1:24K FISH HABITAT DISTRIBUTION DEVELOPMENT PROJECT COMPLETION REPORT

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INTRODUCTION

In February of 2001, as part of the Oregon Plan for Salmon and Watersheds (Oregon Plan), the Oregon Department of Fish and Wildlife began an effort to develop consistent and comprehensive fish habitat distribution data at a scale of 1:24,000, for all salmonid species except cutthroat throughout the anadromous zone of Oregon (Figure 1). The most common example of this scale is the United States Geologic Survey 7.5 minute quadrangle map. This effort was intended to be an initial attempt at compiling the targeted information, and to lay a foundation for future efforts as our understanding of aquatic resources in Oregon improves.

Fish habitat distribution is uniformly thought of as one of basic pieces of information necessary for successful monitoring, evaluation, and assessment of fish resources in Oregon. While ODFW has developed and maintained 1:100,000 scale anadromous fish habitat distribution data for nearly a decade (**Appendix I**), agencies participating in the Oregon Plan recognized the need for one comprehensive fish habitat distribution dataset that is updated with the best available information and is developed at a finer resolution than what had been developed in the past. The 1:24,000 Fish Habitat Distribution Development Project (24K Project) was conceived to address these needs, as an important component of the Oregon Plan. The effort was encouraged and supported by both the Oregon Watershed Enhancement Board (OWEB) and the Governor's Natural Resources Office (GNRO).

The primary goal of the 24K Project was to develop consistent baseline datasets at the 24K scale obtaining universal input and agreement from other Oregon Plan participating projects. While fish habitat distribution data was the primary target, other important information or attributes were also sought during the project, including:

- barriers to adult migration,
- documentation of direct observations,
- species origin and present production information, and
- timing of different life-stages (i.e. holding, spawning, rearing, adult and juvenile migration, and incubation/gravel emergence, etc.).

To ensure the data were developed comprehensively, and could be universally adopted and approved, data were compiled from a variety of sources including resource agencies, tribal entities, watershed councils and other interested public and private entities. The project targeted data collection for chinook, coho, steelhead, chum, sockeye, resident rainbow, redband, and bull trout.

The OWEB provided the bulk of the funding for this project. However, due to limited resources, the original project proposal was modified to exclude the compilation of cutthroat distribution, and was scaled back from the entire state to the anadromous zone of Oregon. Upon review of the goals of the project, the United States Environmental Projection Agency (EPA) and the Oregon Department of Environmental Quality (DEQ) saw a clear relationship between the life-stage timing information being collected and their data needs related to development of temperature standards. As a result, these agencies provided additional support to the 24K Project

so life-stage timing data could be captured at a larger scale during the distribution data compilation effort than what was originally proposed and funded by OWEB.

