF&G) into the lakes. Periodically, creel censuses were undertaken to examine the growth rate of stocked fish. The lakes are slowly developing from a sterile gravel pit, devoid of all vegetation and nutrients, to a functioning lake system, but as of yet there are not enough nutrients in the lakes to support the growth of stocked fingerlings to adulthood. Presently Sport Fish is stocking catchable-sized rainbow trout, coho and arctic char. The lakes look fairly natural now, with vegetation coming back in, and some submerged aquatic vegetation along the shoals, but it is still somewhat sterile. In one spot, colonizing beavers have accelerated the nutrient build-up; the vegetation looks better developed in the beaver area, and fish tend to concentrate there. There is a channel connecting waters from the Chena Lakes to the Chena River, but it is gated to prevent river fish from wandering up into the stocked lakes. The resulting lake complex and park area is becoming very popular, for fishing, boating, swimming, cross-country skiing, dog mushing, etc. By the year 2000, the Borough projects 120,000 recreational user days per year at the Chena Lakes.

Contacts:
Al Townsend, ADF&G, Fairbanks, 451-6192. John Burns at ACOE in Anchorage was involved in the project design, 753-2641. John Shaake, ACOE, Fairbanks, is stationed at the project site, 488-2748. Mike Doxey, ADF&G, Sport Fish, Fairbanks, has been involved in the ongoing stocking program, 456-4359.

References: Publication Date: FDS#91-66,1991 Reference Type: Report
Author: Doxey, Michael
Title: Eval of Rainbow Trout & Coho Salmon stock Prog. in Birch,Chena,& Quartz Lakes.

Other Information Sources:
Talked to Al Townsend, ADF&G, 4/6/93, and Mike Doxey, Sport Fish, ADF&G, Fairbanks on 4/13/93. More info on the lake and channel reconstruction can be found in: Kramer, Michael and Jerome Hallberg, 1982, "Lake and Stream Investigations: Evaluation of Interior Alaska Waters and Sport Fish with Emphasis on Managed Waters - Fairbanks District". G-III-H. (Vol. 23 of Federal Aid in Fish Restoration and Anadromous Fish Studies, ADF&G).

Chena River Gravel Pit, Fbx Identification Code: P0006

Short Description: Mitigation included a buffer & contouring the pit's littoral zone

Nearest Town: Fairbanks Year Began: 1991 Status: Unknown Successful: Unknown

Additional Information:
The project involved placing overburden from a gravel pit (mostly in wetlands) in adjacent wetland areas for residential development. Mitigation entailed a ten foot buffer zone adjacent to the pit and contouring the area near the edge of the pit to create a productive littoral zone once the pit is abandoned, at which time the pit would fill with water. The amount of area involved was 23.5 acres of fill, 54 acres of excavation, and 10 acres of the compensatory buffer and enhanced littoral areas. The area was revegetated with native perennial grasses and shrubs.

Contacts:
Army Corps of Engineers, Anchorage, 753-2716, ACOE file #89084.

References: None

Other Information Sources:
Information came from the ACOE files, and a one paragraph description in an informal paper summarizing the few instances of ACOE involvement in compensatory wetland actions. This summary paper was prepared by Don Kohler, ACOE, Anchorage, in late 1992.

Cominco Port Disposal Pit — Identification Code: P0092

Short Description: Red Dog Port Site. Revegetation experiments in dune communities of Chukchi Sea

Nearest Town: Noatak — Year Began: 1987 — Status: Completed w/M — Successful: Yes

Additional Information:
This project consisted of 3 evaluation plots: a sandy-gravel beach area north of the port (seeded 7/87); a 2nd plot located at the original campsite's fuel bladder containment area used for dormant (fall) seeding (seeded 9/87); and a 3rd plot at the staging area near the containment area, used for spring seeding (seeded 6/88). The evaluation plots were hand seeded, fertilized, & raked, & were evaluated for three growing seasons. The port site exhibited a high loss of accessions in the 1st year, due to storm surges that topped the foredune causing exposure to saltwater, driftwood & other debris, & producing erosion rills. Of 51 accessions planted, only 9 remained by 8/89, all roughly equal in performance. The fall-seeded plot, which differed from the other planting sites because the soils were composed of overburden rather than sand or gravel, originally contained 40 accessions; by 9/89, 12 remained. The spring-planted plot contained 50 accessions; at the 9/90 evaluation, 20 remained. The best performers at the fall site were 'Tundra' Glaucous Bluegrass, 'Sourdough' Bluejoint & 'Alyeska' Polargrass, & good performers were 'Gruening' Alpine Bluegrass, 'Norcoast' Bering Hairgrass & 'Egan' American Sloughgrass. At the spring site, the 8 outstanding performances were from all above except 'Alyeska' plus 'Arctared' Red Fescue, Boreal Wheatgrass T12048, & Bluejoint AKPMC5. In addition, a major demonstration project using adapted native species occurred at an abandoned 1.5 ha solid waste disposal pit, north of the Cominco port. Within the pit itself 3 different seed mixes were planted based on microtypic and moisture conditions. Before seeding, the pit was contoured to reshape the cut slopes, then fertilized, with two special treatment areas receiving different amts. of fertilizer. A plan to recreate a portion of the breached foredune, between the disposal pit and the shoreline, was abandoned after determining it would not withstand storm forces. Instead the breached Beach Wildrye communities were reconnected using transplanted springs and overseeded by Norcoast & Arctared & fertilized. The seedings performed very well with 95% ground cover by the final inspection. Beach Wildrye sprigs & seeded coastal grass were affected by storm surges the 1st & 3rd seasons, and were finally destroyed by violent storm action, but reconnection occurring in the 2nd season indicated transplantation is possible in coastal areas of the Chukchi & may be a valuable erosion control measure. The study also indicated that dormant seeding is a viable option.

Contacts:
Stoney Wright, Alaska Plant Materials Center, Palmer, 745-4469

References: Publication Date: Oct. 1990 Reference Type: Report
Author: Wright, Stoney
Title: 1990 final rpt. of data and observtns. obtained fr the RD Mine eval & demo plots

Other Information Sources:
Wright, S.J. Three case studies of successful wetland rehabilitation in Alaska using newly developed wetland cultivars, in: Land reclamation: advances in research & technology: proceedings of an intl. symp., 14-15 Dec. 1991, Nashville. Am. Soc. of Ag. Eng., pp. 151-159; and Alaska Plant Materials Center Annual Report 1992, pp. 25-26.

Creamer's Field Crane Project Identification Code: P0053

Short Description: Creamer's Field Crane Habitat Project, by ADF&G, funded by Fairbanks Airport

Nearest Town: Fairbanks Year Began: 1989 Status: Completed w/M Successful: Yes

Additional Information:
This experimental effort was designed to alleviate potential airplane/bird collisions by creating alternative roosting areas for sandhill cranes to attract them away from areas used at the Fairbanks International Airport. Once the new roosting habitat was in place at Creamer's Field Refuge, they hoped to lure the cranes there, then eliminate the existing habitat area near the airport. A big (approx. 5 acre), shallow pond was dug near the barley fields at Creamer's Field for the cranes. Fairbanks airport (ADOT/PF) provided funding, staff, and equipment, as available. Work was conducted beginning in 1990. Because the work was done subject to other airport demands on time and equipment, it was difficult to complete all aspects to specifications, but by now (1993) it has gotten very close. To date, the project has been very successful at attracting cranes. The airport is now (1993) planning to fill the open area used by cranes adjacent to the airport (the original trade-off). The area being managed for cranes at Creamer's Field has expanded, from 15 to 45 acres of barley cultivation. Because juvenile cranes do not move on to nesting grounds, ADF&G is developing interpretive programs to take advantage of their presence all summer. They are also trying to also create a more attractive stopover location for migrating geese, which currently use the airport location.

Contacts:
Dan Rosenberg, ADF&G Division of Wildlife Conservation, Anchorage, 267-2453. Also, Robert (Mac) McLean and Audrey McGowan, both ADF&G, Fairbanks are continuing to look at it.

References: None

Other Information Sources:
Talked to Dan Rosenberg, ADF&G, Div. of Wildlife Conservation, 2/22/93. He has numerous files, slides, and video records of the project. Perhaps the Fairbanks ADF&G staffers may write this project up in future Reports for the Division of Wildlife Conservation. Also talked to Mac McLean in Fairbanks on 4/6/93. He has considerable hydrological data, and newer progress reports in the file.

Creamer's Field Waterfowl Proj Identification Code: P0051

Short Description: Creamer's Field Waterfowl Nesting Project, by ADF&G & Ducks Unlimited

Nearest Town: Fairbanks Year Began: 1987 Status: Implementation Successful: Yes

Additional Information:
ADF&G and DU constructed six waterfowl nesting ponds to increase nesting habitat for waterfowl endemic to interior Alaska, test the use of waterfowl enhancement methodologies in the interior, & increase wildlife viewing, hunting, and education opportunities. Tussock low-shrub bog is the predominant habitat type, interspersed with herbaceous bog and tall shrubs. Two bulldozers with ripper bars and U-blades and a backhoe were used to construct ponds and channels in spring 1987. Excavated material covered 15.3 acres. The six ponds, varying from 1.5 to 3.4 acres, were sloped to 4 feet deep. The new ponds are linked to an existing 1.25 acre pond by appx. 2,150 ft of meandering level-ditches. Level-ditches are 20 ft wide and 2 to 3 ft deep. Each pond contains 2 to 4 islands; total island area is 2.75 acres. The 21 islands range from 0.04 acres to 1.0 acres in size. Where necessary, spoil material was added to islands to increase elevation from 1 to 2 feet above water levels. In June, 1987, 16 acres of excavated material (berms and islands) were revegetated with appx. 6,700 lbs of fertilizer (20-20-10) and 600 lbs grass seed. The seed mix consisted of 15% tundra bluegrass (Poa glauca), 32% "arctared" red fescue (Festuca rubra), and 53% "norcoast" Bering hairgrass (Deschampsia beringensis). About 50 lbs of Beckmania syzigachne was hand broadcast around pond margins and in spillways. Islands in the two most southern ponds received the following mix: 50% Beckmania, 10% polar grass (Arctagrostis latifolia), 2% bluejoint (Calamagrostis canadensis) 20% "norcoast" Bering hairgrass, 8% tundra bluegrass, and 10% "arctared" red fescue. The first spring, leakage and low snow pack prevented all the ponds from filling. The north-south elevation gradient of 12.2 ft necessitated the use of spillways at the outlet of each pond, which eroded and required maintenance. In November (1987) the spillways were lined with appx. 6-inch riprap to retard erosion. 20 species of birds were identified the first season following construction, including Canada geese, pintails, sandhill cranes, shovelers, mallards, green-winged teal and American widgeon. Dan Rosenberg feels they should have given more consideration to the elevation differences to begin with, because the spillways between ponds continue to give problems. In 1990 they tried to bolster a couple of spillways (liners, sandbags, etc.) but it didn't work well. A beaver was observed maintaining a spillway well last season. Future plans include introducing other beavers, and redesigning some spillways. Dan's summary is that they had some problems due to permafrost and slopes, but the project was an unequivocal success in terms of enhanced waterfowl habitat.

Contacts:
Dan Rosenberg, ADF&G Division of Wildlife Conservation, Anchorage, 267-2453.

References: Publication Date: July 1988 Reference Type: Report
Author: Campbell, Bruce H.; Rosenberg, Daniel H.
Title: Creamer's Field Waterfowl Nesting Project. In Annual Report, Game Division

Other Information Sources:
Talked to Dan Rosenberg, ADF&G, Div. of Wildlife Conservation, 2/22/93. He has numerous files, slides, and video records of the project.

Darling Creek Identification Code: P0154

Short Description: Retrofit of an existing highway culvert

Nearest Town: Nome Year Began: 1986 Status: Monitoring Successful: Yes

Additional Information:
They tried to correct a fish passage problem resulting from the mistaken placement of the wrong size and type of culvert at this location. The culvert was forming a velocity barrier to passage of juvenile Dolly Varden to upstream rearing areas. The velocity barrier was corrected by constructing a series of rebar and boulder weirs within the existing culvert barrel. Velocity profiles were conducted, and have shown that the resulting velocities are satisfactory. Juvenile Dolly varden are now able to pass, as proven by electroshocking upstream. The site is inspected annually and maintained as needed (basically 10-15 minutes of removing a small amount of trapped debris annually). During project design, a model was being developed jointly by ADF&G, ADOT, and Univ. of Alaska, which applied hydraulic and fish passage principles to culvert design. The prototype model was used to validate the design of these culvert weirs. The model principles are sound, but the specific applications would be different in each case. For instance, the solution used in this creek would not work in areas with higher velocities, steeper gradients, higher bedloads, or beavers.

Contacts:
Mac McLean, ADF&G, Fairbanks, 451-6192; Joel Craft, ADOT, Nome, 443-3444.

References: Publication Date: 1991 Reference Type: Report
Author: Behlke, Charles E. et al.
Title: Fundamentals of culvert design for passage of weak - swimming fish

Other Information Sources:
Talked to Mac McLean, ADF&G, on 4/6/93. Velocity profiles and photos, field reports in files.

Delong Highway Stream Crossing Identification Code: P0093

Short Description: Red Dog Road riparian herbaceous rehabilitation; river crossing seedings

Nearest Town: Noatak Year Began: 1989 Status: Monitoring Successful: Yes

Additional Information:
On June 14, 1989, six of the nine major Delong River crossings were scheduled for revegetation. A seed mix was developed relying entirely on native species, consisting of 'Gruening' Alpine Bluegrass (25%), 'Alyeska' Polargrass (25%), 'Egan' American Sloughgrass (20%), 'Norcoast' Bering Hairgrass (20%), 'Caiggluk' Tilesy Sage (5%), & 'Sourdough' Bluejoint (5%). This mix was hand broadcast at a rate of 40 lbs. per acre & the areas were hand raked. Because snow remained in some areas of the river crossings which were scheduled to be revegetated, seeding was somewhat discontinuous. However, the seedings proceeded as scheduled. During the August 1989 evaluation, all seeded areas had produced measurable growth. By Sept. 1990, these areas were well vegetated. 'Egan', 'Gruening', and 'Alyeska' exhibited the best performance. 'Norcoast' & 'Caiggluk' also produced measurable stands.

Contacts:
Stoney Wright, Alaska Plant Materials Center, Palmer, 745-4469

References: Publication Date: 1990 Reference Type: Report
Author: Wright, Stoney
Title: 1990 Final Rpt of Data & Observ Obtained fr the Red Dog Mine Eval. & Demo. Plots

Other Information Sources:
Just the written reports from the Plant Materials Center.

Denali Clearwater Creek Identification Code: P0158

Short Description: Gabion weir placed below perched culvert to back up water level

Nearest Town: Paxson Year Began: 1987 Status: Completed w/M Successful: Yes
Additional Information:
This project was an experiment prototype of this method of addressing a perched culvert. Backing up water below the 2 ft. perched culvert to raise the water level entering the culvert is less expensive than digging up and replacing a whole culvert under a highway. In this case, they placed a gabion weir below the culvert. A wire mesh cloth liner was placed under the rip rap and gabions, to reduce scouring. They constructed a class II riprap scour apron at the culvert outlet. The weir was constructed of wire mesh, rock-filled gabion baskets with a center notch (to concentrate water during low flow periods). This method has worked well; no maintenance has been required. Velocity measurements were taken to make sure a new barrier had not been created. Grayling have been observed upstream.

Contacts:
Mac McLean, ADF&G, Fairbanks, 451-6192; Chuck Behlke, Private consultant for ADOT, Fairbanks.

References: None

Other Information Sources:
Talked to Mac McLean, ADF&G, on 4/7/93.

East Fork Chena River Identification Code: P0159

Short Description: Diversion to conduct placer mining at East (also called Middle) Fork Chena River

Nearest Town: Fairbanks Year Began: 1989 Status: Monitoring Successful: Unknown

Additional Information:
In order to conduct placer mining in the streambed, the miner constructed a 4800' diversion of East Fork Chena River. ADF&G required a diversion channel that maintained the original width, sinuosity, and gradient, and stable substrate. The miner accomplished this by making a mirror image of the original channel. The diversion channel was inspected in 1989, and ADF&G determined that the gradient was too steep in a 120' reach. They required 2 step pools (3 ft. deep) to be constructed to correct the gradient for fish passage, before he was allowed to divert water into the channel. The river diversion was phased in. At first, only half of the soft plug at the head of the new channel was removed, so half the water was diverted into it. This was done so that: 1) the construction sediments in the new channel would be wetted and settle in place rather than being pushed downstream by high force, and 2) the partial diversion would serve as a warning to signal the fish in the original channel to vacate that reach of stream. This worked, as the next day there were no grayling observed in the old channel. The whole East Fork was then diverted into the bypass. A month later, floodwaters had washed out a bank of the bypass and emptied waters into the lower part of the original channel. ADF&G required the miner to block the breach, which he did in 1989. The mining has been in operation for a few years, but has not been profitable, and is being retired soon. A 1993 inspection by DNR and ADF&G is anticipated to determine whether the miner's reclamation bond will be returned.

Contacts:
Al Townsend, ADF&G, Fairbanks, 451-6192

References: None

Other Information Sources:
Talked to Al Townsend, ADF&G, on 4/6/93. Trip reports and photo records in files.

East Fork Solomon River — Identification Code: P0153

Short Description: Re-established floodplain after moving the Nome-Council Highway out of creek

Nearest Town: Nome Year Began: 1986 Status: Completed w/M Successful: Partially

Additional Information:
Historically, the road had been constructed in 1920's right up the creek bed. ADOT had been maintaining the road and numerous dikes in recent years, but the river kept washing out sections. In 1986, they moved the road up out of the valley bottom, and agreed to rehabilitate 9 miles of the East Fork. The goal was to re-establish a functioning river system and floodplain. The road bed was removed, and the valley floor floodplain was recontoured which has since consolidated the channels leaving a bit of braiding. On the higher (more upland) sections, the road bed was removed and scarified to encourage natural colonization by willow. These upland areas have started to grow back, but after 6 years, only now are willows starting to come back along the lower floodplain. This delay in regrowth may have been caused by aufeis while the river was restabilizing itself after the new construction. It now appears that the stream system is stabilizing in the floodplain, the aufeis formation is decreasing over time and vegetation is just beginning to come in. In hindsight, the process may have been accelerated by establishing one distinct channel at the time the work was done in the mid-1980's, rather than allowing the river to reach its own equilibrium over time. If they had used Dave Rosgen's principles, by establishing a pilot channel, they may have reached the desired outcome (w/riparian vegetation) 8-10 years sooner.

