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
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
Phil Cutler, Alaska Sportfishing Association, Anchorage
Dave Cline, National Audubon Society, Anchorage
Kim Titus, The Wildlife Society, Douglas
Mike Scott, Bureau of Land Management, Anchorage
Susan Will, Kobuk District, BLM, Fairbanks
Brain Lubinski/Jon Kostohrys, Steese/White Mtn District, BLM, Fairbanks
Shelly Jones, Steese/White Mtn District, BLM, Fairbanks
Skip Walker, Institute of Arctic & Alpine Research, Univ. of Colorado
Tamra Faris, NOAA, Juneau
Don Martin, USFS, Juneau
Ron Medel, USFS, Ketchikan
Ron Josephson, ADF&G, CFMD, Douglas
Mark Willette, ADF&G, CFMD, Cordova
Lon White, ADF&G, CFMD, Kodiak
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

Frank Rue
Director
Habitat and Restoration Division
Alaska Department of Fish and Game
P.O. Box 25526
Juneau, Alaska 99802-5526

July 1993
The Alaska Department of Fish and Game receives federal funding. All of its public programs and activities are operated free from discrimination on the basis of race, religion, sex, color, national origin, age, or handicap. Any person who believes he or she has been discriminated against by this agency should write to: OEO, U.S. Department of the Interior, Washington, DC 20240.
# TABLE OF CONTENTS

List of Tables ........................................................................................................ ii
List of Figures ........................................................................................................ iii
Acknowledgements ................................................................................................ iv

CHAPTER 1. INTRODUCTION .............................................................................. 1-1

CHAPTER 2. PROJECT INVENTORY .................................................................... 2-1
A) Methods ........................................................................................................... 2-1
B) Results/Discussion ........................................................................................... 2-3
C) How to Use These Database Reports ............................................................... 2-15
D) Summary Table
   Southeast Alaska ............................................................................................... 2-17
   Southcentral/Southwest ..................................................................................... 2-22
   Northern/Interior .............................................................................................. 2-30
E) Project Narratives
   Southeast Alaska ............................................................................................... 2-35
   Southcentral/Southwest ..................................................................................... 2-59
   Northern/Interior .............................................................................................. 2-112
F) Index to Database Reports ................................................................................ 2-141

CHAPTER 3. CASE STUDIES .............................................................................. 3-1
A) Selection of Case Study Projects .................................................................... 3-1
B) Description of Evaluation Approach ............................................................... 3-9

CHAPTER 4. PROJECT BIBLIOGRAPHY........................................................... 4-1
A) Methods ........................................................................................................... 4-1
B) Bibliography .................................................................................................... 4-3
C) Index to Bibliography ....................................................................................... 4-37

APPENDIX A: Data Field Descriptions for Aquatic Habitat Database ............... A-1

APPENDIX B: Full Data Printout for One Project Record ..................................... B-1

APPENDIX C: Data Entry Form for 309 Aquatic Habitat Database ................... C-1

APPENDIX D: Additional Alaskan Aquatic Habitat Projects Identified During
                 Course of Inventory Research ................................................................ D-1
LIST OF TABLES

Table 1. Description of Selected Data Fields Used in Reports and Discussion . . . 2-5
Table 2. Possible Case Study Projects . . . . . . . . . . . . . . . . . . . . . . . . . 3-4
See Also "Summary Table", Section D of Chapter 2 . . . . . . . . . . . . . . . 2-17
LIST OF FIGURES

Figure 1. Boundaries of the Three State Regions Used to Sort the Project Inventory Data .................................................. 2-4

Figure 2. Years in which Restoration/Enhancement Projects were Begun .......... 2-7

Figure 3. Geographic Distribution of Aquatic Habitat Restoration or Enhancement Projects on Database .................................. 2-8

Figure 4. Types of Aquatic Habitat Being Restored or Enhanced .................. 2-9

Figure 5. Objectives of Restoration/Enhancement Projects .......................... 2-10

Figure 6. Target Habitat Use of Restoration/Enhancement Projects ............... 2-11

Figure 7. Assessment of Success at Meeting Restoration/Enhancement Objectives 2-13
ACKNOWLEDGEMENTS

Individuals representing a wide variety of federal, state, and local government agencies and researchers served as members of an interagency advisory group for the project during the past year. Those that contributed particular guidance include: K Koski, Rick Sinnott, Sandy Tucker, Thede Tobish, Phil Brna, Kevin Brownlee, Janet Schempf, Mary Lee Plumb-Mentjes, Andy Grossman, Sandy Milner, Stoney Wright, Nancy Moore, Robert "Skip" Gish, and Duane Peterson. Dozens of other agency and private industry employees participated in the project by providing project information and/or contact referrals. Many were directly interviewed to obtain descriptions of past Alaskan restoration or enhancement projects. A few individuals took particular time to provide project details in the exact format needed; these include Christopher James, John Edgington, Gary Fandrei, and Ken Hodges.

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

<table>
<thead>
<tr>
<th>FIELD NAME (&amp; abbreviation)</th>
<th>FIELD MEANING</th>
<th>POSSIBLE RESPONSES (if standardized)</th>
<th>RESPONSE CODE MEANINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lead Organization (Lead Org.)</td>
<td>Group that served as the lead for the restoration/enhancement attempt</td>
<td>ACOE, USFS, BLM, ADF&amp;G, ADOT/ PF, AEA, DNR-PMC, MOA, Etc., PRIVATE</td>
<td>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 &amp; Public Facilities, Alaska Energy Authority, Alaska Dept. of Natural Resources-Plant Materials Center, Municipality of Anchorage, Private Company or organization (named in separate field)</td>
</tr>
<tr>
<td>Status (Status)</td>
<td>Current Status of Project</td>
<td>Preliminary Implementation Monitoring Completed w/M Completed w/o M</td>
<td>Preliminary Stage Implementation Stage Monitoring Stage Completed, with some monitoring Completed, no monitoring done</td>
</tr>
<tr>
<td>AK Geographic Region (Region)</td>
<td>Used for sorting data into three state regions</td>
<td>SoEast, SCenSW, NorInt</td>
<td>Southeast Alaska, Southcentral/Southwest, Northern &amp; Interior</td>
</tr>
<tr>
<td>Objectives (Objective)</td>
<td>Category of project objectives. (List up to 4)</td>
<td>HABITAT, EROSION, HYDROLOGY, WATER QUALITY, EXPERIMENT INCIDENTAL, RECREATION/HERITAGE, HARVEST, GENERAL</td>
<td>For birds, fish, invert, 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</td>
</tr>
</tbody>
</table>
Table 1 (continued): Description of Selected Data Fields Used in Reports and Discussion

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

![Graph showing years and project records]

PROJECT INVENTORY
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 Valdez 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
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)**

![Graph showing target habitat use percentages](image-url)
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...
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 relevant 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

<table>
<thead>
<tr>
<th>PROJECT NAME IDENTIFICATION CODE</th>
<th>SHORT DESCRIPTION</th>
<th>LEAD ORG. START YR.</th>
<th>STATUS NEAREST TOWN</th>
<th>PROJECT SIZE</th>
<th>TARGET SPECIES (IF ANY)</th>
<th>HABITAT USE</th>
<th>ACTION TYPE</th>
<th>HABITAT TYPE SUCCESSFUL?</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 Mile Spawning Channel P0105</td>
<td>NSRAA groundwater-fed spawning channel on Chilkat River at Mile 24, Haines Hwy Private 1982</td>
<td>Completed w/M Haines</td>
<td>1500' long x 20' wide</td>
<td>Chum, coho salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM, STABL</td>
<td>Riverine</td>
<td>Partially</td>
</tr>
<tr>
<td>ADOT Hoonah Airport Expansion P0009</td>
<td>Port Fredrick 44. Many-faceted mit. package for fill; spawning, rearing, reveg ADOT/PF 1992</td>
<td>Monitoring Hoonah</td>
<td>In the end, many acres</td>
<td>Anadromous fish</td>
<td>Rearing, Spawning</td>
<td>LFORM, SEED, STABL, PLANT?</td>
<td>Riverine</td>
<td>Yes</td>
</tr>
<tr>
<td>Bayhead Ck Barrier Modification P0129</td>
<td>Step pools blasted into 3 coho barriers USFS 1992</td>
<td>Monitoring Tenakee Springs</td>
<td>Access to 3 stream miles</td>
<td>Coho, Cutthroat, D.Varden</td>
<td>Spawning, Rearing</td>
<td>LFORM</td>
<td>Riverine</td>
<td>Too soon</td>
</tr>
<tr>
<td>Bennett Creek P0098</td>
<td>Torscana Airport South, Prince of Wales Island. Restore logged stream. ADF&amp;G 1991</td>
<td>Implementation Klawock</td>
<td>0.9 mile of stream</td>
<td>Coho salmon</td>
<td>Rearing</td>
<td>LFORM, SEED, PFERT, STABL</td>
<td>Riverine</td>
<td>Too soon</td>
</tr>
<tr>
<td>Big Boulder Creek P0037</td>
<td>Mitigation &amp; Enhancement in association w/ bridge work on Haines Highway ADOT/PF 1991</td>
<td>Monitoring Haines</td>
<td>500-3000m of stream (diff.work)</td>
<td>Chinook salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM, STOCK</td>
<td>Riverine</td>
<td>Too soon</td>
</tr>
<tr>
<td>Bryce Creek Coho Rearing Area P0103</td>
<td>Connecting Rearing sloughs in Salmon River Valley USFS 1989</td>
<td>Monitoring Ryder</td>
<td>23,100 m2</td>
<td>Coho Salmon</td>
<td>Rearing, Overwinter</td>
<td>LFORM, HYDRO</td>
<td>Riverine</td>
<td>Too soon</td>
</tr>
<tr>
<td>Chilkat River Pond Access P0041</td>
<td>Channels to connect river to potential rearing ponds in the upper Chilkat Valley ADF&amp;G 1980</td>
<td>Completed w/M Haines</td>
<td>616'of chnls to 103ac. rearing hab</td>
<td>Coho salmon</td>
<td>Rearing</td>
<td>LFORM</td>
<td>Palustrine</td>
<td>Yes</td>
</tr>
<tr>
<td>Dean Creek Fishway P0118</td>
<td>Alaska Steepass project by USFS. USFS 1983</td>
<td>Completed w/M Kake</td>
<td>access to 30 acres upstream</td>
<td>Coho salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM</td>
<td>Riverine</td>
<td>Yes</td>
</tr>
<tr>
<td>Dog Salmon Creek, Site #1 P0100</td>
<td>Reducing habitat loss resulting from bank erosion and sedimentation ADF&amp;G 1992</td>
<td>Implementation Craig</td>
<td>125' of stream</td>
<td>General</td>
<td>HYDRO, LFORM, STABL</td>
<td>Riverine</td>
<td>Too soon</td>
<td></td>
</tr>
</tbody>
</table>
## SECTION D: SUMMARY TABLE (CONTINUED)

| PROJECT NAME | SHORT DESCRIPTION | LEAD ORG. | STATUS | PROJECT SIZE | TARGET SPECIES | HABITAT USE | ACTION TYPE | HABITAT TYPE | SUCCESSFUL?
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Dog Salmon Creek, Site #2 P0101</td>
<td>Stabilizing a slide north of Port St. Nicholas</td>
<td>ADF&amp;G 1992</td>
<td>Implementation</td>
<td>80' reach of stream</td>
<td>General</td>
<td>STABL, SEED</td>
<td>Riverine</td>
<td>Too soon</td>
<td></td>
</tr>
<tr>
<td>Glacier Highway Reconstruction P0039</td>
<td>1984 work done in Jordan and Duck Creeks in Juneau. AKA Gastineau Channel 306.</td>
<td>ADOT/PF 1984</td>
<td>Completed w/M Juneau</td>
<td>300-600' of Jordan; 500' of Duck</td>
<td>Coho Salmon</td>
<td>Spawning, Rearing</td>
<td>Riverine</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Green's Creek Fish Pass P0055</td>
<td>Fish Pass over barrier falls as mitigation for habitat loss in Tributary.</td>
<td>USFS 1988</td>
<td>Completed w/M Juneau/Hoonah</td>
<td>100 ft of creek</td>
<td>Coho salmon</td>
<td>Rearing, Overwinter</td>
<td>Riverine</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Haines Airport Mitigation P0018</td>
<td>Chilkat River 6. Created fish rearing ponds and wetlands, monitoring req'd.</td>
<td>ADOT/PF 1990</td>
<td>Monitoring Haines</td>
<td>19 acs (tot. wind, ponds, churn.)</td>
<td>Coho salmon, trout</td>
<td>Rearing</td>
<td>Riverine</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Herman Creek P0104</td>
<td>Spawning Channel near Haines</td>
<td>Private 1989</td>
<td>Completed w/M Haines</td>
<td>1500' long x 20' wide</td>
<td>Chum, coho salmon</td>
<td>Spawning, Rearing</td>
<td>Riverine</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Indian River Log Dump P0109</td>
<td>Restoring former Log Dump by removing bark debris.</td>
<td>USFWS 1984</td>
<td>Monitoring Tenakee Springs</td>
<td>1500 sq yds</td>
<td>crabs, clams</td>
<td>General</td>
<td>LFORM, CONTM</td>
<td>Estuarine</td>
<td>Too soon</td>
</tr>
<tr>
<td>Jordan Creek B P0049</td>
<td>Enforcement action will ensure restoration/protection of remaining wetland area</td>
<td>Private 1993</td>
<td>Preliminary Juneau</td>
<td>approx. 1/2 acre wetlands</td>
<td>Cohos, Dolly Varden</td>
<td>Rearing</td>
<td>Riverine</td>
<td>Too soon</td>
<td></td>
</tr>
<tr>
<td>Juneau Airport Dike P0047</td>
<td>Nice freshwater marsh complex was created incidentally by new dike in the 1940's</td>
<td>DOT 1942</td>
<td>Completed w/M Juneau</td>
<td>4-5 acres of sloughs</td>
<td></td>
<td>LFORM</td>
<td>Palustrine</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Juneau Airport Taxiway/GC 341 P0054</td>
<td>Gastineau Channel 341 and other concurrent permits, involving Jordan Creek</td>
<td>CB 1991</td>
<td>Monitoring Juneau</td>
<td>many separate areas</td>
<td></td>
<td>Rearing, General</td>
<td>Estuarine</td>
<td>Yes</td>
<td></td>
</tr>
<tr>
<td>Kennel Crk Large Woody Debris P0129</td>
<td>Felling trees into creek to enhance cover for rearing coho.</td>
<td>USFS 1986</td>
<td>Monitoring Tenakee Springs</td>
<td>8 acres of habitat</td>
<td>Coho salmon</td>
<td>Rearing, Overwinter</td>
<td>Riverine</td>
<td>Too soon</td>
<td></td>
</tr>
<tr>
<td>PROJECT NAME</td>
<td>IDENTIFICATION CODE</td>
<td>SHORT DESCRIPTION</td>
<td>LEAD ORG.</td>
<td>STATUS</td>
<td>NEAREST TOWN</td>
<td>PROJECT SIZE</td>
<td>TARGET SPECIES</td>
<td>HABITAT USE</td>
<td>ACTION TYPE</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------</td>
<td>-------------------</td>
<td>----------</td>
<td>--------</td>
<td>--------------</td>
<td>--------------</td>
<td>---------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Kwetashein Fishway</td>
<td>P0120</td>
<td>Concrete weir &amp; step pool passage for pink salmon</td>
<td>USFS</td>
<td>Completed w/M</td>
<td>Kake</td>
<td>Access to 40 acres</td>
<td>Pink Salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM</td>
</tr>
<tr>
<td>Lake Rear</td>
<td>P0131</td>
<td>Creating rearing cover by felling trees along lakeshore.</td>
<td>USFS</td>
<td>Completed w/M</td>
<td>Kake</td>
<td>4 lakes each approx 30 acres</td>
<td>Coho, Cutthroat, D.Varden</td>
<td>Rearing</td>
<td>LFORM</td>
</tr>
<tr>
<td>Lemon Creek 1-4</td>
<td>P0043</td>
<td>Required to restabilize and replant creek banks after gravel extraction</td>
<td>Private</td>
<td>Monitoring</td>
<td>Juneau</td>
<td>3/4 mile length of stream</td>
<td>Chum, coho, D.Varden</td>
<td>Spawning</td>
<td>LFORM, PLANT, STABL</td>
</tr>
<tr>
<td>Lemon Creek 9</td>
<td>P0049</td>
<td>Create aquatic littoral habitat (shallow shelf) as rehab gravel mining operation</td>
<td>Private</td>
<td>Preliminary</td>
<td>Juneau</td>
<td>5.25 acres whole surface area</td>
<td>Coho salmon</td>
<td>Rearing</td>
<td>LFORM, PLANT</td>
</tr>
<tr>
<td>Man Made Hole Replanting</td>
<td>P0117</td>
<td>Blind Slough Gravel Pit Replanting Area</td>
<td>USFS</td>
<td>Completed w/M</td>
<td>Petersburg</td>
<td>2 acre lake</td>
<td>Coho, Steelhead, Cutthroat</td>
<td>Spawning, Rearing</td>
<td>LFORM</td>
</tr>
<tr>
<td>Marx Creek Spawning Channel</td>
<td>P0102</td>
<td>USFS/ADF&amp;G spawning channel tagging in formerly logged Salmon River Valley</td>
<td>USFS</td>
<td>Monitoring</td>
<td>Hyder</td>
<td>2.2 km long x 6m wide</td>
<td>Chum Salmon</td>
<td>Spawning, General</td>
<td>LFORM, SPOIL, PLANT, STABL</td>
</tr>
<tr>
<td>Mendenhall Ordnance Islands</td>
<td>P0048</td>
<td>Sand islands created from Mendenhall Bar Navigation Channel</td>
<td>ACOE</td>
<td>Completed w/M</td>
<td>Juneau</td>
<td>5-10 acres of dredge spoil island</td>
<td>Shorebirds, Waterfowl</td>
<td>Nesting, General</td>
<td>LFORM, SPOIL</td>
</tr>
<tr>
<td>Mitchell Creek Fish Pass</td>
<td>P0121</td>
<td>Concrete weir and pool structure for coho and steelhead passage</td>
<td>USFS</td>
<td>Completed w/M</td>
<td>Petersburg</td>
<td>Access to 45 acres</td>
<td>Coho, Steelhead, Cutthroat</td>
<td>Spawning, Rearing</td>
<td>LFORM</td>
</tr>
<tr>
<td>Mitchell Pool Enhancement</td>
<td>P0122</td>
<td>Pools for spawning and rearing blasted into bedrock</td>
<td>USFS</td>
<td>Completed w/M</td>
<td>Petersburg</td>
<td>Add 1 acre of rearing habitat</td>
<td>Coho, Steelhead, Cutthroat</td>
<td>Spawning, Rearing</td>
<td>LFORM</td>
</tr>
<tr>
<td>Mitkof Highway Reconstruction</td>
<td>P0038</td>
<td>Removing fish barriers at 25 crossings along 6.4 mile section of highway.</td>
<td>ADOT/PF</td>
<td>Completed w/o M</td>
<td>Petersburg</td>
<td>6.4 miles</td>
<td>Coho and Cutthroat</td>
<td>General</td>
<td>LFORM, SEED, HYDRO</td>
</tr>
<tr>
<td>Mud Bay River LG Woody Debris</td>
<td>P0130</td>
<td>Felling trees into creek to enhance coho rearing cover</td>
<td>USFS</td>
<td>Completed w/M</td>
<td>Noonah</td>
<td>One stream mile</td>
<td>Coho Salmon</td>
<td>Rearing</td>
<td>LFORM</td>
</tr>
<tr>
<td>PROJECT NAME</td>
<td>IDENTIFICATION CODE</td>
<td>SHORT DESCRIPTION</td>
<td>LEAD ORG. START YR.</td>
<td>STATUS</td>
<td>NEAREST TOWN</td>
<td>PROJECT SIZE</td>
<td>TARGET SPECIES</td>
<td>HABITAT USE</td>
<td>ACTION TYPE</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------</td>
<td>--------------------</td>
<td>---------------------</td>
<td>--------</td>
<td>--------------</td>
<td>--------------</td>
<td>---------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>N.F. Game Ck Barrier Modif.</td>
<td>P0127</td>
<td>Step pools created by blasting for coho migration</td>
<td>USFS 1988</td>
<td>Monitoring</td>
<td>Hoonah</td>
<td>3.5 acres of habitat</td>
<td>Coho salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM, STOCK</td>
</tr>
<tr>
<td>North Three Mile Creek</td>
<td>P0097</td>
<td>ADF&amp;G Educational Project on Prince of Wales Island</td>
<td>ADF&amp;G 1992</td>
<td>Implementation</td>
<td>Klawock</td>
<td>180 ft of stream</td>
<td>Pink Salmon</td>
<td>Spawning, Migrating</td>
<td>LFORM, SEED, HYDRO, CUT</td>
</tr>
<tr>
<td>Ophir Creek Flow Improvement</td>
<td>P0045</td>
<td>Trying to improve low flow in a degraded stream system. Much community interest.</td>
<td>ADF&amp;G 1989</td>
<td>Implementation</td>
<td>Kake</td>
<td>7 kilometers is entire reach</td>
<td>Coho, Sockeye</td>
<td>General</td>
<td>LFORM</td>
</tr>
<tr>
<td>Pavlof River Upper Fishpass</td>
<td>P0123</td>
<td>Ladder for pink, chum and coho salmon. Fish use will be determined by tagging.</td>
<td>USFS 1987</td>
<td>Monitoring</td>
<td>Tenakee Springs</td>
<td>13 acres of habitat</td>
<td>Coho salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM</td>
</tr>
<tr>
<td>Pavlov Marsh Wildlife Viewing</td>
<td>P0107</td>
<td>USFS project for &quot;watchable wildlife&quot;: nesting platforms for Canada geese</td>
<td>USFS 1991</td>
<td>Monitoring</td>
<td>Hoonah</td>
<td>100 acre marsh, 10 platforms</td>
<td>Vancouver Canada Goose</td>
<td>Nesting</td>
<td>LFORM</td>
</tr>
<tr>
<td>Slippery Creek Fishway</td>
<td>P0116</td>
<td>Tunneled fishpass through rock</td>
<td>USFS 1987</td>
<td>Completed w/</td>
<td>Kake</td>
<td>Access to 50 acres rearing</td>
<td>Coho salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM</td>
</tr>
<tr>
<td>Starrigavan Creek</td>
<td>P0170</td>
<td>Large woody debris structures placed in stream</td>
<td>USFS 1986</td>
<td>Monitoring</td>
<td>Sitka</td>
<td>210 m</td>
<td>juvenile coho</td>
<td>Rearing, Overwinter</td>
<td>LFORM</td>
</tr>
<tr>
<td>Suntahseen Crk Pink Slam Barrier</td>
<td>P0128</td>
<td>Step pools blasted into falls for pink &amp; chum spawning access.</td>
<td>USFS 1991</td>
<td>Monitoring</td>
<td>Hoonah</td>
<td>2 stream miles</td>
<td>Pink salmon</td>
<td>Spawning, Migrating</td>
<td>LFORM, HYDRO</td>
</tr>
<tr>
<td>Suntahseen Crk Lg Woody Debris</td>
<td>P0125</td>
<td>Reducing stream gradient and velocity with log structures.</td>
<td>USFS 1989</td>
<td>Preliminary</td>
<td>Hoonah</td>
<td>One mile</td>
<td>Coho salmon</td>
<td>Rearing, Overwinter</td>
<td>LFORM</td>
</tr>
<tr>
<td>Suntahseen Fishpasses I &amp; II</td>
<td>P0124</td>
<td>Cooperative USFS, NSRAA and ADF&amp;G FRED Division project for new coho run.</td>
<td>USFS 1989</td>
<td>Monitoring</td>
<td>Hoonah</td>
<td>15 acres above fishpasses</td>
<td>Coho salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM, STOCK</td>
</tr>
<tr>
<td>Switzer Creek Restoration</td>
<td>P0046</td>
<td>An ongoing community project to improve the ability of the creek to support fish</td>
<td>ADF&amp;G 1992</td>
<td>Implementation</td>
<td>Juneau</td>
<td>4 kilometers</td>
<td>Coho, chum, pink, D. Varden</td>
<td>General</td>
<td>LFORM</td>
</tr>
</tbody>
</table>
### SECTION D: SUMMARY TABLE (CONTINUED)