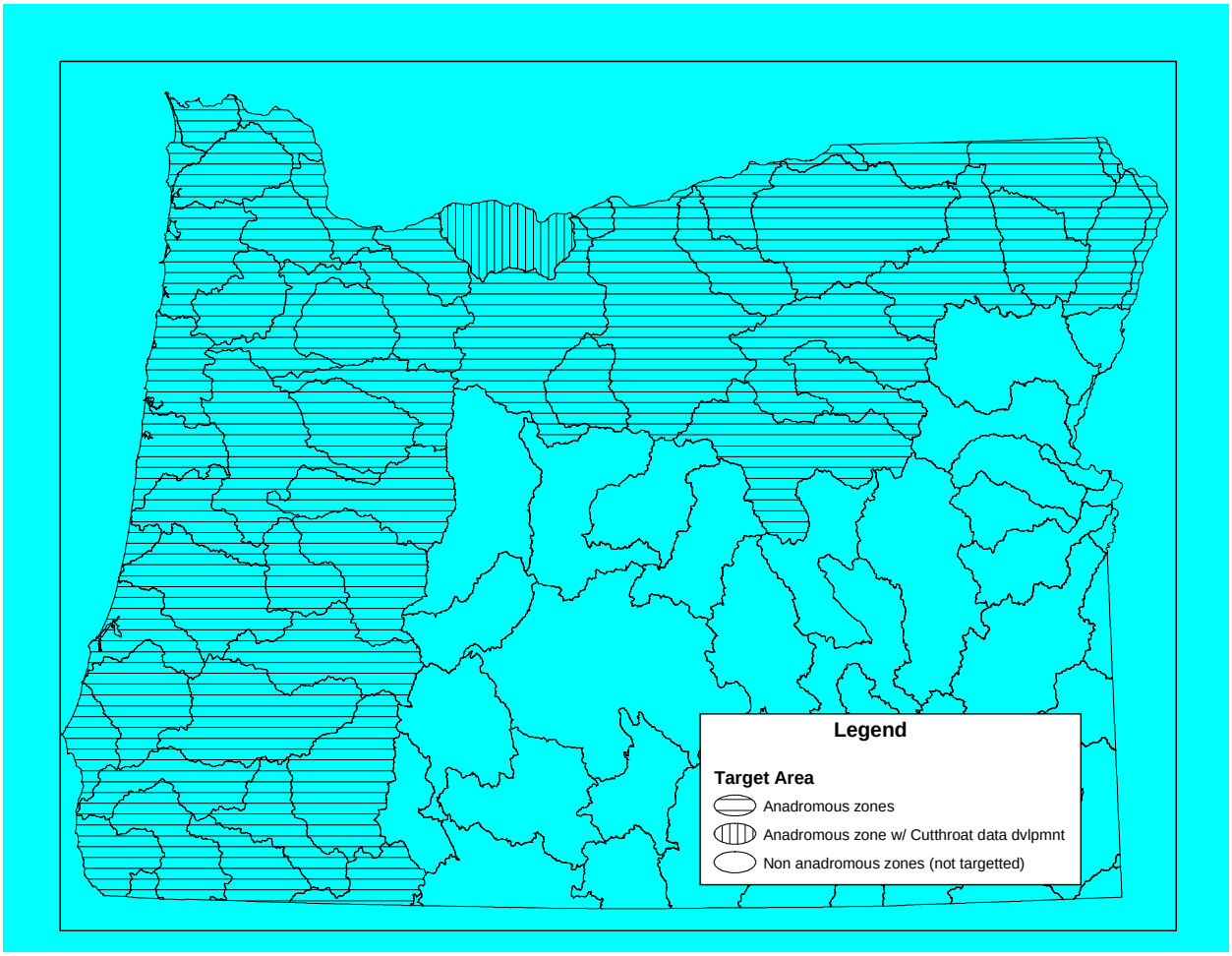

Figure 1. Map depicting Oregon's anadromous zone with 4th HUC boundaries, which represents the target area for the 1:24,000 Fish Habitat Distribution Development Project. The Scott Canyon HUC is highlighted as the target area for cutthroat distribution data capture.

Just prior to beginning field data collection, StreamNet (a cooperative venture of the Pacific Northwest region's fish and wildlife agencies and tribes) contributed resources to capture fish habitat distribution information for cutthroat trout in a limited area within the Columbia basin (see *Project Chronology*, **Appendix II)**. The Hood River area (Scott Canyon hydrologic unit, Figure 1) in north-central Oregon was chosen as the most appropriate location because of the availability of data, and the strong cooperative nature that had been displayed amongst the data contributors in that area during previous distribution development efforts. The goal of this modest effort was to provide a mechanism, and establish a process for future capture of cutthroat information across the state.

The stated objectives of the 24K Project were to:

1) Develop data structures to capture the target information.
2) Capture readily available documentation of direct observations.
3) Compile fish habitat distribution data compatible with the 1:100,000 scale routed stream layer and the 1:24,000 scale quadrangle digital raster graphic (DRG) images.
4) Translate the compiled data into electronic format.
5) Complete a final review of the distribution maps.
6) Make final distribution and other information available via the Internet.
7) As resources allow, maintain and update distribution data layers and other information, as new information becomes available.

This report describes the process and methods that were undertaken and the results that were obtained related to the goals and objectives of the 24K Project, including the additional work funded by EPA, ODEQ, and StreamNet. Also included is a description of the project challenges and recommendations, which are provided as reference should a similar effort be attempted in the future.