Contacts:
Mac McLean, ADF&G, Fairbanks, 451-6192

References: None

Other Information Sources:
Talked to Mac McLean, ADF&G, on 4/6/93. Field notes and photo documentation available in his files.

Eielson mit for illegal fill — Identification Code: P0014

Short Description: French Creek 4--Enforcement action for illegal asbestos fill by US Air Force

Nearest Town: Fairbanks Year Began: 1992 Status: Unknown Successful: Too soon

Additional Information:
The permit application was process after-the-fact, as a resolution of a violation that was self-reported. The project was for an asbestos landfill which had been in operation on Eielson Air Force Base for several years. The existing and proposed fill and/or land clearing would result in a loss of 14.1 acres of palustrine wetlands. The US Air Force proposed to create 0.6 acres of wetland on an adjacent upland as mitigation. ACOE opined that the value of surrounding wetlands had been severely impacted by the adjacent landfill and that this mitigation plan provided appropriate & practicable mitigation for the lost wetland values, even though the mitigation work would be in uplands. The 0.6 acres of wetland would be created near the Mullins Pit, and the slope of a bank would be reduced adjacent to the water-filled pit. The entire area in the mitigation plan would receive a layer of overburden & be seeded with grasses (nonspecific).

Contacts:
Randy Steen from ACOE, Anchorage, 753-2716.

References: None

Other Information Sources:
Brief description on an informal list provided by Don Kohler, ACOE, Anchorage.

Fishing & Aquatic Ed Pond Proj Identification Code: P0156

Short Description: Trout Unlimited/ ADF&G Cooperative Education Project

Nearest Town: Fairbanks Year Began: 1992 Status: Implementation Successful: Too soon

Additional Information:
The intention was to create a trout pond with shallow edges and aquatic vegetation for educational purposes. The pond was excavated with a shallow shelf, 2 1/2 deep (20% of total); the rest 8' deep. They used a geotextile impermeable liner so as to retain water during low ground water periods. They backfilled over the liner with stockpiled overburden (1 1/2 ft over top of liner). They will transplant cattails this spring (1993) and inoculate the pond with water and invertebrates from nearby Jessila Creek. Rainbow trout and grayling will be stocked. Hopefully, waterfowl will introduce other aquatic elements. Invertebrates will be monitored with benthic samples. There is some discussion underway with Sport Fish Division to develop a series of ponds in the future for different uses, e.g., a shallow pond for pike, a deeper one for rainbow trout, one with nesting platforms or islands, one with stabilized banks for dog retriever trials, etc. A maximum of 2-5 acres could be available for these ponds. If they go ahead with this project, they'll probably hire an established pond designer from Colorado.

Contacts:
Mac McLean, ADF&G, Fairbanks, 451-6192

References: None

Other Information Sources:
Talked to Mac McLean, ADF&G, on 4/7/93. Mac wrote up an *As-Built Evaluation with photos* soon after construction (October, 1992), which is in the files.

Glen Creek in Denali Natl Park Identification Code: P0001

Short Description: Pilot study to research techniques to stabilize placer-mined streams

Nearest Town: Kantishna Year Began: 1991 Status: Implementation Successful: Too soon

Additional Information:
Used a BLM-designed scheme for configuring stable channels in coarse alluvium based on pertinent geomorphic, hydraulic, and hydrological principles. With some modifications for subarctic conditions, this was the design basis for this pilot study on abandoned placer mines in lower Glen Creek. The study involved a 1400' reach of Glen Creek, and focused specifically on restoration of over-steep floodplains in that reach. The study's goal was to develop techniques to allow for the evolution of certain hydrologic characteristics such as sinuosity, pool/riffle ratio, and other natural habitat features with minimum construction needs. Channel adjustments will provide for a streambed capacity to contain a

1.5-year flood, and a floodplain capacity to contain a 1.5- to 100-year flood. Sediment loading from bank erosion and other sources must be minimized. Channel controls, such as riprap or gabions, were not used, as these generally hinder natural stream restoration. Techniques involved recontouring the terraced floodplain, revegetating the streambank with feltleaf willow cuttings and alder seedlings, and placing 15' to 20' brush bars perpendicular to the channel to stabilize the floodplain. In future seasons, an adjoining 3200' reach of the creek will be added to the study area. Extensive monitoring of hydrologic and biological parameters is planned.

Contacts:
Ken Karle, Hydraulic Engineer, and Roseann Densmore, Park Ecologist, Denali National Park, Healy, AK, 683-2294

References: Publication Date: Spring, 1992 Reference Type: Journal
Author: Karle, Ken & Roseann Densmore
Title: Stream and Floodplain Restoration on Watersheds Disturbed by Mining

Other Information Sources:
Just the article

Goose Green Gulch Identification Code: P0169

Short Description: Fish & wildlife habitat in a former gravel mine site, North Slope

Nearest Town: Deadhorse Year Began: 1977 Status: Completed w/M Successful: Yes

Additional Information:
This is a rehabilitated gravel mine site which ADF&G monitored during 1989 & 1990. The site, located on an alluvial terrace, was mined during the early 1970's for gravel. In 1977, the site was seeded & fertilized. During 1978-80, the area was selected for an experimental willow planting program. ADF&G monitored the site for vegetative cover, limnological factors, use by wildlife, and fisheries investigations. Periodic flooding contributes nutrients to both aquatic & terrestrial components of the site, including plant propagules. The establishment of willows seems to be a combination of natural seedling establishment, vegetative reproduction & survival of planted cuttings. Grasses, sedges, willows & forbs currently grow within much of Gooser Green Gulch. Limnologically, phytoplankton standing crop was low. Although wildlife use investigations consisted merely of casual observations, Canada geese, adult semipalmated plovers, semipalmated sandpipers, lesser yellowlegs, moose, & caribou were using the site. The ponds in Goose Green Gulch contain a diversity of features that are beneficial to and used by fish. The irregular shape of the ponds provide extensive shoreline for development of emergent vegetation, providing cover & food, and stabilizing the shoreline & pond bottom. Variations in water temperature also contribute to productivity and use by fish. Stability of future alluvial terrace material sites could be enhanced by establishing larger buffer zones between the site & active river channels, reducing the possibility of site erosion. Techniques such as establishing connections to rivers using a combination of shallow scraping & deep excavation to provide fish & waterfowl habitat, and contouring the site to retain adequate moisture for plant growth will go a long way toward mitigating the loss of the original habitat & enhancing the use of the site by some species.

Contacts:
Jack Winters, ADF&G, Habitat Div., Fairbanks, 451-6192

References: Publication Date: 1990 Reference Type: Report
Author: Winters, Jack F.
Title: Goose Green Gulch: fish & wildlife habitat in a former gravel mine site

Other Information Sources:
Just the report.

Graveled Tundra Remediation Identification Code: P0066

Short Description: BP's program to restore areas where gravel was deposited incidentally on tundra

Nearest Town: Deadhorse Year Began: 1990 Status: Implementation Successful: Yes

Additional Information:
After several years of active use of gravel pads, the amount of gravel sloughing from pads and roads onto adjacent tundra (through wind, snow removal, washouts) becomes sufficiently thick to affect the vegetation. The Corps of Engineers considered this "graveled tundra" to be an example of unpermitted wetland filling. A multi-year project was developed by BP to address this problem, and 1990 was the first field season. They experimented with techniques to remove gravel sloughing from tundra while causing minimal additional disturbance. The objectives were to improve conditions for vegetation recovery and reduce the visual impact of the graveled sites. The first year (1990), 10 locations (totalling "155 sites", and approx. 30.6 acres) were treated within the BPX-operated portion of the Prudhoe Bay oilfield. Removal techniques included a large backhoe, laborers with rakes and shovels, and specialized vacuum trucks. In 1991, the program expanded to 21 facility locations (240 sites, 13.6 acres), and in 1992, 27 locations (283 sites) were worked. About 20% of the sites worked in the latter years were those that had been treated previously, but had been "regraveled" in the interim. Vegetation monitoring plots (1m2) were established in 1991, placed at random throughout the project. Photo records, a database, and automated maps are also involved. Their experience in 1990 at the Spine Road washout taught them that removal of recently deposited gravel can yield good recovery of vegetation in the same season. Therefore, recent road washouts and graveled snow areas became the highest priority sites to be treated each year. Also, removing gravel-entrained snow from the tundra in the spring and placing it back on the pads to melt appeared to minimize gravel deposition on the tundra. This procedure then became the norm for snow removal in cooperation with ARCO. In 1992, gravel removal techniques included the combined use of 3 backhoes, 8 gravel conveyors, rakes, shovels, wood planks, and wheelbarrows. In 1993, in addition to simple gravel removal, more "active" revegetation methods may be involved, such as nutrient addition, addressing pH, seeding, and turning thermokarst areas into actual "ponds". 88.7 acres have
been treated to date, with almost the same area remaining to be treated.

Contacts:
Steve Lombard, BP exploration, Environmental and Regulatory Affairs, Anchorage, 564-5081, is the primary contact. Lloyd Fanter, ACOE, Anchorage, 753-2720, was the compliance person to whom all reports were submitted. He attended site visits as well.

References: None

Other Information Sources:
Steve Lombard (BP) provided three pertinent items: 1) a "1990 Final Report" on "Remedial Gravel Removal in the Prudhoe Bay Oilfield", written by Mark E. Miller of LGL Alaska Research Associates for BP Exploration (dated Feb.22, 1991); 2) a "1991 Graveled Tundra Remediation Project Progress Report" written in letter form from Steve Taylor (BP) to Lloyd Fanter (ACOE) dated Feb. 12, 1992; and 3) a "1992 Graveled Tundra Remediation Project Report" written as a memo for internal (BP) distribu

Independence Crk Revegetation Identification Code: P0146

Short Description: Slope stabilization on placer mine tailings using dormant willows

Nearest Town: Fairbanks Year Began: 1989 Status: Completed w/M Successful: Yes

Additional Information:
This project's purpose was to determine if planting dormant willows could rapidly stabilize steep slopes by inhibiting surface erosion and enhancing overall site restoration. The study site had steep slopes of overburden stockpiles with potential for surface erosion. Planting methods followed the guidelines for streambank revegetation (AK. Dept. Nat. Resources- Plant Materials Center, 1986). Stem & branch cuttings were collected from dormant feltleaf willow in 4/89. The stem cuttings were cut to size (8"-10" long, 0.25-0.75" diameter stems), the branches were tied into bundles (later cut to 3'-4' lengths, 4"-6" bundle diameter), & all stored in refrigeration for one month. Once the ground thawed in May, the cuttings were planted along the face of a 500'long slope. A "dibble" was used to make 6" deep vertical holes, the cutting was dropped in (w/only 25% exposed above ground), then the hole was closed by foot. These cuttings were planted in clusters of 5 within 2' diameter circles. The slope angle varied from 10-45 degrees. The willow bundles were planted in a different section where on-going surface erosion & expanding vertical gullies were evident. The bundles were placed randomly throughout one gully, in shallow trenches, secured in place with willow stakes, & partially covered with surrounding soils. Monitoring included: survival rate of cuttings and bundles; annual growth of planted material (e.g., length & diameter of stems, roots, etc.); natural recolonization of the slope; & wildlife occurrence/use of the site. Within 2 weeks, 95% of all material had leafed-out, & growth appeared vigorous. Then in June, heavy rains flooded the area drainages. As a result of excessive runoff, the gullies deepened & all the bundle material was lost. The stem cuttings survived this high water event. The cuttings avg'd 12-18" growth the first season. Total veg. cover in fall 1989 was 30%: 10% planted willows, 20% local colonizing species (mostly Calamagrostis sp. & Polygonum alaskanum). By 1990, cover increased to 70-80%: 20% planted willows, 50-60% local species. 515 of the original 550 cuttings had survived as of 1991. Although the bundles were inadequately secured in the most erodible area to withstand the sudden onset of flood waters, the success of the stem cuttings on overall slope stabilization was evident following the flood. Surface H2O carved small gullies & rills around cuttings but did not dislodge them. Since then, the presence of the willows avoided further gully widening. The cuttings may also have increased water holding capacity of the slope, enabling establishment of local species. A very successful project: continued soil stabilization & plant succession can be expected.

Contacts:
Barb Masinton, then at BLM, Steese/White Mountain District, Fairbanks, but now at BLM in New Mexico (since 1991/92). Her address there: New Mexico State Office (NM-931), 1474 Rodeo Road, Santa Fe, NM, 87502-7115, (505) 438-7445.

References: Publication Date: June 1991 Reference Type: Report
Author: Masinton, Barbara
Title: Stabilizing Steep Slopes Using Dormant Willows

Other Information Sources:
Just the report listed above.

Kink Corner Gravel Pit Identification Code: P0150

Short Description: Mile 22.4 of Nome-Taylor Hwy; Nome River 1. Gravel pit rehab for rearing & ovrwt

Nearest Town: Nome Year Began: 1992 Status: Implementation Successful: Too soon

Additional Information:
This project will be monitored for 5 years. This summer (1993) Mac will examine the amount of deep water vs. littoral zones, to see how well it meets the design criteria. The gravel pit is at the base of a bluff, separated from the Nome River on the west side by the roadbed (Nome-Taylor Highway), which has been in place since the 1920's. Springs feed into the new lake (former pit) from the base of the bluff. There is one outlet to the Nome River under the road, consisting of a 72" culvert. This culvert access was replaced/ improved in 1992. Stocking was not considered necessary. The gravel extraction of the 5.5 acre pit all took place during 1992. Their mining plan incorporated the design features needed for reclamation, e.g. some areas as deep as 16-20' for overwintering habitat, and 40 percent of the total surface is contoured as shallow littoral habitat (less than 3 ft. deep). The stockpiled organic overburden will be replaced along the banks and disturbed areas in 1993. ADF&G will monitor, examining configuration and bathymetry, fish use, etc. The pond is anticipated to serve as summer rearing habitat but will be evaluated for winter use (e.g. winter dissolved 02) as well. If available, local volunteers may plant willow cuttings along the borders in the future.

Contacts:
Mac McLean, ADF&G, Fairbanks, 451-6192; Joel Craft, ADOT, Nome, 443-3444.

References: None

Other Information Sources:
Talked to Mac McLean, ADF&G on 4/6/93. A monitoring plan was attached to the Corps permit in 1991, authored by McLean.

Koppenberg Mine — Identification Code: P0155

Short Description: Reclamation of disturbed floodplain after placer mining

Nearest Town: Fairbanks Year Began: 1987 Status: Implementation Successful: Yes

Additional Information:
When T.J. Koppenberg got done placer mining in 1987, he recontoured the tailings in the disturbed floodplain. In spring of 1989, Ruby Creek (2 1/2 cfs) was directed down 2000 ft of disturbed area to meet Sourdough Creek. By 1991, 90% of the disturbed area had revegetated to willows, grasses, wildflowers. However, there is a three ft. falls where Ruby Creek empties into Sourdough Creek. If the falls are made passable, it would provide fish access into Ruby Creek for grayling, juvenile chinook, round whitefish, burbot, and sculpins. This confluence passage should be corrected by 1995. There are 5 riffles within this reach of the redirected Ruby Creek. Once the fish access is corrected, fish utilization of Ruby Creek will be monitored. Spawning use is a possibility, but rearing use of the area is highly probable.

Contacts:
Al Townsend and Al Ott, ADF&G, Fairbanks, 451-6192.

References: None

Other Information Sources:
Talked to Al Townsend, ADF&G, on 4/6/92. Photo records and trip reports in files.

Kuparuk Arctophila reveg study — Identification Code: P0082

Short Description: PMC & ARCO's study of Arctophila transplanting for waterfowl in Kuparuk Oilfield

Nearest Town: Deadhorse Year Began: 1985 Status: Completed w/M Successful: Partially

Additional Information:
Adapted from Moore & Wright: Results of the limited baseline ecological studies & transplant experiments indicate that transplanting Arctophila is feasible, however, the economic feasibility of transplanting Arctophila is still uncertain. Other questions need to be investigated that go beyond the techniques of transplanting Arctophila from one location to another. For instance, a measure of success needs to be developed. Does this success standard require that Arctophila fulva is growing over a certain percentage of a planting site after a specified time period, or does this newly created community need to function like an undisturbed community? If the latter success standard is applied, then we must learn how an undisturbed community functions. Transplanting Arctophila fulva appears to be a slow and laborious process but feasible from the biological perspective. The project was conducted for Arco, Inc. This study of Arctophila is similar to that conducted by BP (Pro.#83) except that this work was on the shores of lakes involving open and moving water (w/wave action) rather than impoundments, and was smaller in scale and staff than the BP research project.

Contacts:
Nancy J. Moore; Stoney J. Wright, Alaska Dept. of Natural Resources, Plant Materials Center, Palmer, AK 745-4469

References: Publication Date: Feb. 1991 Reference Type: Report
Author: Moore, Nancy J.; Wright, Stoney J.
Title: Revegetation with Arctophila fulva: final report 1985-1989

Other Information Sources:
Just the report.

Kuparuk Mine Site B — Identification Code: P0161

Short Description: Aanaaliq Lakes. Convert gravel pits to overwintering areas for fish in arctic.

Nearest Town: Kuparuk Camp Year Began: 1989 Status: Monitoring Successful: Yes

Additional Information:
In May 1989, 3 connection channels were excavated at Kuparuk Mine Site B. An 18 x 24m inlet channel was excavated to a depth of 1.8m between East Creek and the flooded gravel pit (dubbed as Aanaliq Lake, which had been flooded since 1978). Two similar size channels were dug between the two adjacent lake basins (former gravel pits), making it all one big lake with an island in the middle. The 2 connected basins have an average depth of 23ft. (7.0m) and maximum measured depth of 37ft (11.3m). The excavated channels provide a continuous open water connection between East Creek and the mine site. This pit/lake provides the only overwintering habitat in the East Creek system. In 1989, they introduced 200 large juvenile and adult grayling into the lake and monitored that population. By 1991, 50 large adult grayling remained.
In 1992, they introduced another 300 fish, ranging in size classes. The growth rates have been excellent, but the reproduction success of this population has been limited (not many young observed), possibly because of predation by 9-spine stickleback on grayling fry and/or eggs. If the grayling had been introduced earlier in the lake's formation, perhaps the stickleback would not have a competitive advantage over the grayling fry, allowing a greater level of reproductive success among grayling. In the associated revegetation experiment at Mine Site B (conducted by ABR for ARCO), the overburden received 3

treatments in the fall of 1988: unaided natural recolonization, fertilization, and fertilization + seeding with a natural grass mixture. Geese grazed heavily in the seeded grass areas. ABR's conclusion was that in this situation, where the overburden contained sufficient organic matter mixed in with sand, natural colonization worked well enough. Usually the overburden from a gravel mine consists of gravelly sand without many nutrients.