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

**Region:** SOUTHCENTRAL/SOUTHWEST

<table>
<thead>
<tr>
<th>PROJECT NAME IDENTIFICATION CODE</th>
<th>SHORT DESCRIPTION</th>
<th>LEAD ORG. START YR.</th>
<th>STATUS NEAREST TOWN</th>
<th>PROJECT SIZE</th>
<th>TARGET SPECIES (IF ANY)</th>
<th>HABITAT USE</th>
<th>ACTION TYPE</th>
<th>HABITAT TYPE SUCCESSFUL?</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th of July Creek Mitigation P0141</td>
<td>Spawning channel as mitigation for Seward Marine Industrial Ctr (in Spring Crk).</td>
<td>CitySew 1981</td>
<td>Completed w/o M Seward</td>
<td>600 ft. of streambank</td>
<td>Chum Salmon</td>
<td>Spawning, Rearing</td>
<td>LFDRM, HYDRO</td>
<td>Riverine</td>
</tr>
<tr>
<td>Abbott Loop Sch Crk Realignmnt P0176</td>
<td>MOA Rechannelization of S. Fork Little Campbell Crk at Abbott Loop School</td>
<td>MOA 1987</td>
<td>Completed w/M Anchorage</td>
<td>restored reach totals 725 ft</td>
<td>Coho, Dolly Varden</td>
<td>Rearing, General</td>
<td>LFDRM, START, SEED, PLANT</td>
<td>Riverine</td>
</tr>
<tr>
<td>Anton Larsen Bay P0026</td>
<td>Eelgrass restoration for illegal fill in intertidal lagoon, Kodiak Island.</td>
<td>Private 1984</td>
<td>Completed w/M Larsen Bay</td>
<td>A lagoon of approx. 2 acres</td>
<td>birds, fish, inverts...</td>
<td>General</td>
<td>LFDRM, PLANT, Marine</td>
<td>Marine</td>
</tr>
<tr>
<td>Bayshore Ponds &amp; Berms P0172</td>
<td>Attempt to create freshwater nesting ponds along the tidelands</td>
<td>ADF&amp;G 1971</td>
<td>Completed w/o M Anchorage</td>
<td>9 ponds along 1.5 mile stretch</td>
<td>primarily ducks</td>
<td>Nesting, General</td>
<td>LFDRM, SEED, PLANT</td>
<td>Estuarine</td>
</tr>
<tr>
<td>Bear Lake Fertilization P0111</td>
<td>Ongoing lake stocking and fertilization program, with increased sedimentation.</td>
<td>Private 1981</td>
<td>Implementation Seward</td>
<td>180 ha. lake</td>
<td>Sockeye &amp; coho salmon</td>
<td>Spawning, Rearing</td>
<td>LFDRM, STOCK, HYDRO</td>
<td>Lacustrine</td>
</tr>
<tr>
<td>Beaver Dam Blockages P0110</td>
<td>Ongoing CIIA project to allow fish passage during runs.</td>
<td>Private 1980</td>
<td>Implementation Kenai &amp; Tyonek</td>
<td>6 streams</td>
<td>Sockeye</td>
<td>Migrating, Spawning</td>
<td>LFDRM</td>
<td>Riverine</td>
</tr>
<tr>
<td>Beaver Pond Access Structures P0076</td>
<td>USFS prog to let juv. fish cross beaver dams into productive rearing ponds.</td>
<td>USFS 1989</td>
<td>Monitoring Cordova</td>
<td>6 fry pipes, access to 25 acres</td>
<td>coho salmon</td>
<td>Migrating, Rearing</td>
<td>LFDRM</td>
<td>Riverine</td>
</tr>
<tr>
<td>Bethel Small Boat Harbor P0081</td>
<td>Tidal river bank revegetation program</td>
<td>DNR-PMC 1984</td>
<td>Completed w/M Bethel</td>
<td>2 acres</td>
<td>General</td>
<td>SEED, PLANT, SOIL</td>
<td>Riverine</td>
<td></td>
</tr>
<tr>
<td>Box Canyon Creek P0144</td>
<td>Series of rearing ponds as mitigation for coal loading facility.</td>
<td>ADOT/PF 1986</td>
<td>Completed w/M Seward</td>
<td>1000 ft of stream</td>
<td>Coho and chinook</td>
<td>Spawning, Rearing</td>
<td>LFDRM</td>
<td>Riverine</td>
</tr>
<tr>
<td>Bradley Lake Waterfowl Nesting P0057</td>
<td>Tidal/freshwater waterfowl nesting area as mitigation for AEA's Hydropower Plant</td>
<td>AEA 1991</td>
<td>Monitoring Homer</td>
<td>40 acres</td>
<td>ducks</td>
<td>Nesting, Staging</td>
<td>LFDRM, SEED, PLANT, HYDRO, PFERT</td>
<td>Estuarine</td>
</tr>
<tr>
<td>Brooks River Fish Ladder P0052</td>
<td>Installed at Brooks Falls in 1940's by federal Bureau of Commercial Fisheries</td>
<td>BurComF 1949</td>
<td>Completed w/M King Salmon</td>
<td>80' long, 10' wide fish ladder</td>
<td>Sockeye</td>
<td>Migrating</td>
<td>LFDRM, HYDRO</td>
<td>Riverine</td>
</tr>
</tbody>
</table>

**SUMMARY TABLE**
### SECTION D: SUMMARY TABLE (CONTINUED)

<table>
<thead>
<tr>
<th>PROJECT NAME IDENTIFICATION CODE</th>
<th>PROJECT NAME Short Description</th>
<th>LEAD ORG. START YR.</th>
<th>STATUS NEAREST TOWN</th>
<th>PROJECT SIZE</th>
<th>TARGET SPECIES (IF ANY)</th>
<th>HABITAT USE</th>
<th>ACTION TYPE HABITAT TYPE SUCCESSFUL</th>
</tr>
</thead>
<tbody>
<tr>
<td>California Creek Culvert &amp; Pools P0058</td>
<td>ADOT/PF culvert, fish pools, reveg at Alyeska Highway in Girdwood</td>
<td>ADOT/PF 1992</td>
<td>Implementation Girdwood</td>
<td>500 ft. of streambed</td>
<td>Coho &amp; King Salmon</td>
<td>Spawning, Migrating</td>
<td>LFORM, SEED, PLANT, STABL Riverine Too soon</td>
</tr>
<tr>
<td>Campbell Lake Outlet P0114</td>
<td>Rehabilitation of a sedge wetland (extreme high intertidal)</td>
<td>NOAA 1989</td>
<td>Completed w/o M Anchorage</td>
<td>Approximately 1/2 acre</td>
<td>Pink, coho, king, red</td>
<td>Spawning, Rearing</td>
<td>LFORM, PLANT, HYDRO Palustrine Yes</td>
</tr>
<tr>
<td>Canada Geese Nest Island Prgm P0070</td>
<td>USFS program creating artificial nest islands for Dusky Canada Geese in Cordova</td>
<td>USFS 1983</td>
<td>Monitoring Cordova</td>
<td>800 islands over a wide area</td>
<td>Dusky Canada Goose</td>
<td>Nesting</td>
<td>LFORM, SOIL Palustrine Partially</td>
</tr>
<tr>
<td>Canada Geese Peninsula Cutoffs P0071</td>
<td>USFS program of converting peninsulas into nest islands for Dusky Canada Geese</td>
<td>USFS 1992</td>
<td>Monitoring Cordova</td>
<td>new islands: 0.525 and 1.25 acres</td>
<td>Dusky Canada Goose</td>
<td>Nesting</td>
<td>LFORM Palustrine Too soon</td>
</tr>
<tr>
<td>Canyon Slough P0108</td>
<td>Realignment of slough to accommodate Pipeline route</td>
<td>ADF&amp;G 1975</td>
<td>Completed w/M Valdez</td>
<td>4000+ of channel</td>
<td>Coho, pink salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM Riverine Yes</td>
</tr>
<tr>
<td>Captains Bay 14; Unalaska Crk P0178</td>
<td>Correcting a perched culvert as offsite mitigation for tideland fill, Valdez</td>
<td>ADF&amp;G 1989</td>
<td>Completed w/M Unalaska</td>
<td>1/2 mile stream reach</td>
<td>pink salmon</td>
<td>Spawning, Migrating</td>
<td>LFORM Riverine Partially</td>
</tr>
<tr>
<td>Chester Creek Realignment P0147</td>
<td>Rerouting Chester Creek into University Lake to allow Tudor Centre Devlmt.</td>
<td>ADF&amp;G 1983</td>
<td>Completed w/o M Anchorage</td>
<td>800 ft of new stream bed</td>
<td>rainbow trout, D.Varden</td>
<td>Rearing, General</td>
<td>LFORM, SEED Riverine Yes</td>
</tr>
<tr>
<td>CIAA Fish Passes P0183</td>
<td>Three step-pool fishpasses for sockeye installed by Cook Inlet Aqu.Asmn.</td>
<td>Private 1984</td>
<td>Monitoring varies -- see desc</td>
<td>affects several miles of streams</td>
<td>sockeye salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM, HYDRO Riverine Partially</td>
</tr>
<tr>
<td>CIAA Flow Control Structure P0185</td>
<td>Flow-control dams at lake outlets to ensure sufficient flow during sockeye runs</td>
<td>Private 1979</td>
<td>Implementation Kenai, AK</td>
<td>Harten Lk, 24 ha; Daniels, 286 ha</td>
<td>Sockeye salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM, HYDRO Riverine Yes</td>
</tr>
<tr>
<td>Coghill Lake Fertilization P0168</td>
<td>USFS, PWSAC, &amp; ADF&amp;G project to restore historical sockeye levels via lake fert.</td>
<td>USFS 1993</td>
<td>Implementation Whittier</td>
<td>3128 acre lake</td>
<td>Sockeye</td>
<td>Spawning, Rearing</td>
<td>LAKEFERT ONLY Lacustrine Too soon</td>
</tr>
<tr>
<td>Concord Hills/ Klatt Bog Mitigation P0182</td>
<td>Klatt Bog 6. Preservation/enhancement of 10-12 acres as mitigation for subdiv</td>
<td>Private 1984</td>
<td>Completed w/M Anchorage</td>
<td>10-12 acres, including prev area</td>
<td>waterfowl</td>
<td>Nesting, Staging</td>
<td>LFORM, HYDRO Palustrine Partially</td>
</tr>
<tr>
<td>PROJECT NAME IDENTIFICATION CODE</td>
<td>SHORT DESCRIPTION</td>
<td>LEAD ORG. START YR.</td>
<td>STATUS NEAREST TOWN</td>
<td>PROJECT SIZE</td>
<td>TARGET SPECIES (IF ANY)</td>
<td>HABITAT USE</td>
<td>ACTION TYPE</td>
</tr>
<tr>
<td>---------------------------------</td>
<td>-------------------</td>
<td>---------------------</td>
<td>----------------------</td>
<td>--------------</td>
<td>--------------------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Copper R. Delta Drawdown Ponds P0138</td>
<td>USFS efforts to manage uplifted ponds for waterfowl using HD2 control structures</td>
<td>USFS 1973</td>
<td>Completed w/o M Cordova</td>
<td>11 water control structures</td>
<td>Waterfowl</td>
<td>General</td>
<td>LFORM, PLANT, HYDRO, PFERT,</td>
</tr>
<tr>
<td>Cordova Distr Gravel Pit Rehab P0080</td>
<td>USFS Cordova District has rehabilitated 4 ponds into rearing areas to date</td>
<td>USFS 1978</td>
<td>Monitoring Cordova</td>
<td>10.5 acres total for 4 ponds</td>
<td>Coho, cutthroat, D.Varden</td>
<td>Rearing, Overwinter</td>
<td>LFORM, SEED, PLANT</td>
</tr>
<tr>
<td>Dave's Creek P0148</td>
<td>Spawning channel, Sterling Highway area, near Tern Lake campground</td>
<td>USFS 1983</td>
<td>Completed w/M Cooper Landing</td>
<td>200 meters</td>
<td>chinook</td>
<td>Spawning</td>
<td>LFORM, HYDRO</td>
</tr>
<tr>
<td>DEC Oiled Mussel Bed Experiment P0044</td>
<td>Various techniques tried to treat mussel beds with high oil content. Pr.Wm.Sound</td>
<td>ADEC 1992</td>
<td>Monitoring sites spread out</td>
<td>experimental plots of 1x1m or2x2m</td>
<td>mussels, birds, otters</td>
<td>General</td>
<td>LFORM, CONTM</td>
</tr>
<tr>
<td>Explorer Creek &amp; Ponds P0187</td>
<td>USFS educational project to enhance spawning, rearing &amp; overwintering habitat</td>
<td>USFS 1989</td>
<td>Monitoring Portage</td>
<td>21 acre pond; 3 miles of channel</td>
<td>sockeye, coho &amp; chum</td>
<td>Spawning, Overwinter</td>
<td>LFORM, HYDRO</td>
</tr>
<tr>
<td>Fill Removal--Potter Marsh P0166</td>
<td>Weigh station fill removal as enforcement action for other Corps violation</td>
<td>ACOE 1984</td>
<td>Completed w/M Anchorage</td>
<td>1/5 ac. fill rem; &lt;1 ac. tot. w/veg</td>
<td>waterfowl</td>
<td>General</td>
<td>LFORM, PLANT</td>
</tr>
<tr>
<td>Fish Creek Coastal Wetland R P0035</td>
<td>Mouth of Fish Cr, Anch. To date, only attempt at coastal wetland rest. in AK.</td>
<td>DNR-PMC 1990</td>
<td>Monitoring Anchorage</td>
<td>3 1/2 to 4 acres at mouth</td>
<td>Waterfowl</td>
<td>Nesting</td>
<td>PLANT, SEED</td>
</tr>
<tr>
<td>Fish Creek Mouth Waterfowl Enh P0179</td>
<td>Required to restore/enhance area after damage from sewer line installation</td>
<td>MOA 1986</td>
<td>Completed w/M Anchorage</td>
<td>corridor 300' wide x 1000' long</td>
<td>waterfowl, shorebirds</td>
<td>Nesting, General</td>
<td>LFORM, SEED</td>
</tr>
<tr>
<td>FRED projects on Campbell Ck P0032</td>
<td>Many fish habitat improvements: drop structure, revetments, etc.</td>
<td>ADF&amp;G 1990</td>
<td>Monitoring Anchorage</td>
<td>approx. 1/3 mi. of crk + sloughs</td>
<td>Coho Salmon</td>
<td>Rearing</td>
<td>LFORM, STABL</td>
</tr>
<tr>
<td>FS Cordova Distr.Spinning Chn P0078</td>
<td>USFS (Cordova) spawning channel construction in Copper River area</td>
<td>USFS 1984</td>
<td>Monitoring Cordova</td>
<td>One (Mi.25) channel is 22,500sq.ft</td>
<td>Coho, sockeye salmon</td>
<td>Spawning</td>
<td>LFORM, STABL, PLANT, SEED,</td>
</tr>
<tr>
<td>FS Stream Cover/Brush Bundles P0077</td>
<td>USFS (Cordova) prgm to add cover to barren streams for fish spawning</td>
<td>USFS 1986</td>
<td>Completed w/o M Cordova</td>
<td>close to 100 structures in all</td>
<td>Coho, Dolly Varden</td>
<td>Spawning, Overwinter</td>
<td>LFORM, PLANT</td>
</tr>
</tbody>
</table>
**SECTION D: SUMMARY TABLE (CONTINUED)**

<table>
<thead>
<tr>
<th>PROJECT NAME</th>
<th>SHORT DESCRIPTION</th>
<th>LEAD ORG. START YR.</th>
<th>STATUS NEAREST TOWN</th>
<th>PROJECT SIZE</th>
<th>TARGET SPECIES (IF ANY)</th>
<th>HABITAT USE</th>
<th>ACTION TYPE</th>
<th>HABITAT TYPE SUCCESSFUL?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fucus Recruitment Exp</td>
<td>Post oil spill seaweed recruitment study by Moss Landing Marine Labs</td>
<td>Univ. 1990</td>
<td>Completed w/M</td>
<td>approx. 480 m²</td>
<td>General</td>
<td>PLANT</td>
<td>Marine</td>
<td>Partially</td>
</tr>
<tr>
<td>Glacier District PWS Fish</td>
<td>USFS fishpasses in Western Prince William Sound, managed by Glacier Ranger District</td>
<td>USFS 1972</td>
<td>Completed w/M</td>
<td>12 sites in all-see description</td>
<td>mostly sockeye &amp; pink</td>
<td>Migrating, General</td>
<td>LFORM, HYDRO, STABL</td>
<td>Riverine</td>
</tr>
<tr>
<td>Glenn Highway Mitigation Proj.</td>
<td>Eklutna to Parks Highway reconstruction mitigation project</td>
<td>ADOT/PF 1990</td>
<td>Monitoring</td>
<td>211 acres</td>
<td>pintails</td>
<td>General</td>
<td>LFORM, HYDRO</td>
<td>Palustrine</td>
</tr>
<tr>
<td>Goodnews Platinum Mine</td>
<td>Reopening fish passage through placer mine tailings to spawn/rearing habitat</td>
<td>ADFs 1991</td>
<td>Completed w/M</td>
<td>total distance of 4 to 5 miles</td>
<td>Coho</td>
<td>Rearing, Overwinter</td>
<td>LFORM, SPOIL, HYDRO</td>
<td>Riverine</td>
</tr>
<tr>
<td>Gulkana River 5</td>
<td>Revegetating around new facilities at Sourough Campground, Gulkana River</td>
<td>'BLM 1992</td>
<td>Implementation</td>
<td>&lt;12 acres</td>
<td>General</td>
<td>LFORM, SEED, PLANT, PFERT, SOIL</td>
<td>Yes</td>
<td>Riverine</td>
</tr>
<tr>
<td>Harrison Lagoon Creek P0173</td>
<td>USFS creek diversion into Harrison Lagoon for chum &amp; pink spawning channel, PWS</td>
<td>USFS 1992</td>
<td>Monitoring</td>
<td>112500 sq. ft. spawning channel</td>
<td>chum &amp; pinks</td>
<td>Spawning</td>
<td>LFORM, PLANT, HYDRO, STABL</td>
<td>Riverine</td>
</tr>
<tr>
<td>Huffman Hills Conserv.Easement</td>
<td>UAF's Fucus (seaweed) restoration study in Prince William Sound</td>
<td>UAF 1990</td>
<td>Implementation</td>
<td>200m of beach</td>
<td>PLANT</td>
<td>Marine</td>
<td>Unknown</td>
<td>To soon</td>
</tr>
<tr>
<td>Ingram Pond Coho Rearing Enhc</td>
<td>Tried to create recr. coho fishery by connecting crk to rearing pond &amp; stocking</td>
<td>USFS 1985</td>
<td>Completed w/M</td>
<td>access to 78 acre rearing pond</td>
<td>coho &amp; pink salmon</td>
<td>Rearing, General</td>
<td>LFORM, HYDRO, STOCK</td>
<td>Lacustrine</td>
</tr>
<tr>
<td>Jap Creek Mitigation P0143</td>
<td>Spawning channel as mit for Seward Marine Ind. Ctr. in Spring Creek</td>
<td>CitySew 1985</td>
<td>Completed w/M</td>
<td>6300 square yards</td>
<td>Pink and Chum Salmon</td>
<td>Spawning</td>
<td>LFORM, SEED</td>
<td>Riverine</td>
</tr>
<tr>
<td>Johns Creek P0193</td>
<td>Diversion of channel to new location in close proximity, due to placer mining</td>
<td>ADF&amp;G 1984</td>
<td>Completed w/M</td>
<td>2 miles of stream</td>
<td>king &amp; coho</td>
<td>Spawning, Rearing</td>
<td>LFORM, STABL</td>
<td>Palustrine</td>
</tr>
</tbody>
</table>

Region: SOUTHCENTRAL/SOUTHWEST (Continued)
<table>
<thead>
<tr>
<th>PROJECT NAME</th>
<th>IDENTIFICATION CODE</th>
<th>SHORT DESCRIPTION</th>
<th>LEAD ORG. START YR.</th>
<th>STATUS NEAREST TOWN</th>
<th>PROJECT SIZE</th>
<th>TARGET SPECIES (IF ANY)</th>
<th>HABITAT USE</th>
<th>ACTION TYPE</th>
<th>HABITAT TYPE</th>
<th>SUCCESSFUL?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kenai River Wetland</td>
<td>P0088</td>
<td>Kenai wetland revegetation for illegal fill; Kenai River Slough</td>
<td>DNR-PNC 1989</td>
<td>Completed w/ M Soldotna</td>
<td>.04 ha</td>
<td>General</td>
<td>SEED, PFERT</td>
<td></td>
<td>Palustrine</td>
<td>Yes</td>
</tr>
<tr>
<td>Larson Lake Fertilization</td>
<td>P0184</td>
<td>CIAA lake fertilization project near Talkeetna, currently inactive</td>
<td>Private 1982</td>
<td>Monitoring Talkeetna</td>
<td>176.9 ha. lake</td>
<td>Sockeye salmon</td>
<td>Spawning, Rearing</td>
<td>LACEFERT, STOCK (proposed)</td>
<td></td>
<td>Lacaustine</td>
</tr>
<tr>
<td>Little Campbell Crk. Enhancemt.</td>
<td>P0195</td>
<td>Enhancement/ realignment downstream of Lake Otis Pky during Phase IV constructn.</td>
<td>ADF&amp;G 1988</td>
<td>Completed w/ M Anchorage</td>
<td>approx. 120 yards</td>
<td>juv.coho, Dolly Varden</td>
<td>Monitoring</td>
<td>LFORN, SEED, PLANT, PFERT, STABL</td>
<td></td>
<td>Palustrine</td>
</tr>
<tr>
<td>Lyon Creek Ponds</td>
<td>P0186</td>
<td>USFS converted gravel pits into rearing ponds &amp; spawning channel, Turnagain Pass</td>
<td>USFS 1985</td>
<td>Monitoring Portage</td>
<td>5 tot.ac. ponds, 7800 sq.ft.chnl</td>
<td>Chinook, coho</td>
<td>Spawning, Rearing</td>
<td>LFORN, STOCK, HYDRO, PLANT</td>
<td></td>
<td>Riverine</td>
</tr>
<tr>
<td>Martin River Delta Fish Ponds</td>
<td>P0068</td>
<td>Former borrow pits for AEA's hydroelec. plant were rehab'd for spawning &amp; rearing</td>
<td>AEA 1991</td>
<td>Completed w/o M Homer</td>
<td>30 acres ponds + spawning chann</td>
<td>Coho Salmon</td>
<td>Spawning, Rearing</td>
<td>LFORN, HYDRO, PFERT, STABL</td>
<td></td>
<td>Palustrine</td>
</tr>
<tr>
<td>MLK Sedimentation Pon</td>
<td>P0181</td>
<td>Anchorage Public Works Dept. created several ponds for water quality purposes</td>
<td>MOA 1988</td>
<td>Implementation Anchorage</td>
<td>5 acre ponds now; 3 more planned</td>
<td>waterfowl</td>
<td>General</td>
<td>LFORN, SEED, PLANT, SOIL</td>
<td></td>
<td>Palustrine</td>
</tr>
<tr>
<td>New Chenega Road Construction</td>
<td>P0061</td>
<td>LaTouche Passage 8. Fill removed &amp; spawning gravel replaced (enforcement action)</td>
<td>ADOT/PF 1984</td>
<td>Completed w/ M New Chenega Vill</td>
<td>300'of crk; 2000'of road rehab</td>
<td>pink salmon</td>
<td>Spawning, General</td>
<td>LFORN, SOIL</td>
<td></td>
<td>Riverine</td>
</tr>
<tr>
<td>North Eagle River Interchange</td>
<td>P0059</td>
<td>Involved new channels and pond for coho/ grayling at Carrol &amp; Fire Creeks</td>
<td>ADOT/PF 1991</td>
<td>Monitoring Eagle River</td>
<td>A total of 3 acres of improvements</td>
<td>Coho, grayling</td>
<td>Rearing, Overwinter</td>
<td>LFORN, SEED, PLANT, HYDRO, STABL</td>
<td></td>
<td>Riverine</td>
</tr>
<tr>
<td>Nulbay Park Mitigation Proj.</td>
<td>P0222</td>
<td>Cook Inlet 317. Create intertidal wetland as mitg. for other intertidal fill.</td>
<td>MOA 1988</td>
<td>Completed w/ M Anchorage</td>
<td>500' long oblong area, below RR</td>
<td>waterfowl, shorebirds</td>
<td>Staging</td>
<td>LFORN, SEED, STABL</td>
<td></td>
<td>Estuarine</td>
</tr>
<tr>
<td>Oiled Mussel Bed Manipulation</td>
<td>P0040</td>
<td>Experiment to put a small trench through beds to see if oil escapes. Pr.Wm.Sound</td>
<td>NMFS 1992</td>
<td>Implementation Too spread out</td>
<td>Beds are 50m2, 100m2, and 800m2</td>
<td>mussels, birds, otters</td>
<td>General</td>
<td>LFORN, CONTAM</td>
<td></td>
<td>Marine</td>
</tr>
<tr>
<td>Otter Lake Recreation Area</td>
<td>P0196</td>
<td>Impounded water for waterfowl habitat on Army Base; stocked area with goslings</td>
<td>DOD 1979</td>
<td>Completed w/o M Fort Richardson</td>
<td>100s of acres</td>
<td>Canada geese</td>
<td>Nesting</td>
<td>LFORN, SEED, SOIL, SPOIL, STOCK</td>
<td></td>
<td>Lacaustine</td>
</tr>
</tbody>
</table>
### Region: SOUTHCENTRAL/SOUTHWEST (Continued)