METHODS

Overall Process

NRIMP staff outlined a general process for accomplishing the goals and objectives of the 24K Project. The steps that were outlined were drafted to closely match the stated objectives for the project. It was clearly understood from the beginning of the project, that many of the steps would occur concurrently as the project progressed. The steps that were developed prior to the start of the project were:

Step 1: Develop data structures to capture target information.
Step 2: Capture readily available observation records for each target dataset, and compile existing electronic distribution layers.
Step 3: Compile fish distribution data onto the hardcopy 1:24K topographic maps or capture data electronically.
Step 4: Convert compiled data into electronic format.
Step 5: Complete a final review of all target datasets.
Step 6: Make all the information available via the web.
Step 7: Maintain and update distribution data layers, as new information becomes available, as funding and resources allow.

To increase the likelihood of universal input and agreement, a workshop was held prior to full initiation of the project. Following the workshop, field teams were assembled for data compilation. Crews were dispersed to compile the target data, and updates on the progress of the project were provided via email updates every six to eight weeks to as many as 95 individuals who requested updates, representing 32 agencies/entities. What follows are descriptions of

specific aspects of the 24K Project, as they were described at the start of the project. Deviations from what is described here are discussed in the *Results and Discussion* section of this report.

Pre-project Workshop

Potential data providers, including agencies and entities participating in the Oregon Plan, were invited to a workshop that was held on May 8, 2001. The stated purpose of the workshop was to:

- Familiarize potential data providers and users with the details of the project.
- Provide an opportunity for input and review.
- Identify and resolve specific issues.
- Encourage cooperation as we move forward.

A total of 31 individuals representing 12 agencies attended and participated in the workshop. Attendees to the workshop were briefed on the objectives, general process, and schedule of the project, and were encouraged to provide any information they might have when contacted by field data compilers. They were also asked to provide input on a list of questions and unresolved issues associated with specific data types, as well as describe any concerns they might have with the project, so concerns could be addressed before the project started. Input provided during the workshop was incorporated into the project procedures manual (ODFW, 2001) where appropriate, and was included in training the field data providers.

Field Data Compilers

One Assistant Project Leader, four data compilers, and one project assistant were hired, trained, and divided into three two-person field crews. The Coast Crew was primarily responsible for data collection in the coastal anadromous zone, the Columbia Crew was responsible for the inner Columbia anadromous zone, and the Willamette Crew focused on the anadromous portions of the Willamette, Umpqua, and Upper Rogue areas (**Appendix III**). Not all compilation areas were uniquely assigned to a single data compiler crew, so the Assistant Project Leader was responsible for coordinating the efforts of the three crews, while at the same time, participating as a member of one of the data compiler crews. The compilers met with data contributors (described below) within their respective areas of responsibility to collect the information on fish habitat distribution, barriers, documentation, life-stage timing, species origin and present production, using the procedures described in this report.

Data Contributors

Fish biologists and other agency professionals from ODFW, Bureau of Land Management, United States Forest Service, Oregon Department of Forestry, Native American Tribes, and soil and water conservation groups were contacted and asked to contribute data to the 24K Project. Data contributors also included major private landholders, environmental consultants, watershed councils, fishing guides and naturalists. Organizations and entities that actually contributed information to the project are listed in **Appendix IV**. Those who were contacted, but did not

contribute information were not comprehensively documented, and therefore are not included in this report.

Interviewing Procedures

The data compiler field crews generally met with ODFW district fish biologists first, and then attempted to meet with other geographically appropriate entities such as those listed in **Appendix IV**. The goals and objectives of the project were discussed, and crews responded to questions pertaining to the project, including questions concerning future uses. Contributors were then asked to examine pre-existing information that had been placed on hardcopy maps, and provide edits based on their professional knowledge (obtained through experiences in the field, literature review, and/or communications with peers and others familiar with the target area), or documented information related to the data type being reviewed. As subsequent contributors were interviewed, they were also asked to review the information provided by previous contributors. Any disputes with pre-existing information had to be supported with documented field observations, whereas disputes with newly compiled information from previous data contributors could be based on professional judgment, and were recorded and addressed under a separate process (see *Dispute Resolution Process* below). This process continued until all potential data contributors had been contacted and given an opportunity to include their information. After all of the willing contributors were interviewed, the maps and mylar overlays were again submitted to ODFW district fish biologists for final approval.