Contacts:
For fish habitat-- Carl Hemming, ADF&G, Fairbanks, 451-6192. Mike Joyce is the overall contact at ARCO, Anchorage, 265-6534. For revegetation study, Torre Jorgenson at Alaska Biological Research, Fairbanks, 455-6777.

References: Publication Date: Reference Type: ConfPro
Author: Hemming, Carl
Title: Eval of an Experimental Intro of Arctic Grayling to a Rehab. gravel extract site

Other Information Sources:
Talked to Carl Hemming, ADF&G, on 4/5/93. The paper cited above was presented at an AFS symposium on Fish Ecology in Arctic North America, May 19-21, 1992, in Fairbanks. Torre Jorgenson (ABR) says the revegetation study at this site is briefly described in "Land Rehabilitation Studies in the Kuparuk Oilfield, Alaska 1990," dated 1991, written by Alaska Biological Research (Torre is 1st author) for ARCO.

Kuparuk Mine Site D, Part 1

Identification Code: P0134

Short Description: Perched wetland creation & reveg on an overburden stockpile at Kuparuk grvl pit

Nearest Town: Kuparuk Camp Year Began: 1990 Status: Monitoring Successful: Yes

Additional Information:
See "Kuparuk Mine Site D, Part 2" (#P0139) for the fish habitat part of this gravel pit rehab project. The following details the treatment of overburden at the materials site, including overburden revegetation and wetland creation. After scarification, the entire overburden stockpile was fertilized & seeded with native grasses. The resulting plant cover was composed almost entirely of the seeded grass cultivars: Poa glauca (18.2%), Festuca rubra (12.6%) & Arctagrostis latifolia (3%). Several indigenous plants colonized the overburden, the most common being Braya purpurescens. After the first summer, seeded grass establishment was extremely good. The overburden at Mine Site D was gravelly mineral soil, w/o much organic content. For the wetland creation experiment, of principal interest was evaluating the use of berms for capturing drifting snow to increase soil moisture, and the use of topsoil to increase water storage & nutrient availability. Large berms (3-4 m high) were built to capture drifting snow, & small berms (1-2 m high) were built to impound meltwater in two ponds (north & south). A channel was cut into the berm to allow meltwater from both sides to flow into the basin. A total of 785 Arctophila fulva sprigs were transplanted & seeds of indigenous hydrophytic grass & sedge species were sown. Aquatic invertebrates, phytoplankton, bacteria, sediments & detritus were introduced. Survival of the transplanted A. fulva was high, providing a small amount of cover. Of the aquatic invertebrates, only Chironomidae were present after 6 weeks, probably from natural colonization rather than the introduction. The mortality of all other invertebrate taxa was probably due to poor habitat quality, lack of emergent vegetation or detritus. Wildlife use of the overburden pile & south pond indicated that the new habitat was highly desirable, so the objective of providing forage to compensate for lost habitat has already been achieved to some extent. At least 10 grazing caribou & shorebirds were seen at the pond's shore. Greater white-fronted geese & northern pintails were seen feeding & resting where A. fulva was transplanted. Additional forage was probably created by the combination of seeding & fertilizing, transplanting & colonizing. Water quality (e.g., pH) may need to be manipulated & more emergent vegetation may need to be introduced before the pond becomes suitable habitat for the introduced

invertebrate taxa. Further investigation is needed as to how to enhance the establishment of a diverse community of emergent vascular plants, benthic invertebrates, plankton, etc.

Contacts:
For wetland creation & reveg work: Torre Jorgenson, Timothy Cater, & Laura Jacobs at Alaska Biological Research (consultants for ARCO), Fairbanks, 455-6777. The overall contact is Mike Joyce at ARCO, Anchorage, 265-6534. Carl Hemming (ADF&G, Fbx, 451-6192) worked on the fish habitat rehab of the gravel pit itself (described under "Kuparuk Mine Site D, Part 2", #P0139.

References: Publication Date: April 1992 Reference Type: Report
Author: Jorgenson, M. Torre, Cater, Timothy C.; Jacobs, Laura L.
Title: Wetland creation & revegetation on an overburden stockpile at Mine Site D, Kupar
Other Information Sources:
Report only.

Kuparuk Mine Site D, Part 2 Identification Code: P0139

Short Description: Fish Habitat Rehab of Gravel Pit (see also Proj# 0134 for other work at site)

Nearest Town: Kuparuk Camp Year Began: 1990 Status: Implementation Successful: Partially

Additional Information:
See "Kuparuk Mine Site D, Part 1" (Project #0134) for discussion of related studies on overburden reveg and perched wetland creation at the same site. The following describes efforts to rehabilitate the gravel pit as fish habitat. In 1985, the entire flow of neighboring Charlie Creek was diverted into the mine site. In 1986, the water level of the pit reached the stream water surface level, reestablishing stream flow downstream of the mine site. Before the 1990 rehabilitation efforts, depth profiles indicated steep sides, flat basin floors, depths >10 m., little shoreline development, and a rectangular perimeter. In May, 1990, several inlet and outlet channels were constructed, the overburden berms on the south & west sides of the mine site were removed, the access road culvert was improved, and the two perched ponds on top of the overburden pile were excavated (the latter described under Project #0134). Material removed from the overburden berms was placed on top of the ice, to provide organic and fine grained material to the basin when the ice thawed. In 1992, 708 grayling were transplanted into the lake; cisco & stickleback were already present. The project was designed to provide fish rearing and possibly overwintering habitat. The site will be monitored in 1993 to determine survival, growth and reproductive success among the introduced grayling. If the recurring problem of one of the lake's outlet channels draining the lake too low can be fixed, the rehabilitation will be more effective. Previous attempts to plug the outlet channel have failed, but in 1993 this outlet channel will be plugged which should stabilize the water level both in the lake and in the other surface water connection (to Charlie Crk).

Contacts:
For the Fish Habitat work: Carl Hemming, ADF&G, Habitat Div., Fairbanks, 451-6192. Mike Joyce, ARCO, is the overall contact for Kuparuk Mine Site D, at 265-6534. The related study on overburden reveg & perched wetland creation (see Project #0139) was conducted by Torre Jorgenson et al. at Alaska Biological Research, Fbx, 455-6777.

References: None

Other Information Sources:
Talked to Carl Hemming, ADF&G, on 4/5/93. Some info contained in Carl's annual ADF&G technical reports (e.g., #89-1), which documented the pre-existing conditions.

Kuparuk River 119 Identification Code: P0012

Short Description: Rehab 3.5 gravel pad as compensation for 5 acre high value wetland fill

Nearest Town: Deadhorse Year Began: 1992 Status: Unknown Successful: Too soon

Additional Information:
The applicant's proposal was to remove & reuse gravel from a 3.5 acre West Sak 15 exploratory pad & to rehabilitate this site into high quality habitat. This was proposed as compensatory mitigation for a proposed fill of 24 wetland acres, 5 of which were considered high value habitat. The performance goal of the rehab is to create high-value wetland habitat consisting of a wet and moist tundra complex with shallow-water vegetated ponds. Carex aquatilis and Arctophila fulva were to be used in the revegetation.

Contacts:
Mike Joyce, ARCO, 265-6534. Terry Carpenter was probably the Corps contact.

References: None

Other Information Sources:
ACOE files.

Kuskokwim Streambank Bioenginr Identification Code: P0063

Short Description: SCS Streambank bioengineering trial at Upper Kalskag, Kuskokwim River

Nearest Town: Upper Kalskag Year Began: 1991 Status: Monitoring Successful: Partially

Additional Information:
Two "check dams" (also called sediment retention structures) were built of horizontally stacked spruce logs (6-8" diameter), soil, and brush at the outlet of 2 gullies. The new road above Mrs. Gregory's property had concentrated the water into certain areas (at culvert outlets) where it was cutting large gullies and eroding away her land. The intention of these structures was not to stop the flow of water running off from the new road area above, but to dissipate the water's energy as it filtered through the brush layers. [During the following season's runoff, one of the two check dams failed.] Below the check dams, the main river bank was stabilized using a brush and fill layering system. The vertical cut bank was graded into a series of shallow steps. Willow wattles were formed by laying out several cuttings in the same orientation and then taping them together. A wattle was placed at the rear of a "step", laid horizontally along the back of the step, perpendicular to the "fall line" of the slope. These wattles were secured with vertical stakes that extended from the wattle down into the bank. Live brush cuttings were placed with the cut ends under the wattles, and the ragged branches extending forward over the front of each step. Fill dirt was then placed over the entire area, covering the steps and willow wattles, leaving only approx. 2' of the protruding brush layers visible. The resulting slope was about a 3:1 gradient. Deb Swanson's observations: the willows were not cut and transplanted during their dormant season. June was probably too late for high transplanting success (the cuttings were already in leaf when planted). Some willow establishment did occur, however. Break-up was relatively mild during this stretch of the river in 1992, so the integrity of the bank stabilization project has not yet truly been tested.

Contacts:
Doug Witte, then at SCS, now at state DNR, originally did the work. At SCS, Anchorage, Deb Swanson (272-4119) has assumed some duties and visited the site in 1992.

References: Publication Date: July 18, 1991 Reference Type: Letter
Author: Witte, Douglas
Title: Kalskag River Bank Stabilization / Bioengineering Trial

Other Information Sources:
Talked to Deb Swanson, SCS, Anchorage, on 3/8/93. She had diagrams of the bioengineering design and photo records of the work year (1991) and following season (1992). Doug Witte's write-up of the project (listed above) is on SCS letterhead, and appears to be an accounting of the Kuskokwim River Basin Field Work done in 1991, with this project singled out and described on 5 pages.

Nome Creek Riparian Project

Identification Code: P0162

Short Description: Re-establishing floodplain community in placer mine tailings, BLM.

Nearest Town: Fairbanks Year Began: 1991 Status: Implementation Successful: Too soon

Additional Information:
The recommendation in the original Environmental Assessment (EA) was that the placer miner recontour the streambed before he left. This he attempted in 1990, but without satisfactory results. The river was creating new braiding channels. In 1991, BLM began a broad project to re-establish the dynamic equilibrium of the floodplain system along 3/4 mile of Nome Creek. Their goals were to: return invertebrate populations to natural levels, increase abundance of grayling and whitefish, maintain water quality, and determine a cost-efficient set of reclamation techniques to recommend on future EA's involving placer mining. They employed many of Dave Rosgen's principles in this reclamation design. In 1991, BLM recontoured the banks with heavy equipment to better direct the flow, and attempted to consolidate the creek by cutting off or restricting flow into bypass channels. The banks were terraced with high water events in mind (gravel transport, etc). The areas sufficiently recontoured were planted the following year (1992) with willow cuttings (2500 cuttings over 1 acre). The willows were planted right into the gravel tailings on the river's edge and floodplain. This particular area had been old settling ponds, so some fine sediments were present in the gravel for root establishment. Willow survival looks very high one year later. Smoothing and recontouring of the riparian zone continued in other sections in 1991-92. They terraced the floodplain and added a few bends in the stream to limit velocity. These bends may be reinforced in 1993 with riprap or root wads. They also intend to install several vortex rock weirs. The majority of the revegetation work will be done by 1994 (reseeding, more willow planting). Monitoring will primarily focus on invertebrate production because that is the stream indicator that responds most quickly to changes in water quality, the food chain, habitat, etc. Brian Lubinski expects a noticeable increase/ trend in invertebrates by 1998, with the numbers of juvenile fish expected to respond next.

Contacts:
Brian Lubinski (Fish Biology) and Jon Kostohrys (Hydrology), BLM, Steese\White Mountain District, Fairbanks, 474-2350

References: Report Expected

Other Information Sources:
Talked to Brian Lubinski, BLM, on 4/5/93. A basic reclamation plan for Nome Creek was written by BLM and ADF&G (Roger Post) in 1986 or 1987. In 1993-94, an internal report that summarizes the baseline data will come out.

Pebble Creek Identification Code: P0192

Short Description: Gravel removal & stream & lake rehabilitation at Kuparuk R. tributary

Nearest Town: Deadhorse Year Began: 1989 Status: Completed w/M Successful: Yes

Additional Information:
During spring breakup, the gravel access road would regularly washout at this site. ADF&G determined that the washout gravels did not present a barrier to fish movement, but that significant erosion of road fill materials in the stream & adjacent wetlands did occur. Abandoned culverts were also present in the road fill material. ADF&G recommended a rehabilitation plan including removal of outwashed gravel, removal of the road across stream & adjacent wetlands, reestablishment of stream channel below the road, & removal of existing culverts. Due to fish resources present & the degree of rehabilitation required, this project was rated an 8 (out of 10) in ADFG's priority evaluation of BP rehabilitation projects. Gravel was removed in two phases, using a backhoe in the channel during winter, and by ripping & front end loader on outwash gravels in wetlands. Removal of an upstream berm was accomplished during the summer using an URCA super sucker and hand removal. The culvert was also removed. A new creek channel was constructed in the extreme western portion of the project area to restore the channel to its original location. The renewed channel intercepted the existing channel on the south side of the removed road with a wide (apx.) 60 feet mouth to catch as much of the water as possible at breakup. Ponds had been lost due to road placement. At pond sites the road gravel was removed until the original ground was exposed. When completed, low areas corresponded with original conditions, as verified from aerial photos. At breakup, ponds nearly recreated pre-road conditions. During summer-fall 1992, Arctic grayling, slimy sculpin, ninespine stickleback & burbot were collected in Pebble Creek with clear indications of Arctic grayling spawning & rearing.

Contacts:
Al Ott, ADF&G, Habitat & Restoration Div., Fairbanks, 451-6192; Tom Barnes, BP Exploration, Environmental & Regulatory Affairs, Anchorage, 564-5154

References: Publication Date: Feb. 1993 Reference Type: Report
Author: BP Exploration
Title: 1992 BPX Cross Drainage Update

Other Information Sources:
Ott, Alvin G. An evaluation of the effectiveness of rehabilitation at selected streams in North Slope oilfields. Alaska Dept. of Fish & Game, Habitat & Restoration Div., April 1993 [report].

Pile Driver & 23 Mile Sloughs Identification Code: P0160

Short Description: Conversion from glacial to clear water as part of Chena Lakes Flood Ctrl Project

Nearest Town: North Pole Year Began: 1976 Status: Completed w/o M Successful: Yes

Additional Information:
In 1976, ACOE blocked the waters of the Tanana River from entering Pile Driver Slough and 23 Mile Slough at several points, to prevent the glacial waters from entering the sloughs and eroding ACOE flood control structures downstream. When the river inlets were blocked, the water in these sloughs turned clear, fed then only through groundwater filtration/upwellings through the gravel plugs (the water still originating from the Tanana River). Thus unintentionally they dramatically changed the quality of fish habitat in these two connected sloughs. Species composition changed from burbot and migrating salmon in the former glacial

waters, to grayling, whitefish, burbot, and spawning chum salmon in the clear waters. Sport Fish Division began stocking rainbow trout in the sloughs in 1987. Trout cannot successful overwinter in the sloughs, so they only stock catchable-sized rainbows now. They have conducted grayling assessments annually since 1990. Grayling appear to be utilizing the area well, with a population estimate of between 14,000 and 20,000 in the entire 16 miles of Pile Driver and 23 Mile Sloughs combined. Grayling may either migrate into Moose Creek or the Tanana River for the winter, or some may stay in the slough. Grayling spawning has been documented in the sloughs. The sloughs are now a highly popular recreational
fishing destination (17,000 recreation user-days in 1991). Vegetation increased in the channel area after the sloughs became clear. There are now rooted aquatic plants and algae in the channels.

Contacts:
John Shaake, ACOE, Fairbanks, 488-2748; Bob Clark, ADF&G, Sport Fish, Fairbanks, 456-4359. Al ownsend, ADF&G, Habitat, Fairbanks, 451-6192.

References: None

Other Information Sources:
Talked to Al Townsend, ADF&G, on 4/6/92; and Bob Clark, Sport Fish Division, Fairbanks, on 4/13/93.

Pile Driver Slough wetland rst — Identification Code: P0091

Short Description: Eielson wetland restoration following damage from construction activities

Nearest Town: Eielson — Year Began: 1985 — Status: Completed w/M — Successful: Yes

Additional Information:
During a road construction project near Eielson, a wetland adjacent to an overflow channel was damaged by fill & equipment movement. The Corps of Engineers required site restoration & the Alaska Plant Materials Center responded with a plan using 50% native American sloughgrass. The purpose of the planting was to determine the potential of reestablishing wetland species following construction activities. The disturbance was relatively small but typical of wetland disturbances in Alaska. The fill and equipment tracks were leveled and contoured to recreate a natural topography. During June 1985 the site was hand seeded with sloughgrass at a rate of 11.2 kg per ha. The area was then fertilized with 20-20-10 at a rate of 504 kg per ha. The site at Eielson was originally a grass community and the seeded species appear quite natural. By 1988, large, vigorous stands of Sloughgrass existed throughout the planting site. The result was 85% cover and a native reinvasion of Bluejoint and willow. This suggests that Sloughgrass seedings will not prevent native plants from invading a site.

Contacts:
Stoney Wright, Alaska Plant Materials Center, Palmer, 745-4469

References: — Publication Date: Jan. 1989 — Reference Type: Report
Author: Wright, Stoney J.
Title: Final rpt of data & observ. obtained for Chena flood control eval. plots...1985-

Other Information Sources:
Wright, S.J. Three case studies of successful wetland rehabilitation in Alaska using newly developed wetland cultivars, in: Land reclamation: advances in research & technology: proceedings of the intl. symp. 14-15 Dec. 1992, Nashville, pp. 151-159.

Pilgrim River @Nome-Taylor Hwy Identification Code: P0151

Short Description: Re-established access to rearing channels

Nearest Town: Nome Year Began: 1991 Status: Completed w/M Successful: Yes

Additional Information:
Subsequent observations found coho juveniles throughout the rearing channels which were rich with aquatic vegetation and insects. No coho were observed there before the 48" culvert re-opened access to the Pilgrim River. The building of the highway had isolated these side channels from the river since the 1950's. There may be a need for future gravel mining in this area, and fish habitat features for both sides of the highway have already been tentatively designed (e.g., chum spawning and coho and sockeye rearing habitat) This will not take place until ADOT requires new gravel material, but the area has been identified as having high potential for both source material and fish habitat opportunities.

Contacts:
Mac McLean, ADF&G, Fairbanks, 451-6192; Joel Craft, ADOT, Nome, 443-3444.

References: None

Other Information Sources:
Talked to Mac McLean, ADF&G, Fairbanks on 4/6/93. More info & photos are in files.