<table>
<thead>
<tr>
<th>PROJECT NAME</th>
<th>IDENTIFICATION CODE</th>
<th>SHORT DESCRIPTION</th>
<th>LEAD ORG. START YR.</th>
<th>STATUS NEAREST TOWN</th>
<th>PROJECT SIZE</th>
<th>TARGET SPECIES (IF ANY)</th>
<th>HABITAT USE</th>
<th>ACTION TYPE</th>
<th>HABITAT TYPE SUCCESSFUL?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Packers Lake Fertilization</td>
<td>P0110</td>
<td>Ongoing lake fertilization &amp; sockeye stocking program, with flow control dam</td>
<td>Private 1983</td>
<td>Implementation Kenai</td>
<td>280.4 ha lake</td>
<td>Sockeye salmon Spawning, Rearing</td>
<td>LFORM, STOCK, HYDRO</td>
<td>Lacustrine Yes</td>
<td></td>
</tr>
<tr>
<td>Paint River Fish Ladder</td>
<td>P0113</td>
<td>CIR project to develop a new sockeye run with a cement fish ladder</td>
<td>Private 1993</td>
<td>Implementation McNeil Sanctuary</td>
<td>access to 27 miles of stream</td>
<td>All salmon species Migrating</td>
<td>LFORM, STOCK, HYDRO</td>
<td>Riverine Too soon</td>
<td></td>
</tr>
<tr>
<td>Palmer Bay Flats Waterfowl Enc</td>
<td>P0050</td>
<td>DU/ADF&amp;G project to increase nesting and rearing habitat for waterfowl</td>
<td>ADF&amp;G 1986</td>
<td>Implementation Palmer/Wasilla</td>
<td>135 acres whole project area</td>
<td>mallards, pintails Nesting, Rearing</td>
<td>LFORM, SPOIL, SEED, PLANT, PFERT</td>
<td>Palustrine Yes</td>
<td></td>
</tr>
<tr>
<td>Pigot Bay Spawning Channel</td>
<td>P0175</td>
<td>USFS chum spawning channel to replace habitat lost during 1984 earthquake</td>
<td>USFS 1991</td>
<td>Implementation Whittier</td>
<td>2500' channel</td>
<td>Chum salmon Spawning</td>
<td>LFORM, STOCK</td>
<td>Riverine Partially</td>
<td></td>
</tr>
<tr>
<td>Portage Airstrip Ponds</td>
<td>P0189</td>
<td>Rehabilitation of former gravel pits into a put-and-take fishery</td>
<td>USFS 1992</td>
<td>Implementation Portage</td>
<td>15 acres total</td>
<td>grayling, chinook Overwinter, General</td>
<td>LFORM, SEED, PLANT, STOCK</td>
<td>Palustrine Too soon</td>
<td></td>
</tr>
<tr>
<td>Portage Alder Pond</td>
<td>P0190</td>
<td>Gravel pit rehab into a groundwater-fed put-and-take fishery</td>
<td>USFS 1987</td>
<td>Implementation Portage</td>
<td>3 1/2 acre pond</td>
<td>rainbow trout Overwinter, General</td>
<td>LFORM, STOCK, HYDRO</td>
<td>Palustrine Yes</td>
<td></td>
</tr>
<tr>
<td>Potter Creek Rechannel</td>
<td>P0165</td>
<td>Rebuilding a spawning reach of Potter Creek that had breached &amp; was flooding</td>
<td>ADOT/PF 1980</td>
<td>Completed w/M Anchorage</td>
<td>100 yds of spawning channel</td>
<td>Pink Salmon Spawning</td>
<td>LFORM</td>
<td>Riverine Yes</td>
<td></td>
</tr>
<tr>
<td>Potter Marsh Creation</td>
<td>P0056</td>
<td>The unintentional creation of a freshwater marsh by railroad fill in 1916</td>
<td>Fed. RR 1916</td>
<td>Completed w/o M Anchorage</td>
<td>564 Acres</td>
<td>LFORM, HYDRO</td>
<td>Palustrine Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Potter Marsh Waterfowl Enhcmnt</td>
<td>P0057</td>
<td>Habitat enhancement projects undertaken in Potter Marsh over the years.</td>
<td>ADF&amp;G 1978</td>
<td>Completed w/M Anchorage</td>
<td>a few acres</td>
<td>Waterfowl Nesting, General</td>
<td>LFORM, SOIL, SEED</td>
<td>Palustrine No</td>
<td></td>
</tr>
<tr>
<td>Rabbit Creek Fishpass</td>
<td>P0115</td>
<td>Step pools and riparian revegetation</td>
<td>ADOT/PF 1988</td>
<td>Completed w/M Anchorage</td>
<td>Roughly 150' coho, pink, chinook</td>
<td>LFORM, SPOIL, PLANT, HYDRO</td>
<td>Riverine Yes</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rabbit Crt Step Pools Below RR</td>
<td>P0164</td>
<td>Rock weirs placed below perched culvert for fish access to Potter Marsh</td>
<td>AK RR 1990</td>
<td>Completed w/o M Anchorage</td>
<td>50' reach; access to large marsh</td>
<td>pinks, kings, cohos Spawning, Rearing</td>
<td>LFORM</td>
<td>Riverine Yes</td>
<td></td>
</tr>
<tr>
<td>PROJECT NAME</td>
<td>IDENTIFICATION CODE</td>
<td>SHORT DESCRIPTION</td>
<td>LEAD ORG.</td>
<td>STATUS</td>
<td>NEAREST TOWN</td>
<td>PROJECT SIZE</td>
<td>TARGET SPECIES (IF ANY)</td>
<td>HABITAT USE</td>
<td>ACTION TYPE</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------</td>
<td>-------------------</td>
<td>-----------</td>
<td>--------</td>
<td>--------------</td>
<td>--------------</td>
<td>------------------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Resurrection Crk Fish Habitat</td>
<td>P0033</td>
<td>USFS instream structures, reenv, rearing ponds, to restore placer-mined reaches</td>
<td>USFS</td>
<td>Implementation</td>
<td>Hope</td>
<td>3 miles</td>
<td>Coho Salmon</td>
<td>Rearing, Overwinter</td>
<td>LFORM, PLANT, SEED</td>
</tr>
<tr>
<td>Shaishnikof River fish pass</td>
<td>P0029</td>
<td>Removal of fish barriers at offsite mt for intertidal fill (Unalaska Bay 12)</td>
<td>Private</td>
<td>Completed w/M</td>
<td>Unalaska</td>
<td>3 barriers 1.5 and 2.0</td>
<td>Pink &amp; coho salmon</td>
<td>Migrating, General</td>
<td>LFORM</td>
</tr>
<tr>
<td>Soldotna Creek Culvert</td>
<td>P0140</td>
<td>Steep Culvert With Baffles for Fish Passage</td>
<td>ADOT/PF</td>
<td>Completed w/o M</td>
<td>Soldotna</td>
<td>250 ft. of streambank</td>
<td>Coho and Chinook</td>
<td>Rearing, Overwinter</td>
<td>SEED, PLANT, STABL</td>
</tr>
<tr>
<td>Solomon Gulch Tail Race</td>
<td>P0106</td>
<td>AEA effort to convert the hydropower tailrace to pink &amp; chum spawning area</td>
<td>AEA</td>
<td>Completed w/M</td>
<td>Valdez</td>
<td>150' long x 30-60' wide</td>
<td>Pink &amp; chum salmon</td>
<td>Spawning</td>
<td>LFORM, STABL</td>
</tr>
<tr>
<td>Stump Lake H2O Control Structr</td>
<td>P0075</td>
<td>USFS's attempt to arrest the drainage of Stump Lake after 1964 earthquake damage</td>
<td>USFS</td>
<td>Completed w/M</td>
<td>Cordova</td>
<td>50 acres</td>
<td>cutthroat, coho, D.Varden</td>
<td>Rearing</td>
<td>LFORM, STABL, HYDRO, SEED</td>
</tr>
<tr>
<td>Tangle Ponds in Portage Valley</td>
<td>P0191</td>
<td>USFS gravel pit rehab for recreational trout fishing; also called &quot;Pond 3.93&quot;</td>
<td>USFS</td>
<td>Implementation</td>
<td>Portage</td>
<td>13 acres combined</td>
<td>rainbows, grayling</td>
<td>Overwinter, General</td>
<td>LFORM, PLANT, SOIL, STABL</td>
</tr>
<tr>
<td>Tokun Lake Fertilization</td>
<td>P0079</td>
<td>A joint USFS (Cordova) &amp; ADF&amp;G effort to increase food available for sockeye</td>
<td>USFS</td>
<td>Completed w/o M</td>
<td>Cordova</td>
<td>lake is 600 acres surface area</td>
<td>sockeye salmon</td>
<td>Rearing, General</td>
<td>LFERT</td>
</tr>
<tr>
<td>Trapper Creek Step Pools</td>
<td>P0060</td>
<td>Step pools for fish passage through culverts on 4 streams along Parks Hwy</td>
<td>ADOT/PF</td>
<td>Completed w/M</td>
<td>Trapper Creek</td>
<td>250 ft of each creek</td>
<td>Coho, king salmon</td>
<td>Rearing, Migrating</td>
<td>LFORM, SEED, PLANT, HYDRO, STABL</td>
</tr>
<tr>
<td>Tributary &quot;A&quot; Rearing Enhancmnt</td>
<td>P0034</td>
<td>Tributary &quot;A&quot; goes to East Fork Crk, off Six Mile Crk in Turnagain Pass area</td>
<td>USFS</td>
<td>Completed w/o M</td>
<td>Hope</td>
<td>one-half mile</td>
<td>Coho &amp; Chinook Salmon</td>
<td>Rearing</td>
<td>LFORM</td>
</tr>
<tr>
<td>Twentymile R. Waterfowl Improv</td>
<td>P0197</td>
<td>Blasting (pothole) project for waterfowl enhancement near Portage</td>
<td>BLM</td>
<td>Completed w/M</td>
<td>Portage</td>
<td>apx. 3 acres</td>
<td>White-fronted goose</td>
<td>Nesting</td>
<td>LFORM</td>
</tr>
<tr>
<td>Ugashik River B</td>
<td>P0028</td>
<td>Becharof State Well #1. Revegetation of abandoned airstrip on Alaska Peninsula</td>
<td>Private</td>
<td>Completed w/M</td>
<td>Pilot Point</td>
<td>25 acres; runway 5500' long</td>
<td>General</td>
<td>LFORM, PFERT, SEED</td>
<td>Palustrine</td>
</tr>
<tr>
<td>PROJECT NAME</td>
<td>IDENTIFICATION CODE</td>
<td>SHORT DESCRIPTION</td>
<td>LEAD ORG.</td>
<td>STATUS</td>
<td>NEAREST TOWN</td>
<td>PROJECT SIZE</td>
<td>TARGET SPECIES</td>
<td>HABITAT USE</td>
<td>ACTION TYPE</td>
</tr>
<tr>
<td>--------------</td>
<td>---------------------</td>
<td>-------------------</td>
<td>-----------</td>
<td>--------</td>
<td>--------------</td>
<td>-------------</td>
<td>---------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Unocal Fuel Spill</td>
<td>P0094</td>
<td>Lewis River Freshwater Wetland Rehabilitation</td>
<td>DNR-PMC</td>
<td>Monitoring</td>
<td>Beluga</td>
<td>approx. 1 acre</td>
<td></td>
<td>General</td>
<td>SEED, PFERT, CONTN</td>
</tr>
<tr>
<td>USFS 1964 Earthquake Stream</td>
<td>P0072</td>
<td>Attempting to repair stream mouths uplifted during earthquake in Pr.Wm.Sound</td>
<td>USFS</td>
<td>Completed w/M</td>
<td>Cordova</td>
<td>A dozen or so streams</td>
<td>Salmon-- pink &amp; chum</td>
<td>Spawning, Migrating</td>
<td>LFORM, STABL</td>
</tr>
<tr>
<td>USFS Cordova Dist. Fishpasses</td>
<td>P0074</td>
<td>4 fishpasses constructed within USFS's Cordova Ranger District, Pr.Wm.Sound</td>
<td>USFS</td>
<td>Completed w/M</td>
<td>Cordova</td>
<td>4 streams, many acres of habitat</td>
<td>Salmon--pink, coho, red</td>
<td>Migrating</td>
<td>LFORM, STABL</td>
</tr>
<tr>
<td>USFS Log/Debris Removal Program</td>
<td>P0073</td>
<td>1960-70's misguided removal of logs to aid fish passage, increase spawning area</td>
<td>USFS</td>
<td>Completed w/o N</td>
<td>Cordova</td>
<td>16-20 streams, Pr.Wm.Sound</td>
<td>Salmon--pink, coho, red</td>
<td>Spawning, Migrating</td>
<td>LOG/DEBRIS REMOVAL</td>
</tr>
<tr>
<td>Westchester Lagoon Formation</td>
<td>P0174</td>
<td>Urban freshwater lake formed using tidegates at outlet of Chester Creek</td>
<td>NOAA</td>
<td>Completed w/M</td>
<td>Anchorage</td>
<td>Lagoon is roughly 100 acres</td>
<td>waterfowl</td>
<td>Nesting, General</td>
<td>LFORM, HYDRO, SEED, STABL</td>
</tr>
<tr>
<td>Westchester Lagoon Offsite Mitigation</td>
<td>P0180</td>
<td>Fish Creek 6 (Zamarello's fill) led to wetland construction as offsite mitg</td>
<td>ACOE</td>
<td>Completed w/M</td>
<td>Anchorage</td>
<td>area 600' long (uphill) x 80'wide</td>
<td>waterfowl, shorebirds</td>
<td>Staging, General</td>
<td>LFORM, SEED, PLANT</td>
</tr>
<tr>
<td>Williwaw Ponds &amp; Spawning Chl</td>
<td>P0142</td>
<td>USFS rehab of gravel pit for coho rearing and a chum spawning channel in Portage</td>
<td>USFS</td>
<td>Implementation</td>
<td>Portage</td>
<td>13.7 ac. ponds, 1.2 ac. channel</td>
<td>Chum &amp; Red Salmon</td>
<td>Spawning, Rearing</td>
<td>LFORM, SEED, PLANT, SOIL, PFERT</td>
</tr>
</tbody>
</table>
### SECTION D: SUMMARY TABLE (CONTINUED)

**Region:** NORTHERN/INTERIOR

<table>
<thead>
<tr>
<th>PROJECT NAME</th>
<th>IDENTIFICATION CODE</th>
<th>SHORT DESCRIPTION</th>
<th>LEAD ORG.</th>
<th>STATUS NEAREST TOWN</th>
<th>PROJECT SIZE</th>
<th>TARGET SPECIES (IF ANY)</th>
<th>HABITAT USE</th>
<th>ACTION TYPE</th>
<th>HABITAT TYPE SUCCESSFUL?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arco Kuparuk Photo-Trend Plots</td>
<td>P0137</td>
<td>Permanent plots to monitor success of tundra revegetation methods over time</td>
<td>Private</td>
<td>Monitoring Kuparuk Camp</td>
<td>Eight 4m x 10m sites</td>
<td>General</td>
<td>SEED, PFERT</td>
<td>Palustrine Partially</td>
<td></td>
</tr>
<tr>
<td>ARCO Sag Site C</td>
<td>P0149</td>
<td>Gravel Pit Rehabilitation on Sag River Floodplain</td>
<td>Private</td>
<td>Completed w/M Deachorse</td>
<td>38.2 acres</td>
<td>Grayling</td>
<td>Rearing, Overwinter</td>
<td>LFORM</td>
<td>Lacustrine Partially</td>
</tr>
<tr>
<td>Atigun Pass Riparian Rehab</td>
<td>P0084</td>
<td>Establishing willows &amp; ponds on sites (Sten Crk) where Pipeline was replaced</td>
<td>DNR-PNC</td>
<td>Implementation Atigun Pass</td>
<td>16 sites (for reveg work)</td>
<td>Grayling, DV, whitefish</td>
<td>Rearing, General</td>
<td>LFORM, PLANT, SEED</td>
<td>Palustrine Yes</td>
</tr>
<tr>
<td>Banner Ck Material Site</td>
<td>P0152</td>
<td>Gravel site rehab with interconnecting channels for coho rearing.</td>
<td>ADOT/PF</td>
<td>Implementation Nome</td>
<td>Approximately 20 acres of ponds</td>
<td>coho, grayling</td>
<td>Rearing, Overwinter</td>
<td>LFORM, PLANT, STABL</td>
<td>Lacustrine Too soon</td>
</tr>
<tr>
<td>Bearing Tree Creek</td>
<td>P0157</td>
<td>Series of step pools created within culvert using rebar and boulders</td>
<td>ADOT/PF</td>
<td>Completed w/M Beaver Ck, Yukon</td>
<td>180° long culvert</td>
<td>grayling, suckers, pike</td>
<td>Rearing</td>
<td>LFORM, HYDRO, STABL</td>
<td>Riverine Partially</td>
</tr>
<tr>
<td>BP &amp; Arco Cross Drainage Projs</td>
<td>P0194</td>
<td>Rehabilitation of North Slope streams affected by roads for oil development</td>
<td>AD&amp;G</td>
<td>Completed w/M Deachorse</td>
<td>404,076 sq. ft. (BP only)</td>
<td>Arctic grayling</td>
<td>General</td>
<td>LFORM</td>
<td>Palustrine Yes</td>
</tr>
<tr>
<td>BP Pad 822-33-11-13, Pru</td>
<td>P0064</td>
<td>Revegetation Project on abandoned gravel drilling pad, an experiment by BP.</td>
<td>Private</td>
<td>Monitoring Deachorse</td>
<td>24 acres were treated</td>
<td>General</td>
<td>LFORM, SEED, SOIL, PFERT</td>
<td>Palustrine Yes</td>
<td></td>
</tr>
<tr>
<td>BP Put River #1 Pad Experiment</td>
<td>P0030</td>
<td>A many-factored revegetation experiment on an abandoned gravel pad.</td>
<td>UAF</td>
<td>Monitoring Prudhoe Bay</td>
<td>5 expr.blocks of 100' x 125' each</td>
<td>General</td>
<td>LFORM, SOIL, SEED, PFERT</td>
<td>Palustrine Too soon</td>
<td></td>
</tr>
<tr>
<td>BP's Arctophila reveg research</td>
<td>P0083</td>
<td>BP studied arctic pendant grass for reveg use on artificial water impoundments</td>
<td>USFWS</td>
<td>Completed w/M Deachorse</td>
<td>100 sites</td>
<td>Waterbirds</td>
<td>General</td>
<td>PLANT</td>
<td>Palustrine Yes</td>
</tr>
<tr>
<td>Chena Lakes (Kutscheld Lake)</td>
<td>P0163</td>
<td>Gravel pits rehab'd for fish &amp; recreational use; Chena Lakes Flood Ctrl Proj</td>
<td>ACOE</td>
<td>Completed w/o M North Pole</td>
<td>294 Acres</td>
<td>Rainbow trout, coho</td>
<td>General</td>
<td>LFORM, STOCK</td>
<td>Lacustrine Yes</td>
</tr>
<tr>
<td>Chena River Gravel Pit, Fhx</td>
<td>P0086</td>
<td>Mitigation included a buffer &amp; contouring the pit's littoral zone</td>
<td>Private</td>
<td>Unknown Fairbanks</td>
<td>10 acres (of compensation)</td>
<td>Waterfowl, Shorebirds</td>
<td>General</td>
<td>LFORM, SPOIL, PLANT</td>
<td>Riverine Unknown</td>
</tr>
<tr>
<td>PROJECT NAME</td>
<td>SHORT DESCRIPTION</td>
<td>LEAD ORG.</td>
<td>STATUS</td>
<td>PROJECT SIZE</td>
<td>TARGET SPECIES</td>
<td>HABITAT USE</td>
<td>ACTION TYPE</td>
<td>HABITAT TYPE</td>
<td>SUCCESSFUL?</td>
</tr>
<tr>
<td>-------------</td>
<td>-------------------</td>
<td>-----------</td>
<td>--------</td>
<td>--------------</td>
<td>----------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Cominco Port Disposal Pit P0092</td>
<td>Red Dog Port Site. Revegetation experiments in dune communities of Chukchi Sea</td>
<td>DNR-PMC</td>
<td>Completed w/M</td>
<td>1.5 ha (4 acres)</td>
<td></td>
<td>General</td>
<td>PLANT, PFERT, LFORM</td>
<td>Palustrine</td>
<td>Yes</td>
</tr>
<tr>
<td>Creamer's Field Crane Project P0053</td>
<td>Creamer's Field Crane Habitat Project, by ADfG &amp; funded by Fairbanks Airport</td>
<td>ADfG</td>
<td>Completed w/M</td>
<td>about 5 acres</td>
<td>Sandhill Cranes</td>
<td>Staging, General</td>
<td>LFORM</td>
<td>Palustrine</td>
<td>Yes</td>
</tr>
<tr>
<td>Creamer's Field Waterfowl Project P0051</td>
<td>Creamer's Field Waterfowl Nesting Project, by ADfG &amp; Ducks Unlimited</td>
<td>ADfG</td>
<td>Implementation</td>
<td>105 acres? (1/2 mi. x 1/4 mile)</td>
<td>Waterfowl</td>
<td>Nesting, General</td>
<td>LFORM, SEED, PFERT</td>
<td>Palustrine</td>
<td>Yes</td>
</tr>
<tr>
<td>Darling Creek P0154</td>
<td>Retrofit of an existing highway culvert</td>
<td>ADOT/PF</td>
<td>Monitoring</td>
<td>60 ft.</td>
<td></td>
<td>Migrating</td>
<td>LFORM, HYDRO, STABL, MODEL</td>
<td>Riverine</td>
<td>Yes</td>
</tr>
<tr>
<td>Denali Clearwater Creek P0158</td>
<td>Gabion weir placed below perched culvert to back up water level</td>
<td>ADOT/PF</td>
<td>Completed w/M</td>
<td>Two 70' culverts</td>
<td>Grayling</td>
<td>Spawning, Rearing</td>
<td>LFORM, HYDRO, STABL</td>
<td>Riverine</td>
<td>Yes</td>
</tr>
<tr>
<td>East Fork Chena River P0159</td>
<td>Diversion to conduct placer mining at East (also called Middle) Fork Chena River</td>
<td>Private</td>
<td>Monitoring</td>
<td>4800 ft. channel</td>
<td>Grayling</td>
<td>Spawning, Rearing</td>
<td>LFORM, HYDRO</td>
<td>Riverine</td>
<td>Unknown</td>
</tr>
<tr>
<td>East Fork Solomon River P0153</td>
<td>Re-established floodplain after moving the Nome-Council Highway out of creek</td>
<td>ADOT/PF</td>
<td>Completed w/M</td>
<td>9 miles of stream</td>
<td></td>
<td>General</td>
<td>LFORM</td>
<td>Riverine</td>
<td>Partially</td>
</tr>
<tr>
<td>Eielson mit for illegal fill P0014</td>
<td>French Creek 4--Enforcement action for illegal asbestos fill by US Air Force</td>
<td>DOD</td>
<td>Unknown</td>
<td>0.6 acres</td>
<td>Waterfowl</td>
<td>General</td>
<td>LFORM, PLANT, STOCK</td>
<td>Palustrine</td>
<td>Too soon</td>
</tr>
<tr>
<td>Fishing &amp; Aquatic Ed Pond Project P0156</td>
<td>Trout Unlimited/ ADfG Cooperative Education Project</td>
<td>ADfG</td>
<td>Implementation</td>
<td>56 x 60'ft, 8' deep</td>
<td>Rainbow trout, grayling</td>
<td>General</td>
<td>LFORM, PLANT, STOCK</td>
<td>Palustrine</td>
<td>Too soon</td>
</tr>
<tr>
<td>Glen Creek in Denali Natl Park P0001</td>
<td>Pilot study to research techniques to stabilize placer-mined streams</td>
<td>NPS</td>
<td>Implementation</td>
<td>1400' reach, more soon</td>
<td></td>
<td>General</td>
<td>LFORM, PLANT, MODEL</td>
<td>Riverine</td>
<td>Too soon</td>
</tr>
</tbody>
</table>
### Section D: Summary Table (Continued)