Maps for Hard Copy Data Collection

Pre-existing information served as a starting point for acquiring and editing target information. Electronic data for distribution, documented observations, and barrier locations were collected from various sources, including some of those listed under *Data Contributors* above, during the initial stages of the project. This pre-existing data, along with information from previous distribution development efforts by ODFW (**Appendix I**), were plotted on 1:24,000 scale United States Geological Survey (USGS) digital raster graphic (DRG) quadrangle pairs for each geographic area that was to be canvassed by the field data compilers. An Arc/INFO Macro Language program (drgmapper.aml) served to automate the map production process, with some customizations necessary depending on the pre-existing data being used for a particular area. Quad maps were paired east to west and plotted for each species and run. Quad-pairs were grouped based on 4th Hydrologic Unit (HUC) boundaries, and were distributed to data compilers based on their area of responsibility, using from 1 to 6 geographically related HUCs as the approach for establishing data compilation areas. However, as was stated earlier, crews sometimes shared the responsibility of compiling information in compilation areas, as is shown in **Appendix III**. Mylar overlays were placed on the maps and each contributor was given the opportunity to add to, edit, and/or dispute the distribution and barrier information contained on the maps and/or mylars, using colored pens.

Field data compilers were also asked to obtain information on the historic origin and current production method that is sustaining the population being depicted by the distribution

information. This information was also captured on the mylars along with the identification of the person who provided the information.

A more detailed account of how distribution, barrier, origin, and production data were to be captured in the field can be found in the 24K Project procedures manual (ODFW, 2001). Refer to the sections titled *Procedure for Updating Distribution* (page 8), *Updating Distribution with Data Providers* (page 9), and *Barrier Data Compilation Protocol* (page 11).

Life-stage Timing Data Collection

Field data compilers were charged with capturing information on timing of fish occurrence by life-stage behavior (spawning, egg incubation through fry emergence, rearing, migrating of adults and juveniles), which is referred to in the this report as "life-stage timing data". Data were compiled for each target salmonid species, both anadromous and resident, but unlike with distribution information, cutthroat trout and some non-salmonid species information was also targeted. However, contributors were asked to only provide information on wild/natural populations. In order to address the differing life history patterns, a separate set of behavioral categories and definitions were used for anadromous and resident species. **Appendix V** represents the information given to data providers prior to developing life-stage timing information. This information includes a complete list of timing-related terms and definitions.

Life-stage timing data was captured in 'periodicity tables' using Microsoft Excel spreadsheets (Figure 2). The spreadsheet format that was used had been modified from one designed by DEQ for their TMDL development effort (ODEQ, 2000). The life-stage timing information includes the general time of year that a particular life-stage and/or behavior of a specific species and run of fish occur in a specific geographic area. Contributors were asked to not describe the timing for any particular year, but to take into the account the full range of variability associated with changing environmental conditions and fish population fluctuations. As an example, major 100 year, or greater, flood events were not typically included when identifying and describing spatial or temporal variability.

Periodicity tables were initially delineated and populated using the boundaries and the inverse of the information contained in the *Oregon Guidelines for Timing of In-Water Work to Protect Fish and Wildlife Resources, June 2000,* (ODFW, 2000). The in-water timing guidelines identify times when it is thought to be safe to allow in-water work to occur. The in-water timing guideline boundaries were used because they delineate distinct areas where the timing of fish activities are different, which was the goal of the 24K Project. The inverse was used based in the notion that approved periods of in-water activity generally occur when fish presence is reduced or non-existent. While this was not 100% true, it was sufficient to create a starting point from which data contributors could develop the information that was targeted in this effort. Data compilers were to work through the spreadsheets with the data contributors and record new or modified timing information, including the professional opinion as to the intensity (as a percentage) of the life-stage activity. Compilers were also to capture any pertinent verbal comments that explained or qualified the information contained in the tables. As with the

distribution and barrier information, the tables were first reviewed by ODFW district staff, then by representatives from other geographically appropriate entities such as those listed under *Data Contributors* above. Once everyone involved had looked at the tables, the tables were to be returned to ODFW staff for a final review and approval.