Prudhoe Airport Wetland Rest. *Identification Code: P0136*

Short Description: Experimental techniques to reveg. gravel access roads on tundra at ARCO Airport

Nearest Town: Deadhorse Year Began: 1988 Status: Monitoring Successful: Too soon

Additional Information:
The purpose of the research program was to investigate techniques for rehabilitating disturbed lands in Prudhoe Bay Oilfield, to evaluate environmental factors limiting revegetation of disturbed sites, & to develop techniques to overcome those limitations. Three gravel access roads were scraped down to a 4-6 inch thickness during the winter of 1988-89. Five plant-cultivation treatments were applied to each road: 1) no treatment; 2) fertilizer; 3) fertilizer & tundra plug transplants; 4) fertilizer & indigenous-sedge seed; 5) fertilizer & native grass-cultivar seed. After the 1st summer, plant cover was negligible in the natural, fertilizer & fertilizer & sedge-seed treatments. Some plant cover was found in the plug-transplant treatment, primarily due to Carex aquatilis and in the grass-cultivar treatment, due to the germination of grasses. Because the seedlings were immature, it was not possible to distinguish individual species. Lack of June & July rainfall contributed to poor germination in the 1st season, but seeds were expected to germinate the following year. The soils were primarily gravel (apx. 70%) & sand. Soil moisture & organic content were low. The rapid thaw settlement from the melting of ice wedges below the gravel provided some advantages for wetland restoration. The polygonization provides a diversity of soil & hydrologic characteristics in the troughs & polygon centers that is similar to natural tundra. Such habitat diversity provides a broader range of plant and invertebrate colonizers. The visual contrast between the flat, scraped area & adjacent tundra is reduced.

Contacts:
M. Torre Jorgenson; Janet G. Kidd

References: Publication Date: April 15, 1991 Reference Type: Report
Author: Jorgenson, M. Torre; Kidd, Janet G.
Title: Land rehabilitation studies in the Prudhoe Bay oilfield, Alaska, 1990

Other Information Sources:
All information taken from above report.

Put 27 Mine Site Identification Code: P0145

Short Description: BP's rehab of gravel mining site, Prudhoe Bay Unit.

Nearest Town: Deadhorse Year Began: 1990 Status: Monitoring Successful: Too soon

Additional Information:
In 1990, based on ADF&G's recommendations, BP excavated an inlet channel from the Put River to the abandoned (and dry) gravel pit. The intent of the project was to expand overwintering habitat in the Put River system. The breach was designed with a bottom width of 30 ft (9.1 m) a top width of 120 ft. (36.6m), a 3:1 side slope, and depth of 6ft (1.8m) below the surface elevation of the Put River. The mine site was filled with spring break-up waters by late-May 1990, forming a 35 acre (14.2 ha) lake containing an estimated 396M gal. of water. They sampled fish in Put 27 to evaluate colonization and use of the site in the first year (1990). They found 9 fish species, including those with marine, anadromous and freshwater life history patterns. Since 1990, however, water quality sampling indicates an increase in salinity. Current water quality conditions favor use by marine and anadromous fish species, rather than by freshwater species such as grayling. They hope to resample the lake's fish population in 1993.

Contacts:
Carl Hemming, ADF&G, Fairbanks, 451-6192; Tom Barnes, BP Exploration, Anchorage, 564-5154

References: Publication Date: 1990 Reference Type: Report
Author: Hemming, Carl R.
Title: Fish & Habitat Investigations of Flooded North Slop Gravel Mine Sites

Other Information Sources:
Talked to Carl Hemming, ADF&G, on 4/5/93.

Reserve Pit Remediation Identification Code: P0135

Short Description: Drill site 3O Kuparuk; Reveg on overburden cap overlying drill cuttings

Nearest Town: Deadhorse Year Began: 1989 Status: Monitoring Successful: Yes

Additional Information:
In 1989, the below-grade-freeze-back technique (a technique used for older reserve pits whereby materials are immobilized in a centralized below-grade pit that is capped and allowed to freeze back) for immobilizing drilled cuttings in permafrost was used at Drill Site 3O. Prior to drilling, two large pits were excavated to contain the drilled cuttings & the organic rich overburden was stockpiled on an adjacent ice pad. During drilling, cuttings with residual fluids were placed in the pits & then backfilled with the overburden to provide appropriate thermal protection & to prevent water from pooling on the surface. The small, pigging pit was not filled in. Both pits received very similar preparation & treatment and were considered portions of the same treatment. The areas were seeded (70% Poa glauca & 30% Festuca) & fertilized in Oct. 1989. While vegetation was sampled, site factors were evaluated as well. Mean total live cover doubled from 1990 (22.1%) to 1991 (48.1%). The dominant species were P. glauca & F. rubra. Mosses & algae were also present. Growth was probably due to favorable soil conditions such as moderately high nutrient levels & high organic content of the soil & high 1989 precipitation. The overburden soil appeared well suited to support plant growth & growth did not seem to be affected by saline conditions. Scat density was used as an indirect measure for wildlife use & casual observations indicated species

presence and evident grazing due to clipped leaves. This was 1 of 6 studies conducted in Kuparuk Oilfield to test 7 rehabilitation strategies. The results provided evidence that land rehabilitation in the Arctic is feasible and relatively rapid when adequate hydrologic & pedologic conditions are provided.

Contacts:
M. Torre Jorgenson; Timothy C. Cater

References: Publication Date: July 31, 1992 Reference Type: report
Author: Jorgenson, M. Torre; Cater, Timothy C.
Title: Land rehabilitation studies in the Kuparuk Oilfield, Alaska, 1991

Other Information Sources: Just the report.

Revegetation of X-Pad, Prudhoe Identification Code: P0065

Short Description: Revegetation on abandoned gravel drilling pad by BP.

Nearest Town: Deadhorse Year Began: 1989 Status: Monitoring Successful: Partially

Additional Information:
This project was undertaken as part of BP's research in anticipation of long-term reclamation projects in the arctic. Abandoned portions of the pad were reshaped or removed. Gravel from the site was reused in routine maintenance work in the oil field. Several sub-units of this project include: 1) the Abandoned Flare Pit site. In 1989, 3-6" of topsoil was placed where gravel had been removed, and the areas seeded with Alyeska Polargrass (Arctagrostis latifolia), Tundra Bluegrass (Poa glauca), and Arctared fescue (Festuca rubra). Dry granular fertilizer (20-20-10) was applied at 400 lbs/acre. The soil surface was scarified prior to dormant seeding. The area was re-fertilized in Sept, 1989. Revegetation appeared very successful, with species diversity, canopy cover and plant density all well developed. However, the thicknesses of the remaining gravel layer and topsoil did not meet Corps specifications in some restored areas. To correct this, in 1990 the topsoil was bladed aside, the gravel substrate was excavated to <6" above the original tundra, topsoil was replaced, scarified as a seed bed, reseeded and fertilized as before. 1990 was a drought summer and germination was only 10%. 1991 was a short cold season, and although 60% of the previous year's seeding germinated, the new plants did not mature much before winter. 2) At an area of gravel deposition on tundra between pad facilities, the gravel was hydroseeded in Sept 1988, but was unsuccessful, in part due to heavy snow cover and standing water. The gravel was removed in summer 1990. Since then the site has shown some vegetation recovery, but not a true success. 3) In 1989, an existing dump pit was removed and the area was subject to the same reclamation procedures outlined above under the Flare Pit. Judging by plant density, canopy cover, and seedhead production, this area appears to be doing well. At the first two sites, the X-Pad project has been somewhat disappointing, with only sparse vegetation showing. Most sprouts died quickly. Steve Lombard feels that they were just not as lucky on this site (in terms of rainfall when needed, etc.) as they had been on the BP Pad reveg site. The lack of success may also involve the soil chemistry at the X-Pad site, which they intend to investigate further.

Contacts:
Steve Lombard, BP exploration, Environmental and Regulatory Affairs, Anchorage, 564-5081, is the primary contact. Philip Smith, of PSA, Inc., Anchorage, worked on the seeding. Lloyd Fanter, ACOE, Anchorage, 753-2720, was the compliance person to whom all reports were submitted. He attended site visits as well.

References: None

Other Information Sources:
Steve Lombard (BPX) provided copies of the 1989, 1990, and 1991 progress reports submitted from BP (Steve Taylor) to the Corps of Engineers (addressed to Lloyd Fanter). These were submitted in letter form, designated as reports for work authorized under the Corps Letter #V-820741 and Corps Permit #N-820741, the latter also known as Beaufort Sea 353. Steve Lombard was interviewed about this project on 1/28/93. Photo records are available.

Tunalik Test Wellsite No. 1 Identification Code: P0031

Short Description: Long-term study of tundra vegetation on gravel pads

Nearest Town: Prudhoe Bay? Year Began: 1980 Status: Completed w/M Successful: Yes

Additional Information:
The drill pad had an insulated portion (underlain by styrofoam) and an uninsulated portion. When abandoned, a trench was cut through the taxiway to drain a large impoundment. The entire drilling pad, road, taxiway, and apron were seeded in 1980 and again in 1982 with a mixture of glaucous bluegrass (Poa glauca), red fescue (Festuca rubra), arctic polargrass (Arctagrostis latifolia), and Kentucky bluegrass (Poa pratensis). The same areas were fertilized in 1980 and 1982 with nitrogen, phosphorus, and potassium. The airstrip was neither seeded nor fertilized (a control). The site was revisited in 1984, and re-examined in 1991. Presence/absence of plant cover species were recorded in each treatment area each time. Wildlife observations (lemming grazing, caribou and waterfowl use) were recorded. The non-insulated portion of the drilling pad has undergone thermokarst, forming pools and troughs. These moister areas supported a variety of native species in addition to the species seeded. The insulated portion had glaucous bluegrass and moss, as did most dry sites in the seeded /fertilized zones. Different native species (typical of gravel bars and sandbars) occurred on the unseeded airstrip. In 1991 the researchers also noticed that vegetation (wet sedge meadow) previously damaged by contaminated drainage from the "reserve pit" had recovered. These people intend to continue monitoring over time. See article for more info.

Contacts:
Jay McKendrick, UAF Professor, based out of the UAF Agriculture & Forestry Experimental Station, Palmer

References: Publication Date: January 1992 Reference Type: Journal
Author: McKendrick, Jay D., Peter C. Scorup, Warren E. Fiscus, etc.
Title: Lessons form the Tunalik Test Wellsite No. 1--National Petroleum Reserve in AK

Other Information Sources:
Just the article.

Index to Database Records

F. INDEX TO DATABASE REPORTS

Restoration or enhancement projects are grouped in the following categories:

EXPERIMENTAL ATTEMPTS (continued)

Lake Rearing Cover Enhancement	SoEast
Lemon Creek 9	SoEast
North Eagle River Interchange	SCenSW
Nulbay Park Mitigation Proj.	SCenSW
Oiled Mussel Bed Manipulation	SCenSW
Palmer Hay Flats Waterfowl Enc	SCenSW
Pavlov Marsh Wildlife Viewing	SoEast
Pile Driver Slough wetland rst	NorInt
Potter Marsh Waterfowl Enhcmnt	SCenSW
Prudhoe Airport Wetland Rest.	NorInt
Stump Lake H2O Control Structr	SCenSW
Tunalik Test Wellsite No. 1	NorInt
Tyee Hydroelectric Spawning Ch	SoEast
USFS 1964 Earthquake Streamwrk	SCenSW
USFS Cordova Distr. Fishpasses	SCenSW

FILL--

•REMOVAL/RECOVERY

Anton Larsen Bay	SCenSW
Cominco Port Disposal Pit	NorInt
Fill Removal-- Potter Marsh	SCenSW
Kenai River Wetland	SCenSW
Pile Driver Slough wetland rst	NorInt

•TRADEOFFS FOR MISC. FILLS

4th of July Creek Mitigation	SCenSW
Captains Bay 14;Unalaska Crk	SCenSW
Campbell Creek 57	SCenSW
Chena River Gravel Pit, Fbx	NorInt
Chester Creek Realignment	SCenSW
Concord Hills/ Klatt Bog Mitg.	SCenSW
Eielson mit for illegal fill	NorInt
Fill Removal-- Potter Marsh	SCenSW
Fish Creek Coastal Wetland Rst	SCenSW
Huffman Hills Conserv.Easement	SCenSW
Jordan Creek 8	SoEast
Little Campbell Crk. Enhancmt.	SCenSW
Nulbay Park Mitigation Proj.	SCenSW
Shaishnikof River fish pass	SCenSW
Westchester Lagoon Offsite Mit	SCenSW

FISH HABITAT IMPROVEMENT ACTIONS--

•ADDITION OF LARGE ORGANIC DEBRIS

ADOT Hoonah Airport Expansion	SoEast
Bennett Creek	SoEast
Big Boulder Creek	SoEast
Chester Creek Realignment	SCenSW
Dog Salmon Creek, Site #1	SoEast
Dog Salmon Creek, Site #2	SoEast
FRED projects on Campbell Ck	SCenSW
FS Stream Cover/ Brush Bundles	SCenSW
Haines Airport Mitigation	SoEast
Harrison Lagoon Creek	SCenSW

FISH HABITAT IMPROVEMENT ACTIONS--

•ADDITION OF LARGE ORGANIC DEBRIS (continued)

Johns Creek	SCenSW
Juneau Airport Taxiway/GC 341	SoEast
Kennel Crk Large Woody Debris	SoEast
Lake Rearing Cover Enhancement	SoEast
Little Campbell Crk. Enhancmt.	SCenSW
Man Made Hole	SoEast
Martin River Delta Fish Ponds	SCenSW
Mitchell Pool Enhancement	SoEast
Mud Bay River LG Woody Debris	SoEast
North Eagle River Interchange	SCenSW
Portage Airstrip Ponds	SCenSW
Portage Alder Pond	SCenSW
Resurrection Crk Fish Habitat	SCenSW
Starrigavin Creek	SoEast
Suntaheen Crk Lg Woody Debris	SoEast
Switzer Creek Restoration	SoEast
Tangle Ponds in Portage Valley	SCenSW
Trapper Creek Step Pools	SCenSW
Tributary "A" Rearing Enhancmt	SCenSW
Williwaw Ponds & Spawning Chl	SCenSW

•BOULDER PLACEMENT

Abbott Loop Sch Crk Realignmnt	SCenSW
ADOT Hoonah Airport Expansion	SoEast
Bearing Tree Creek	NorInt
Big Boulder Creek	SoEast
California Creek Culvert&Pools	SCenSW
Chester Creek Realignment	SCenSW
CIAA Fish Passes	SCenSW
Darling Creek	NorInt
Glacier Dtrict PWS Fishpasses	SCenSW
Haines Airport Mitigation	SoEast
Johns Creek	SCenSW
Lemon Creek 1-4	SoEast
Little Campbell Crk. Enhancmt.	SCenSW
Mitkof Highway Reconstruction	SoEast
North Eagle River Interchange	SCenSW
Rabbit Crk Step Pools Below RR	SCenSW
Resurrection Crk Fish Habitat	SCenSW
Solomon Gulch Tail Race	SCenSW
Trapper Creek Step Pools	SCenSW

•CULVERT INSTALLATION

Atigun Pass Riparian Rehab	NorInt
Banner Ck Material Site	NorInt
Bearing Tree Creek	NorInt
BP & Arco Cross Drainage Projs	NorInt
Canyon Slough	SCenSW
Captains Bay 14;Unalaska Crk	SCenSW
Darling Creek	NorInt
Denali Clearwater Creek	NorInt

FISH HABITAT IMPROVEMENT ACTIONS--
•CULVERT INSTALLATION (continued)

Glacier Highway Reconstruction	SoEast
Juneau Airport Taxiway/GC 341	SoEast
Kink Corner Gravel Pit	NorInt
Mitkof Highway Reconstruction	SoEast
North Three Mile Creek	SoEast
Pilgrim River @Nome-Taylor Hwy	NorInt
Soldotna Creek Culvert	SCenSW

•FISH PASSAGE

ARCO Sag Site C	NorInt
Bayhead Ck Barrier Modific.	SoEast
Bear Lake Fertilization	SCenSW
Beaver Dam Blockages	SCenSW
Beaver Pond Access Structures	SCenSW
Bennett Creek	SoEast
Brooks River Fish Ladder	SCenSW
Bryce Creek Coho Rearing Area	SoEast
Campbell Lake Outlet	SCenSW
Captains Bay 14;Unalaska Crk	SCenSW
Chilkat River Pond Access	SoEast
CIAA Fish Passes	SCenSW
Dean Creek Fishway	SoEast
Denali Clearwater Creek	NorInt
Glacier Dtrict PWS Fishpasses	SCenSW
Green's Creek Fish Pass	SoEast
Jordan Creek 8	SoEast
Kink Corner Gravel Pit	NorInt
Kuparuk Mine Site B	NorInt
Kwatahein Fishway	SoEast
Mitchell Creek Fish Pass	SoEast
N.F. Game Ck Barrier Modif.	SoEast
North Eagle River Interchange	SCenSW
North Three Mile Creek	SoEast
Ophir Creek Flow Improvement	SoEast
Packers Lake Fertilization	SCenSW
Paint River Fish Ladder	SCenSW
Pavlof River Upper Fishpass	SoEast
Put 27 Mine Site	NorInt
Rabbit Creek Fishpass	SCenSW
Rabbit Crk Step Pools Below RR	SCenSW
Shaishnikof River fish pass	SCenSW
Slippery Creek Fishway	SoEast
Soldotna Creek Culvert	SCenSW
Suntaheen Ck Pink Slmn Barrier	SoEast
Suntaheen Fishpasses I & II	SoEast
Switzer Creek Restoration	SoEast
Trapper Creek Step Pools	SCenSW
USFS Cordova Distr. Fishpasses	SCenSW
Virginia Lake Fert. & Fishpass	SoEast

FISH HABITAT IMPROVEMENT ACTIONS--
•GRAVEL WORK (addition or cleaning)

BP & Arco Cross Drainage Projs	NorInt
FS Cordova Dstr.Spawning Chnls	SCenSW
Glacier Highway Reconstruction	SoEast
Glen Creek in Denali Natl Park	NorInt
Goodnews Platinum Mine	SCenSW
Marx Creek Spawning Channel	SoEast
Mitchell Pool Enhancement	SoEast
New Chenega Road Construction	SCenSW
Pebble Creek	NorInt
Solomon Gulch Tail Race	SCenSW
Tyee Hydroelectric Spawning Ch	SoEast
West Camden Egg Boxes	SoEast

•INCUBATION BOXES

Big Boulder Creek	SoEast
Packers Lake Fertilization	SCenSW
Paint River Fish Ladder	SCenSW
West Camden Egg Boxes	SoEast