<table>
<thead>
<tr>
<th>Project Name</th>
<th>Identification Code</th>
<th>Short Description</th>
<th>Lead Org. Start Yr.</th>
<th>Status Nearest Town</th>
<th>Project Size</th>
<th>Target Species (If Any)</th>
<th>Habitat Use</th>
<th>Action Type</th>
<th>Habitat Type Successful?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Goose Green Gulch</td>
<td>P0169</td>
<td>Fish &amp; wildlife habitat in a former gravel mine site, North Slope</td>
<td>ADF&amp;G 1977</td>
<td>Completed w/M Deadhorse</td>
<td>40 acres</td>
<td>grayling</td>
<td>Rearing</td>
<td>LFORM, SEED, PLANT, PFERT</td>
<td>Palustrine Yes</td>
</tr>
<tr>
<td>Gravelyed Tundra Remediation</td>
<td>P0065</td>
<td>BP's program to restore areas where gravel was deposited incidentally on tundra</td>
<td>Private 1990</td>
<td>Implementation Deadhorse</td>
<td>649 sites tting 88.7 acres so far</td>
<td>None</td>
<td>General</td>
<td>LFORM</td>
<td>Palustrine Yes</td>
</tr>
<tr>
<td>Independence Crk Revegetation</td>
<td>P0146</td>
<td>Slope stabilization on placer mine tailings using dormant willows</td>
<td>BLM 1989</td>
<td>Completed w/M Fairbanks</td>
<td>500' by 35' of planted bank</td>
<td>None</td>
<td>General</td>
<td>LFORM, PLANT</td>
<td>Riverine Yes</td>
</tr>
<tr>
<td>Kink Corner Gravel Pit</td>
<td>P0150</td>
<td>Mile 22.4 of Nome-Taylor Hwy; Nome River 1. Gravel pit rehab for rearing &amp; overwinter</td>
<td>ADOT/PF 1992</td>
<td>Implementation Nome</td>
<td>5 acres</td>
<td>Coho, Dolly Varden</td>
<td>Rearing, Overwinter</td>
<td>LFORM, SOIL</td>
<td>Riverine Too soon</td>
</tr>
<tr>
<td>Koppenberg Mine</td>
<td>P0155</td>
<td>Reclamation of disturbed floodplain after placer mining</td>
<td>Private 1987</td>
<td>Implementation Fairbanks</td>
<td>2000 ft of creek; 15 acres</td>
<td>grayling, king, rd. whitefish</td>
<td>Rearing</td>
<td>LFORM</td>
<td>Riverine Yes</td>
</tr>
<tr>
<td>Kuparuk Arctophila reveg</td>
<td>P0082</td>
<td>PMC &amp; ARCO's study of Arctophila transplanting for waterfowl in Kuparuk Oilfield</td>
<td>DNR-PMC 1985</td>
<td>Completed w/M Deadhorse</td>
<td>11 sites</td>
<td>Waterfowl</td>
<td>General</td>
<td>PLANT, PFERT</td>
<td>Palustrine Partially</td>
</tr>
<tr>
<td>Kuparuk Mine Site B</td>
<td>P0161</td>
<td>Annalig Lakes, Convert gravel pits to overwintering areas for fish in arctic.</td>
<td>Private 1989</td>
<td>Monitoring Kuparuk Camp</td>
<td>9.1 acre lake</td>
<td>grayling, whitefish</td>
<td>Rearing, Overwinter</td>
<td>LFORM, SEED, STOCK, PFERT</td>
<td>Lacustrine Yes</td>
</tr>
<tr>
<td>Kuparuk Mine Site D, Part 1</td>
<td>P0134</td>
<td>Perched wetland creation &amp; reveg on an overburden stockpile at Kuparuk gravel pit</td>
<td>Private 1990</td>
<td>Monitoring Kuparuk Camp</td>
<td>23 ha pit &amp; 29 ha. overburden</td>
<td>shorebirds, waterfowl</td>
<td>General</td>
<td>SEED, PFERT, LFORM, STOCK</td>
<td>Palustrine Yes</td>
</tr>
<tr>
<td>Kuparuk Mine Site D, Part 2</td>
<td>P0139</td>
<td>Fish Habitat Rehab of Gravel Pit (see also Project 0134 for other work at site)</td>
<td>Private 1990</td>
<td>Implementation Kuparuk Camp</td>
<td>80 acres total</td>
<td>grayling, etc.</td>
<td>General</td>
<td>LFORM, STOCK, SOIL</td>
<td>Lacustrine Partially</td>
</tr>
<tr>
<td>Kuparuk River 119</td>
<td>P0012</td>
<td>Rehab 3.5 gravel pad as compensation for 5 acre high value wetland fill</td>
<td>Private 1992</td>
<td>Unknown Deadhorse</td>
<td>3.5 acres</td>
<td></td>
<td>General</td>
<td>PLANT, LFORM</td>
<td>Palustrine Too soon</td>
</tr>
<tr>
<td>Kuskokwim Streambank Bioeng</td>
<td>P0063</td>
<td>SCS Streambank bioengineering trial at Upper Kalskag, Kuskokwim River</td>
<td>SCS 1991</td>
<td>Monitoring Upper Kalskag</td>
<td>4000 sq. ft. treatment area</td>
<td></td>
<td>LFORM, PLANT, STABL</td>
<td>Riverine Partially</td>
<td></td>
</tr>
</tbody>
</table>
### SECTION D: SUMMARY TABLE (CONTINUED)

<table>
<thead>
<tr>
<th>PROJECT NAME</th>
<th>IDENTIFICATION CODE</th>
<th>SHORT DESCRIPTION</th>
<th>LEAD ORG., STATUS NEAREST TOWN</th>
<th>STATUS NEAREST TOWN</th>
<th>PROJECT SIZE</th>
<th>TARGET SPECIES (IF ANY)</th>
<th>HABITAT USE</th>
<th>ACTION TYPE</th>
<th>HABITAT TYPE SUCCESSFUL?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nome Creek Riparian Project</td>
<td>P0162</td>
<td>Re-establishing floodplain community in placer mine tellings, BLM.</td>
<td>BLM</td>
<td>Implementation, Fairbanks</td>
<td>3/4 mile of river, 30 acres</td>
<td>Fish, Inverts</td>
<td>General</td>
<td>LFORM, PLANT, HYDRO, STABL</td>
<td>Riverine, Too soon</td>
</tr>
<tr>
<td>Pebble Creek</td>
<td>P0192</td>
<td>Gravel removal &amp; stream &amp; lake rehabilitation at Kuparuk R. tributary</td>
<td>ADT&amp;G</td>
<td>Completed w/M, Deadhorse</td>
<td>1000 ft.</td>
<td>Arctic grayling</td>
<td>General</td>
<td>LFORM, STABL</td>
<td>Palustrine, Yes</td>
</tr>
<tr>
<td>Pile Driver &amp; 23 Mile Sloughs</td>
<td>P0160</td>
<td>Conversion from glacial to clear water as part of Chena Lakes Flood Ctrl Project</td>
<td>ACOE</td>
<td>Completed w/o M, North Pole</td>
<td>16 mile channel, put together</td>
<td></td>
<td></td>
<td></td>
<td>Riverine, Yes</td>
</tr>
<tr>
<td>Pile Driver Slough wetland re</td>
<td>P0091</td>
<td>Eielson wetland restoration following damage from construction activities</td>
<td>DNR-PMC</td>
<td>Completed w/M, Eielson</td>
<td>&lt; 0.5 acre</td>
<td></td>
<td>General</td>
<td>SEED, PFERT, LFORM</td>
<td>Riverine, Yes</td>
</tr>
<tr>
<td>Pilgrim River Gnome-Taylor Hwy</td>
<td>P0151</td>
<td>Re-established access to rearing channels</td>
<td>ADOT/PF</td>
<td>Completed w/M, Nome</td>
<td>access to 1 mile of channels</td>
<td>Coho salmon</td>
<td>Rearing</td>
<td>LFORM</td>
<td>Palustrine, Yes</td>
</tr>
<tr>
<td>Prudhoe Airport Wetland Rest.</td>
<td>P0136</td>
<td>Experimental techniques to reveg. gravel access roads on tundra at ARCO Airport</td>
<td>Private</td>
<td>Monitoring, Deadhorse</td>
<td>5 x 0.34 acre blocks</td>
<td></td>
<td>General</td>
<td>SEED, LFORM, PFERT, PLANT</td>
<td>Palustrine, Too soon</td>
</tr>
<tr>
<td>Put 27 Mine Site</td>
<td>P0145</td>
<td>BP's rehab of gravel mining site, Prudhoe Bay Unit.</td>
<td>Private</td>
<td>Monitoring, Deadhorse</td>
<td>35 acre lake</td>
<td>Grayling, Arctic char, cisco</td>
<td>Rearing, Overwinter</td>
<td>LFORM</td>
<td>Lacustrine, Too soon</td>
</tr>
<tr>
<td>Reserve Pit Remediation</td>
<td>P0135</td>
<td>Drill site 30 Kupuk; Revel on overburden cap overlying drill cuttings</td>
<td>Private</td>
<td>Monitoring, Deadhorse</td>
<td>Approx. 10 acres</td>
<td>Waterbirds, Caribou</td>
<td>General</td>
<td>LFORM, SEED, PFERT, CONTM</td>
<td>Palustrine, Yes</td>
</tr>
<tr>
<td>Revegetation of X-Pad, Prudhoe Pad 65</td>
<td>P0065</td>
<td>Revegetation on abandoned gravel drilling pad by BP.</td>
<td>Private</td>
<td>Monitoring, Deadhorse</td>
<td>17,000 sq. ft. total</td>
<td></td>
<td>General</td>
<td>LFORM, SEED, SOIL, PFERT, CONTM</td>
<td>Palustrine, Partially</td>
</tr>
<tr>
<td>Tunalik Test Wellsite No. 1</td>
<td>P0031</td>
<td>Long-term study of tundra vegetation on gravel pads</td>
<td>UAF</td>
<td>Completed w/M, Prudhoe Bay?</td>
<td>approx. 1.2 ac. pad +1.7 ac. of ro</td>
<td></td>
<td></td>
<td>SEED, PFERT</td>
<td>Palustrine, Yes</td>
</tr>
</tbody>
</table>
Project Narratives
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 mitigation package for fill: spawning, rearing, revegetation.

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 Modification**

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.
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 continue 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
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 Begun: 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:

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 Begun: 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 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 rye and 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 contour 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:

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:

PROJECT NARRATIVES: SOUTHEAST ALASKA 2-41
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.

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 1,159,002 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

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

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 hydroteed 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:

**Kwatabein 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.


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 epilimnetic 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, a noticeable 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

PROJECT NARRATIVES: SOUTHEAST ALASKA 2-47
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
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:

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:

**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
Mitkof Highway Reconstruction

Identification Code: P0038

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

Nearest Town: Petersburg Year Begao: 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
N.F. Game Ck Barrier Modif.  Identification Code: P0127

Short Description: Step pools created by blasting for coho migration


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:

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 helicopetered 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; Christopher James, USFS, Hoonah, 945-3631

References: None

Other Information Sources:

Pavlof Marsh Wildlife Viewing
Identification Code: P0107

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

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 fish pass 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, USDA Sitka Ranger District, 204 Sigina Way, Sitka 99835, 747-6671

References:
Author: Killinger, Gregory M.
Title: 1992 Annual Report - Starrigavin Creek

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, USDA, Hoonah, 945-3631

References: None

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

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:

References: Report Expected
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:
Author: Kelly, Michael D.
Title: Tyee Hydroelectric Year-End Spawning Tailrace Monitoring Report

PROJECT NARRATIVES: SOUTHEAST ALASKA

2-57
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:

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:  

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.
REGION: SOUTHCENTRAL/SOUTHWEST

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 irrationally 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:

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:
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 sprigs 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


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 salmon were...
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 hydoseed 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
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 Prym 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, cupe). 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.
Canada Geese Peninsula Cutoffs

Identification Code: P0071

Short Description: USPS 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.

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
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 NPAC 071-OYD 4-780301 (ADF&G's Corps files) for Chester Creek 2—Packwood Company. A report was written by Curt L. Korns (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 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 & Scurvy, 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.
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 Lotfsfeldt) at Glacier Ranger District of Chugach National Forest, Girdwood, 783-3242.

References: None

Concord Hills/ Klatt Bog Mitz.
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

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, mitig. & natrl proc

PROJECT NARRATIVES: SOUTHCENTRAL/SOUTHWEST 2-73
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.
(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.
Fish Creek Coastal Wetland Rest 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, as were 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

PROJECT NARRATIVES: SOUTHCENTRAL/SOUTHWEST
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:
Theede 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
FS Cordova Distr. 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 would 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 District 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 USPS 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 Mitig Monitoring Proj 1992 Prog Report

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, USPS, 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. 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’d conservation easement for dev.in preservtn wetlds


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 recre. 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.

PROJECT NARRATIVES: SOUTHCENTRAL/SOUTHWEST 2-85
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:

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:
Author: Wright, Stoney

Larson Lake Fertilization
Identification Code: P0184
Short Description: CIAA lake fertilization project near Talkeetna, currently inactive

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

PROJECT NARRATIVES: SOUTHCENTRAL/SOUTHWEST 2-87
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 silt 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/PP 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 Creekl Ponds Identification Code: P0186

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

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

2-88 PROJECT NARRATIVES: SOUTHCENTRAL/SOUTHWEST
Addition 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 Lottsfieldt, 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 areas 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, Theede Tobish, MOA Planning Dept., 343-4222.

References: Report Expected

Other Information Sources:
Talked to Tom Bacon, MOA Public Works, on 5/26/93, and Theede 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 (enforcement 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:
Theede Tobish, Planning Dept, Municipality of Anchorage, 343-4222.

References: None

Other Information Sources:
Talked to Theede 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
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.

PROJECT NARRATIVES: SOUTHCENTRAL/SOUTHWEST 2-93
Contact: 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:

Paint River Fish Ladder Identification Code: P0113
Short Description: CIAA project to develop a new sockeye run with a cement fish ladder

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

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


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

PROJECT NARRATIVES: SOUTHCENTRAL/SOUTHWEST 2-95
Portage Airstrip Ponds

Identification Code: P0189

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


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 Enhancement 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 goose 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 with 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

**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 #0784-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

PROJECT NARRATIVES: SOUTHCENTRAL/SOUTHWEST 2-101
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 1, 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 Struct

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"


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.

Tukun Lake Fertilization
Identification Code: P0079
Short Description: A joint USFS (Cordova) & ADF&G effort to increase food available for sockeye


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 limnologists 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 Enhancement
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 Imprvmt
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 approx. 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


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 Progrrm
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 Public 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 mitiga

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 Brms, 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 Chnl**

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:
Author: U.S. Forest Service  Publication Date: 1987  Reference Type: Report
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 Kuparuk 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

**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
Atigun Pass Riparian Rehab

Identification Code: P0084

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 b/n 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; FMC 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 rehabilitation plan interim report 1992

Other Information Sources:
Banner Ck Material Site
Identification Code: PO152

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: PO157

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
BP & Arco Cross Drainage Proj

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 baseline 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 vegetation 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:

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:
Author: McKendrick, Jay D., Peter C. Scourup, 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 impoundments, 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:
Author:
Title: North Slope Research Notes: Arctophila fulva revegetation feasibility study

Other Information Sources:
Information verified with BP staff.
Chena Lakes (Kutschied 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 levees 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).
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' Glaucaus Bluegrass, 'Sourdough' Bluejoint & 'Alyeska' Polargrass, & good performers were 'Grueniog' 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 TI2048, & Bluejoint AKPMCS. 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 ams. 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:

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 Project

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 Beckmanisia syzigachne was hand broadcast around pond margins and in spillways. Islands in the two most southern ponds received the following mix: 50% Beckmannia, 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:
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:

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

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' Polargraas (25%), 'Egan' American Sloughgrass (20%), 'Norcoast' Bering Hairgrass (20%), 'Caiggluk' Tiley 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:
Author: Wright, Stoney
Title: 1990 Final Rpt of Data & Observ Obtained fr the Red Dog Mine Eval. & Demo. Plots
Publication Date: 1990
Reference Type: Report

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

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

PROJECT NARRATIVES: NORTHERN/INTERIOR 2-123
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


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


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 feldleaf 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
Author: Karle, Ken & Roseann Densmore
Title: Stream and Floodplain Restoration on Watersheds Disturbed by Mining

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 Goose 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
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:
Independence Crk Revegetation

Identification Code: PO146

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:
Author: Masinton, Barbara
Title: Stabilizing Steep Slopes Using Dormant Willows

Other Information Sources:
Just the report listed above.

Kink Corner Gravel Pit

Identification Code: PO150

Short Description: Mile 22.4 of Nome-Taylor Hwy; Nome River 1. Gravel pit rehab for rearing & ovwrt

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:

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 Aanaaliq 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:
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

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 purpurea. 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

PROJECT NARRATIVES: NORTHERN/INTERIOR 2-131
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 Bioengineering

Identification Code: P0063

Short Description: SCS Streambank bioengineering trial at Upper Kalskag, Kuskokwim River


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.
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, slurry 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 owensend,
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.
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:

References: None

Other Information Sources:

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 Slope 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 30 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 30. 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; Caster, 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 Ayleska 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

PROJECT NARRATIVES: NORTHERN/INTERIOR 2-139
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 Panter). 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:

AIRPORT(S)
CONTAMINANT REMOVAL
CULVERT CORRECTIONS
DAM(S)
DOCKS OR PORT FACILITIES
EELGRASS
EROSION CONTROL OBJECTIVES
ESTUARINE HABITAT
EXPERIMENTAL ATTEMPTS
FILL
• REMOVAL & RECOVERY
• TRADE-OFFS FOR MISC. FILLS

FISH HABITAT IMPROVEMENT ACTIONS
• ADDITION OF LARGE ORGANIC DEBRIS
• BOULDER PLACEMENT
• CULVERT INSTALLATION
• FISH PASSAGE
• GRAVEL WORK
• INCUBATION BOXES
• LAKE FERTILIZATION
• LIVE VEGETATION
• OTHER ARTIFICIAL STRUCTURES
• REFUSE REMOVAL
• RIPARIAN ZONE
• SPAWNING CHANNELS

HARVEST OBJECTIVES
HIGHWAY/ROAD
• MITIGATION FOR DEVELOPMENT OF
• RESTORATION FROM

HYDROELECTRIC PLANT

HYDROLOGICAL OBJECTIVES

INCIDENTAL HABITAT CREATIONS

LACUSTRINE HABITAT

LANDFILL/WASTE—mitigation or restoration from
LOGGING IMPACT RESTORATION
MARINE HABITAT

MINING IMPACT RESTORATION
• GRAVEL MINING
• HARDROCK MINING
• PLACER MINING

NATURAL DISASTER—restoration from

OFFSITE MITIGATION

OIL/GAS DRILLING

OILSPILL RESTORATION

PALUSTRINE HABITAT

RECREATIONAL/EDUCATIONAL OBJECTIVES

RIVERINE HABITAT

SHOREBIRD HABITAT IMPROVEMENT

TARGET HABITAT USE
• NESTING
• OVERWINTERING
• REARING
• SPAWNING
• STAGING

TARGET SPECIES
• ARCTIC GRAYLING
• CANADA GEESE
• CHINOOK/KING SALMON
• CHUM SALMON
• COHO/SILVER SALMON
• CUTTHROAT TROUT
• DOLLY VARDEN
• INVERTEBRATES
• PINK SALMON
• PINTAIL DUCKS
• RAINBOW TROUT
• SANDHILL CRANES
• SOCKEYE/RED SALMON
• STEELHEAD TROUT
• WHITEFISH
• WHITE-FRONTED GEESE

TUNDRA

UTILITY LINE(S)

WATER QUALITY OBJECTIVES

WATERFOWL HABITAT IMPROVEMENT
### AIRPORT(S)

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>ADOT Hoonah Airport Expansion</td>
<td>SeEast</td>
</tr>
<tr>
<td>Creamer’s Field Crane Project</td>
<td>NorInt</td>
</tr>
<tr>
<td>Haines Airport Mitigation</td>
<td>SeEast</td>
</tr>
<tr>
<td>Juneau Airport Taxiway/GC 341</td>
<td>SeEast</td>
</tr>
<tr>
<td>Ugashik River 8</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### CONTAMINANT REMOVAL

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>DEC Oiled Mussel Bed Experiment</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Indian River Log Dump</td>
<td>SeEast</td>
</tr>
<tr>
<td>Oiled Mussel Bed Manipulation</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Reserve Pit Remediation</td>
<td>NorInt</td>
</tr>
<tr>
<td>revegetation of X-Pad, Prudhoe</td>
<td>NorInt</td>
</tr>
<tr>
<td>Unocal Fuel Spill</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### CULVERT CORRECTIONS

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing Tree Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>California Creek Culvert&amp;Pools</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Captains Bay 14; Unalaska Crk</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Darling Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>Denali Clearwater Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>Juneau Airport Taxiway/GC 341</td>
<td>SeEast</td>
</tr>
<tr>
<td>Kink Corner Gravel Pit</td>
<td>NorInt</td>
</tr>
<tr>
<td>Mitkof Highway Reconstruction</td>
<td>SeEast</td>
</tr>
<tr>
<td>Ophir Creek Flow Improvement</td>
<td>SeEast</td>
</tr>
<tr>
<td>Rabbit Creek Fishpass</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Rabbit Crk Step Pools Below RR</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Trapper Creek Step Pools</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### DAM(S)

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbell Lake Outlet</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Chena Lakes (Kutscheid Lake)</td>
<td>NorInt</td>
</tr>
</tbody>
</table>

### DOCKS OR PORT FACILITIES

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>4th of July Creek Mitigation</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Bethel Small Boat Harbor</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Box Canyon Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Gulkana River 5</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Jap Creek Mitigation</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### EELGRASS

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anton Larsen Bay</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

See also "Additional Projects" (Appendix D)

### EROSION CONTROL OBJECTIVES

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atigun Pass Riparian Rehab</td>
<td>NorInt</td>
</tr>
<tr>
<td>Bennett Creek</td>
<td>SeEast</td>
</tr>
<tr>
<td>Bethel Small Boat Harbor</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Big Boulder Creek</td>
<td>SeEast</td>
</tr>
<tr>
<td>BP &amp; Arco Cross Drainage Projs</td>
<td>NorInt</td>
</tr>
<tr>
<td>Canyon Slough</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Cominco Port Disposal Pit</td>
<td>NorInt</td>
</tr>
<tr>
<td>Copper R. Delta Drawdown Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Dog Salmon Creek, Site #1</td>
<td>SeEast</td>
</tr>
<tr>
<td>Dog Salmon Creek, Site #2</td>
<td>SeEast</td>
</tr>
<tr>
<td>FRED projects on Campbell Ck</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Glen Creek in Denali Natl Park</td>
<td>NorInt</td>
</tr>
<tr>
<td>Goose Green Gulch</td>
<td>NorInt</td>
</tr>
<tr>
<td>Independence Creek Revegetation</td>
<td>NorInt</td>
</tr>
<tr>
<td>Kuskokwim Streambank Bioengineer</td>
<td>NorInt</td>
</tr>
<tr>
<td>Lemon Creek 1-4</td>
<td>SeEast</td>
</tr>
<tr>
<td>Nome Creek Riparian Project</td>
<td>NorInt</td>
</tr>
<tr>
<td>North Eagle River Interchange</td>
<td>SCenSW</td>
</tr>
<tr>
<td>USFS 1964 Earthquake Streamwrk</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### ESTUARINE HABITAT

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayshore Ponds &amp; Berms</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Bradley Lake Waterfowl Nesting</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Fish Creek Coastal Wetland Rst</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Fish Creek Mouth Waterfowl Enh</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Indian River Log Dump</td>
<td>SeEast</td>
</tr>
<tr>
<td>Juneau Airport Taxiway/GC 341</td>
<td>SeEast</td>
</tr>
<tr>
<td>Lemon Creek 9</td>
<td>SeEast</td>
</tr>
<tr>
<td>Nulubay Park Mitigation Proj.</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Paint River Fish Ladder</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### EXPERIMENTAL ATTEMPTS

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arco Kuparuk Photo-Trend Plots</td>
<td>NorInt</td>
</tr>
<tr>
<td>Bearing Tree Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>Beaver Pond Access Structures</td>
<td>SCenSW</td>
</tr>
<tr>
<td>BP Pad #22-53-11-13, Prudhoe</td>
<td>NorInt</td>
</tr>
<tr>
<td>BP Put River #1 Pad Experiment</td>
<td>NorInt</td>
</tr>
<tr>
<td>Bradley Lake Waterfowl Nesting</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Brooks River Fish Ladder</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Canada Geese Peninsula Cutoffs</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Chilkat River Pond Access</td>
<td>SeEast</td>
</tr>
<tr>
<td>Cominco Port Disposal Pit</td>
<td>NorInt</td>
</tr>
<tr>
<td>Copper R. Delta Drawdown Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Creamer’s Field Crane Project</td>
<td>NorInt</td>
</tr>
<tr>
<td>Creamer’s Field Waterfowl Proj</td>
<td>NorInt</td>
</tr>
<tr>
<td>Dave’s Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>DEC Oiled Mussel Bed Experiment</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Explorer Creek &amp; Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Fish Creek Coastal Wetland Rst</td>
<td>SCenSW</td>
</tr>
<tr>
<td>FRED projects on Campbell Ck</td>
<td>SCenSW</td>
</tr>
<tr>
<td>FS Cordova Dstr.Spawning Chnls</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Fucus Recruitment Experiment</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Glen Creek in Denali Natl Park</td>
<td>NorInt</td>
</tr>
<tr>
<td>Gravelled Tundra Remediation</td>
<td>NorInt</td>
</tr>
<tr>
<td>Herring Bay Experimental Study</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Indian River Log Dump</td>
<td>SeEast</td>
</tr>
<tr>
<td>Juneau Airport Taxiway/GC 341</td>
<td>SeEast</td>
</tr>
<tr>
<td>Kuparuk Arcotophilia reveg study</td>
<td>NorInt</td>
</tr>
<tr>
<td>Kuparuk Mine Site B</td>
<td>NorInt</td>
</tr>
<tr>
<td>Kuparuk Mine Site D, Part 1</td>
<td>NorInt</td>
</tr>
<tr>
<td>Kuparuk Mine Site D, Part 2</td>
<td>NorInt</td>
</tr>
<tr>
<td>Kuskokwim Streambank Bioengineer</td>
<td>NorInt</td>
</tr>
</tbody>
</table>
### EXPERIMENTAL ATTEMPTS (continued)