Rock Creek (Giliam Co.) Anadromous Species

Life Stage/Activity/Species	Jan		Feb		Mar		Apr		May		Jun		Jul		Aug		Sep		Oct		Nov		Dec	
Upstream Adult Migration																								
Summer Steelhead	X	X	X	X	X	X	X	X											X	X	X	X	X	X
Adult Holding																								
Summer Steelhead				Likely no use																				
Adult Spawning																								
Summer Steelhead					X	X	X	X	X	X	X													
Egg Incubation Through Fry Emergence																								
Summer Steelhead						X	X	X	X	X	X	X												
Juvenile Rearing																								
Summer Steelhead	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Downstream Juvenile Migration																								
Summer Steelhead							X	X	X	X	X													

	Represents 90% of the periods of peak use based on professional opinion.
	Represents 10% of use based professional opinion
	Represents periods of presence-no level of use indicated
X	Represents Document 203320

#203320- Stock Summary Reports for Columbia River Anadromous Salmonids

Figure 2. Example of a periodicity table used to compile life-stage timing information.

A more detailed account of how life-stage timing data was to be captured during the 24K Project can be found in the 1:24K Project procedures manual (ODFW, 2001). Refer to the section titled *Life-stage Timing Data Outline* (pages 15-16).

Documentation Collection Procedures

While on-site with the data contributors, the data compiler field crews were responsible for collecting hard copy documentation that supported or confirmed the distribution, barrier, and life-stage timing information that was provided to them. Documentation related to origin and present production information was also sought. Established criteria were used to identify appropriate information that could be used as documentation for each data type. These criteria are described in the 24K Project procedures manual (ODFW, 2001). The compilers were

instructed to make two photocopies of documents that met the criteria. The compilers would then assign each document a unique reference identification (RefID) number, enter the documentation information into the Documentation database, and submit one copy of the document to the StreamNet Library so it could be made available to data users upon request.

As part of entering documentation records into the Documentation Database, each record was to be assigned a documentation extent and documentation quality rating. The documentation extent described how extensively fish were observed utilizing the surveyed habitat. Documentation quality was intended to provide information on how the observation was made and by whom. The desire was to provide data users with the ability to determine if the quality of the documentation was suitable for their use.

For more details on the collection and entry of documentation, see the 1:24K Project procedures manual (ODFW, 2001). Refer to the sections titled *Procedure for Updating Distribution* (page 8), *Updating Distribution with Data Providers* (page 9), and *Barrier Data Compilation Protocol* (page 11). Refer to the section titled *Documentation Data Outline* (pages 12-13) for descriptions of documentation related to other targeted data types, and to the section titled *Documentation Matrix* (page 14) for a description of how documentation quality was to be assigned.

Dispute Resolution Process

Much of the information collected during the 24K Project was based on professional knowledge, which inherently means one contributors input may conflict with another's. For this reason, a process was developed to provide a consistent methodology for data compilers to follow in the event of a disagreement between data providers. Field data compilers were instructed to follow the procedure laid out in the *Dispute Resolution Decision Tree* (**Appendix VI**). The decision tree was designed to be used as a step-through process with pre-determined outcomes, that addresses all types of disputes, including disputes related to unique or uncommon observations, written documentation, and habitat suitability. The decision tree puts the responsibility on the data providers to support their opinion with sufficient, indisputable proof. Documentation (as defined in the *Documentation* section below) is clearly established as the level of proof necessary to reach a concluding decision.

Previously established distribution usetypes did not bind data providers if they had sufficient cause to believe that the previously established distribution was in error. Therefore, a separate, more detailed procedure was necessary to address a dispute over pre-existing distribution (see description under *Description of Data Captured by Field Data Compilers* section below) information, and more specifically, what to do when habitat surveys indicate the end of fish use below the presumed available habitat. The protocol and description of acceptable information for this scenario is described in the 1:24K Project procedures manual (ODFW, 2001). Refer to the section titled *Conditions for Disputing Previously Established Distribution Type Designations* (pages 28 and 29).

Fish Habitat Distribution and Barrier Data Entry Procedures

ODFW Geographic Information Systems (GIS) staff in cooperation with the Assistant Project Leader and a data entry technician translated the barrier and distribution edits and additions into electronic format by using an ArcView/Microsoft Access interface application called the Data Capture Tool (DCT) (Figure 3). This application was developed specifically for the 24K Project as an efficient tool for capturing a great deal GIS and tabular information using one application. DRG images, which are static electronic pictures of USGS 7.5 minute quad maps, were used as the backdrop in the ArcView component of the DCT, which allowed the GIS operator to visually verify the spatial accuracy of the digitization of 24K and 100K barriers and distribution. The associated attributes were entered into Microsoft Access, which is a relational database application, via a series of forms built into the DCT.