•LAKE FERTILIZATION

Bear Lake Fertilization	SCenSW
Coghill Lake Fertilization	SCenSW
Larson Lake Fertilization	SCenSW
Packers Lake Fertilization	SCenSW
Tokun Lake Fertilization	SCenSW
Virginia Lake Fert. & Fishpass	SoEast

•LIVE VEGETATION (in stream or for bank stabilization)

Abbott Loop Sch Crk Realignmnt	SCenSW
Atigun Pass Riparian Rehab	NorInt
Banner Ck Material Site	NorInt
Campbell Lake Outlet	SCenSW
Chester Creek Realignment	SCenSW
Cordova Dstr Gravel Pit Rehabs	SCenSW
Dog Salmon Creek, Site #2	SoEast
Glacier Highway Reconstruction	SoEast
Glen Creek in Denali Natl Park	NorInt
Juneau Airport Taxiway/GC 341	SoEast
Lemon Creek 1-4	SoEast
Lemon Creek 9	SoEast
Lyon Creek Ponds	SCenSW
Marx Creek Spawning Channel	SoEast
Nome Creek Riparian Project	NorInt
North Eagle River Interchange	SCenSW
Resurrection Crk Fish Habitat	SCenSW
Tangle Ponds in Portage Valley	SCenSW

•OTHER ARTIFICIAL STRUCTURES

Bearing Tree Creek	NorInt
California Creek Culvert&Pools	SCenSW
Campbell Lake Outlet	SCenSW

FISH HABITAT IMPROVEMENT ACTIONS--
•OTHER ARTIFICIAL STRUCTURES (continued)

Cordova Dstr Gravel Pit Rehabs	SCenSW
Darling Creek	NorInt
Dave's Creek	SCenSW
Denali Clearwater Creek	NorInt
Dog Salmon Creek, Site #1	SoEast
FRED projects on Campbell Ck	SCenSW
FS Stream Cover/ Brush Bundles	SCenSW
Glacier Dtrict PWS Fishpasses	SCenSW
Jap Creek Mitigation	SCenSW
Lemon Creek 1-4	SoEast
Man Made Hole	SoEast
Martin River Delta Fish Ponds	SCenSW
Mitkof Highway Reconstruction	SoEast
Nome Creek Riparian Project	NorInt
Potter Marsh Creation	SCenSW
Rabbit Creek Fishpass	SCenSW
Soldotna Creek Culvert	SCenSW
Solomon Gulch Tail Race	SCenSW
Stump Lake H2O Control Structr	SCenSW
Trapper Creek Step Pools	SCenSW
Tyee Hydroelectric Spawning Ch	SoEast
USFS 1964 Earthquake Streamwrk	SCenSW
USFS Cordova Distr. Fishpasses	SCenSW

•REFUSE REMOVAL

BP & Arco Cross Drainage Projs	NorInt
Dog Salmon Creek, Site #1	SoEast
Goodnews Platinum Mine	SCenSW
North Three Mile Creek	SoEast
Switzer Creek Restoration	SoEast
USFS Log/Debris Removal Progrm	SCenSW
West Camden Egg Boxes	SoEast

•RIPARIAN ZONE

Abbott Loop Sch Crk Realignmnt	SCenSW
Atigun Pass Riparian Rehab	NorInt
California Creek Culvert&Pools	SCenSW
Dog Salmon Creek, Site #2	SoEast
Glen Creek in Denali Natl Park	NorInt
Little Campbell Crk. Enhancmt.	SCenSW
Nome Creek Riparian Project	NorInt

•SPAWNING CHANNELS

24 Mile Spawning Channel	SoEast
4th of July Creek Mitigation	SCenSW
ADOT Hoonah Airport Expansion	SoEast
Canyon Slough	SCenSW
Dave's Creek	SCenSW
East Fork Chena River	NorInt
Explorer Creek & Ponds	SCenSW
FS Cordova Dstr.Spawning Chnls	SCenSW
Harrison Lagoon Creek	SCenSW

FISH HABITAT IMPROVEMENT ACTIONS--
•SPAWNING CHANNELS (continued)

Herman Creek	SoEast
Jap Creek Mitigation	SCenSW
Johns Creek	SCenSW
Koppenberg Mine	NorInt
Lyon Creek Ponds	SCenSW
Martin River Delta Fish Ponds	SCenSW
Marx Creek Spawning Channel	SoEast
New Chenega Road Construction	SCenSW
Pigot Bay Spawning Channel	SCenSW
Potter Creek Rechannel	SCenSW
Solomon Gulch Tail Race	SCenSW
Tyee Hydroelectric Spawning Ch	SoEast
USFS 1964 Earthquake Streamwrk	SCenSW
Williwaw Ponds & Spawning Chl	SCenSW

HARVEST OBJECTIVES (of shellfish, commercial fish, etc.)

Bayhead Ck Barrier Modific.	SoEast
Bear Lake Fertilization	SCenSW
Beaver Dam Blockages	SCenSW
Beaver Pond Access Structures	SCenSW
Brooks River Fish Ladder	SCenSW
Bryce Creek Coho Rearing Area	SoEast
CIAA Fish Passes	SCenSW
CIAA Flow Control Structures	SCenSW
Coghill Lake Fertilization	SCenSW
Dean Creek Fishway	SoEast
Glacier Dtrict PWS Fishpasses	SCenSW
Harrison Lagoon Creek	SCenSW
Kwatahein Fishway	SoEast
Lake Rearing Cover Enhancement	SoEast
Larson Lake Fertilization	SCenSW
Mitchell Creek Fish Pass	SoEast
N.F. Game Ck Barrier Modif.	SoEast
Packers Lake Fertilization	SCenSW
Paint River Fish Ladder	SCenSW
Pavlof River Upper Fishpass	SoEast
Pigot Bay Spawning Channel	SCenSW
Slippery Creek Fishway	SoEast
Suntaheen Ck Pink Slmn Barrier	SoEast
Suntaheen Fishpasses I & II	SoEast
Tokun Lake Fertilization	SCenSW
USFS Cordova Distr. Fishpasses	SCenSW
Virginia Lake Fert. & Fishpass	SoEast

HIGHWAY/ROAD--
•MITIGATION FOR DEVELOPMENT OF

Banner Ck Material Site	NorInt
Big Boulder Creek	SoEast
Bradley Lake Waterfowl Nesting	SCenSW
Darling Creek	NorInt
Delong Highway Stream Crossing	NorInt

RECREATIONAL/EDUCATIONAL OBJECTIVES (continued)

Nome Creek Riparian Project	NorInt
North Three Mile Creek	SoEast
Otter Lake Recreation Area	SCenSW
Pavlov Marsh Wildlife Viewing	SoEast
Portage Airstrip Ponds	SCenSW
Portage Alder Pond	SCenSW
Stump Lake H2O Control Structr	SCenSW
Tangle Ponds in Portage Valley	SCenSW
Westchester Lagoon Formation	SCenSW

RIVERINE HABITAT (over 50 projects), see "Summary Table," Section D

SHOREBIRD HABITAT IMPROVEMENT

BP's Arctophila reveg research	NorInt
Chena River Gravel Pit, Fbx	NorInt
Fish Creek Mouth Waterfowl Enh	SCenSW
Kuparuk Mine Site D, Part 1	NorInt
Mendenhall Dredge Islands	SoEast
Nulbay Park Mitigation Proj.	SCenSW
Reserve Pit Remediation	NorInt
Westchester Lagoon Offsite Mit	SCenSW

TARGET HABITAT USE--

•NESTING

Bayshore Ponds & Berms	SCenSW
Bradley Lake Waterfowl Nesting	SCenSW
Canada Geese Nest Island Prgm	SCenSW
Canada Geese Peninsula Cutoffs	SCenSW
Concord Hills/ Klatt Bog Mitg.	SCenSW
Creamer's Field Waterfowl Proj	NorInt
Fish Creek Coastal Wetland Rst	SCenSW
Fish Creek Mouth Waterfowl Enh	SCenSW
Mendenhall Dredge Islands	SoEast
Otter Lake Recreation Area	SCenSW
Palmer Hay Flats Waterfowl Enc	SCenSW
Pavlov Marsh Wildlife Viewing	SoEast
Potter Marsh Waterfowl Enhcmnt	SCenSW
Twentymile R. Waterfowl Imprvt	SCenSW
Westchester Lagoon Formation	SCenSW

•OVERWINTERING

ARCO Sag Site C	NorInt
Banner Ck Material Site	NorInt
Bryce Creek Coho Rearing Area	SoEast
Cordova Dstr Gravel Pit Rehabs	SCenSW
Explorer Creek & Ponds	SCenSW
FS Stream Cover/ Brush Bundles	SCenSW
Goodnews Platinum Mine	SCenSW
Green's Creek Fish Pass	SoEast
Kennel Crk Large Woody Debris	SoEast
Kink Corner Gravel Pit	NorInt

TARGET HABITAT USE--

•OVERWINTERING (continued)

Kuparuk Mine Site B	NorInt
North Eagle River Interchange	SCenSW
Portage Airstrip Ponds	SCenSW
Portage Alder Pond	SCenSW
Put 27 Mine Site	NorInt
Resurrection Crk Fish Habitat	SCenSW
Soldotna Creek Culvert	SCenSW
Starrigavin Creek	SoEast
Suntaheen Crk Lg Woody Debris	SoEast
Tangle Ponds in Portage Valley	SCenSW
West Camden Egg Boxes	SoEast

•REARING (over 50 projects), see "Summary Table," Section D

•SPAWNING (over 50 projects), see "Summary Table," Section D

•STAGING

Bradley Lake Waterfowl Nesting	SCenSW
Concord Hills/ Klatt Bog Mitg.	SCenSW
Creamer's Field Crane Project	NorInt
Nulbay Park Mitigation Proj.	SCenSW
Westchester Lagoon Offsite Mit	SCenSW

TARGET SPECIES--

•ARCTIC GRAYLING

ARCO Sag Site C	NorInt
Atigun Pass Riparian Rehab	NorInt
Banner Ck Material Site	NorInt
Bearing Tree Creek	NorInt
BP & Arco Cross Drainage Projs	NorInt
Denali Clearwater Creek	NorInt
East Fork Chena River	NorInt
Fishing & Aquatic Ed Pond Proj	NorInt
Goose Green Gulch	NorInt
Koppenberg Mine	NorInt
Kuparuk Mine Site B	NorInt
Kuparuk Mine Site D, Part 2	NorInt
North Eagle River Interchange	SCenSW
Pebble Creek	NorInt
Portage Airstrip Ponds	SCenSW
Put 27 Mine Site	NorInt
Tangle Ponds in Portage Valley	SCenSW

•CANADA GEESE

Canada Geese Nest Island Prgm	SCenSW
Canada Geese Peninsula Cutoffs	SCenSW
Otter Lake Recreation Area	SCenSW
Pavlov Marsh Wildlife Viewing	SoEast

TARGET SPECIES--(continued)

TARGET SPECIES--

Chapter 3

Case Studies

CHAPTER 3. CASE STUDIES

A. SELECTION OF CASE STUDY PROJECTS

Although the project inventory effectively portrays the range of aquatic habitat restoration or enhancement work that has been conducted in the state, many questions remain unanswered. In order to take direction for future efforts based on previous experience, it is important to address other issues, such as: the amount of "return" or desired result realized for the investment of time, labor, and materials; the feasibility of restoring different types of aquatic habitat, including hidden costs or other difficulties; and identifying features that are often overlooked.

These questions reflect one of the main goals of this project--identifying the types of aquatic habitat restoration or enhancement that appear to be most effective for the effort, so as to direct any future actions towards the most worthwhile undertakings.

In order to address these remaining questions, during the second year of this grant several of the previously identified aquatic restoration and enhancement projects will be investigated in greater depth. Case histories will be developed for each project selected. This approach will provide a closer look at the types of projects of most interest in Alaska, the constraints involved and the lessons learned from the restoration attempts. Many of the case study sites will be visited first-hand in the summer and fall of 1993 and evaluated as to their current level of effectiveness; when appropriate, the case histories will also include a synopsis of certain projects that are already documented in other reports or investigations (e.g., the Glenn Highway project). Field inspections may not be necessary in those cases.

The case histories are expected to include the following components (adapted from EPA, 1989). Although many of the headings are similar to those in the project inventory in Chapter 2, the case history report will discuss each project in more depth and with relevence to future applications.

Project name & type (short description)
Aquatic habitat type, location, size, map
Goals & specific objectives of project
Implementation methods (include estimated costs, if possible)
Judgement of success (including what they were or weren't able to achieve, what problems were encountered, impediments to success).
Lessons learned (including what participants feel should have been done differently)
Significance of the project (e.g., novel approach or specific goals, whether it is part of a long term research project, etc.)
"For Further Information" (i.e., contact persons and any written reports)

The target audience for the case history descriptions has been identified as permit reviewers and others involved in local planning and land use decisions (for example, coastal district staff).

Defining Categories of Interest

In developing a strategy to select case study projects, the first step was to define which types of projects were most important to illustrate. Several criteria were considered:

- *Types of aquatic habitats impacted most often in Alaska.* Focusing project evaluation efforts on techniques that have been used to restore or enhance the aquatic habitats that are impacted most often (e.g., bank stabilizations) would ensure that our results are immediately useful or applicable to current needs.

- *Type of impacts anticipated in the future.* Selecting project examples which represent obvious or growing development trends in the state would also ensure that pertinent issues are addressed within the case studies (e.g., if airport expansion in tidal areas is occurring in coastal communities around the state, we might want to include a review of that type of project and discuss which methods appear to be the most promising).

- *Redundant evaluation efforts.* Efficiency might dictate that we give a lower priority to those types of restoration or enhancement projects that have been extensively discussed in other works (e.g., gravel pits in the northern or interior area, which are the topic of another Alaska Department of Fish and Game Technical Report).

The considerations above led us to assess which types of aquatic habitat restoration and enhancement projects in Alaska were of primary interest for case study selection. A review of the contents of the database itself revealed several categories of common project types. Members of the interagency advisory group for this study, composed of permit reviewers, researchers, and local land use planners, also suggested several categories of particular interest to them. The resulting list of categories represents project types that are either commonly encountered in the state (and/or of particular interest in the future) or those that address specific information needs.

Rehabilitating gravel pits/gravel mined areas into fish habitat
Correcting fish access to perched culverts on streams
Adding cover to fish habitats
Increasing fish rearing and overwintering areas either by excavating or by reconnecting access to side waterways
Fish spawning channels
Stream realignments, bank and riparian habitat restorations (e.g. Canyon Slough, Abbott Loop School)
Airport expansion in wetlands with fish habitat considerations
Impounding water in new areas for waterfowl (& fish) use
Trade-offs or other optimization of remaining habitat when wetland fills are approved
Intertidal restorations

Selecting Individual Projects

Once the categories of interest were established, the next step was to select which individual project sites would best represent them as case histories. This was not a simple process of selecting one or two projects per category, because frequently more than one type of activity occurs at each location.

Numerous considerations were also involved in selecting the specific case study sites, such as:

- *Age of Projects*. Selecting "older" projects to review (i.e., those that have been in place for several years) might make it easier to conclude the direction of progress towards or away from the project objectives.

- *Point of Reference*. The job of evaluation would also be easier if selected sites had adequate baseline or "pre-project" data available, so that the progress of the restoration/ enhancement could be assessed by comparing the "before" and "after" values.

- *Relative Level of Success*. The level of success was an important consideration because we wanted to chronicle projects that had succeeded as well as those that had not, since often more is learned from an attempt that was "almost" successful than from one which appeared to work well, for reasons never identified.

- *Access*. It is important to consider the likelihood of receiving permission to visit project sites on private property (for field inspections) when making case study selections.

- *Uniqueness or significance of project*. For example, if only one tidal salt marsh restoration has been attempted to date, perhaps it should be prioritized as a case study so the limited information is readily available to coastal districts and agency staff.

Of course, the number of people, time and travel funds available for the case studies also influenced our decision to visit only a few different communities, while at the same time trying to survey projects which represent the informational needs of coastal communities across the state. The geographical areas or topics that were already covered by other ADF&G reports (e.g., gravel pit rehabilitations in the northern and interior region of the state) were not addressed within the case study selection.

The possible case study projects, the categories they represent, and other considerations are listed below in Table 2. The criteria above will continue to be applied to this list, eventually yielding 20 to 25 projects for case history development.

TABLE 2. POSSIBLE CASE STUDY PROJECTS

PROJECT NAME and/or description	CATEGORY	LOCATION	YEAR STARTED	SUCCESS-FUL?	SITE VISIT OR SUMMARIZE OTHER INFO?	PROS/CONS FOR INCLUDING
Gastineau Channel 302 (P42)	GRAVEL MINING REHAB	Juneau	1992	Unknown	Visit	There aren't many examples of intertidal gravel mining rehabilitation. Messy history with landowners; access could be a problem.
Williwaw Ponds & Spawning Channel (P42)	GRAVEL MINING REHAB, SPAWNING CHANNEL	Portage	1984-present	Partial success	Visit	Just about finished. Has some rearing fish; ponds still very sterile.
Bradley Lake Hydroelectric Plant (Martin River) turning borrow pits into fish habitat (P68)	GRAVEL MINING REHAB, REARING/OV AREAS, SPAWNING CHANNEL	Homer, Kachemak Bay	1991	Unknown, some pinks	Visit	They were not required to monitor. Rearing and spawning into Katchemak Bay
Mile 18 area, Cordova District Gravel Pit Rehabs (P80)	GRAVEL MINING REHAB, REARING/OV AREAS	Cordova	1978-2 ponds 1991-2 ponds	Yes	?	Fairly good data from such a long time ago
Lemon Crk 1-4 rehabilitation of gravel-mined stream (P43)	GRAVEL MINING REHAB, REARING/OV AREAS, RIPARIAN HABITAT	Juneau	1989-92	Yes	Visit	Alders have taken well; creek will be more stable when gravel mining operations cease completely.
Captain's Bay, Unalaska Creek-- Ladder for perched culvert (P178)	PERCHED CULVERT CORRECTION	Unalaska	1989-90	Partial success	Write-Up Only	Nice design, but troublesome without continued maintenance
Trapper Creek Step Pools (P54)	PERCHED CULVERT CORRECTION	Trapper Creek	1990	Success	Visit	Only example of this approach to perched culverts that ADOT/PF has done to date
Rabbit Creek Fish Pass-- Step Pools and Riparian Vegetation (P115)	PERCHED CULVERT CORRECTION, RIPARIAN HABITAT	Anchorage	1988	PC-yes, RH-no, overgrazed	Visit	Perched culvert technique was mostly a success, would have done it differently now. Vegetation was unsuccessful due to grazing.
Juneau Taxiway--Gastineau channel 341 (P54). Replaced perched with arched culvert over Jordan Crk; added limbs as cover above	PERCHED CULVERT CORRECTION, COVER, AIRPORT EXPANSION, INTERTIDAL (1991, on other side of airport)	Juneau	1991-92	Yes but new	Visit	Perched culvert replaced with arched on Jordan Crk, boulders and LOD added above. On Temsco property, experimental replacement of intertidal slough area; geese there now.