<table>
<thead>
<tr>
<th>Action Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lake Rearing Cover Enhancement</td>
<td>SoEast</td>
</tr>
<tr>
<td>Lemon Creek 9</td>
<td>SoEast</td>
</tr>
<tr>
<td>North Eagle River Interchange</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Nulbay Park Mitigation Proj.</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Oiled Mussel Bed Manipulation</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Palmer Hay Flats Waterfowl Enc</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Pavlov Marsh Wildlife Viewing</td>
<td>SoEast</td>
</tr>
<tr>
<td>Pile Driver Slough wetland rst</td>
<td>NorInt</td>
</tr>
<tr>
<td>Potter Marsh Waterfowl Enhcmnt</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Prudhoe Airport Wetland Rest.</td>
<td>NorInt</td>
</tr>
<tr>
<td>Stump Lake H2O Control Structr</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Tunalik Test Wellsite No. 1</td>
<td>NorInt</td>
</tr>
<tr>
<td>Tyee Hydroelectric Spawning Ch</td>
<td>SoEast</td>
</tr>
<tr>
<td>USFS 1964 Earthquake Streamwkr</td>
<td>SCenSW</td>
</tr>
<tr>
<td>USFS Cordova Distr. Fishpasses</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### FISHER HABITAT IMPROVEMENT ACTIONS— ADDITION OF LARGE ORGANIC DEBRIS (continued)

<table>
<thead>
<tr>
<th>Action Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Johns Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Juneau Airport Taxiway/GC 341</td>
<td>SoEast</td>
</tr>
<tr>
<td>Kennel Crk Large Woody Debris</td>
<td>SoEast</td>
</tr>
<tr>
<td>Lake Rearing Cover Enhancement</td>
<td>SoEast</td>
</tr>
<tr>
<td>Little Campbell Crk. Enhancmt.</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Man Made Hole</td>
<td>SoEast</td>
</tr>
<tr>
<td>Martin River Delta Fish Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Mitchell Pool Enhancement</td>
<td>SoEast</td>
</tr>
<tr>
<td>Mud Bay River LG Woody Debris</td>
<td>SCenSW</td>
</tr>
<tr>
<td>North Eagle River Interchange</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Portage Airstrip Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Portage Alder Pond</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Resurrection Crk Fish Habitat</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Starrigavan Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Suntasheen Crk Lg Woody Debris</td>
<td>SoEast</td>
</tr>
<tr>
<td>Switzer Creek Restoration</td>
<td>SoEast</td>
</tr>
<tr>
<td>Tangle Ponds in Portage Valley</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Trapper Creek Step Pools</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Tributary &quot;A&quot; Rearing Enhancmt</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Williwaw Ponds &amp; Spawning Ch</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### 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/ Klaat 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   |
  - Shishnmikof 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   |

### BOULDER PLACEMENT

- Abbott Loop Sch Crk Realignmnt                          | SCenSW   |
- ADOT Hoonah Airport Expansion                           | SoEast   |
- Bearng 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   |
- Midkof 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   |

### INDEX TO DATABASE REPORTS

2-143
### FISH HABITAT IMPROVEMENT ACTIONS—

#### CULVERT INSTALLATION (continued)

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glacier Highway Reconstruction</td>
<td>SoEast</td>
</tr>
<tr>
<td>Juneau Airport Taxiway/GC 341</td>
<td>SoEast</td>
</tr>
<tr>
<td>Kink Corner Gravel Pit</td>
<td>NorInt</td>
</tr>
<tr>
<td>Mitkof Highway Reconstruction</td>
<td>SoEast</td>
</tr>
<tr>
<td>North Three Mile Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Pilgrim River @Nome-Taylor Hwy</td>
<td>NorInt</td>
</tr>
<tr>
<td>Soldotna Creek Culvert</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

#### FISH PASSAGE

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARCO Sag Site C</td>
<td>NorInt</td>
</tr>
<tr>
<td>Bayhead Ck Barrier Modif.</td>
<td>SoEast</td>
</tr>
<tr>
<td>Bear Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Beaver Dam Blockages</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Beaver Pond Access Structures</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Bennett Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Brooks River Fish Ladder</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Bryce Creek Coho Rearing Area</td>
<td>SoEast</td>
</tr>
<tr>
<td>Campbell Lake Outlet</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Captains Bay 14;Unalaska Crk</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Chilkat River Pond Access</td>
<td>SoEast</td>
</tr>
<tr>
<td>CIAA Fish Passes</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Dean Creek Fishway</td>
<td>SoEast</td>
</tr>
<tr>
<td>Denali Clearwater Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>Glacier Dtrict PWS Fishpasses</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Green’s Creek Fish Pass</td>
<td>SoEast</td>
</tr>
<tr>
<td>Jordan Creek 8</td>
<td>SoEast</td>
</tr>
<tr>
<td>Kink Corner Gravel Pit</td>
<td>NorInt</td>
</tr>
<tr>
<td>Kuparuk Mine Site B</td>
<td>NorInt</td>
</tr>
<tr>
<td>Kwatahein Fishway</td>
<td>SoEast</td>
</tr>
<tr>
<td>Mitchell Creek Fish Pass</td>
<td>SoEast</td>
</tr>
<tr>
<td>N.F. Game Ck Barrier Modif.</td>
<td>SoEast</td>
</tr>
<tr>
<td>North Eagle River Interchange</td>
<td>SCenSW</td>
</tr>
<tr>
<td>North Three Mile Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Ophir Creek Flow Improvement</td>
<td>SoEast</td>
</tr>
<tr>
<td>Packers Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Paint River Fish Ladder</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Pavlof River Upper Fishpass</td>
<td>SoEast</td>
</tr>
<tr>
<td>Put 27 Mine Site</td>
<td>NorInt</td>
</tr>
<tr>
<td>Rabbit Creek Fishpass</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Rabbit Ck Step Pools Below RR</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Shishnikof River fish pass</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Slippery Creek Fishway</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Soldotna Creek Culvert</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Suntaheen Ck Pink Smm Barrier</td>
<td>SoEast</td>
</tr>
<tr>
<td>Suntaheen Fishpasses I &amp; II</td>
<td>SoEast</td>
</tr>
<tr>
<td>Switzer Creek Restoration</td>
<td>SoEast</td>
</tr>
<tr>
<td>Trapper Creek Step Pools</td>
<td>SCenSW</td>
</tr>
<tr>
<td>USFS Cordova Distr. Fishpasses</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Virginia Lake Fert. &amp; Fishpass</td>
<td>SoEast</td>
</tr>
</tbody>
</table>

### GRAVEL WORK (addition or cleaning)

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP &amp; Arco Cross Drainage Projs</td>
<td>NorInt</td>
</tr>
<tr>
<td>FS Cordova Dstr.Spawning Chns</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Glacier Highway Reconstruction</td>
<td>SoEast</td>
</tr>
<tr>
<td>Glen Creek in Denali Natl Park</td>
<td>NorInt</td>
</tr>
<tr>
<td>Goodnews Platinum Mine</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Marx Creek Spawning Channel</td>
<td>SoEast</td>
</tr>
<tr>
<td>Mitchell Pool Enhancement</td>
<td>SoEast</td>
</tr>
<tr>
<td>New Chenega Road Construction</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Pebble Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>Solomon Gulch Tail Race</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Tyee Hydroelectric Spawning Ch</td>
<td>SoEast</td>
</tr>
<tr>
<td>West Camden Egg Boxes</td>
<td>SoEast</td>
</tr>
</tbody>
</table>

### INCUBATION BOXES

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Boulder Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Packers Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Paint River Fish Ladder</td>
<td>SCenSW</td>
</tr>
<tr>
<td>West Camden Egg Boxes</td>
<td>SoEast</td>
</tr>
</tbody>
</table>

### LAKE FERTILIZATION

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bear Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Coghill Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Larson Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Packers Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Tokua Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Virginia Lake Fert. &amp; Fishpass</td>
<td>SoEast</td>
</tr>
</tbody>
</table>

### LIVE VEGETATION (in stream or for bank stabilization)

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbott Loop Sch Ck Realignmnt</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Atigun Pass Riparian Rehab</td>
<td>NorInt</td>
</tr>
<tr>
<td>Banner Ck Material Site</td>
<td>NorInt</td>
</tr>
<tr>
<td>Campbell Lake Outlet</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Chester Creek Realignment</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Cordova Dstr Gravel Pit Rehabs</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Dog Salmon Creek, Site # 2</td>
<td>SoEast</td>
</tr>
<tr>
<td>Glacier Highway Reconstruction</td>
<td>SoEast</td>
</tr>
<tr>
<td>Glen Creek in Denali Natl Park</td>
<td>NorInt</td>
</tr>
<tr>
<td>Juneau Airport Taxiway/GC 341</td>
<td>SoEast</td>
</tr>
<tr>
<td>Lemon Creek 1-4</td>
<td>SoEast</td>
</tr>
<tr>
<td>Lemon Creek 9</td>
<td>SoEast</td>
</tr>
<tr>
<td>Lyon Creek Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Marx Creek Spawning Channel</td>
<td>SoEast</td>
</tr>
<tr>
<td>Nome Creek Riparian Project</td>
<td>NorInt</td>
</tr>
<tr>
<td>North Eagle River Interchange</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Resurrection Crk Fish Habitat</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Tangle Ponds in Portage Valley</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### OTHER ARTIFICIAL STRUCTURES

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bearing Tree Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>California Creek Culvert &amp; Pools</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Campbell Lake Outlet</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

---

INDEX TO DATABASE REPORTS

2-144
## FISH HABITAT IMPROVEMENT ACTIONS

### OTHER ARTIFICIAL STRUCTURES (continued)

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cordova District Gravel Pit Rehabs</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Darling Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>Dave's Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Denali Clearwater Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>Dog Salmon Creek, Site #1</td>
<td>SoEast</td>
</tr>
<tr>
<td>FRED projects on Campbell Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>FS Stream Cover/ Brush Bundles</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Glacier District PWS Fishpasses</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Jap Creek Mitigation</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Lemon Creek 1-4</td>
<td>SoEast</td>
</tr>
<tr>
<td>Man Made Hole</td>
<td>SoEast</td>
</tr>
<tr>
<td>Martin River Delta Fish Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Mitkof Highway Reconstruction</td>
<td>SoEast</td>
</tr>
<tr>
<td>Nome Creek Riparian Project</td>
<td>NorInt</td>
</tr>
<tr>
<td>Potter Marsh Creation</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Rabbit Creek Fishpass</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Soldotna Creek Culvert</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Solomon Gulch Tail Race</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Stump Lake H2O Control Structures</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Trapper Creek Step Pools</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Tyee Hydroelectric Spawning Channel</td>
<td>SoEast</td>
</tr>
<tr>
<td>USFS 1964 Earthquake Streamwork</td>
<td>SCenSW</td>
</tr>
<tr>
<td>USFS Cordova District Fishpasses</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### REFUSE REMOVAL

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>BP &amp; Arco Cross Drainage Projs</td>
<td>NorInt</td>
</tr>
<tr>
<td>Dog Salmon Creek, Site #1</td>
<td>SoEast</td>
</tr>
<tr>
<td>Goodnews Platinum Mine</td>
<td>SCenSW</td>
</tr>
<tr>
<td>North Three Mile Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Switzer Creek Restoration</td>
<td>SoEast</td>
</tr>
<tr>
<td>USFS Log/Debris Removal Program</td>
<td>SCenSW</td>
</tr>
<tr>
<td>West Camden Egg Boxes</td>
<td>SoEast</td>
</tr>
</tbody>
</table>

### RIPARIAN ZONE

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbott Loop Sch Ck Realignment</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Atigun Pass Riparian Rehab</td>
<td>NorInt</td>
</tr>
<tr>
<td>California Creek Culvert&amp;Pools</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Dog Salmon Creek, Site #2</td>
<td>SoEast</td>
</tr>
<tr>
<td>Glen Creek in Denali Natl Park</td>
<td>NorInt</td>
</tr>
<tr>
<td>Little Campbell Ck. Enhancmt.</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Nome Creek Riparian Project</td>
<td>NorInt</td>
</tr>
</tbody>
</table>

### SPAWNING CHANNELS

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 Mile Spawning Channel</td>
<td>SoEast</td>
</tr>
<tr>
<td>4th of July Creek Mitigation</td>
<td>SCenSW</td>
</tr>
<tr>
<td>ADOT Hoonah Airport Expansion</td>
<td>SoEast</td>
</tr>
<tr>
<td>Canyon Slough</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Dave's Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>East Fork Chena River</td>
<td>NorInt</td>
</tr>
<tr>
<td>Explorer Creek &amp; Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>FS Cordova Distr.Spawning Chnls</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Harrison Lagoon Creek</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### SPAWNING CHANNELS (continued)

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Herman Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Jap Creek Mitigation</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Johns Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Koppenberg Mine</td>
<td>NorInt</td>
</tr>
<tr>
<td>Lyon Creek Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Martin River Delta Fish Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Marx Creek Spawning Channel</td>
<td>SoEast</td>
</tr>
<tr>
<td>New Chenega Road Construction</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Pigot Bay Spawning Channel</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Potter Creek Rechannel</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Solomon Gulch Tail Race</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Tyee Hydroelectric Spawning Ch</td>
<td>SoEast</td>
</tr>
<tr>
<td>USFS 1964 Earthquake Streamwork</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Williwaw Ponds &amp; Spawning Ch</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### HARVEST OBJECTIVES

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayhead Ck Barrier Modif.</td>
<td>SoEast</td>
</tr>
<tr>
<td>Bear Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Beaver Dam Blockages</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Beaver Pond Access Structures</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Brooks River Fish Ladder</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Bryce Creek Coho Rearing Area</td>
<td>SoEast</td>
</tr>
<tr>
<td>CIAA Fish Pass</td>
<td>SCenSW</td>
</tr>
<tr>
<td>CIAA Flow Control Structures</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Coghill Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Dean Creek Fishway</td>
<td>SoEast</td>
</tr>
<tr>
<td>Glacier District PWS Fishpasses</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Harrison Lagoon Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Kwasutein Fishway</td>
<td>SoEast</td>
</tr>
<tr>
<td>Lake Rearing Cover Enhancement</td>
<td>SoEast</td>
</tr>
<tr>
<td>Larson Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Mitchell Creek Fish Pass</td>
<td>SoEast</td>
</tr>
<tr>
<td>N.F. Game Ck Barrier Modif.</td>
<td>SoEast</td>
</tr>
<tr>
<td>Packers Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Paint River Fish Ladder</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Pavlof River Upper Fishpass</td>
<td>SoEast</td>
</tr>
<tr>
<td>Pigot Bay Spawning Channel</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Slippery Creek Fishway</td>
<td>SoEast</td>
</tr>
<tr>
<td>Suntanen Chk Pink Slmn Barrier</td>
<td>SoEast</td>
</tr>
<tr>
<td>Suntanen Fishpasses I &amp; II</td>
<td>SoEast</td>
</tr>
<tr>
<td>Tokun Lake Fertilization</td>
<td>SCenSW</td>
</tr>
<tr>
<td>USFS Cordova Distr. Fishpasses</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Virginia Lake Fert. &amp; Fishpass</td>
<td>SoEast</td>
</tr>
</tbody>
</table>

### HIGHWAY/ROAD

<table>
<thead>
<tr>
<th>Project Description</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Banner Ck Material Site</td>
<td>NorInt</td>
</tr>
<tr>
<td>Big Boulder Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Bradley Lake Waterfowl Nesting</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Darling Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>Delong Highway Stream Crossing</td>
<td>NorInt</td>
</tr>
</tbody>
</table>
HIGHWAY/ROAD--

•MITIGATION FOR DEVELOPMENT OF
(continued)
Glacier Highway Reconstruction SoEast
Glenn Highway Mitigation Proj. SCenSW
Gulkana River 5 SCenSW
Jordan Creek 8 SoEast
Kink Corner Gravel Pit NorInt
New Chenega Road Construction SCenSW
North Eagle River Interchange SCenSW
Rabbit Creek Fishpass SCenSW

•RESTORATION FROM
Bearing Tree Creek NorInt
Big Boulder Creek SoEast
BP & Arco Cross Drainage Projs NorInt
BP’s Articphilia reevge research NorInt
California Creek Culvert&Pools SCenSW
Captains Bay 14;Unalaska Crk SCenSW
Darling Creek NorInt
Denali Clearwater Creek NorInt
East Fork Solomon River NorInt
Jordan Creek 8 SoEast
Mikof Highway Reconstruction SoEast
New Chenega Road Construction SCenSW
North Three Mile Creek SoEast
Ophir Creek Flow Improvement SoEast
Pebble Creek NorInt
Prudhoe Airport Wetland Rest. NorInt
Rabbit Creek Fishpass SCenSW
Rabbit Crk Step Pools Below RR SCenSW
Soldota Creek Culvert SCenSW
Trapper Creek Step Pools SCenSW

HYDROELECTRIC PLANT--mitigation for
Bradley Lake Waterfowl Nesting SCenSW
Solomon Gulch Tail Race SCenSW
Tyee Hydroelectric Spawning Ch SoEast

HYDROLOGICAL OBJECTIVES (flood control, in-
stream flow, etc.)
Abbott Loop Sch Crk Realignment SCenSW
Bear Lake Fertilization SCenSW
Big Boulder Creek SoEast
Bryce Creek Coho Rearing Area SoEast
California Creek Culvert&Pools SCenSW
CIAA Flow Control Structures SCenSW
Copper R. Delta Drawdown Ponds SCenSW
Dog Salmon Creek, Site #1 SoEast
East Fork Solomon River NorInt
Glen Creek in Denali Natl Park NorInt
Goose Green Gulch NorInt
Juneau Airport Dike SoEast
Juneau Airport Taxiway/GC 341 SoEast

HYDROLOGICAL OBJECTIVES (continued)
Little Campbell Crk. Enhancmnt. SCenSW
Marx Creek Spawning Channel SoEast
Nome Creek Spawning Channel SCenSW
Ophir Creek Flow Improvement SCenSW
Packers Lake Fertilization SCenSW
Pile Driver & 23 Mile Sloughs NorInt
USFS 1964 Earthquake Streamwrk SCenSW

INCIDENTAL HABITAT CREATIONS (created w/o
intention or as a consequence of some other action)
Juneau Airport Dike SoEast
Mendenhall Dredge Islands SoEast
Pile Driver & 23 Mile Sloughs NorInt
Potter Marsh Creation SCenSW

LACUSTRINE HABITAT
ARCO Sag Site C NorInt
Banner Ck Material Site NorInt
Bear Lake Fertilization SCenSW
Chena Lakes (Kutscheid Lake) NorInt
CIAA Flow Control Structures SCenSW
Coghill Lake Fertilization SCenSW
Ingram Pond Coho Rearing Enhc SCenSW
Kuparuk Mine Site B NorInt
Kuparuk Mine Site D, Part 2 NorInt
Lake Rearing Cover Enhancement SoEast
Larson Lake Fertilization SCenSW
Otter Lake Recreation Area SCenSW
Packers Lake Fertilization SCenSW
Put 27 Mine Site NorInt
Stump Lake H2O Control Struct SCenSW
Tokun Lake Fertilization SCenSW
Virginia Lake Pert. & Fishpass SoEast
Westchester Lagoon Formation SCenSW

LANDFILL/WASTE--mitigation or restoration from
Cominco Port Disposal Pit NorInt
Eielson mit for illegal fill NorInt
Gastineau Channel 302 SoEast
Haines Airport Mitigation SoEast

LOGGING IMPACT RESTORATION
Bennett Creek SoEast
Bryce Creek Coho Rearing Area SoEast
Dog Salmon Creek, Site #1 SoEast
Dog Salmon Creek, Site #2 SoEast
Indian River Log Dump SoEast
Marx Creek Spawning Channel SoEast
North Three Mile Creek SoEast
Ophir Creek Flow Improvement SoEast
Starrigavin Creek SoEast
Switzer Creek Restoration SoEast
### MARINE HABITAT

- Anton Larsen Bay
- Bayshore Ponds & Berms
- DEC Oiled Mussel Bed Experiment
- Fucus Recruitment Experiment
- Herring Bay Experimental Study
- Mendenhall Dredge Islands
- Oiled Mussel Bed Manipulation

### MINING IMPACT RESTORATION—GRAVEL MINING (pits or streams)

- ARCO Sag Site C
- Banner Ck Material Site
- Chena Lakes (Kutscheid Lake)
- Chena River Gravel Pit, Fbx
- Cordova Dstr Gravel Pit Rehabs
- Explorer Creek & Ponds
- Gastineau Channel 302
- Goose Green Gulch
- Kink Corner Gravel Pit
- Kuparuk Mine Site B
- Kuparuk Mine Site D, Part 1
- Kuparuk Mine Site D, Part 2
- Lemon Creek 1-4
- Lemon Creek 9
- Lyon Creek Ponds
- Man Made Hole
- Martin River Delta Fish Ponds
- Portage Airstrip Ponds
- Portage Alder Pond
- Put 27 Mine Site
- Switzer Creek Restoration
- Tangle Ponds in Portage Valley
- Williwaw Ponds & Spawning Chi

### HARDROCK MINING

- Green's Creek Fish Pass
- Switzer Creek Restoration

### PLACER MINING

- East Fork Chena River
- Glen Creek in Denali Natl Park
- Goodnews Platinum Mine
- Independence Crk Revegetation
- Johns Creek
- Koppenberg Mine
- Nome Creek Riparian Project
- Resurrection Crk Fish Habitat

### NATURAL DISASTER—restoration from

- Man Made Hole
- Marx Creek Spawning Channel
- Ophir Creek Flow Improvement
- Stump Lake H2O Control Struct
- USFS 1964 Earthquake Streamwrk

### OFFSITE MITIGATION

- Captains Bay 14; Unalaska Crk
- Jap Creek Mitigation
- Little Campbell Crk. Enhancmnt.
- Shaishnikof River fish pass
- Westchester Lagoon Offsite Mit

### OIL/GAS DRILLING

- Arco Kuparuk Photo-Trend Plots
- BP Pad #22-33-11-13, Prudhoe
- BP Put River # 1 Pad Experiment
- Graved Tundra Remediation
- Kuparuk Arctophila reveg study
- Kuparuk River 119
- Reserve Pit Remediation
- Revegetation of X-Pad, Prudhoe
- Tunilik Test Wellsite No. 1
- Ugashik River 8
- Uncal Fuel Spill

### OILSPILL RESTORATION

- DEC Oiled Mussel Bed Experiment
- Fucus Recruitment Experiment
- Herring Bay Experimental Study
- Oiled Mussel Bed Manipulation

### PALUSTRINE HABITAT

-orghini Pond Coho Rearing Enhc
- Juneau Airport Taxiway/GC 341
- Lake Rearing Cover Enhancement
- Lyon Creek Ponds

### RECREATIONAL/EDUCATIONAL OBJECTIVES

- 24 Mile Spawning Channel
- Abbott Loop Sch Crk Realignment
- Chena Lakes (Kutscheid Lake)
- Cordova Dstr Gravel Pit Rehabs
- Creamer's Field Crane Project
- Creamer's Field Waterfowl Proj
- Dave's Creek
- Delong Highway Stream Crossing
- Explorer Creek & Ponds
- Fishing & Aquatic Ed Pond Proj
- Herman Creek
- Ingram Pond Coho Rearing Enhc
- Jordan Creek 8
- Juneau Airport Taxiway/GC 341
- Lake Rearing Cover Enhancement
- Lyon Creek Ponds

### INDEX TO DATABASE REPORTS

2-147
### RECREATIONAL/EDUCATIONAL OBJECTIVES

<table>
<thead>
<tr>
<th>Project</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nome Creek Riparian Project</td>
<td>NorInt</td>
</tr>
<tr>
<td>North Three Mile Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Otter Lake Recreation Area</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Pavlov Marsh Wildlife Viewing</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Portage Airstrip Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Portage Alder Pond</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Stump Lake H2O Control Struct</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Tangle Ponds in Portage Valley</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Westchester Lagoon Formation</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

### OVERWINTERING (continued)

- Kuparuk Mine Site B
- North Eagle River Interchange
- Portage Airstrip Ponds
- Portage Alder Pond
- Put 27 Mine Site
- Resurrection Crk Fish Habitat
- Soldotna Creek Culvert
- Starrigavan Creek
- Suntaheen Crk Lg Woody Debris
- Tangle Ponds in Portage Valley
- West Camden Egg Boxes

### RIVERINE HABITAT (over 50 projects), see

"Summary Table," Section D

### SHOREBIRD HABITAT IMPROVEMENT

- BP's Arctophila reveg research
- Chena River Gravel Pit, Fbx
- Fish Creek Mouth Waterfowl Enh
- Kuparuk Mine Site D, Part 1
- Mendenhall Dredge Islands
- Nulbay Park Mitigation Proj.
- Reserve Pit Remediation
- Westchester Lagoon Offsite Mit

### TARGET HABITAT USE--

#### NESTING

- Bayshore Ponds & Berms
- Bradley Lake Waterfowl Nesting
- Canada Geese Nest Island Prgm
- Canada Geese Peninsula Cutoffs
- Concord Hills/ Kllat Bog Mitg.
- Creamer's Field Waterfowl Proj.
- Fish Creek Coastal Wetland Rst
- Fish Creek Mouth Waterfowl Enh
- Mendenhall Dredge Islands
- Otter Lake Recreation Area
- Palmer Hay Flats Waterfowl Enc
- Pavlov Marsh Wildlife Viewing
- Potter Marsh Waterfowl Enhcmnt
- Twentymile R. Waterfowl Impvrt
- Westchester Lagoon Formation