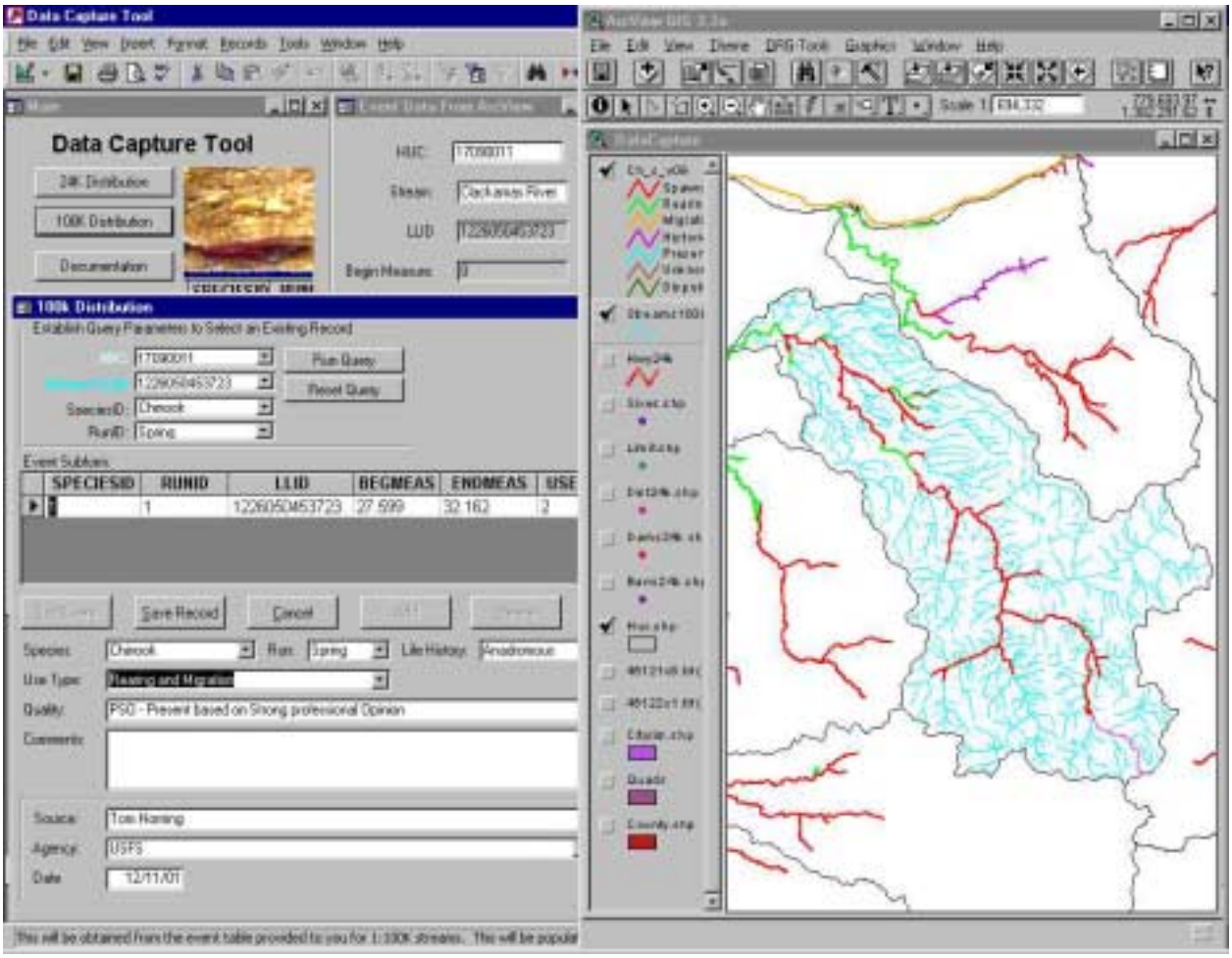

Figure 3: Screen capture of the Data Capture Tool used in the 24K Project to covert hardcopy distribution and barrier information into electronic format.