Table 2 (continued). Possible Case Study Projects

PROJECT NAME and/or description	CATEGORY	LOCATION	YEAR STARTED	SUCCESS-FUL?	SITE VISIT OR SUMMARIZE OTHER INFO?	PROS/CONS FOR INCLUDING
USFS Cordova brush bundles, stream covers (P77)	COVER	Cordova	1986-92	New	Visit, or they could recount?	Well set up to evaluate, no evaluation as yet
Hoonah Airport Mitigation (P9); Created a complex of fish habitat (streams and rearing sloughs) as mitigation for intertidal fill	COVER, REARING/OV AREAS, SPAWNING IMPROVEMENT, GRAVEL MINING REHAB, AIRPORT EXPANSION	Hoonah	1992	New	?	Interesting attempt at a variety of habitat improvements in one place. Cable-anchored trees for cover, formed intertidal pools, improved spawning habitat. 1993 will be first year to monitor.
Big Boulder Creek. Fish habitat improvements as highway mitigation (P37)	COVER	Haines	1992	New	?	Cabled logs along 300 m of stream in 1992; Kevin Brownlee will monitor
Kennel Creek Large Woody Debris (P128)	COVER	Tenakee Springs	1986, eval in 1992	Too soon	Write-up	They have very good data--e.g., snorkling evaluation of fish use of different areas in Oct. 1992. Will monitor fish habitat preference & fish density, cross sections of channel for scour and deposition around debris structures
Mud Bay River Lg Woody Debris (P130). Felled trees into creeks w/ explosives in steril sections. Extensive pre-project monitoring	COVER	Hoonah	1984-85	Unknown	Visit?	Very good pre-project measurement of habitat parameters, and immediately afterwards for that first year only (juvenile cohos observed). 5 year monitoring was never done.
Starrigavin Creek (P170) Primarily stop-log dam structures for pooling; also some large woody debris additions	STREAM STRUCTURES, COVER, OVER-WINTERING HABITAT	Sitka	1986	Yes	Write-Up Only	They have reports & very good data. Will be a Ph.D. dissertation. Coho densities twice as high in structured section as in control section; overwintering capacity increased substantially
Chilkat River Rearing Pond Access (P41)	REARING/OV AREAS	Haines	1980	Yes	Write-Up or Visit	Good data--they followed up with a tagging study, and could calculate the economic gain from higher fish returns
Glacier Highway Reconstruction (P39)	REARING/OV AREAS, RIPARIAN HABITAT	Juneau	1984	Yes	Visit	Monitored by Sport Fish Division for two years
Chugach National Forest's 25 Mile Spawning Channel (P78)	SPAWNING CHANNEL	Cordova	1984-1987	Partial	Visit? (some info)	Successful at first, then silted in the gravels--they're trying different remedies

Table 2 (continued). Possible Case Study Projects

PROJECT NAME and/or description	CATEGORY	LOCATION	YEAR STARTED	SUCCESS-FUL?	SITE VISIT OR SUMMARIZE OTHER INFO?	PROS/CONS FOR INCLUDING
Box Canyon Creek Spawning channel & rearing ponds (P144)	SPAWNING CHANNEL, REARING/OV AREAS	Seward	1986	Partial	Visit	Still good potential, but needs monitoring provisions--problems with garbage, beavers, & erosion
4th of July Crk spawning channel as mitigation for habitat loss (Marine Industrial Facility) (P141)	SPAWNING CHANNEL	Seward	1981	Only in short-term	Visit OK	Worked for chum salmon spawning at first, then waves created berm closing off access. Not engineered correctly
Abbott Loop School Creek realignment (P176)	RIPARIAN HABITAT, REALIGNMENTS	Anchorage	1987-88	Worked well	Visit	A success story, but also better funded than most projects. Good data, not much recently.
Canyon Slough Realignment as part of TAPS route (P108)	RIPARIAN HABITAT, REALIGNMENTS, INCREASED (PINK) SPAWNING & (COHO) REARING AREAS	Valdez	1975	Worked well--has restabilized	Visit?	Ken Roberson has done reports, could always update. A good example of a major stream realignment project after many years.
Haines Airport Mitigation (P18). Created a complex of wetlands & fish habitat using boulders, large organic debris, riparian & wetland vegetation on margins.	RIPARIAN HABITAT, COVER, REARING/OV AREAS, AIRPORT EXPANSION	Haines	1990	Fairly New	Visit	ADOT/PF has a monitoring plan. Would represent a category of interest, in that similar airport expansions in wetlands are anticipated in other parts of the state.
Little Campbell Creek Realignment south of Lake Otis (P195)	REALIGNMENT, RIPARIAN HABITAT, COVER, REARING/OV AREAS	Anchorage	198?	Mostly yes. learned some lessons	Visit	Creek realigned for development, new channel designed as park w/ fish habitat. Problem with gradient.
Weigh Station Removal, Potter Marsh (P166)	RIPARIAN HABITAT	Anchorage	1984	Riparian reveg worked well	Visit	Alders & seeding of new banks looks natural now. Not a big project, but easy access & easy to evaluate.
Independence Creek. (P146) Riparian planting for stabilization following placer mining	RIPARIAN HABITAT, BANK RESTORATION, PLACER MINING	Fairbanks	1989	Worked well	Visit	Not monitored for a few years now, very promising at the start. Thorough prevous data exists.

Table 2 (continued). Possible Case Study Projects

PROJECT NAME and/or description	CATEGORY	LOCATION	YEAR STARTED	SUCCESS-FUL?	SITE VISIT OR SUMMARIZE OTHER INFO?	PROS/CONS FOR INCLUDING
Glenn Highway project. (P177) Highway impounds water for waterfowl as tradeoff for wetland fill	WATERFOWL PONDS/ IMPOUNDMENTS	north of Anchorage	1991-present	Still in progress	Write-Up Only	ADF&G already has data from before and after, but not necessarily directly comparable. Can summarize & refer to other reports.
Bayshore Ponds & Berms (P172). Attempt to create freshwater nesting ponds along the tideflats	WATERFOWL PONDS/ IMPOUNDMENTS	Anchorage	1971	Not terribly successful, some bird use	Visit	An experiment to berm up/ impound freshwater on tideflats to create nesting habitat. No nesting takes place. Would now be designed differently.
Nulbay Park (P22). Attempt at freshwater impoundment in intertidal area	WATERFOWL PONDS/ IMPOUNDMENTS, GENERAL FILL MITIGATION	Anchorage	completed 1991	Only marginally successful	Visit	Not very successful, but unique attempt with lots of potential application
Bradley Lake Waterfowl Mitigation Area. (P67) (intertidal site)	WATERFOWL PONDS/ IMPOUNDMENTS	Homer	1991	New	Write-Up Only	Dan Rosenberg (ADF&G) has been monitoring. Some problems encountered with water levels.
Creamer's Field Waterfowl Enhancement (P51)	WATERFOWL PONDS/ IMPOUNDMENTS	Fairbanks	1987-present	Mostly successful	Write-Up Only	Several ADF&G people have been monitoring. Some problems encountered with water levels & spillways.
Fish Creek Coastal Wetland Restoration. Intertidal restoration after disturbance. (P179, P35)	INTERTIDAL, RIPARIAN HABITAT, WATERFOWL PONDS/ IMPOUNDMENTS	Anchorage	1986, 1990	At first, no. 2nd attempt still new.	Visit	Original duck pond design failed. Later work may be the only carefully designed and monitored coastal marsh restoration in Alaska
Creamer's Field Crane Project (P53)	AIRPORT EXPANSION (OFFSITE)	Fairbanks	1989	Yes	Either	Many ADF&G people have been monitoring. Easy access.
North Eagle River Inter-change (P59). Varied bird & fish habitat as mitigation for highway fill in wetlands	GENERAL FILL MITIGATION, REARING/OV AREAS, WATERFOWL PONDS/ IMPOUNDMENTS, RIPARIAN HABITAT	Eagle River	1991	New, but yes	Visit	Good photo records & observations. Covers many categories, but fairly new project.

Table 2 (continued). Possible Case Study Projects

PROJECT NAME and/or description	CATEGORY	LOCATION	YEAR STARTED	SUCCESS-FUL?	SITE VISIT OR SUMMARIZE OTHER INFO?	PROS/CONS FOR INCLUDING
Fish Creek 6/ Offsite mitg. at Westchester Lagoon (P180). Small wetland of varied water depths created from upland area adjacent to a larger wetland complex.	GENERAL FILL MITIGATION, WATERFOWL	Anchorage	1985-86	Yes	Visit	First example of offsite mitigation for wetland fills in Anchorage. Nice gradation of wetland habitat types, based on shallow slope gradient & varying water depths.
Jordan Creek 8 (P49). For illegal fill, had to reconnect side channels for rearing + did more work on tributary to Switzer Crk	GENERAL FILL MITIGATION, REARING/OV AREAS	Juneau	1993	Too soon	Too Soon?	Example of a number of categories from southeastern Alaska
Restoration of intertidal sedge wetland below outlet of Campbell Lake (P114)	GENERAL FILL MITIGATION, INTERTIDAL	Anchorage	1989-90	Seems to have worked well	Visit	Photos, etc., available. Good one to follow up on now, after a few years to establish.
Resurrection Creek--many categories. (P33)	COVER, REARING/OV AREAS, MANY STRUCTURES, PLACER MINING	Hope	1992-still implementing	New	Visit	New, but very ambitious project covering many categories, and has good data. To date, they have installed 36 structures, such as logs, boulders, rootwads, etc., to increase pools and rearing areas.

B. DESCRIPTION OF EVALUATION APPROACH

The literature consulted (e.g., Kentula et al. 1993, Zentner 1988, EPA 1989, Zedler 1990, etc.) discusses at least two kinds of "evaluations" (also called inspections, monitoring, or assessments) for aquatic habitat projects: one that certifies that the work was *performed to specifications* (i.e., in compliance with the contract, permit, or stipulations), and another that looks at the overall *effectiveness* of that attempt at habitat improvement (i.e., "success"). The former is the type performed most often, and can usually be conducted relatively soon after work is completed at the site. As part of this grant project, however, we have the rare opportunity to also address the second question-- that of project effectiveness-- and look at projects that are further along in years. It can take several years or even decades to ascertain the effectiveness of certain restoration or enhancement projects.

Given this rare opportunity to evaluate overall project effectiveness, the next question is to determine which information is most important to acquire at these case study sites, and how the results will be compared. Once again, the literature suggests several approaches:

1) Evaluating projects for which specific objectives were stated at the beginning (e.g., 50% plant cover on banks within two years) would allow comparison against those target objectives;

2) Evaluating projects for which adequate baseline or "pre-project" data exists would delineate the progress of the restoration/enhancement by comparing the "before" and "after" values;

3) A few studies have used a "paired survey" approach, where a restored aquatic body is compared to a "naturally occurring" body within the same region and land use setting (i.e., only comparing palustrine wetlands in urban settings to others in urban settings).

In the Alaskan context, our choices for case study sites would be extremely limited if we adopted any one of these approaches for the following reasons: 1) rarely have the project objectives been clearly detailed in the records so as to dictate what should be measured in the evaluation (although often the individuals involved may still be consulted to better determine the specific objectives); 2) prime examples with baseline data do not exist for every category of aquatic habitat restoration or enhancement that we want to evaluate in this study; and 3) the diversity and scope of aquatic habitats in Alaska would make establishing standard reference sites for all case study sites beyond the ability of this grant project.

In developing the evaluation criteria to be submitted at this time, it became apparent that there was no standard method of measurement that would apply to the range of projects represented here. Not only are different parameters important for each type of aquatic habitat due to the different functions and roles they serve, but different parameters become important for each restoration or enhancement attempt due to varying project objectives. A wetland revegetation project in an isolated setting could not be evaluated based on the same set of parameters as a stream rechannelization, for example.

After discussion with the interagency advisory group members, we concluded that for our purposes in conducting these case study evaluations what we must do is examine the outcome based on each project's original objectives. When necessary, the objectives can be further defined by consulting with the individuals involved. At the same time, we will take advantage of any additional information on a case-by-case basis, such as pre-project information or photos, ready reference site information (for example, a "control" section of same stream, etc.). When little other information is obtainable, at the very least we will carefully describe the current condition of the restoration/enhancement site in order to pass along any useful information.

To illustrate this evaluation approach, for a project correcting fish access through a perched culvert, we would naturally measure the number of fish upsteam of the culvert, as well as the integrity of the structure itself after several seasons and high water flows. In the case of the bank revegetation/stabilization project at Independence Mine, previous sampling data exists for two seasons following the work, so those measurements can be repeated to delineate change or progress since that time.

The exact method of evaluation used for each project will be elaborated in the case history descriptions to be completed during the second year of the project.

Chapter 4

Project Bibliography

CHAPTER 4. PROJECT BIBLIOGRAPHY

A. METHODS

A bibliography of reference materials pertaining to the restoration and enhancement of aquatic habitats in Alaska is one of the first year's products for the Section 309 grant project. Comprehensive library searches found few formally published Alaskan citations on aquatic habitat restoration or enhancement. Rather, most of the relevant local information was uncovered while documenting past Alaskan restoration efforts for the associated project inventory (database). This documentation often took the form of internal reports of the agencies or companies involved. This type of "grey" literature was included in the bibliography if it met the following criteria: 1) direct applicability to the Alaskan aquatic habitat restoration and enhancement theme, and 2) existence in a form obtainable to others (i.e., a dated and titled report, not just a file memo) and/or present in libraries.

Literature searches were conducted on Western Library Network, Enviroline, Environmental Bibliography, Life Sciences Collection, Aquatic Sciences and Fisheries Abstracts, GPO Publications Reference and Zoological Record databases. Although the number of Alaskan entries on this topic was not extensive, the literature search revealed many publications from outside the state that pertain to 309 project issues, e.g., identifying criteria to evaluate the effectiveness of aquatic habitat projects, conducting case studies, formulating recommendations, proposing policy language, etc. Those publications that appeared to have relevance to the Alaskan situation, either for their direct scientific applicability (e.g., estuary rehabilitation in British Columbia adjacent to southeastern Alaska) or as examples of how similar issues were addressed in other areas, were included in the bibliography. Preference was given to more recent material (within the last 10-15 years) when selecting which material from outside the state to include. Alaskan references of any age were included.

This bibliography is composed of books, journal articles, conference papers, dissertations, and agency and company reports. It was produced using ProCite 2.0 Software. The formatting is alphabetical by author, with a subject index listing the citations by specific issues and project types to facilitate searches by users. All category headings in the index should be interpreted within the context of the overall aquatic habitat restoration and enhancement topic (see list below). Publications that document work within the State of Alaska are indicated by bold type throughout the bibliography. Members of the project's interagency advisory group reviewed the content and format of the draft version of this bibliography.

Disk copies of this ProCite 2.0 bibliographic database are available by request from the Division Librarian, Habitat and Restoration Division, Alaska Department of Fish and Game, 333 Raspberry Road, Anchorage, AK 99518, Phone: 267-2314.

Index Headings for Bibliography:

BANK STABILIZATION	LOGGING IMPACT RESTORATION
CLASSIFICATION (WETLANDS)	MINING IMPACT RESTORATION
ECONOMIC ANALYSIS	MITIGATION BANKING
EELGRASS	MITIGATION, COMPENSATORY
EROSION CONTROL	MONITORING GUIDELINES
ESTUARY RESTORATION AND ENHANCEMENT	OILSPILL CLEANUP
EVALUATION CRITERIA AND TECHNIQUES	PLANNING AND POLICY
FIELD METHODS	PROJECT DESIGN
FISH HABITAT IMPROVEMENT	REARING PONDS
FISH PASSAGE STRUCTURES	REVEGETATION
GENERAL (WETLANDS)	RIPARIAN HABITATS
GRAVEL FILL REHABILITATION	SPAWNING CHANNELS
GRAVEL MINING IMPACT RESTORATION	STREAM RESTORATION AND ENHANCEMENT
HYDROLOGIC FUNCTIONS	TUNDRA
INSTREAM STRUCTURES FOR FISH HABITAT	URBAN EMPHASIS
LAKE FERTILIZATION	WATER QUALITY
LAKE RESTORATION AND ENHANCEMENT	WATERFOWL HABITAT IMPROVEMENT
LEGAL ANALYSIS	WILDLIFE HABITAT IMPROVEMENT

B. BIBLIOGRAPHY

NOTE: Publications that document work within Alaska are indicated by bold type.