#### REARING (over 50 projects), see "Summary Table," Section D

#### SPAWNING (over 50 projects), see "Summary Table," Section D

#### STAGING

- Bradley Lake Waterfowl Nesting
- Concord Hills/ Kllat Bog Mitg.
- Creamer's Field Crane Project
- Nulbay Park Mitigation Proj.
- Westchester Lagoon Offsite Mit

### TARGET SPECIES--

#### ARCTIC GRAYLING

- ARCO Sag Site C
- Atigun Pass Riparian Rehab
- Banner Ck Material Site
- Bearing Tree Creek
- BP & Arco Cross Drainage Prjs
- Denali Clearwater Creek
- East Fork Chena River
- Fishing & Aquatic Ed Pond Proj
- Goose Green Gulch
- Koppenberg Mine
- Kuparuk Mine Site B
- Kuparuk Mine Site D, Part 2
- North Eagle River Interchange
- Pebble Creek
- Portage Airstrip Ponds
- Put 27 Mine Site
- Tangle Ponds in Portage Valley

#### CANADA GEESE

- Canada Geese Nest Island Prgm
- Canada Geese Peninsula Cutoffs
- Otter Lake Recreation Area
- Pavlov Marsh Wildlife Viewing

### INDEX TO DATABASE REPORTS
TARGET SPECIES—(continued)

• CHINOOK/KING SALMON

<table>
<thead>
<tr>
<th>Location</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Big Boulder Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Box Canyon Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>California Creek Culvert&amp;Pools</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Campbell Lake Outlet</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Dave’s Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Johns Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Koppenberg Mine</td>
<td>NorInt</td>
</tr>
<tr>
<td>Lyon Creek Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Man Made Hole</td>
<td>SoEast</td>
</tr>
<tr>
<td>Portage Airstrip Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Rabbit Creek Fishpass</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Rabbit Creek Step Pools Below RR</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Soldotna Creek Culvert</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Trapper Creek Step Pools</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Tributary &quot;A&quot; Rearing Enhancmnt</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

• CHUM SALMON

<table>
<thead>
<tr>
<th>Location</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>24 Mile Spawning Channel</td>
<td>SoEast</td>
</tr>
<tr>
<td>4th of July Creek Mitigation</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Explorer Creek &amp; Ponds</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Harrison Lagoon Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Herman Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Jap Creek Mitigation</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Lemon Creek 1-4</td>
<td>SoEast</td>
</tr>
<tr>
<td>Marx Creek Spawning Channel</td>
<td>SoEast</td>
</tr>
<tr>
<td>Pigot Bay Spawning Channel</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Solomon Gulch Tail Race</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Switzer Creek Restoration</td>
<td>SoEast</td>
</tr>
<tr>
<td>Tyee Hydroelectric Spawning Ch</td>
<td>SoEast</td>
</tr>
<tr>
<td>USFS 1964 Earthquake Streamwrk</td>
<td>SCenSW</td>
</tr>
<tr>
<td>West Camden Egg Boxes</td>
<td>SoEast</td>
</tr>
<tr>
<td>Williwaw Ponds &amp; Spawning Chl</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

• COHO/SILVER SALMON (over 50 projects), see "Summary Table," Section D

• CUTTHROAT TROUT

<table>
<thead>
<tr>
<th>Location</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bayhead Ck Barrier Modifc.</td>
<td>SoEast</td>
</tr>
<tr>
<td>Cordova Dstr Gravel Pit Rehabs</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Lake Rearing Cover Enhancement</td>
<td>SoEast</td>
</tr>
<tr>
<td>Mitchell Pool Enhancement</td>
<td>SoEast</td>
</tr>
<tr>
<td>Mitkof Highway Reconstruction</td>
<td>SoEast</td>
</tr>
<tr>
<td>Stump Lake H2O Control Structr</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

• DOLLY VARDEN

<table>
<thead>
<tr>
<th>Location</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abbott Loop Sch Crk Realignmnt</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Atigun Pass Riparian Rehab</td>
<td>NorInt</td>
</tr>
<tr>
<td>Bayhead Ck Barrier Modifc.</td>
<td>SoEast</td>
</tr>
<tr>
<td>Chester Creek Realignment</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Cordova Dstr Gravel Pit Rehabs</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Darling Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>FS Stream Cover/ Brush Bundles</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

TARGET SPECIES—(continued)

• DOLLY VARDEN (continued)

<table>
<thead>
<tr>
<th>Location</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jordan Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Kink Corner Gravel Pit</td>
<td>NorInt</td>
</tr>
<tr>
<td>Lake Rearing Cover Enhancement</td>
<td>SoEast</td>
</tr>
<tr>
<td>Lemon Creek 1-4</td>
<td>SoEast</td>
</tr>
<tr>
<td>Little Campbell Crk. Enhancmt.</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Stump Lake H2O Control Structr</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Switzer Creek Restoration</td>
<td>SoEast</td>
</tr>
</tbody>
</table>

• INVERTEBRATES

<table>
<thead>
<tr>
<th>Location</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anton Larsen Bay</td>
<td>SCenSW</td>
</tr>
<tr>
<td>DEC Oiled Mussel Bed Experiment</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Indian River Log Dump</td>
<td>SoEast</td>
</tr>
<tr>
<td>Nome Creek Riparian Project</td>
<td>NorInt</td>
</tr>
<tr>
<td>Oiled Mussel Bed Manipulation</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

• PINK SALMON

<table>
<thead>
<tr>
<th>Location</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Campbell Lake Outlet</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Canyon Slough</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Captains Bay 14;Unalaska Crk</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Darling Creek</td>
<td>NorInt</td>
</tr>
<tr>
<td>Glacier Dist PWS Fishpasses</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Harrison Lagoon Creek</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Ingram Pond Coho Rearing Enhnc</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Jap Creek Mitigation</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Kwatahein Fishway</td>
<td>SoEast</td>
</tr>
<tr>
<td>New Chenega Road Construction</td>
<td>SCenSW</td>
</tr>
<tr>
<td>North Three Mile Creek</td>
<td>SoEast</td>
</tr>
<tr>
<td>Potter Creek Rechannel</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Rabbit Creek Fishpass</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Rabbit Creek Step Pools Below RR</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Shishnikof River fish pass</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Solomon Gulch Tail Race</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Suntabeen Ck Pink Slmm Barrier</td>
<td>SoEast</td>
</tr>
<tr>
<td>Switzer Creek Restoration</td>
<td>SoEast</td>
</tr>
<tr>
<td>Tyee Hydroelectric Spawning Ch</td>
<td>SoEast</td>
</tr>
<tr>
<td>USFS 1964 Earthquake Streamwrk</td>
<td>SCenSW</td>
</tr>
<tr>
<td>USFS Cordova Distr. Fishpasses</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

• PINTAIL DUCKS

<table>
<thead>
<tr>
<th>Location</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glenn Highway Mitigation Proj.</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Palmer Hay Flats Waterfowl Enc</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

• RAINBOW TROUT

<table>
<thead>
<tr>
<th>Location</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chena Lakes (Kutscheid Lake)</td>
<td>NorInt</td>
</tr>
<tr>
<td>Chester Creek Realignment</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Fishing &amp; Aquatic Ed Pond Proj</td>
<td>NorInt</td>
</tr>
<tr>
<td>Portage Alder Pond</td>
<td>SCenSW</td>
</tr>
<tr>
<td>Tangle Ponds in Portage Valley</td>
<td>SCenSW</td>
</tr>
</tbody>
</table>

• SANDHILL CRANES

<table>
<thead>
<tr>
<th>Location</th>
<th>Section</th>
</tr>
</thead>
<tbody>
<tr>
<td>Creamer’s Field Crane Project</td>
<td>NorInt</td>
</tr>
</tbody>
</table>

INDEX TO DATABASE REPORTS   2-149
TARGET SPECIES—(continued)
• SHOREBIRDS (general), see "Shorebird Habitat Improvement"

• SOCKEYE/RED SALMON
  Bear Lake Fertilization  SCanSW
  Beaver Dam Blockages  SCanSW
  Brooks River Fish Ladder  SCanSW
  Campbell Lake Outlet  SCanSW
  CIESA Fish Passes  SCanSW
  CIESA Flow Control Structures  SCanSW
  Coghill Lake Fertilization  SCanSW
  Explorer Creek & Ponds  SCanSW
  FS Cordova Distr. Spawning Chns  SCanSW
  Glacier Distric PWS Fishpasses  SCanSW
  Larson Lake Fertilization  SCanSW
  Ophir Creek Flow Improvement  SoEast
  Packers Lake Fertilization  SCanSW
  Tokun Lake Fertilization  SCanSW
  USFS Cordova Distr. Fishpasses  SCanSW
  Virginia Lake Fert. & Fishpass  SoEast
  Williwaw Ponds & Spawning Chl  SCanSW

• STEELHEAD TROUT
  Man Made Hole  SoEast
  Mitchell Creek Fish Pass  SoEast
  Mitchell Pool Enhancement  SoEast

• WATERFOWL (general), see "Waterfowl Habitat Improvement"

• WHITEFISH
  Atigun Pass Riparian Rehab  NorInt
  Koppenberg Mine  NorInt
  Kuparuk Mine Site B  NorInt

• WHITE-FRONTED GEESE
  Twentymile R. Waterfowl Imprvt  SCanSW

TUNDRA
  Arco Kuparuk Photo-Trend Plots  NorInt
  BP & Arco Cross Drainage Projs  NorInt
  BP Pad #22-33-11-13, Prudhoe  NorInt
  BP Put River #1 Pad Experiment  NorInt
  Cominco Port Disposal Pit  NorInt
  Gravelied Tundra Remediation  NorInt
  Kuparuk River 119  NorInt
  Prudhoe Airport Wetland Rest.  NorInt
  Revegetation of X-Pad, Prudhoe  NorInt
  Tunaliq Test Wellsite No. 1  NorInt
  Ugashik River 8  SCanSW

UTILITY LINE(S)—mitigation or restoration from
  Atigun Pass Riparian Rehab  NorInt
  Bayshore Ponds & Berms  SCanSW
  Campbell Lake Outlet  SCanSW
  Canyon Slough  SCanSW
  Fish Creek Coastal Wetland Rst  SCanSW
  Fish Creek Mouth Waterfowl Enh  SCanSW

WATER QUALITY OBJECTIVES
  Abbott Loop Sch Crk Realignment  SCanSW
  Delong Highway Stream Crossing  NorInt
  East Fork Chena River  NorInt
  Haines Airport Mitigation  SoEast
  Koppenberg Mine  NorInt
  MOA Sedimentation Ponds  SCanSW
  Switzer Creek Restoration  SoEast

WATERFOWL HABITAT IMPROVEMENT
  Bayshore Ponds & Berms  SCanSW
  BP's Arctophilia reveg research  NorInt
  Bradley Lake Waterfowl Nesting  SCanSW
  Canada Geese Nest Island Prgm  SCanSW
  Canada Geese Peninsula Cutoffs  SCanSW
  Chena River Gravel Pit, Fbrx  NorInt
  Concord Hills/ Klat Bog Mitg.  SCanSW
  Copper R. Delta Drawdown Ponds  SCanSW
  Creamer's Field Crane Project  NorInt
  Creamer's Field Waterfowl Proj  NorInt
  Eliason mit for illegal fill  NorInt
  Fill Removal— Potter Marsh  SCanSW
  Fish Creek Coastal Wetland Rst  SCanSW
  Fish Creek Mouth Waterfowl Enh  SCanSW
  Glenn Highway Mitigation Proj.  SCanSW
  Kuparuk Arctophilia reveg study  NorInt
  Kuparuk Mine Site D, Part 1  NorInt
  Mendenhall Dredge Islands  SoEast
  MOA Sedimentation Ponds  SCanSW
  Nulivik Park Mitigation Proj.  SCanSW
  Otter Lake Recreation Area  SCanSW
  Palmer Hay Flats Waterfowl Enc  SCanSW
  Pavlov Marsh Wildlife Viewing  SoEast
  Potter Marsh Waterfowl Enhcmnt  SCanSW
  Reserve Pit Remediation  NorInt
  Twentymile R. Waterfowl Imprvt  SCanSW
  Westchester Lagoon Formation  SCanSW
  Westchester Lagoon Offsite Mit  SCanSW
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 relevance 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>
<thead>
<tr>
<th>PROJECT NAME and/or description</th>
<th>CATEGORY</th>
<th>LOCATION</th>
<th>YEAR STARTED</th>
<th>SUCCESSFUL</th>
<th>SITE VISIT OR SUMMARIZE OTHER INFO?</th>
<th>PROS/CONS FOR INCLUDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Galloca Channel 302 (P42)</td>
<td>GRAVEL MINING REHAB</td>
<td>Juneau</td>
<td>1992</td>
<td>Unknown</td>
<td>Visit</td>
<td>There aren't many examples of intertidal gravel mining rehabilitation. Messy history with landowners; access could be a problem.</td>
</tr>
<tr>
<td>Williwaw Ponds &amp; Spawning Channel (P42)</td>
<td>GRAVEL MINING REHAB, SPAWNING CHANNEL</td>
<td>Portage</td>
<td>1984-present</td>
<td>Partial success</td>
<td>Visit</td>
<td>Just about finished. Has some rearing fish; ponds still very sterile.</td>
</tr>
<tr>
<td>Bradley Lake Hydroelectric Plant (Martin River) turning borrow pits into fish habitat (P68)</td>
<td>GRAVEL MINING REHAB, REARING/OV AREAS, SPAWNING CHANNEL</td>
<td>Homer, Kachemak Bay</td>
<td>1991</td>
<td>Unknown, some pinks</td>
<td>Visit</td>
<td>They were not required to monitor. Rearing and spawning into Kachemak Bay</td>
</tr>
<tr>
<td>Mile 18 area, Cordova District Gravel Pit Rehabs (P60)</td>
<td>GRAVEL MINING REHAB, REARING/OV AREAS</td>
<td>Cordova</td>
<td>1978-2 ponds 1991-2 ponds</td>
<td>Yes</td>
<td>?</td>
<td>Fairly good data from such a long time ago</td>
</tr>
<tr>
<td>Lemon Creek 1-4 rehabilitation of gravel-mined stream (P43)</td>
<td>GRAVEL MINING REHAB, REARING/OV AREAS, RIPARIAN HABITAT</td>
<td>Juneau</td>
<td>1989-92</td>
<td>Yes</td>
<td>Visit</td>
<td>Alders have taken well; creek will be more stable when gravel mining operations cease completely.</td>
</tr>
<tr>
<td>Captain's Bay, Unalaska Creek—Ladder for perched culvert (P178)</td>
<td>PERCHED CULVERT CORRECTION</td>
<td>Unalaska</td>
<td>1989-90</td>
<td>Partial success</td>
<td>Write-Up Only</td>
<td>Nice design, but troublesome without continued maintenance</td>
</tr>
<tr>
<td>Trepper Creek Step Pools (P54)</td>
<td>PERCHED CULVERT CORRECTION</td>
<td>Trapper Creek</td>
<td>1990</td>
<td>Success</td>
<td>Visit</td>
<td>Only example of this approach to perched culverts that ADOT/PP has done to date</td>
</tr>
<tr>
<td>Rabbit Creek Fish Pass—Step Pools and Riparian Vegetation (P115)</td>
<td>PERCHED CULVERT CORRECTION, RIPARIAN HABITAT</td>
<td>Anchorage</td>
<td>1988</td>
<td>PC-yes, RH-no, overgrazed</td>
<td>Visit</td>
<td>Perched culvert technique was mostly a success, would have done it differently now. Vegetation was unsuccessful due to grazing.</td>
</tr>
<tr>
<td>PROJECT NAME and/or description</td>
<td>CATEGORY</td>
<td>LOCATION</td>
<td>YEAR STARTED</td>
<td>SUCCESSFUL</td>
<td>SITE VISIT OR SUMMARIZE OTHER INFO?</td>
<td>PROS/CONS FOR INCLUDING</td>
</tr>
<tr>
<td>--------------------------------</td>
<td>----------</td>
<td>----------</td>
<td>--------------</td>
<td>------------</td>
<td>-----------------------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td>USFS Cordova brush bundles, stream covers (P77)</td>
<td>COVER</td>
<td>Cordova</td>
<td>1986-92</td>
<td>New</td>
<td>Visit, or they could recount?</td>
<td>Well set up to evaluate, no evaluation as yet</td>
</tr>
<tr>
<td>Hoonah Airport Mitigation (P9); Created a complex of fish habitat (streams and rearing sloughs) as mitigation for intertidal fill</td>
<td>COVER, REARING/OV AREAS, SPAWNING IMPROVEMENT, GRAVEL MINING REHAB, AIRPORT EXPANSION</td>
<td>Hoonah</td>
<td>1992</td>
<td>New</td>
<td>?</td>
<td>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.</td>
</tr>
<tr>
<td>Big Boulder Creek. Fish habitat improvements as highway mitigation (P37)</td>
<td>COVER</td>
<td>Haines</td>
<td>1992</td>
<td>New</td>
<td>?</td>
<td>Cabled logs along 300 m of stream in 1992; Kevin Brownlee will monitor</td>
</tr>
<tr>
<td>Kennel Creek Large Woody Debris (P128)</td>
<td>COVER</td>
<td>Tenakee Springs</td>
<td>1986, eval in 1992</td>
<td>Too soon</td>
<td>Write-up</td>
<td>They have very good data—e.g., snorkeling evaluation of fish use of different areas in Oct. 1992. Will monitor fish habitat preference &amp; fish density, cross sections of channel for scour and deposition around debris structures</td>
</tr>
<tr>
<td>Mud Bay River Lg Woody Debris (P130). Felled trees into creeks w/ explosives in sterile sections. Extensive pre-project monitoring</td>
<td>COVER</td>
<td>Hoonah</td>
<td>1984-85</td>
<td>Unknown</td>
<td>Visit?</td>
<td>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.</td>
</tr>
<tr>
<td>Starrigavin Creek (P170); Primarily stop-log dam structures for pooling; also some large woody debris additions</td>
<td>STREAM STRUCTURES, COVER, OVER-WINTERING HABITAT</td>
<td>Sitka</td>
<td>1986</td>
<td>Yes</td>
<td>Write-Up Only</td>
<td>They have reports &amp; 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</td>
</tr>
<tr>
<td>Chilkat River Rearing Pond Access (P41)</td>
<td>REARING/OV AREAS</td>
<td>Haines</td>
<td>1980</td>
<td>Yes</td>
<td>Write-Up or Visit</td>
<td>Good data—they followed up with a tagging study, and could calculate the economic gain from higher fish returns</td>
</tr>
<tr>
<td>Glacier Highway Reconstruction (P39)</td>
<td>REARING/OV AREAS, RIPARIAN HABITAT</td>
<td>Juneau</td>
<td>1984</td>
<td>Yes</td>
<td>Visit</td>
<td>Monitored by Sport Fish Division for two years</td>
</tr>
<tr>
<td>Chugach National Forest's 25 Mile Spawning Channel (P78)</td>
<td>SPAWNING CHANNEL</td>
<td>Cordova</td>
<td>1984-1987</td>
<td>Partial</td>
<td>Visit? (some info)</td>
<td>Successful at first, then silted in the gravel—they're trying different remedies</td>
</tr>
</tbody>
</table>
Table 2 (continued). Possible Case Study Projects

<table>
<thead>
<tr>
<th>PROJECT NAME and/or description</th>
<th>CATEGORY</th>
<th>LOCATION</th>
<th>YEAR STARTED</th>
<th>SUCCESSFUL?</th>
<th>SITE VISIT OR SUMMARIZE OTHER INFO?</th>
<th>PROS/CONS FOR INCLUDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Box Canyon Creek Spawning channel &amp; rearing ponds (P141)</td>
<td>SPAWNING CHANNEL, REARING/OV AREAS</td>
<td>Seward</td>
<td>1986</td>
<td>Partial</td>
<td>Visit</td>
<td>Still good potential, but needs monitoring provisions—problems with garbage, beavers, &amp; erosion</td>
</tr>
<tr>
<td>4th of July Crk spawning channel as mitigation for habitat loss (Marine Industrial Facility) (P141)</td>
<td>SPAWNING CHANNEL</td>
<td>Seward</td>
<td>1981</td>
<td>Only in short-term</td>
<td>Visit OK</td>
<td>Worked for chum salmon spawning at first, then waves created berm closing off access. Not engineered correctly</td>
</tr>
<tr>
<td>Abbott Loop School Creek realignment (P176)</td>
<td>RIPARIAN HABITAT, REALIGNMENTS</td>
<td>Anchorage</td>
<td>1987-88</td>
<td>Worked well</td>
<td>Visit</td>
<td>A success story, but also better funded than most projects. Good data, not much recently</td>
</tr>
<tr>
<td>Canyon Slough Realignment as part of TAPS route (P108)</td>
<td>RIPARIAN HABITAT, REALIGNMENTS, INCREASED (PINK) SPAWNING &amp; (COHO) REARING AREAS</td>
<td>Valdez</td>
<td>1975</td>
<td>Worked well—has reestablished</td>
<td>Visit?</td>
<td>Ken Roberson has done reports, could always update. A good example of a major stream realignment project after many years</td>
</tr>
<tr>
<td>Haines Airport Mitigation (P18). Created a complex of wetlands &amp; fish habitat using boulders, large organic debris, riparian &amp; wetland vegetation on margins.</td>
<td>RIPARIAN HABITAT, COVER, REARING/OV AREAS, AIRPORT EXPANSION</td>
<td>Haines</td>
<td>1990</td>
<td>Fairly New</td>
<td>Visit</td>
<td>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</td>
</tr>
<tr>
<td>Little Campbell Creek Realignment south of Lake Otis (P195)</td>
<td>REALIGNMENT, RIPARIAN HABITAT, COVER, REARING/OV AREAS</td>
<td>Anchorage</td>
<td>1987</td>
<td>Mostly yes. learned some lessons</td>
<td>Visit</td>
<td>Creek realigned for development, new channel designed as park w/ fish habitat. Problem with gradient</td>
</tr>
<tr>
<td>Weigh Station Removal, Potter Marsh (P166)</td>
<td>RIPARIAN HABITAT</td>
<td>Anchorage</td>
<td>1984</td>
<td>Riparian reveg worked well</td>
<td>Visit</td>
<td>Alders &amp; seeding of new banks looks natural now. Not a big project, but easy access &amp; easy to evaluate</td>
</tr>
<tr>
<td>Independence Creek. (P146) Riparian planting for stabilization following placer mining</td>
<td>RIPARIAN HABITAT, BANK RESTORATION, PLACER MINING</td>
<td>Fairbanks</td>
<td>1989</td>
<td>Worked well</td>
<td>Visit</td>
<td>Not monitored for a few years now, very promising at the start. Thorough previous data exists</td>
</tr>
</tbody>
</table>
Table 2 (continued). Possible Case Study Projects

<table>
<thead>
<tr>
<th>PROJECT NAME and/or description</th>
<th>CATEGORY</th>
<th>LOCATION</th>
<th>YEAR STARTED</th>
<th>SUCCESSFUL?</th>
<th>SITE VISIT OR SUMMARIZE OTHER INFO?</th>
<th>PROS/CONS FOR INCLUDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glenn Highway project. (P177) Highway impounds water for waterfowl as tradeoff for wetland fill</td>
<td>WATERFOWL PONDS/IMPOUNDMENTS</td>
<td>north of Anchorage</td>
<td>1991-present</td>
<td>Still in progress</td>
<td>Write-Up Only</td>
<td>ADF&amp;G already has data from before and after, but not necessarily directly comparable. Can summarize &amp; refer to other reports.</td>
</tr>
<tr>
<td>Bayshore Ponds &amp; Berms (P172). Attempt to create freshwater nesting ponds along the tideflats</td>
<td>WATERFOWL PONDS/IMPOUNDMENTS</td>
<td>Anchorage</td>
<td>1971</td>
<td>Not terribly successful, some bird use</td>
<td>Visit</td>
<td>An experiment to bring up/impound freshwater on tideflats to create nesting habitat. No nesting takes place. Would now be designed differently.</td>
</tr>
<tr>
<td>Nulato Park (P22). Attempt at freshwater impoundment in intertidal area</td>
<td>WATERFOWL PONDS/IMPOUNDMENTS, GENERAL FILL MITIGATION</td>
<td>Anchorage</td>
<td>completed 1991</td>
<td>Only marginally successful</td>
<td>Visit</td>
<td>Not very successful, but unique attempt with lots of potential application</td>
</tr>
<tr>
<td>Bradley Lake Waterfowl Mitigation Area. (P57) (intertidal site)</td>
<td>WATERFOWL PONDS/IMPOUNDMENTS</td>
<td>Homer</td>
<td>1991</td>
<td>New</td>
<td>Write-Up Only</td>
<td>Dan Rosenberg (ADF&amp;G) has been monitoring. Some problems encountered with water levels.</td>
</tr>
<tr>
<td>Creamer's Field Waterfowl Enhancement (P51)</td>
<td>WATERFOWL PONDS/IMPOUNDMENTS</td>
<td>Fairbanks</td>
<td>1987-present</td>
<td>Mostly successful</td>
<td>Write-Up Only</td>
<td>Several ADF&amp;G people have been monitoring. Some problems encountered with water levels &amp; spillways.</td>
</tr>
<tr>
<td>Fish Creek Coastal Wetland Restoration. Intertidal restoration after disturbance. (P179, P35)</td>
<td>INTERTIDAL, RIPARIAN HABITAT, WATERFOWL PONDS/IMPOUNDMENTS</td>
<td>Anchorage</td>
<td>1986, 1990</td>
<td>At first, no. 2nd attempt still new.</td>
<td>Visit</td>
<td>Original duck pond design failed. Later work may be the only carefully designed and monitored coastal marsh restoration in Alaska</td>
</tr>
<tr>
<td>Creamer's Field Crane Project (P53)</td>
<td>AIRPORT EXPANSION (OFFSITE)</td>
<td>Fairbanks</td>
<td>1989</td>
<td>Yes</td>
<td>Either</td>
<td>Many ADF&amp;G people have been monitoring. Easy access.</td>
</tr>
</tbody>
</table>
Table 2 (continued). Possible Case Study Projects