Data Synchronization

Since four different staff members had responsibility for converting hard copy information into electronic format, all distribution, documentation, and barrier records were entered into replicas of the distribution, barrier, and documentation Microsoft Access databases. Periodically, the group would synchronize the replicate copies of each database with the master copy to verify that all data were being captured and stored correctly, to ensure that team members were not duplicating each other's efforts, and to serve as a back-up, in case one replica became corrupted and unusable.

Description of Data Captured by Field Data Compilers

The types of data compiled during the 24K Project were meant to enhance the corporate knowledge of Oregon Plan participants, as well as other data users. The format of each type was reviewed and discussed during the pre-project workshop, to ensure they resulted in usable information that is consistent across the anadromous zone, is as comprehensive as possible, and is updateable as new information is obtained. As was stated earlier in this report, the 24K Project was intended to be an initial effort at compiling this information. Therefore, the data that resulted from this effort are dynamic in nature, meaning they can and should be updated as new knowledge is gained. Understanding the details of the data that were compiled during the 24K Project is critical to being able to utilize it properly. This section describes each 24K Project data type, generally as it was formatted following the pre-project workshop, distinguishing the information that was based on professional judgment from that which was developed from documented observation. A complete list of data types, and field attributes in provided is **Appendix VII**.

Habitat Distribution

This dataset was intended to provide a picture of the fish habitat that is or was available and utilized by fish species in Oregon. It is not a depiction of where the fish are, as fish movements are influenced greatly by environmental factors and population size. For the purposes of the 24K Project, "habitat distribution" is defined as suitable areas believed to be currently or historically used by wild, natural, and/or hatchery fish populations. The term "currently" is defined as, within the past five reproductive cycles for a given species. "Historically" is defined as prior to the past five reproductive cycles for a given species. Distribution data were captured at two different scales. Data associated with 1:100,000 scale streams were collected and managed in a linear format and data associated with 1:24,000 scale streams were collected in a point format which describe the uppermost endpoint of distribution.

Data providers were asked to assess the usability and availability of the habitat based on observations and/or best professional judgment of the condition of the habitat. No attempt was made to identify the habitat that had actually been judged suitable via visual inspection, because of the subjective nature of habitat suitability and high level of variability in habitat quality across the landscape. Instead, fish presence was thought to be a better indicator of fish habitat use. Therefore, data providers were asked to indicate their level of confidence that fish do use the habitat currently, or have used it historically (see *Data Quality Rating* below).

The primary attributes that were collected with fish habitat distribution were Usetype, Data Quality, origin and present production. The details for these data fields are provided below. Supplementary attributes include information related to: stream name, date, source name, source agency, comments, life history, federal and state ESA status, RefID, and 4th field HUC number. Details of these attributes can be found in the Distribution Metadata located at http://oregonstate.edu/dept/nrimp/information/fishdistdata.htm.

Although it was not intended, one set of usetypes was used to represent both anadromous and resident species. The reasons for this, and possible ramifications are discussed below in the *Results and Discussion* section of this report.

Usetype categories – describes the type of fish use for a given area.

1) **Spawning and rearing**: Areas where eggs are deposited and fertilized, where gravel emergence occurs, and where at least some juvenile development occurs.
2) **Rearing and migration**: Areas outside primary spawning habitats where juvenile fish take up residence during some stage of juvenile development and use the area for feeding, shelter, and growth. Some migration also occurs as juvenile and adult fish move between the ocean and spawning grounds.
3) **Migration**: Areas where juvenile and/or adult fish pass through as they move between the ocean and spawning and rearing areas. While all migratory corridors provide some rearing opportunities, areas with this designation are distinguished by fish moving through fairly quickly, making contributions to juvenile rearing relatively insignificant.
4) **Previous/Historic**: areas of otherwise suitable habitat that fish no longer access and will not access in the foreseeable future without human intervention. The species is thought to no longer be present or has not been detected within the past five reproductive cycles.
5) **Present, usetype unknown or unspecified**: Areas where a species occurs and uses the habitat, but the use is mixed (e.g. multiple usetypes), unknown or not distinguished by the data contributor.
6) **Unknown**: Areas where no information exists to confirm or refute the existence and use of a particular species, and data providers were unwilling and/or unable to speculate about a particular species' existence.
7) **Absent**: Areas where *at least one* of the following criteria is true for a given species and run:
    - *Criterion 1*: Fish can't access the area and have not accessed the area since the European settlement based on observation or the best professional judgment of the data contributor. Reasons might include the habitat being above an established impassable barrier, or access is limited by environmental factors such as historically poor habitat and/or consistently inappropriate flow regimes.
    - *Criterion 2*: Following a Fish Presence Survey (FPS) or similar effort where the end of fish use was established and comments were provided that indicate that the habitat above is not suitable, and there's no documented proof that the habitat above the survey endpoint was ever suitable for fish use.