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WILDLIFE HABITAT IMPROVEMENT
(continued)

Appendices

APPENDIX A: Data Field Descriptions for Aquatic Habitat Database

FIELD NAME (& abbreviation)	FIELD MEANING	POSSIBLE RESPONSES (if standardized)	RESPONSE CODE MEANINGS
Project Name (ProjName)			
Project ID Code (Proj#)	Computer-assigned unique identifier		
Short Description (AKA)	Type of Project		
Lead Organization (LeadOrg)	Group that served as the lead for the restoration/ enhancement attempt	ACOE USFS USFWS BLM SCS DOD NPS ADF&G ADOT/PF AEA DNR-PMC MOA CitySew Private	U.S. Army Corps of Engineers U.S. Forest Service U.S. Fish & Wildlife Service U.S. Bureau of Land Management U.S. Soil Conservation Service U.S. Dept. of Defense (not ACOE) U.S. National Park Service Alaska Dept. of Fish and Game Alaska Dept. of Transportation & Public Facilities Alaska Energy Authority Alaska Dept. of Natural Resources-Plant Materials Center Municipality of Anchorage City of Seward Private Company or organization (named in next field)
Company Name (CompName)	Name of lead organization if a private company		
Organization Town (OrgTown)	Office/town of lead organization		
Agency Project/Permit# (AgPermit#)	File or reference number for project		
Beginning Year (BegYear)	Year restoration/ enhancement work began at project site		
Ending Year (EndYear)	Year work was completed at site, if applicable		
Duration (Duration)	Automatically calculated from the start/end years above. All periods less than 1 year recorded as "1"		

APPENDIX A (Continued): Data Field Descriptions for Aquatic Habitat Database

FIELD NAME (& abbreviation)	FIELD MEANING	POSSIBLE RESPONSES (if standardized)	RESPONSE CODE MEANINGS
Status (Status)	Current Status of Project	P I M C N	Preliminary Stage Implementation Stage Monitoring Stage Completed, with some monitoring Completed, no monitoring done
EcoRegion (ERCode)	Denotes the ecoregion divisions of Alaska after Bailey (1976) and Cowardin et al. (1979), to the province/section level. Two ecoregions were subdivided for this database. Boundaries of ecoregions are illustrated in Figure 1.	1210 1220 M1210 1310 1320 M1310 M1330 M2410 M2420	Arctic Tundra Bering Tundra Brooks Range Yukon Parkland Yukon Forest Alaska Range Aleutians Southeast Alaska Forest Southcentral Alaska Forest
Waterbody Name (Waterbody)	River, lake, or stream		
Nearest Town (NearTown)	Nearest town to project site		
AK Geographic Region (Region)	Used for sorting data into three state regions	SoEast SCenSW NorInt	Southeast Alaska Southcentral/Southwest Northern/Interior
Project Size (Size)	Area in acres, length of stream in miles, whatever measure provided		
Township (Tship)	Township in township/ range system	e.g., "15N"	
Range (Range)	Range in township/range system	e.g., "03E"	
Section (Sctn)	Section in township/ range system	e.g., "13"	
Meridian (Meridian)	Base meridian for township/range system in that area	Alaska meridians: Seward Copper River Kateel River Fairbanks Umiat	
Topo Map Quad Name (TopoMap)	Name of U.S.G.S quad map on which site occurs	e.g., "Seward B-4"	

APPENDIX A (Continued): Data Field Descriptions for Aquatic Habitat Database

FIELD NAME (& abbreviation)	FIELD MEANING	POSSIBLE RESPONSES (if standardized)	RESPONSE CODE MEANINGS
Anadromous Waterbody Catalog Number (Stream#)	Number for that waterbody in ADF&G's anadromous catalog, if applicable		
Other Location Description (LocDescr)	Location of site in relation to landmarks, highways, etc.		
Contacts (Contacts)	Name, affiliation, office/ town & phone number for contact people, and other relevant information		
Primary Habitat Type (HabCode1)	Describes type of habitat being restored or enhanced using National Wetland Inventory Codes (Cowardin et al. 1979) in a system - subsystem - class format	A 4 character code sequence. Coded information is detailed. See explanations in Cowardin et al. (1979).	The major divisions (systems) of the habitat codes are: Riverine Estuarine Palustrine Lacustrine Marine
Secondary Habitat Type (HabCode2)	If more than one habitat type is being restored/ enhanced	Same as above	Same as above
Stream Channel Type (ChType)	A 3 digit USFS Channel Type Designation, if given	These codes were only recorded on database if provided by USFS personnel.	See USFS reference to interpret.
Objectives (Objective) *Continued on next page.*	Category of project objectives. (List up to 4)	HABITAT EROSION HYDROLOGY Water Quality (WATERQUAL) EXPERIMENT INCIDENTAL	For birds, fish, inverts, etc. To control erosion or stabilize sediments or shoreline e.g., flood control, water quantity, in-stream flow, groundwater recharge, or stormwater retention Via filtration, sediment trapping, wastewater treatment, or reducing pollutant load from urban or agricultural runoff Work done as part of an experiment If aquatic habitat was created w/o intention or calculation as a consequence of some other action or project, such as construction of a highway

APPENDIX A (Continued): Data Field Descriptions for Aquatic Habitat Database

FIELD NAME (& abbreviation)	FIELD MEANING	POSSIBLE RESPONSES (if standardized)	RESPONSE CODE MEANINGS
Objectives, *Continued.*	Category of project objectives. (List up to 4)	Recreation/Heritg. (RECR/HERIT) HARVEST GENERAL	For aesthetics, recreation, education, etc. Of commercial fish, shellfish, etc. When specific objectives not clearly identified
Target Group (TGroup)	If project's objective is to create animal habitat, choose from:	Birds Fish Mammals Inverts General Other	Invertebrates
Target Habitat Use (THabUse)	If applicable. List up to two.	Spawning Rearing Overwintering Migrating Nesting Staging General	
Primary Target Species (TSpecies)	If applicable	Standardized common names used for data entry	
Mitigation (Mitg)	Was this project undertaken in conjunction with other development involving habitat alteration or loss?	Yes (Y) or No (N)	
Development Activity (DevAct)	If yes above, name type of development activity being mitigated (list up to 3 items)	Abbreviations were established for many activities, not presented here due to space.	e.g., highways, airports, boatdocks, placer mining, utility lines, oil and gas drilling, gravel mining, misc. wetland fill, urbanization, logging, etc.
Restoration of Past Damage (PreDam)	Was project undertaken to restore habitat previously damaged by development activities or a natural disaster?	Yes (Y) or No (N)	
Past Activity (PastAct)	If yes above, name type of past activity resulting in damage (list up to 3 items)	Same abbreviations as for "Development Activity" above.	All the development categories listed above, plus earthquake, oil spill, bad culvert, etc.

APPENDIX A (Continued): Data Field Descriptions for Aquatic Habitat Database

FIELD NAME (& abbreviation)	FIELD MEANING	POSSIBLE RESPONSES (if standardized)	RESPONSE CODE MEANINGS
Enhancement (Enhc)	Was project undertaken to enhance the habitat potential of a relatively undisturbed area?	Yes (Y) or No (N)	
Implementation Action (Action)	Type of actions performed at site (list up to 5)	Landform (LFORM)	Modifying topography by earth-moving, e.g., dike construction or breaching, grading, channel construction or blockage, constructing ponds or nesting sites, etc.
		SPOIL	Special case wherein restoration is attempted using dredged material *(diking or filling)*
		SEED	Using and disseminating seed sources
		PLANT	Introducing planted seedlings, transplants, or cuttings
		SOIL	Adding soil or peat to site, including surface preparation such as disking
		Stocking (STOCK)	Introducing animals to the site
		Hydrology (HYDRO)	Actively manipulating water levels, such as draining, pumping, stop-log spillways.
		CUT	Cutting, thinning, or mowing vegetation to encourage desired species
		Plant fertilization (PFERT)	For establishment of plants
		Stabilization (STABL)	Using rip rap, wave breaks, or mesh to stabilize stream banks or substrate. Includes containment materials such as concrete revetments, bulkheads, gabions, or sod to stabilize planted areas.
		Contaminants (CONTM)	Removing contaminants as part of restoration, such as following an oil spill
		MODEL	Using explicit spatial or temporal models for planning, designing, or evaluating projects.
Fish Habitat Action Subcategory (FishActn)	Action subcategory if a fish habitat improvement project (list up to 3)	Abbreviations were established for several standard habitat improvement methods.	e.g., boulders, large organic debris, artificial structures, fishpasses, spawning channels, etc. (see Data Entry Form, Appendix C)

APPENDIX A (Continued): Data Field Descriptions for Aquatic Habitat Database

FIELD NAME (& abbreviation)	FIELD MEANING	POSSIBLE RESPONSES (if standardized)	RESPONSE CODE MEANINGS
Plant Materials Used (Genera)	Plant materials used in revegetation.	Entered by Latin or common names.	
Quantified Results (Quant)	Were quantitative results reported for one or more response variables?	Yes (Y) or No (N)	
Response (Response)	Indicates what was measured, monitored, or evaluated in the aftermath of the project. May include non-quantitative monitoring. (List up to 5)	WFOWL SHBIRDS OTHBIRDS SHELL INVERTS SALMOND OTHFISH VEGET HUSE HYDROL SOIL PHLFORM WQUAL SUCCESS	Waterfowl Shorebirds Other Birds Shellfish Other Invertebrates Salmonids (i.e., salmon, Dolly Varden, char) Other Fish Vegetation Human Use Hydrology In erosion control or stabilization Physical landform changes, in topography or stream channel morphology Water Quality If included guidelines to determine criteria for success, or evaluation of results in terms of functions and values
Response Species (RSpecies)	Primary species or group monitored in aftermath, if applicable	Entered using common names	
Response Parameter (RParam)	Parameters measured in aftermath, if applicable	Information was entered however indicated on data, no codes established	e.g., presence/ absence, smolt yield, density, percent vegetation cover, water flow rate, etc.
Evaluation of Habitat Quality (EvHab)	Was project evaluated on the basis of improved habitat features?	Yes (Y) or No (N)	
Evaluation of Animal Use (EvUse)	Was project evaluated on the basis of subsequent inhabitation/animal use?	Yes (Y) or No (N)	
Evaluation of Economics (EvEcon)	Was project evaluated on an economic basis? (i.e., costs vs. benefits, etc.)	Yes (Y) or No (N)	

APPENDIX A (Continued): Data Field Descriptions for Aquatic Habitat Database

FIELD NAME (& abbreviation)	FIELD MEANING	POSSIBLE RESPONSES (if standardized)	RESPONSE CODE MEANINGS
Estimated Cost (EstCost)	Estimated cost of restoration/enhancement measures, if given		
References (Refs)	Were follow-up results written in published or unpublished reports or grey literature?	Yes (Y), No (N), or Expected (E)	"Expected" means project will be reported on at a known point in the future, which was then listed in the "Other Sources" field, below.
Authors (Authors)	Entered last-name-first for the first author, if there is a report.		
Publication Date (PubDate)	Entered by year, or month and year		
Title (Title)	Title of reference/report (abbreviated to best fit space allowed)		
Reference Type (RefType)	Type of reference material	Book Journal AgReport Dissert ConfPro NewsLtr Letter	Book Journal article Agency or Company Report Dissertation Conference Proceedings Newsletter Letter
Other Sources (OthSource)	If information was obtained from files, interviews, etc. Also lists other known sources.		
Assessment of Success (Assess)	Do biologists involved feel that this project was successful at improving aquatic habitat to meet the objectives?	Y N P T I U	Yes, for the most part No, largely a failure Partial Success (<50% effective) Too soon to tell Inconclusive Results Unknown--no follow up
Additional Information/ Project Description (ProjDesc)	Narrative section containing additional project-specific information, such as elaborating the objectives and approaches used, and any lessons learned from the project		

APPENDIX A (Continued): Data Field Descriptions for Aquatic Habitat Database

FIELD NAME (& abbreviation)	FIELD MEANING	POSSIBLE RESPONSES (if standardized)	RESPONSE CODE MEANINGS
Date Entered/ Last Edited (Datein)	Date project added to database or last edited		
By: (Who)	Initials of entry person		

APPENDIX B: Full Data Printout for One Project Record

NOTE: Inapplicable or unobtainable information appears blank following the field heading. Responses appear in coded database form (see Appendix A). Field headings are spelled out for easier readibility.

Project Name: Bayshore Ponds & Berms — Project ID Code: P0172
Short Description: Attempt to create freshwater nesting ponds along the tideflats

Lead Organization: ADF&G — Company Name, if Appl:
Lead Organization based in: Anchorage — Agency Permit#:
Year Work Began: 1971 — Year Ended: 1971
Status: Completed, no monitoring — Duration: 1 year

LOCATION
EcoRegion Code: M2420 — Region: SCenSW
Waterbody: Cook Inlet Tide Flats — Nearest Town: Anchorage
Township: 12N Range: 03W Meridian: Seward — Section: 23
TopoMap Quad: Anchorage A-8 — Anadromous Stream#:
Location Descr: Ponds arranged along 1.3 miles at base of bluff below Bayshore subdivision, immediately south of Campbell Crk outlet.

CONTACTS: Dimitri Bader, then of ADF&G, now retired, worked on this project. Current contacts would include Bruce Campbell & Dave Harkness, Wildlife Conservation Division, ADF&G, Anchorage, 267-2179.

HABITAT TYPE
Habitat Code 1: E2EM Habitat Code 2: M— — Forest Serv. Stream Chnl Type:
Project Size: 9 ponds along 1.3 mile stretch

OBJECTIVE INFORMATION
Objectives: HABITAT
Target Group: Birds Targ. Habitat Use: Nesting, General Targ. Species: Primarily ducks
Done as Mitigation? Y — For Devel.Activity: UTILITY LINE (SEWER)
Done to restore previous damage?: N — For Past Activity:
Done as pure enhancement?: N

IMPLEMENTATION ACTIONS
Actions: LFORM, SEED, PLANT — Fish Habitat Actns:
Plant Species Used: Carex,Triglocum,marestail,many

RESPONSE INFORMATION
Quantified Results: N Responses measured: WFOWL, VEGET, HYDROL
Response Species: Response Parameter: Observations only
Was project evaluated on:
Habitat Quality? Y
Animal Inhabitation or Use? Y
Economic Cost/Benefits? N Estimated Cost, if available:

Were results written up in a "report"?: N
Authors: — Publication Date:
Title: — Reference Type:

Other Info Sources: Talked with Dave Harkness, ADF&G, Wildlife Conservation, Anchorage.
Assessment of "Success": N

ADDITIONAL PROJECT DESCRIPTION:
The Municipality was in the process of installing a new sewer line under the tideflats along the base of the bluff. ADF&G (Dimitri Bader) decided to take advantage of the presence of the heavy equipment there by trying to create some nesting ponds for waterfowl. Several ponds (nine total) were excavated on either side of the sewer line as it was installed. These ponds were laid out linearly along the route of the sewer line. Pond sizes range from 150' to 800' long, and from 100' to 200' wide. They are irregularly shaped, and some contain islands. The pond designs were more or less "guess work" at that time. The ponds were constructed by dredging out an area to the specified depth, depositing the material in a berm around the pond perimeter to contain the water, then revegetating the berms and islands. The ponds filled mostly with freshwater, although the saltwater intrusion at very high tides reduces the nesting potential of the ponds. A variety of species was used for the revegetation-- sedges, marestail, Triglocum, arrow grass, goosetongue, etc., but these did not establish adequate cover. Both sprigging and seeding methods were used. The arrow grass has been most successful. These ponds and berms are still in place after 20 years, and ducks do use them for feeding and loafing, but not nesting. The area of intersection of the sedge margin, mudflat, and ponds receives the most bird use. Reasons for the very limited success include the exposed location of the ponds, very little available cover and upland edge for nesting, and salt water intrusion. The ponds were excavated to 12" -18" depth (which is the preferred depth for dabbling ducks) but they are shallower now due to silting in. The design of this project-- separated small ponds, rectangular in shape-- would probably be modified today into a series of interconnecting shallow swales.

Date Entered or last edited on computer: 05/20/93
By (initials): BLP

APPENDIX C: Data Entry Form for 309 Aquatic Habitat Database

DATE ENTERED/LASTED EDITED (MM/DD/YY) _____ BY: (person's initials): ____

==========

PROJECT NAME _____ PROJECT ID. CODE (computer-assigned) ____

SHORT DESCRIPTION (type of project) _____

_____

LEAD ORGANIZATION _____ (Use standardized codes for agencies; "Private" for the private sector)

IF LEAD IS A PRIVATE COMPANY, GIVE NAME _____

WHICH OFFICE (TOWN) _____

AGENCY PROJECT/PERMIT NUMBER _____

YEAR WORK BEGAN AT PROJECT SITE: _____ ENDING YEAR (if any): _____

CURRENT STATUS: ___

P = Preliminary Stage
I = Implementation Stage
M = Monitoring Stage
C = Completed, with monitoring
N = Completed, No monitoring ever done

DURATION: ____ [This value should be automatically calculated from the starting and ending years entered above. It indicates the maximum time reported for a particular project, rounded off to the nearest year, to distinguish the longer-term projects/studies from incidental studies. All periods less than one year are recorded as "1".]

LOCATION INFORMATION

ECOREGION _____ WATERBODY NAME (River, Lake or Stream) _____

The EcoRegion field denotes the divisions of Alaska recommended by Cowardin et al. (1979) to the province/section level. (A four or five character code; see map.)

NEAREST TOWN _____GEOGRAPHIC REGION (for sorting data)_____

PROJECT SIZE _____

(Enter area in acres/length of stream in miles, whatever measure provided)

OTHER LOCATORS, if available: Township____ Range____ Section ____ Meridian ____

USGS Topo Map Quad Name _____

ADF&G Anadromous stream catalog # (up to 22 chars) _____

OTHER LOCATION DESCRIPTION, as available (Hwy, Lat/Lon, etc.) _____

_____

CONTACTS INFORMATION

For each person, list first and last name, organization, office/town, phone number, and any other relevant information (e.g., now retired, or only involved in revegetation part of work, etc.)

_____

_____

_____

PRIMARY HABITAT TYPE being restored/enhanced (Cowardin Classification) _____
SECONDARY AQUATIC HABITAT TYPE being restored/enhanced, if any _____
These fields describe the subject wetland/stream using National Wetland Inventory codes (Cowardin et al. 1979) in a System-subsystem-Class-subclass format.
STREAM CHANNEL TYPE ____ (3 digit USFS Channel Type Designation, when given)

OBJECTIVE INFORMATION

OBJECTIVE _____ (List up to 4 items, separated by commas)

The categories for this field are:

- **Habitat** (for birds, fish, mammals, inverts, etc., see below)
- **Erosion** (to control erosion or stabilize shoreline and sediment)
- **Hydrology** (e.g., flood control, water quantity, in-stream flow, groundwater recharge, or stormwater retention)
- **Water Quality** (to improve water quality through filtration of contaminants, sediment trapping, nutrient sink functions, wastewater treatment, reducing pollutant load from urban or agricultural runoff)
- **Experiment** (work done as part of an experiment)
- **Incidental** (If a wetland is created without intention or calculation as a consequence of some other action or project, such as construction of a highway or reservoir.)
- **Recreation/Heritage** (aesthetics, recreation, education, etc.)
- **Harvest** (of shellfish, commercial fish, etc.)
- **General** (Category used when specific objectives were not clearly identified.)

TARGET GROUP (if project's objective is to create animal habitat, choose from):
__Birds, __Mammals, __Fish, __Inverts, __Other, __General.
TARGET HABITAT USE (if applicable, list up to 2): __SPawning, __REaring, __OVerwintering, __MIgrating, __NEsting, __STaging, __GEneral
PRIMARY TARGET SPECIES (if applicable) _____
[use standardized common names for data entry]

MITIGATION ___ (Y/N) Was this project undertaken in conjunction with other development involving habitat alteration or loss?
IF YES, NAME GENERAL TYPE OF DEVELOPMENT ACTIVITY _____
(List up to 3 items. These category choices include: **bridge/highway construction, airports, dams, boat docks/bulkheads, landfill/waste, hardrock mining, placer mining, utility lines, oil and gas drilling, hydroelectric plant, gravel mining, misc. wetland fill, urbanization, logging, dredging, military installation**, etc.)