<table>
<thead>
<tr>
<th>PROJECT NAME and/or description</th>
<th>CATEGORY</th>
<th>LOCATION</th>
<th>YEAR STARTED</th>
<th>SUCCESSFUL</th>
<th>SITE VISIT OR SUMMARIZE OTHER INFO?</th>
<th>PROS/CONS FOR INCLUDING</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fish Creek Offsite mitig. at Westchester Lagoon (P180). Small wetland of varied water depths created from upland area adjacent to a larger wetland complex.</td>
<td>GENERAL FILL MITIGATION, WATERFOWL</td>
<td>Anchorage</td>
<td>1985-86</td>
<td>Yes</td>
<td>Visit</td>
<td>First example of offsite mitigation for wetland fills in Anchorage. Nice gradation of wetland habitat types, based on shallow slope gradient &amp; varying water depths.</td>
</tr>
<tr>
<td>Jordan Creek 8 (P49). For illegal fill, had to reconnect side channels for rearing + did more work on tributary to Switzer Crk</td>
<td>GENERAL FILL MITIGATION, REARING/OV AREAS</td>
<td>Juneau</td>
<td>1993</td>
<td>Too soon</td>
<td>Too Soon?</td>
<td>Example of a number of categories from southeastern Alaska</td>
</tr>
<tr>
<td>Restoration of intertidal sedge wetland below outlet of Campbell Lake (P114)</td>
<td>GENERAL FILL MITIGATION, INTERTIDAL</td>
<td>Anchorage</td>
<td>1989-90</td>
<td>Seems to have worked well</td>
<td>Visit</td>
<td>Photos, etc., available. Good one to follow up on now, after a few years to establish.</td>
</tr>
<tr>
<td>Resurrection Creek—many categories, (P33)</td>
<td>COVER, REARING/OV AREAS, MANY STRUCTURES, PLACER MINING</td>
<td>Hope</td>
<td>1992-still implementing</td>
<td>New</td>
<td>Visit</td>
<td>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.</td>
</tr>
</tbody>
</table>
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 upstream 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:

<table>
<thead>
<tr>
<th>Bank Stabilization</th>
<th>Logging Impact Restoration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Classification (Wetlands)</td>
<td>Mining Impact Restoration</td>
</tr>
<tr>
<td>Economic Analysis</td>
<td>Mitigation Banking</td>
</tr>
<tr>
<td>Eelgrass</td>
<td>Mitigation, Compensatory</td>
</tr>
<tr>
<td>Erosion Control</td>
<td>Monitoring Guidelines</td>
</tr>
<tr>
<td>Estuary Restoration and Enhancement</td>
<td>Oilspill Cleanup</td>
</tr>
<tr>
<td>Evaluation Criteria and Techniques</td>
<td>Planning and Policy</td>
</tr>
<tr>
<td>Field Methods</td>
<td>Project Design</td>
</tr>
<tr>
<td>Fish Habitat Improvement</td>
<td>Rearing Ponds</td>
</tr>
<tr>
<td>Fish Passage Structures</td>
<td>Revegetation</td>
</tr>
<tr>
<td>General (Wetlands)</td>
<td>Riparian Habitats</td>
</tr>
<tr>
<td>Gravel Fill Rehabilitation</td>
<td>Spawning Channels</td>
</tr>
<tr>
<td>Gravel Mining Impact Restoration</td>
<td>Stream Restoration and Enhancement</td>
</tr>
<tr>
<td>Hydrologic Functions</td>
<td>Tundra</td>
</tr>
<tr>
<td>Instream Structures for Fish Habitat</td>
<td>Urban Emphasis</td>
</tr>
<tr>
<td>Lake Fertilization</td>
<td>Water Quality</td>
</tr>
<tr>
<td>Lake Restoration and Enhancement</td>
<td>Waterfowl Habitat Improvement</td>
</tr>
<tr>
<td>Legal Analysis</td>
<td>Wildlife Habitat Improvement</td>
</tr>
</tbody>
</table>
NOTE: Publications that document work within Alaska are indicated by bold type.

Alaska Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement. Annual. *FRED...annual report to the Alaska State Legislature. "Fish habitat restoration and improvement" section*. Juneau, Alaska: Alaska Department of Fish and Game, Division of Fisheries Rehabilitation, Enhancement.


Hardy BBT, Ltd. 1987. Reclamation guidelines for northern Canada. Northern Affairs Program for Land Resources (Canada).


PROJECT BIBLIOGRAPHY


---


---


---


---


---


---


---


---


---


C. INDEX TO BIBLIOGRAPHY

BANK STABILIZATION
Barrick, 1984
Ferrin & Staats, 1989
Moore, 1986
Seward Ranger District, 1990
Smyth & Barnes, 1979
Witte, 1991

CLASSIFICATION (WETLANDS)
Bailey, 1976
Cowardin et al., 1979
Van Hees, 1990

ECONOMIC ANALYSIS
Sheridan, 1969

EELGRASS
Harrison, 1990
Hoffman, 1990(a)
Hoffman, 1990(b)
Hoffman, 1991(a)
Hoffman, 1991(b)
Merkel, 1990
Merkel, 1991(a)
Merkel, 1991(b)
Merkel, 1992
Merkel, in press
Merkel & Hoffman, 1990
Nitsos, 1990
Phillips, 1990
Thom, 1990
U.S. Army Corps of Engineers, 1990
Wyllie-Echeverria & Ruckelshaus, 1992
Wyllie-Echeverria & Thom, in press
Zimmerman et al., 1991

EROSION CONTROL
Bucaria, 1984
Lindquist & Filmer, 1988
Marcus, 1988
Masinton, 1991
Smyth & Barnes, 1979

ESTUARY RESTORATION AND ENHANCEMENT (continued)
Maddux, 1986
Shreffler et al., 1992
Simenstad et al., 1991
Tanner, 1990
Zedler, 1988

EVALUATION CRITERIA AND TECHNIQUES
American Fisheries Society, Oregon Chapter, 1989
Birkill & Gray, 1989
Bisson, 1990
Brinson & Lee, 1989
Brown, 1989
Canter et al., 1991
Connin, 1991
D'Avanzo, 1989
Erwin, 1989
Everest & Sedell, 1984
Everest et al., 1990
Hall, 1984
Hall & Baker, 1982
House et al., 1989
Jackson, 1990
Kentula et al., 1993
Koski et al., 1984
Kunz et al., 1988
Pacific Estuarine Research Laboratory, 1990
Petrosky & Holubetz, 1987
Platts et al., 1985
Race, 1985
Race, 1988
Reeves et al., 1991
Rhoads & Miller, 1990
Robison, 1990
Stackhouse, 1991
Zedler, 1988
Zentner, 1988

FIELD METHODS
Anderson, 1990
Bishop et al., 1989
Bishop et al., 1990
Buckley, 1989
Burton et al., 1989
Cowan, 1990
Crispin, 1990
Eggers, 1992
Faber et al., 1988

INDEX TO BIBLIOGRAPHY
FIELD METHODS (continued)
House et al., 1990
Lambert & Darris, 1989
Lisle & Overton, 1990
Martin, 1986-
Pacific Estuarine Research Lab., 1990
Reeves & Roelofs, 1982
Robison, 1990
U.S. Army Corps of Eng, 1990
Zedler et al., 1982

FISH HABITAT IMPROVEMENT

AK Dept. Fish Game, FRED, annual
Amer. Fish. Soc., Alaska Chap., 1990
Amer. Fish. Soc., Alaska Chap., 1992
Amer. Fish. Soc., Oregon Chap, 1989
Anderson, 1990
Bishop & Pollard, 1991
Bryant, 1988
Buell, 1986
Burgess, 1985
Cederholm et al., 1988
Chilibeck et al., 1992
Cowan, 1990
Crispin, 1990
Duff et al., 1988
Everest et al., 1990
Fisher, 1985
Haddix, 1993
Hall & Baker, 1982
Hemming, 1988
Hemming, 1990
Hemming, 1992
Hemming, in press
Holler, 1990
House & Crispin, 1990
Hunt, 1989
Hunter, 1991
Jackson, 1986
Kerr Wood Leidal Assoc. & Lister Assoc., 1980
Hunter, 1991
Kessler, 1989
Klingemn, 1984
Koski, 1992
Koski et al., 1984
Lisle & Overton 1990
Martin, 1986-
Mih, 1978
Moberly, 1983
Nassichuk, 1986
Novak, 1983

FISH HABITAT IMPROVEMENT (continued)
Olson & West, 1990
Reeves et al., 1991(a)
Reeves et al., 1991(b)
Reeves & Roelofs, 1982
Rickel, 1984
Rodgers, 1986
Rowse & Kaill, 1983
Russell & Schramek, 1981
Sedell & Luchessa, 1982
Sedell et al., 1984
Schoen, 1992
Shapiro & Wright, 1984
Stein, 1985
Swanson, 1979
Sweet, 1975
U.S. Army Corps of Engineers, 1990
U. S. Bureau of Land Mgt., 1985
U.S. For. Serv., Alaska Region, 1980
V.A. Poulin & Assoc., 1991
Wesche, 1985
Will, 1991
Winters, 1990
Winters, 1992

FISH PASSAGE STRUCTURES
Baker & Votapka, 1990
Behlke et al., 1991
Bibb, 1987
Blackett, 1987
Buck et al., 1978
Burger et al., 1985
Denton, 1993
Eicher, 1971
Gish, in press
Hall, 1984

GENERAL (WETLANDS)
Boule, 1988
Brocksen & Wisniewski, 1989
Erwin, 1991
Hall, 1989
Josselyn, 1982
Kusler & Kentula, 1989
Kusler, 1990
Madson, 1986
Madson, 1988
Meda, 1990
Moss, 1983
Odum, 1988
Schneller-McDonald et al., 1990

INDEX TO BIBLIOGRAPHY

4-38
GENERAL (WETLANDS) (continued)
van der Valk & Hall, 1990
Van Hees, 1990

GRAVEL FILL REHABILITATION
BP Exploration, 1993
Brown & Miller, 1988
McKendrick, 1991
McKendrick et al., 1992(a)
McKendrick et al., 1992(b)
Muretta & Price, 1982
Ott, 1993
Post, 1991
Walker et al., 1987

GRAVEL MINING IMPACT RESTORATION
Branch, 1988
Bryant, 1988
Eagles, 1982
Hemming, 1988
Hemming, 1990
Hemming, 1992
Hemming, in press
Hemming et al., 1989
Roach, 1993
Winters, 1990

HYDROLOGIC FUNCTIONS
Costs & Williams, 1990
Costs et al., 1989
Ford & Bedford, 1987
Klingeman, 1984
Pacific Estuarine Research Laboratory, 1990
Rosgen, 1992
van der Valk & Hall, 1990

INSTREAM STRUCTURES FOR FISH HABITAT
DeBano & Hanson, 1987
DeBano & Heede, 1987
Hall, 1984
Hunt, 1989
Killinger, 1992
Olson & West, 1990
Robison, 1990

LAKE FERTILIZATION
Burkett et al., 1989
Cook Inlet Aquaculture Assn., 1983-93
Cook Inlet Aquaculture Assn., 1984-87
Cook Inlet Aquaculture Assn., 1993
Koenigs, 1983

LAKE FERTILIZATION (continued)
Koenigs et al., 1989
Moberly, 1983
Rowse & Kail, 1983
Vincent-Lang et al., 1988

LAKE RESTORATION AND ENHANCEMENT
Bjork, 1980
Cook Inlet Aquaculture Assn., 1981-83
Cook Inlet Aquaculture Assn., 1984
Doxey, 1991
Johnson et al., 1981(b)
Lowe et al., 1992
Perkinson, 1983
Shapiro & Wright, 1984
Vincent-Lang et al., 1988

LEGAL ANALYSIS
Kruczynski, 1990(a)
Kusler, 1988
Petrillo, 1988
Rouvalis, 1988
Salvesen, 1990
Whitaker & Terrell, 1992

LOGGING IMPACT RESTORATION
Bryant et al., 1992
Cole, 1982
Koski, 1984
Koski, 1992
MacDonald et al., 1991
Sedell et al., 1984
V.A. Poulin & Assoc., 1991

MINING IMPACT RESTORATION
Branch, 1988
Brooks, 1990
Brooks et al., 1988
Elliott & McKendrick, 1984
Karle & Densmore, 1992
Masinton, 1991
Robb & Ohlsson, 1982

MITIGATION BANKING
Castelle et al., 1992(a)
Castelle et al., 1992(b)
Castelle et al., 1992(c)
Ford, 1991
IEP & Coastal and Estuarine Research, 1988
Jatnieks-Straumanis & Foote, 1988
Kussler, 1992

INDEX TO BIBLIOGRAPHY
MITIGATION BANKING (continued)
Maddux, 1986
Marsh & Acker, 1992
Niedzalkowski & Jaksch, 1989
Short, 1988

MITIGATION, COMPENSATORY
Alaska Dept. of Fish & Game, 1984
Birkit & Gray, 1989
Brinson & Lee, 1989
Brown & Miller, 1988
Brown, 1989
Canter et al., 1991
Cutler, 1979
Demgen, 1988
Holland & Kentula, 1992
Horner & Raedeke, 1989
Jensen, 1988
Jorgenson, 1988
Jorgenson et al., 1992
Josselyn et al., 1989
Kruczynski, 1990(a)
Kruczynski, 1990(b)
Kusler et al., 1988
Leslie, 1990
Martin et al., 1988
Merkel, 1991(a)
Mureta & Price, 1982
Murphy & Phillips, 1989
Race, 1985
Race, 1986
Redmond, 1992
Reimold, 1989
Resource Analysts et al., 1988
Resource Analysts et al., 1989
Sale & Railsback, 1991
Salvesen, 1990
Schonholtz, 1988
Seuner, 1987
Swanson, 1979
Tanner, 1990
Weiss & McCort, 1988
Weiss, 1993
Weller et al., 1988

MONITORING GUIDELINES (continued)
Bishop et al., 1989
Bishop et al., 1990
Faber et al., 1988
Horner & Raedeke, 1989
Kruczynski, 1990(b)
MacDonald et al., 1991

MONITORING GUIDELINES (continued)
Petrosky & Holubetz, 1987
Plakfkin et al., 1989
Rigney et al., in press
Simenstad et al., 1991
Tetreault et al., 1988
Zedler et al., 1982

OILSPILL CLEANUP
Bauer et al., 1992
Cairns et al., 1977
Cairns & Dickson, 1977
De Vogelaere & Foster, 1993
Jorgenson, 1988
Jorgenson & Cater, 1992
McKendrick & Mitchell, 1978
Univ. of AK Fish, School of Fisheries & Ocean Studies, 1992

PLANNING AND POLICY
Bowles, 1991
Chilibeck et al., 1992
Cowell & Bottomley, 1987
Cutler, 1979
Ford, 1991
Garbiach, 1989
Hoffman, 1991(b)
Kentula et al., 1993
Kunz et al., 1988
Kusler, 1988
Leslie, 1990
Lewis, 1988
Marsh & Acker, 1992
Martin et al., 1988
Metz, 1988
National Research Council, 1991
Powers & Spense, 1989
Race, 1985
Race, 1986
Reimold, 1989
Rouvalis, 1988
Senner, 1987
Tanner, 1990
Whitaker & Terrell, 1992
Wilkinson, 1988

PROJECT DESIGN
Buckley, 1989
Connin, 1991
Kentula et al., 1993
Metz, 1988
Stanley, in press

INDEX TO BIBLIOGRAPHY
PROJECT DESIGN (continued)
Tetreault et al., 1988
Wein & McCort, 1988

REARING PONDS
Bachen, 1984
Bishop et al., 1989
Bishop et al., 1990
Josephson, 1986
Russell & Schramek, 1981
U.S. Forest Serv., Tongass Natl. For., n.d.

REVEGETATION
AK Dept. Fish Game, Habitat, 1986
AK Div. of Ag., Plant Mat. Cntr., 1987
AK Rural Development Council, 1977
Allen et al., 1988
Amundsen & McCort, 1982
Anderson & Ohmart, 1985
Bliss, 1979
Bliss, 1988
BP Exploration (Alaska), 1991
Brown et al., 1978
Brown & Johnston, 1981
Burton et al., 1989
Cargill & Chapin, 1987
Chan & Wong, in press
Chapin et al., 1982
Cole, 1982
Cooperative Extension Service, 1973
Densmore & Zasada, 1978
Ebersole, 1989
Fridriksson & Webber, 1987
Hardy BBT Ltd., 1987
Johnson, 1981
Johnson & Specht, 1975
Johnson & Van Cleve, 1976
Johnson et al., 1981
Lambert & Darris, 1989
Lindquist & Filmer, 1988
McKendrick, 1991
McKendrick et al., 1992(a)
McKendrick et al., 1992(b)
McKendrick & Mitchell, 1978
Mitchell, 1978

REVEGETATION (continued)
Oakley, 1984(b)
Plumb-Mentjes, 1990
Salzberg et al., 1987
Stanley, in press
Stevens, 1979
U.S. Army Corps of Engineers, 1990
Univ. of AK Fbks., Sch. Fish. &
Ocean Studies, 1992
Van Cleve, 1973
Van Cleve, 1977
Walker et al., 1987
Webber & Ives, 1978
Wright, 1989(a)
Wright, 1989(b)
Wright, 1990
Wright, 1992(a)
Wright, 1992(b)
Wright, 1992(c)
Wright et al., 1993(a)
Wright et al., 1993(b)
Wright et al., 1993(c)

RIPARIAN HABITATS
Anderson et al., 1978
Anderson & Ohmart, 1985
Baird, 1989
Burgess, 1985
Chan & Wong, in press
Connin, 1991
DeBano & Hansen, 1989
DeBano & Heede, 1987
Manci, 1989
Monsen, 1983
Platts & Rinne, 1985
Van Deventer, 1992
Van Haveren & Jackson, 1986
Wilkinson, 1988

SPAWNING CHANNELS
Bachen, 1984
Bevan, 1964
Bevan et al., 1961
Kelly, 1987
Lister et al., 1980
Nece, 1961
Novak & Denton, 1989
Roberson, 1978

STREAM RESTORATION AND ENHANCEMENT
AK Dept. Fish Game, FRED, annual
AK Dept. Fish Game, Habitat, 1986
TUNDRA (continued)
Cargill & Chapin, 1987
Chapin et al., 1982
Ebersole, 1989
McKendrick, 1991
Mitchell, 1977
Ott, 1993
Plumb-Mentjes, 1990
Post, 1991
Stevens, 1979
Van Cleve, 1973
Van Cleve, 1977
Walker et al., 1987
Webber & Ives, 1978

URBAN EMPHASIS
Clark, 1989
Esry & Cairns, 1989
Gilderdale et al., 1989
Lewis, 1988
Petriillo, 1988
Resource Analysts et al., 1988
Resource Analysts et al., 1989
Schonholz, 1988
Sedell et al., 1991
Wilkinson, 1988

WATER QUALITY
Brinson, 1988
Glazacheva, 1975
Hemming, 1988
Hemming, 1990
Hemming, 1992
Herricks & Osborne, 1985
Nassichuk, 1986

WATERFOWL HABITAT IMPROVEMENT
Babler, 1992
Babler et al., 1992
Bucaria, 1984
Campbell et al., 1987
Campbell et al., 1987
Jones, 1982
Martin, 1986-
Mickelson, 1974
U.S. Army Corps of Engineers, 1990
Weiss, 1993

WILDLIFE HABITAT IMPROVEMENT
Anderson et al., 1978
Elliot & McKenrick, 1984
Martin, 1986-
WILDLIFE HABITAT IMPROVEMENT
(continued)
Martin et al., 1988
McCluskey et al., 1983
Rigney et al., in press
Swanson, 1979
Winters, 1990
Appendices
## APPENDIX A: Data Field Descriptions for Aquatic Habitat Database

<table>
<thead>
<tr>
<th>FIELD NAME (with abbreviation)</th>
<th>FIELD MEANING</th>
<th>POSSIBLE RESPONSES (if standardized)</th>
<th>RESPONSE CODE MEANINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Project Name (ProjName)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Project ID Code (Proj#)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Short Description (AKA)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Lead Organization (LeadOrg)</strong></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Company Name (CompName)</td>
<td>Name of lead organization if a private company</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organization Town (OrgTown)</td>
<td>Office/town of lead organization</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Agency Project/Permit# (AgPermit#)</td>
<td>File or reference number for project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Beginning Year (BegYear)</td>
<td>Year restoration/enhancement work began at project site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ending Year (EndYear)</td>
<td>Year work was completed at site, if applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Duration (Duration)</td>
<td>Automatically calculated from the start/end years above. All periods less than 1 year recorded as &quot;1&quot;</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIELD NAME (&amp; abbreviation)</td>
<td>FIELD MEANING</td>
<td>POSSIBLE RESPONSES (if standardized)</td>
<td>RESPONSE CODE MEANINGS</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>---------------</td>
<td>--------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Status (Status)</td>
<td>Current Status of Project</td>
<td>P, I, M, C, N</td>
<td>Preliminary Stage, Implementation Stage, Monitoring Stage, Completed, with some monitoring, Completed, no monitoring done</td>
</tr>
<tr>
<td>EcoRegion (ERCode)</td>
<td>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.</td>
<td>1210, 1220, M1210, 1310, 1320, M1310, M1330, M2410, M2420</td>
<td>Arctic Tundra, Bering Tundra, Brooks Range, Yukon Parkland, Yukon Forest, Alaska Range, Aleutians, Southeast Alaska Forest, Southcentral Alaska Forest</td>
</tr>
<tr>
<td>Waterbody Name (Waterbody)</td>
<td>River, lake, or stream</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nearest Town (NearTown)</td>
<td>Nearest town to project site</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AK Geographic Region (Region)</td>
<td>Used for sorting data into three state regions</td>
<td>SoEast, SCenSW, NorInt</td>
<td>Southeast Alaska, Southcentral/Southwest, Northern/Interior</td>
</tr>
<tr>
<td>Project Size (Size)</td>
<td>Area in acres, length of stream in miles, whatever measure provided</td>
<td>e.g., &quot;15N&quot;</td>
<td></td>
</tr>
<tr>
<td>Township (Tship)</td>
<td>Township in township/range system</td>
<td>e.g., &quot;03E&quot;</td>
<td></td>
</tr>
<tr>
<td>Range (Range)</td>
<td>Range in township/range system</td>
<td>e.g., &quot;13&quot;</td>
<td></td>
</tr>
<tr>
<td>Section (Sctn)</td>
<td>Section in township/range system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Meridian (Meridian)</td>
<td>Base meridian for township/range system in that area</td>
<td>Alaska meridians: Seward, Copper River, Kateel River, Fairbanks, Umiat</td>
<td></td>
</tr>
<tr>
<td>Topo Map Quad Name (TopoMap)</td>
<td>Name of U.S.G.S quad map on which site occurs</td>
<td>e.g., &quot;Seward B-4&quot;</td>
<td></td>
</tr>
</tbody>
</table>
### APPENDIX A (Continued): Data Field Descriptions for Aquatic Habitat Database

<table>
<thead>
<tr>
<th>FIELD NAME (&amp; abbreviation)</th>
<th>FIELD MEANING</th>
<th>POSSIBLE RESPONSES (if standardized)</th>
<th>RESPONSE CODE MEANINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anadromous Waterbody Catalog Number (Stream#)</td>
<td>Number for that waterbody in ADF&amp;G's anadromous catalog, if applicable</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Location Description (LocDescr)</td>
<td>Location of site in relation to landmarks, highways, etc.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Contacts (Contacts)</td>
<td>Name, affiliation, office/town &amp; phone number for contact people, and other relevant information</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Primary Habitat Type (HabCode1)</td>
<td>Describes type of habitat being restored or enhanced using National Wetland Inventory Codes (Cowardin et al. 1979) in a system - subsystem - class format</td>
<td>A 4 character code sequence. Coded information is detailed. See explanations in Cowardin et al. (1979).</td>
<td>The major divisions (systems) of the habitat codes are: Riverine, Estuarine, Palustrine, Lacustrine, Marine</td>
</tr>
<tr>
<td>Secondary Habitat Type (HabCode2)</td>
<td>If more than one habitat type is being restored/enhanced</td>
<td>Same as above</td>
<td>Same as above</td>
</tr>
<tr>
<td>Stream Channel Type (ChType)</td>
<td>A 3 digit USFS Channel Type Designation, if given</td>
<td>These codes were only recorded on database if provided by USFS personnel.</td>
<td>See USFS reference to interpret.</td>
</tr>
<tr>
<td>Objectives (Objective) Continued on next page.</td>
<td>Category of project objectives. (List up to 4)</td>
<td>HABITAT EROSION 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</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>HYDROLOGY</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water Quality (WATERQUAL)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>EXPERIMENT INCIDENTAL</td>
<td></td>
</tr>
<tr>
<td>FIELD NAME (&amp; abbreviation)</td>
<td>FIELD MEANING</td>
<td>POSSIBLE RESPONSES (if standardized)</td>
<td>RESPONSE CODE MEANINGS</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>--------------</td>
<td>-------------------------------------</td>
<td>-----------------------</td>
</tr>
<tr>
<td>Objectives, Continued.</td>
<td>Category of project objectives. (List up to 4)</td>
<td>Recreation/Herit. (RECR/HERIT) HARVEST GENERAL</td>
<td>For aesthetics, recreation, education, etc. Of commercial fish, shellfish, etc. When specific objectives not clearly identified</td>
</tr>
<tr>
<td>Target Group (TGroup)</td>
<td>If project's objective is to create animal habitat, choose from:</td>
<td>Birds Fish Mammals Inverts General Other</td>
<td>Invertebrates</td>
</tr>
<tr>
<td>Target Habitat Use (THabUse)</td>
<td>If applicable. List up to two.</td>
<td>Spawning Rearing Overwintering Migrating Nesting Staging General</td>
<td></td>
</tr>
<tr>
<td>Primary Target Species (TSpecies)</td>
<td>If applicable</td>
<td>Standardized common names used for data entry</td>
<td></td>
</tr>
<tr>
<td>Mitigation (Mitg)</td>
<td>Was this project undertaken in conjunction with other development involving habitat alteration or loss?</td>
<td>Yes (Y) or No (N)</td>
<td></td>
</tr>
<tr>
<td>Development Activity (DevAct)</td>
<td>If yes above, name type of development activity being mitigated (list up to 3 items)</td>
<td>Abbreviations were established for many activities, not presented here due to space.</td>
<td>e.g., highways, airports, boatdocks, placer mining, utility lines, oil and gas drilling, gravel mining, misc. wetland fill, urbanization, logging, etc.</td>
</tr>
<tr>
<td>Restoration of Past Damage (PreDam)</td>
<td>Was project undertaken to restore habitat previously damaged by development activities or a natural disaster?</td>
<td>Yes (Y) or No (N)</td>
<td></td>
</tr>
<tr>
<td>Past Activity (PastAct)</td>
<td>If yes above, name type of past activity resulting in damage (list up to 3 items)</td>
<td>Same abbreviations as for &quot;Development Activity&quot; above.</td>
<td>All the development categories listed above, plus earthquake, oil spill, bad culvert, etc.</td>
</tr>
</tbody>
</table>
### APPENDIX A (Continued): Data Field Descriptions for Aquatic Habitat Database

<table>
<thead>
<tr>
<th>FIELD NAME (&amp; abbreviation)</th>
<th>FIELD MEANING</th>
<th>POSSIBLE RESPONSES (if standardized)</th>
<th>RESPONSE CODE MEANINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Enhancement (Enhc)</td>
<td>Was project undertaken to enhance the habitat potential of a relatively undisturbed area?</td>
<td>Yes (Y) or No (N)</td>
<td></td>
</tr>
<tr>
<td>Implementation Action (Action)</td>
<td>Type of actions performed at site (list up to 5)</td>
<td>Landform (LFORM)</td>
<td>Modifying topography by earth-moving, e.g., dike construction or breaching, grading, channel construction or blockage, constructing ponds or nesting sites, etc.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SPOIL</td>
<td>Special case wherein restoration is attempted using dredged material (diking or filling)</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SEED</td>
<td>Using and disseminating seed sources</td>
</tr>
<tr>
<td></td>
<td></td>
<td>PLANT</td>
<td>Introducing planted seedlings, transplants, or cuttings</td>
</tr>
<tr>
<td></td>
<td></td>
<td>SOIL</td>
<td>Adding soil or peat to site, including surface preparation such as diskig</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stocking (STOCK)</td>
<td>Introducing animals to the site</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Hydrology (HYDRO)</td>
<td>Actively manipulating water levels, such as draining, pumping, stop-log spillways</td>
</tr>
<tr>
<td></td>
<td></td>
<td>CUT</td>
<td>Cutting, thinning, or mowing vegetation to encourage desired species</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Plant fertilization (PFERT)</td>
<td>For establishment of plants</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stabilization (STABL)</td>
<td>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</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Contaminants (CONTM)</td>
<td>Removing contaminants as part of restoration, such as following an oil spill</td>
</tr>
<tr>
<td></td>
<td></td>
<td>MODEL</td>
<td>Using explicit spatial or temporal models for planning, designing, or evaluating projects</td>
</tr>
<tr>
<td>Fish Habitat Action Subcategory (FishActn)</td>
<td>Action subcategory if a fish habitat improvement project (list up to 3)</td>
<td>Abbreviations were established for several standard habitat improvement methods.</td>
<td>e.g., boulders, large organic debris, artificial structures, fishpasses, spawning channels, etc. (see Data Entry Form, Appendix C)</td>
</tr>
</tbody>
</table>

DATA FIELD DESCRIPTIONS
APPENDIX A (Continued): Data Field Descriptions for Aquatic Habitat Database

<table>
<thead>
<tr>
<th>FIELD NAME (&amp; abbreviation)</th>
<th>FIELD MEANING</th>
<th>POSSIBLE RESPONSES (if standardized)</th>
<th>RESPONSE CODE MEANINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plant Materials Used (Genera)</td>
<td>Plant materials used in revegetation.</td>
<td>Entered by Latin or common names.</td>
<td></td>
</tr>
<tr>
<td>Quantified Results (Quant)</td>
<td>Were quantitative results reported for one or more response variables?</td>
<td>Yes (Y) or No (N)</td>
<td></td>
</tr>
<tr>
<td>Response (Response)</td>
<td>Indicates what was measured, monitored, or evaluated in the aftermath of the project. May include non-quantitative monitoring. (List up to 5)</td>
<td>WFOWL SHBIRDS OTHBIRDS SHELL INVERTS SALMOND OTHFISH VEGET HUSE HYDROL SOIL PHLFORM WQUAL SUCCESS</td>
<td>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</td>
</tr>
<tr>
<td>Response Species (RSpecies)</td>
<td>Primary species or group monitored in aftermath, if applicable</td>
<td>Entered using common names</td>
<td></td>
</tr>
<tr>
<td>Response Parameter (RParam)</td>
<td>Parameters measured in aftermath, if applicable</td>
<td>Information was entered however indicated on data, no codes established</td>
<td>e.g., presence/absence, smolt yield, density, percent vegetation cover, water flow rate, etc.</td>
</tr>
<tr>
<td>Evaluation of Habitat Quality (EvHab)</td>
<td>Was project evaluated on the basis of improved habitat features?</td>
<td>Yes (Y) or No (N)</td>
<td></td>
</tr>
<tr>
<td>Evaluation of Animal Use (EvUse)</td>
<td>Was project evaluated on the basis of subsequent inhabitation/animal use?</td>
<td>Yes (Y) or No (N)</td>
<td></td>
</tr>
<tr>
<td>Evaluation of Economics (EvEcon)</td>
<td>Was project evaluated on an economic basis? (i.e., costs vs. benefits, etc.)</td>
<td>Yes (Y) or No (N)</td>
<td></td>
</tr>
</tbody>
</table>
APPENDIX A (Continued): Data Field Descriptions for Aquatic Habitat Database

<table>
<thead>
<tr>
<th>FIELD NAME (&amp; abbreviation)</th>
<th>FIELD MEANING</th>
<th>POSSIBLE RESPONSES (if standardized)</th>
<th>RESPONSE CODE MEANINGS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated Cost (EstCost)</td>
<td>Estimated cost of restoration/enhancement measures, if given</td>
<td></td>
<td></td>
</tr>
<tr>
<td>References (Refs)</td>
<td>Were follow-up results written in published or unpublished reports or grey literature?</td>
<td>Yes (Y), No (N), or Expected (E)</td>
<td>&quot;Expected&quot; means project will be reported on at a known point in the future, which was then listed in the &quot;Other Sources&quot; field, below.</td>
</tr>
<tr>
<td>Authors (Authors)</td>
<td>Entered last-name-first for the first author, if there is a report.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Publication Date (PubDate)</td>
<td>Entered by year, or month and year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Title (Title)</td>
<td>Title of reference/report (abbreviated to best fit space allowed)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Other Sources (OthSource)</td>
<td>If information was obtained from files, interviews, etc. Also lists other known sources.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Assessment of Success (Assess)</td>
<td>Do biologists involved feel that this project was successful at improving aquatic habitat to meet the objectives?</td>
<td>Y, N, P, T, I, U</td>
<td>Yes, for the most part, No, largely a failure, Partial Success (&lt;50% effective), Too soon to tell, Inconclusive Results, Unknown—no follow up</td>
</tr>
<tr>
<td>Additional Information/Project Description (ProjDesc)</td>
<td>Narrative section containing additional project-specific information, such as elaborating the objectives and approaches used, and any lessons learned from the project</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FIELD NAME (&amp; abbreviation)</td>
<td>FIELD MEANING</td>
<td>POSSIBLE RESPONSES (if standardized)</td>
<td>RESPONSE CODE MEANINGS</td>
</tr>
<tr>
<td>-----------------------------</td>
<td>-----------------------------------</td>
<td>---------------------------------------</td>
<td>------------------------</td>
</tr>
<tr>
<td>Date Entered/Last Edited (Datein)</td>
<td>Date project added to database or last edited</td>
<td></td>
<td></td>
</tr>
<tr>
<td>By: (Who)</td>
<td>Initials of entry person</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
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 spelt out for easier readability.

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—
Project Size: 9 ponds along 1.3 mile stretch

OBJECTIVE INFORMATION
Objectives: HABITAT
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
Plant Species Used: Carex, Triglocum, marestail, many

Fish Habitat Acts:

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:
Title:

Publication Date:
Reference Type:

FULL DATA RECORD
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 900' 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.)

DATA ENTRY FORM
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).
- Spill (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 diskimg or removing debris)
- Stocking (introducing animals to the aquatic site)
- Hydrology (actively manipulating water levels, such as draining, pumping, stop-log 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 O₂ 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, Incubation Boxes,
- Fish Passes, Gravel Work (addition or cleaning),
- Culverts, Refuse Removal, or
- Spawning Channels, 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]
________________________________________
________________________________________
________________________________________
________________________________________

DATA ENTRY FORM
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

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>YEAR</th>
<th>CONTACTS</th>
<th>OTHER SOURCE/COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other FRED Lake Fertilization projects in Southeast, including McDonald &amp; Hugh Smith lakes</td>
<td>ongoing</td>
<td>Dave Barto, ADF&amp;G FRED Limnology, Juneau, 465-4268. Also Mike Haddix, ADF&amp;G FRED, Ketchikan, 225-5095</td>
<td>FRED Annual reports</td>
</tr>
<tr>
<td>Chum salmon habitat improvement using dikeing, etc. Portland Canal (Ketchikan)</td>
<td>late 1970's</td>
<td>Dr. Jack Helle, NMFS, Auke Bay Lab, 789-6038</td>
<td></td>
</tr>
<tr>
<td>Improving fish habitat affected by logging: Indian Creek spawning channel by NMFS &amp; University of Washington</td>
<td>1960's</td>
<td>Dr. K Koski, NMFS, Auke Bay Lab, 789-6024</td>
<td>Small patches transplanted. Observed that initially, transplanted appeared to take as well in Southeast AK as in Puget Sound, Washington. No monitoring.</td>
</tr>
<tr>
<td>Experimental eelgrass (Zostera) transplants—Admiralty Island</td>
<td>?</td>
<td>Keith Markel, Pacific Southwest Biological Services, Inc., National City, CA. (619) 477-5333.</td>
<td></td>
</tr>
<tr>
<td>Seal Cove eelgrass transplants as mitigation for illegal fill in intertidal area of Tongass Narrows. Did not work well.</td>
<td>1985-86</td>
<td>Many contacts consulted—NMFS, ADF&amp;G, USFWS, ACOE—no one can recall much info</td>
<td></td>
</tr>
<tr>
<td>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.</td>
<td>ongoing</td>
<td>Mike Haddix &amp; Tim Zadina, ADF&amp;G, FRED Limnology, Ketchikan, 225-5095.</td>
<td>Should be info in FRED Division annual reports—statewide and southeast reports.</td>
</tr>
<tr>
<td>Several projects conducted jointly by ADF&amp;G and US Forest Service, e.g.: Irish Creek Fishpass, Harding River, St. John's Crk Fishway, Portage Crk, Anan Crk (Wrangell).</td>
<td>1980's to present</td>
<td>Joe Teter/Dick Aho (both USFS, Petersburg, 772-3841). Bob Zorich, ADF&amp;G, FRED, Petersburg, 772-3801. Dennis Reed, USFS, Wrangell, 874-2323.</td>
<td>Info in FRED Division annual reports, as well as mention in US Forest Service annual reports. Irish Creek had good data sets available.</td>
</tr>
<tr>
<td>Tropicadero Crk, USFS, Prince of Wales Island. Rick Harris of Sealaska Corp. said results were disappointing.</td>
<td>?</td>
<td>Dave Johnson, USFS, Craig, 826-3271.</td>
<td></td>
</tr>
<tr>
<td>USFS Waterfowl habitat projects in SB: loon platforms &amp; blasting (Thorne Bay); nesting platforms (Craig); floating nest islands for swans (Yakutat, USFS). The Pavlov Marsh nesting enhancement (Hoohnah) is already on database.</td>
<td>1991-</td>
<td>For Thorne Bay—Erik Johnston, USFS, 828-3301. For Craig—Dave Johnson, USFS, 826-3271. For Yakutat—Dorin Walter, USFS, 784-3359.</td>
<td></td>
</tr>
<tr>
<td>USFS Margaret Lake Study—effects of fish ladder on entire watershed and trophic levels</td>
<td>current</td>
<td>Mason (Buck) Bryant, USFS Research, Juneau, 586-7818.</td>
<td>Some info in annual progress reports.</td>
</tr>
<tr>
<td>NW Baranof Island, watershed restoration study from effects of logging. No restoration activities as yet— not within project scope.</td>
<td>1991?</td>
<td>Mason (Buck) Bryant, USFS Research, Juneau, 586-7818.</td>
<td>New progress report available.</td>
</tr>
</tbody>
</table>

ADDITIONAL PROJECTS
### B. SOUTHCENTRAL/SOUTHWEST ALASKA

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>YEAR</th>
<th>CONTACTS</th>
<th>OTHER SOURCE/COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>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.</td>
<td>discussion phase only</td>
<td>Phil Brna, ADF&amp;G, Joint Pipeline Office, Anchorage, 278-8594. Mary Lee Plumb-Menjes, ACOE, Anchorage, 753-2712.</td>
<td>Discussion with FERC includes both freshwater and saltwater, on-site &amp; offsite compensatory mitigation options, proposed by a TAGS consultant.</td>
</tr>
<tr>
<td>Chevak Bay Airport; construction of tributary channel to O'Brien Creek; salmon spawning area</td>
<td>1993</td>
<td>Carol Santer, ADOT/PF, Anchorage, 266-1509</td>
<td>Environmental assessments; ADOT/PF, ADF&amp;G and other regulatory agencies have files</td>
</tr>
<tr>
<td>Ketchikan Bay 150—mitigation for small boat harbor expansion was to expand the existing fish &quot;lagoon&quot; along the spit</td>
<td>1990?</td>
<td>Larry Degan, USFWS, Anchorage, 271-2797.</td>
<td>Created additional recreational fishing opportunity in a 'terminal' (stocked) fishery</td>
</tr>
<tr>
<td>Seward Hwy realignment (due to rock hazards) along Snow River Tributary north of Seward; channel construction, Dolly Varden habitat</td>
<td>begin 1993</td>
<td>Carol Santer, ADOT/PF, Anchorage, 266-1509</td>
<td>Environmental assessments; ADOT/PF, ADF&amp;G and other regulatory agencies have files</td>
</tr>
<tr>
<td>Other FRED lake fertilization projects in Southcentral Alaska, including Leisure Lake &amp; several lakes on Kodiak Island</td>
<td>ongoing, beginning 1984</td>
<td>Gary Kyle, Limnologist, FRED Division, ADF&amp;G, Soldotna, 262-9360.</td>
<td>Several of their lake fertilization projects are described on the database from information obtained from the Cook Inlet Aquaculture Association; a few remain undocumented.</td>
</tr>
<tr>
<td>Several Kenai River bank restorations conducted by landowners (e.g., George Holly, Bob Penney). Some were very successful.</td>
<td>1980's</td>
<td>Gay Muhlb erg and Stewart Seberg, ADF&amp;G, Anchorage, 267-2284. Also Phil Brna, ADF&amp;G, at 278-8594.</td>
<td>Many small scale bank restorations have been attempted by landowners; some successful, some not.</td>
</tr>
<tr>
<td>City of Soldotna stream bank restoration demonstration project at 2 sites along Kenai River</td>
<td>work begins 1994</td>
<td>Gay Muhlb erg, ADF&amp;G, Anchorage, 267-2284</td>
<td>Preparing final design by end of 1993. Should be very interesting project</td>
</tr>
<tr>
<td>USPS Russian River streambank restoration '1990' demonstration project</td>
<td>not done—plans continue changing</td>
<td>Dave Blanchet, Chugach National Forest, Supervisor's Office, Anchorage, 271-2538</td>
<td>USPS may have preliminary plans, still subject to change</td>
</tr>
<tr>
<td>Turnaround removal on New Seward Hwy alongside Potter's Marsh (trade for illegal fill on neighboring ADOT project)</td>
<td>1989</td>
<td>Don McKay, ADF&amp;G, 267-2284</td>
<td>ADOT/PF, ADF&amp;G and Corps of Engineers have files. A small project.</td>
</tr>
<tr>
<td>Potter Marsh—flag cover on culvert of Rabbit Creek under road emptying into marsh</td>
<td>1982?</td>
<td>Deve Harkness, ADF&amp;G, Anchorage, 267-2179</td>
<td>A water control project rather than habitat-oriented</td>
</tr>
<tr>
<td>Ship Creek—Elmendorf dam reconstruction with fish pass</td>
<td>1983</td>
<td>Phil Brna, ADF&amp;G, at State Pipeline Office, Anchorage, 278-8594</td>
<td>Hard to evaluate—fishpass never opened due to objections from neighboring hatchery</td>
</tr>
<tr>
<td>Chester Creek 34—MOA will construct stop pools &amp; fish pass to rectify perched culvert at Lake Otis Parky</td>
<td>1993</td>
<td>Wayne Dolezal, ADF&amp;G, Anchorage, 267-2284</td>
<td>Just now underway. Regulatory agencies have files.</td>
</tr>
<tr>
<td>Women's Bay 18 (Kodiak); restoring illegal fill &amp; culvert to original</td>
<td>1991</td>
<td>Wayne Dolezal, ADF&amp;G, Anchorage, 267-2284</td>
<td>A minor project</td>
</tr>
<tr>
<td>Fish pass along Relief Drive to Horsehoe Lake (Kodiak); mitigation for re-routing stream for housing construction</td>
<td>in discussion</td>
<td>Lon White (ADF&amp;G, FRED, Kodiak, 486-1874); &amp; Wayne Dolezal (ADF&amp;G, Anchorage, 267-2284)</td>
<td>Project has been in discussion/holding pattern for years</td>
</tr>
</tbody>
</table>
### SOUTHCENTRAL/SOUTHWEST ALASKA (Continued)

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>YEAR</th>
<th>CONTACTS</th>
<th>OTHER SOURCE/COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Horseshoe Lake 1 (Kodiak). Illegal fill removal and revegetation</td>
<td>not done yet</td>
<td>Wayne Dolezal, ADF&amp;G, Anchorage, 267-2284</td>
<td>AC&amp;E &amp; ADF&amp;G have permitting files</td>
</tr>
<tr>
<td>Old Harbor Airport, new site (Kodiak). Sitka Island Strait 1. Tributary channel construction, salmon spawning area, shorebird habitat improvement</td>
<td>1993</td>
<td>Carol Sanner, ADOT/FF, Anchorage, 266-1509</td>
<td>Environmental assessments; ADOT/FF, ADF&amp;G and other regulatory agencies have files</td>
</tr>
<tr>
<td>Mill Bay 2, Seabreeze Circle (Kodiak). Mitigation for illegal wetland fill.</td>
<td>1993</td>
<td>Wayne Dolezal, ADF&amp;G, Anchorage, 267-2284</td>
<td>ADF&amp;G and Corps has files</td>
</tr>
<tr>
<td>Popof Strait 18 (near Sand Point). Negotiating a fish passage enhancement project as mitigation for airstrip fill</td>
<td>not done yet</td>
<td>Wayne Dolezal, ADF&amp;G, Anchorage, 267-2284</td>
<td>Project still in discussion</td>
</tr>
<tr>
<td>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.</td>
<td>not done yet</td>
<td>Wayne Dolezal, ADF&amp;G, Anchorage, 267-2284</td>
<td>Permitting agencies have files</td>
</tr>
<tr>
<td>Illulituk Bay 51, Dutch Harbor. Will breach a berm for fish passage at Morris Cove. Supposed to create an artificial reef as well.</td>
<td>not done yet</td>
<td>Wayne Dolezal, ADF&amp;G, Anchorage, 267-2284</td>
<td>Unsure at this point whether project will proceed as planned</td>
</tr>
<tr>
<td>Illulituk 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.</td>
<td>not done yet</td>
<td>Wayne Dolezal, ADF&amp;G, Anchorage, 267-2284</td>
<td>Still in planning stage; should be a very interesting project</td>
</tr>
<tr>
<td>Pyramid Creek 1 (Unalaska); a successful bank stabilization &amp; current deflector project</td>
<td>1988-89</td>
<td>Wayne Dolezal, ADF&amp;G, Anchorage, 267-2284</td>
<td>Files of permitting agencies. More of a stream engineering than habitat-oriented effort</td>
</tr>
<tr>
<td>Nondalton Airport (Lake Clark). Sixmile Lake 1. Tributary channel construction, Dolly Varden habitat, not done as mitigation.</td>
<td>1993</td>
<td>Carol Sanner, ADOT/FF, Anchorage, 266-1509</td>
<td>ADOT/FF, ADF&amp;G and other regulatory agencies have files</td>
</tr>
<tr>
<td>Placer mining stream diversion w/ some meander &amp; pools (currently 2000' long, will be 7000'), in Granite Creek, George River Drainage. Plan not yet in place for eventual stream reclamation</td>
<td>diversion 1991—no reclamation yet</td>
<td>Wayne Dolezal, ADF&amp;G, Anchorage, 267-2284; Dave Kelley or Carl Persson, BLM, Anchorage District, 267-1213.</td>
<td>Not yet in reclamation stage</td>
</tr>
</tbody>
</table>

**ADDITIONAL PROJECTS**
## C. NORTHERN/INTERIOR ALASKA

<table>
<thead>
<tr>
<th>PROJECT</th>
<th>YEAR</th>
<th>CONTACTS</th>
<th>OTHER SOURCE/COMMENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Older BP projects on North Slope</td>
<td>since 1970's</td>
<td>Jay McKendrick, UAF Agricultural &amp; Forestry Experimental Station in Palmer, 746-9450.</td>
<td>some info on his work was gleaned from issues of <em>Agroborealis</em>.</td>
</tr>
<tr>
<td>Biological Restoration of the North Prudhoe Bay State #2 Exploratory Well Site. Deep &amp; shallow marsh/pond complex, <em>Arctophila</em> &amp; Carex plantings, moist meadow.</td>
<td>1992</td>
<td>Mike Joyce, ARCO, 265-6534. Alaska Biological Research (ABR, Fairbanks, 455-6777) is conducting this study on contract to ARCO.</td>
<td>Progress report will soon be available (1993).</td>
</tr>
<tr>
<td>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.</td>
<td>1970's-80's</td>
<td>Barbara Mahoney, NMFS, Anchorage, 271-5006.</td>
<td>Barbara Mahoney has reports.</td>
</tr>
<tr>
<td>Many stream crossing &amp; 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.</td>
<td>1978</td>
<td>Al Ott, ADF&amp;G, Habitat Division, Fairbanks, 451-6192.</td>
<td>USFWS compiled information into a report on what was done at the time, <em>Gravel Removal Studies in Arctic &amp; Subarctic Floodplains in Alaska</em>, 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.</td>
</tr>
<tr>
<td>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.</td>
<td>current</td>
<td>Patrick Scannel, USFWS, Fairbanks, 456-0388.</td>
<td>Soon written up in report form.</td>
</tr>
</tbody>
</table>