RESTORATION OF PAST DAMAGE ___ (Y/N) Was this project undertaken to restore habitat previously damaged by development activities or a natural disaster?
IF YES, NAME TYPE OF PAST ACTIVITY RESULTING IN DAMAGE _____
[List up to 3 items. Categories include all those listed above, plus **natural disaster** (earthquake, etc.), **oil spill, bad culvert]**

ENHANCEMENT ___ (Y/N) Was this project undertaken to enhance the habitat potential of a relatively undisturbed area?

IMPLEMENTATION ACTION INFORMATION

ACTION TYPE _____ (List up to 5 items)

Action describes the procedures, activities, and methods employed in the restoration of aquatic habitat. Actions are undertaken to achieve the objectives just defined.

- **Landform** (modifying topography by earthmoving, e.g., dike or levee construction or breaching, grading, channel construction or blockage, building wildlife habitat features such as ponds or nesting sites, backfilling and contouring).
- **Spoil** (Special case wherein restoration is attempted using dredged material, diking, or filling with dredged material)
- **Seed** (using and disseminating seed sources)
- **Plant** (introducing planted seedings, transplants, or cuttings)
- **Soil** (Adding soil or peat to the aquatic habitat site, including surface preparation such as disking or removing debris)
- **Stocking** (introducing animals to the aquatic site)
- **Hydrology** (actively manipulating water levels, such as draining, pumping, stoplog spillways. Does not include actions described under "Landform")
- **Biocide** (e.g., using herbicides prior to planting desired species)
- **Cut** (cutting, thinning, or mowing vegetation to encourage desired plant species)
- **Plant Fertilization** (for establishment of plants)
- **Fire** (prescribed burning as a wetland vegetation management tool)
- **Stabilization** (using rip rap, wave breaks, or mesh to stabilize streambanks or substrate, or to reduce wave energy or stress. Includes containment materials such as hay bales, concrete revetments, bulkheads, gabions, sod and burlap for the stabilization of planted areas)
- **Contaminants** (In some cases, existing contaminants were removed as part of restoration, for example following an oil spill)
- **Model** (using explicit spatial or temporal models for planning, designing or evaluating projects. Includes using aerial imagery for the analysis of community types and vegetation mapping)
- **Lab** (small plot experiments under controlled conditions. Includes evaluating the effects of salinity, temperature, water depth, turbidity, etc., on growth; vegetative culture techniques; analysis of species tolerance to low O_2 or ammonia, etc.)

If a Fish Habitat Improvement Project, specify ACTION subcategory (List up to 3 items):

Boulder Placement,
Large Organic Debris (adding anchored logs, root wads, trees, brush bundles),
Artificial Structures (gabions, riprap, revetments, etc.),
Live Vegetation (e.g., in stream or for bank stabilization),
Riparian Buffer Zone Improvements (in band 100' around stream),
Excavating for Groundwater Sources,
Fish Passes,
Culverts,
Spawning Channels,
Incubation Boxes,
Gravel Work (addition or cleaning),
Refuse Removal, or
Lake Fertilization.

PLANT MATERIALS (used for revegetation, if applicable): _____

(Use latin or common names. May list several, and/or end with "Many". Up to 30 chars)

RESPONSE INFORMATION

QUANTIFIED RESULTS: ___ (Y/N)

Y = Quantitative results were reported for one or more response variables.
N = No quantitative results were reported.

RESPONSE: _____ (List up to 5 items)

Indicates what was measured, monitored, or evaluated in the aftermath of the project.

- **Waterfowl**
- **Shorebirds**
- **Other Birds**
- **Mammals**
- **Amphibians**
- **Shellfish**
- **Other Invertebrates**
- **Salmonids** (includes all salmon, Dolly Varden, char, trout)
- **Other Fish**
- **Vegetation**
- **Human Use**
- **Hydrology**
- **Soil** (in erosion control or stabilization)
- **Physical Landform Changes** (in topography or stream channel morphology)
- **Water Quality**
- **Chemical** (as an indicator of another category in the response field, such as water quality or soil, which is also noted in this field)
- **Economics** (if reference is made to the costs of the project, monitoring, cost comparisons, and project feasibility studies)
- **Success** (If study included guidelines to determine criteria for success, mitigation success, or evaluation of project results in terms of wetland functions and values)

PRIMARY RESPONSE SPECIES MEASURED _____

[If applicable. Use standardized common names for data entry]

BIOLOGICAL PARAMETER MEASURED _____

(e.g., presence/absence index, density, smolt yield, other population estimates--enter whatever is indicated on data, up to 20 chars)

PROJECT EVALUATION PROCESS: After implementation, was the project evaluated on the basis of:

___ Y/N A) Habitat Quality (improvement of habitat features)
___ Y/N B) Inhabitation/Animal Use
___ Y/N C) Economics
Estimated Cost of Restoration/Enhancement Measures, if given:_____

REFERENCES: ___ (Y/N)

Y = Follow-up results written in published or unpublished reports or grey literature.
N = No "report" was prepared. Information may be in agency files.
E = Report "Expected" by a certain date; give details under "other sources", below.

REPORT INFORMATION
(if any; More complete information entered into bibliography)

AUTHOR(S): (Last name first) _____
TITLE _____
PUBLICATION DATE _____
REFERENCE TYPE _____ (e.g., Book, Journal, Agency Report, Dissertation, Conference Proceedings, Newsletter, Newspaper)

OTHER SOURCES (i.e., where else was this information obtained, such as interviews, and what auxiliary sources are known, such as memos, files, brief summaries in other reports):

_____
_____
_____

ASSESSMENT: Whether or not formal reports are available, do biologists involved feel that this project was successful at improving aquatic habitat to meet the objectives? ____
[Opinions OK in absence of adequate data]

Y = Yes, for the most part
N = No, largely a failure
P = Partially Successful (<50% effective)
T = Too Soon To Tell
I = Inconclusive Results
U = Unknown--no follow up

OTHER PROJECT DESCRIPTION/TEXT: (Which may cover any of the following points):

More about objectives,
Type of expertise consulted in design (hydrologists, fish biologists, etc.),
Steps involved in implementation,
Was evaluation adequate?,
Effectiveness at meeting goals/objectives,
What do participants feel should have been done differently,
Significance of project (e.g., novel approach or specific goals; is it part of a long term research effort?; what "red flags" for the future can be surmised from these efforts?)

[Unlimited field length; field will continue scrolling as information is typed in]

_____
_____
_____
_____
_____
_____
_____

APPENDIX D: Additional Alaskan Aquatic Habitat Projects Identified During Course of Inventory Research

These projects are not currently in the R:BASE database inventory due to one of the following reasons: 1) no response to inquiries; 2) brought to our attention too late in the process to properly research; 3) not exactly within the project scope; 4) work had not yet begun by winter 1992/93; or 5) time limitations. This list may provide additional assistance for readers.

A. SOUTHEAST ALASKA

PROJECT	YEAR	CONTACTS	OTHER SOURCE/COMMENTS
Other FRED Lake Fertilization projects in Southeast, including McDonald & Hugh Smith lakes	ongoing	Dave Barto, ADF&G FRED Limnology, Juneau, 465-4268. Also Mike Haddix, ADF&G FRED, Ketchikan, 225-5095	FRED Annual reports
Chum salmon habitat improvement using diking, etc. Portland Canal (Ketchikan)	late 1970's	Dr. Jack Helle, NMFS, Auke Bay Lab, 789-6038	
Improving fish habitat affected by logging: Indian Creek spawning channel by NMFS & University of Washington	1960's	Dr. K Koski, NMFS, Auke Bay Lab, 789-6024	
Experimental eelgrass (Zostera) transplants--Admiralty Island	?	Keith Merkel, Pacific Southwest Biological Services, Inc., National City, CA. (619) 477-5333.	Small patches transplanted. Observed that initially, transplants appeared to take as well in Southeast AK as in Puget Sound, Washington. No monitoring.
Seal Cove eelgrass transplants as mitigation for illegal fill in intertidal area of Tongass Narrows. Did not work well.	1985-86	Many contacts consulted --NMFS, ADF&G, USFWS, ACOE--no one can recall much info	
Many FRED fishpass projects besides the ones listed in the database: e.g., Margaret Creek, Old Frank's Lake, Big Lake (Ratz Harbor), Bakewell Cr., Steelhead Cr.	ongoing	Mike Haddix & Tim Zadina, ADF&G, FRED Limnology, Ketchikan, 225-5095.	Should be info in FRED Division annual reports--statewide and southeast reports.
Several projects conducted jointly by ADF&G and US Forest Service, e.g.: Irish Creek Fishpass, Harding River, St. John's Crk Fishway, Portage Crk, Anan Crk (Wrangell).	1980's to present	Joe Teter/Dick Aho (both USFS, Petersburg, 772-3841). Bob Zorich, ADF&G, FRED, Petersburg, 772-3801. Dennis Reed, USFS, Wrangell, 874-2323.	Info in FRED Division annual reports, as well as mention in US Forest Service annual reports. Irish Creek had good data sets available.
Trocadero Crk, USFS, Prince of Wales Island. Rick Harris of Sealaska Corp. said results were disappointing.	?	Dave Johnson, USFS, Craig, 826-3271.	
USFS Waterfowl habitat projects in SE: loon platforms & blasting (Thorne Bay); nesting platforms (Craig); floating nest islands for swans (Yakutat, USFS). The Pavlov Marsh nesting enhancement (Hoonah) is already on database.	1991-	For Thorne Bay--Erik Johnston, USFS, 828-3301. For Craig--Dave Johnson, USFS, 826-3271. For Yakutat--Dorin Walter, USFS, 784-3359.	
USFS Margaret Lake Study--effects of fish ladder on entire watershed and trophic levels	current	Mason (Buck) Bryant, USFS Research, Juneau, 586-7818.	Some info in annual progress reports.
NW Baranof Island, watershed restoration study from effects of logging. No restoration activities as yet-- not within project scope.	1991?	Mason (Buck) Bryant, USFS Research, Juneau, 586-7818.	New progress report available.

B. SOUTHCENTRAL/SOUTHWEST ALASKA

PROJECT	YEAR	CONTACTS	OTHER SOURCE/COMMENTS
Proposed LNG terminal site in Anderson Bay, near Valdez (Trans-Alaska Gas System). A variety of mitigation options are under discussion in the EIS supplement.	discussion phase only	Phil Brna, ADF&G, Joint Pipeline Office, Anchorage, 278-8594. Mary Lee Plumb-Mentjes, ACOE, Anchorage, 753-2712.	Discussion with FERC includes both freshwater and saltwater, on-site & offsite compensatory mitigation options, proposed by a TAGS consultant.
Chenega Bay Airport; construction of tributary channel to O'Brien Creek; salmon spawning area	1993	Carol Sanner, ADOT/PF, Anchorage, 266-1509	Environmental assessments; ADOT/PF, ADF&G and other regulatory agencies have files
Katchemak Bay 150--mititgation for small boat harbor expansion was to expand the existing fish "lagoon" along the spit	1990?	Larry Dugan, USFWS, Anchorage, 271-2797.	Created additional recreational fishing opportunity in a 'terminal' (stocked) fishery
Seward Hwy realignment (due to rock hazards) along Snow River Tributary north of Seward; channel construction, Dolly Varden habitat	begin 1993	Carol Sanner, ADOT/PF, Anchorage, 266-1509	Environmental assessments; ADOT/PF, ADF&G and other regulatory agencies have files
Other FRED lake fertilization projects in Southcentral Alaska, including Leisure Lake & several lakes on Kodiak Island	ongoing, beginning 1984	Gary Kyle, Limnologist, FRED Division, ADF&G, Soldotna, 262-9360.	Several of their lake fertilization projects are described on the database from information obtained from the Cook Inlet Aquaculture Association; a few remain undocumented.
Several Kenai River bank restorations conducted by landowners (e.g., George Holly, Bob Penney). Some were very successful.	1980's	Gay Muhlberg and Stewart Seaberg, ADF&G, Anchorage, 267-2284. Also Phil Brna, ADF&G, at 278-8594.	Many small scale bank restorations have been attempted by land-owners; some successful, some not.
City of Soldotna stream bank restoration demonstration project at 2 sites along Kenai River	work begins 1994	Gay Muhlberg, ADF&G, Anchorage, 267-2284	Preparing final design by end of 1993. Should be very interesting project
USFS Russian River streambank restoration '1990' demonstration project	not done--plans continue changing	Dave Blanchet, Chugach National Forest, Supervisor's Office, Anchorage, 271-2538	USFS may have preliminary plans, still subject to change
Turnaround removal on New Seward Hwy alongside Potter's Marsh (trade for illegal fill on neighboring ADOT project)	1989	Don McKay, ADF&G, 267-2284	ADOT/PF, ADF&G and Corps of Engineers have files. A small project.
Potter Marsh--flap cover on culvert of Rabbit Creek under road emptying into marsh	1982?	Dave Harkness, ADF&G, Anchorage, 267-2179	A water control project rather than habitat-oriented
Ship Creek--Elmendorf dam reconstruction with fish pass	1983	Phil Brna, ADF&G, at State Pipeline Office, Anchorage, 278-8594	Hard to evaluate--fishpass never opened due to objections from neighboring hatchery
Chester Crk 34--MOA will construct step pools & fish pass to rectify perched culvert at Lake Otis Pkwy	1993	Wayne Dolezal, ADF&G, Anchorage, 267-2284	Just now underway. Regulatory agencies have files.
Women's Bay 18 (Kodiak), restoring illegal fill & culvert to original	1991	Wayne Dolezal, ADF&G, Anchorage, 267-2284	A minor project
Fish pass along Selief Drive to Horseshoe Lake (Kodiak); mitigation for re-routing stream for housing construction	in discussion	Lon White (ADF&G, FRED, Kodiak, 486-1874); & Wayne Dolezal (ADF&G, Anchorage, 267-2284)	Project has been in discussion/ holding pattern for years

SOUTHCENTRAL/SOUTHWEST ALASKA (Continued)

PROJECT	YEAR	CONTACTS	OTHER SOURCE/COMMENTS
Horseshoe Lake 1 (Kodiak). Illegal fill removal and revegetation	not done yet	Wayne Dolezal, ADF&G, Anchorage, 267-2284	ACOE & ADF&G have permitting files
Old Harbor Airport, new site (Kodiak). Sitkalidak Strait 1. Tributary channel construction, salmon spawning area, shorebird habitat improvement	1993	Carol Sanner, ADOT/PF, Anchorage, 266-1509	Environmental assessments; ADOT/PF, ADF&G and other regulatory agencies have files
Mill Bay 2, Seabreeze Circle (Kodiak). Mitigation for illegal wetland fill.	1993	Wayne Dolezal, ADF&G, Anchorage, 267-2284	ADF&G and Corps has files
Popof Strait 18 (near Sand Point); negotiating a fish passage/ enhancement project as mitigation for airstrip fill	not done yet	Wayne Dolezal, ADF&G, Anchorage, 267-2284	Project still in discussion
King Cove 5 (Cold Bay). A 780 ft causeway will have 40 ft breach as mitigation measure. First of this type of project in this part of the state.	not done yet	Wayne Dolezal, ADF&G, Anchorage, 267-2284	Permitting agencies have files
Iliuliuk Bay 51, Dutch Harbor. Will breach a berm for fish passage at Morris Cove. Supposed to create an artificial reef as well.	not done yet	Wayne Dolezal, ADF&G, Anchorage, 267-2284	Unsure at this point whether project will proceed as planned
Iliuliuk Bay 41, Dutch Harbor. Modified artificial reef. Testing a method of providing shore cover by placing chain structure as substrate for marine organisms. Mitigation for years of wetland fill.	not done yet	Wayne Dolezal, ADF&G, Anchorage, 267-2284	Still in planning stage; should be a very interesting project
Pyramid Creek 1 (Unalaska); a successful bank stabilization & current deflector project	1988-89	Wayne Dolezal, ADF&G, Anchorage, 267-2284	Files of permitting agencies. More of a stream engineering than habitat-oriented effort
Nondalton Airport (Lake Clark). Sixmile Lake 1. Tributary channel construction, Dolly Varden habitat, not done as mitigation.	1993	Carol Sanner, ADOT/PF, Anchorage, 266-1509	ADOT/PF, ADF&G and other regulatory agencies have files
Placer mining stream diversion w/ some meander & pools (currently 2000' long, will be 7000'), in Granite Creek, George River Drainage. Plan not yet in place for eventual stream reclamation	diversion 1991—no reclamation yet	Wayne Dolezal, ADF&G, Anchorage, 267-2284; Dave Kelley or Carl Persson, BLM, Anchorage District, 267-1213.	Not yet in reclamation stage

C. NORTHERN/INTERIOR ALASKA

PROJECT	YEAR	CONTACTS	OTHER SOURCE/COMMENTS
Older BP projects on North Slope	since 1970's	Jay McKendrick, UAF Agricultural & Forestry Experimental Station in Palmer, 746-9450.	some info on his work was gleaned from issues of *Agroborealis*.
Ecological Restoration of the North Prudhoe Bay State #2 Exploratory Well Site. Deep & shallow marsh/pond complex, *Arctophila* & *Carex* plantings, moist meadow.	1992	Mike Joyce, ARCO, 265-6534. Alaska Biological Research (ABR, Fairbanks, 455-6777) is conducting this study on contract to ARCO.	Progress report will soon be available (1993).
Various causeways (West Dock Causeway, Endicott) in Beaufort Sea. Not included in inventory because not a habitat restoration/ enhancement project per se, but minimization of impacts.	1970's-80's	Barbara Mahoney, NMFS, Anchorage, 271-5006.	Barbara Mahoney has reports.
Many stream crossing & gravel site associated with TAPS (Trans Alaska Pipeline). Al Ott reports approx. 400 sites in all were rehabilitated in summer 1978. There were 10-15 floodplain gravel pit (aquatic habitat) rehabilitations that turned out well, among them: West Fork Tolovana River, Prospect Creek, Jim River, Trevor Crk, Dietrich River, and more recently, the Middle Fork of Koyukuk/Union Gulch Creek.	1978	Al Ott, ADF&G, Habitat Division, Fairbanks, 451-6192.	USFWS compiled information into a report on what was done at the time, *Gravel Removal Studies in Arctic & Subarctic Floodplains in Alaska*, FWS/OBS-80/80, June 1980. The State Pipeline Office (Anchorage) now has the original files. Al Ott can provide more recent observations on the outcomes of these sites. These efforts are unique in that they provide 15 years of evidence.
Placer Mine Settling Ponds near Fairbanks. Study of existing conditions (water chemistry, etc.). No rest./enhancement actions as yet, so not within this project scope.	current	Patrick Scannel, USFWS, Fairbanks, 456-0388.	Soon written up in report form.