An expanded description of these criteria is provided in the 1:24K Project procedures manual (ODFW, 2001). Refer to the sections titled *Expanded criteria for applying the "Absent" distribution type* (page 7).

8) **Disputed**: Areas where presence and/or usetype is disputed between participating biologists or natural resources professionals.

9) **Outlier, successful reproduction questionable**: Areas where distribution of a particular species meets *all four* of the following criteria:
   - *Criterion 1*: the site must be accessible to the species;
   - *Criterion 2*: the species must occur elsewhere in the 4th field hydrologic unit;
   - *Criterion 3*: the species does not successfully reproduce at a sufficient level to sustain a population, possibly due to habitat constraints such as stream gradient, flow regime, sediment, etc.; and
   - *Criterion 4*: the species is routinely observed at the site in its adult life-stage.

   It should be noted here that the "Outlier" category was added after the pre-project workshop and the development of the 24K Procedures Manual (ODFW, 2001). Future updates of the manual will include this usetype category.

Data quality rating – describes the level of confidence the data provider has that a species and run actually utilizes a particular area (e.g. the presence of a species). The rating does not address the level of confidence that a particular area is utilized in a certain way (e.g. the use-type of the habitat). Data providers were asked to provide this information for each specie/run or usetype change using the following rating scale:

1) **Present based on Undocumented professional Observation (PUO)**: Areas where field biologists or other natural resources professionals have observed a particular species, or know of another professional biologist who has observed the species, but the observation was not recorded in a manner that allows it to be used as official documentation.
2) **Present based on Strong professional Opinion (PSO)**: Areas where data providers suspect the species in question is present, but where the species has not been specifically observed or surveyed. This classification is generally based on geographically similar information, i.e. presence of fish and similar habitat in neighboring streams strongly supports the use by fish, under the right circumstances, in the stream in question.
3) **Present based on Modest professional Opinion (PMO)**: Areas where data providers suspect the species may be present because there is no evidence to suggest that the species shouldn't be present. This classification is not based on geographically similar information, i.e. there is no data from neighboring streams to support or refute presence. This category is automatically assigned to distribution records where the data provider fails to indicate their confidence in the presence of a species.
4) **Documented presence (DOC)**: Areas where fish have been observed and properly documented across the full extent of a distribution usetype within a single waterbody. This data quality rating only applied on a limited basis because most documented observations occur at a specific place in a stream, rather than throughout the entire extent of a particular usetype.

A more detailed description of the Habitat Distribution data can be found in the 1:24K Project Procedures Manual (ODFW, 2001). Refer to the section titled *Fish Habitat Distribution Data Outline* (pages 5 - 6).

Barriers

Identifying impediments to fish passage is a critical link to understanding the distribution of fish and determining the location of available habitat across the landscape. Data providers were asked to confirm the existence, location, and blockage extent of fish passage barriers that were in ODFW's barrier and culvert databases prior to the 24K Project, and also to provide the same information on any barriers not contained in these databases. Barriers, as a 24K Project data category, are defined as natural or man-made structures and/or conditions that impede the migration of adult fish – obstructions to juvenile upstream or downstream passage were also captured, but the block extent was codes as "passable" because of the focus on adult passage. The barrier types captured during the 24K Project included:

- dams,
- falls,
- culverts,
- hatchery structures,
- debris jams/landslides,
- cascade/gradient/velocity barriers,
- areas of insufficient flow,
- temperature/pollution barriers,
- tidal gates, and
- water diversions.

Where possible, data contributors were encouraged to include details describing each barrier, such as height, ownership, the presence of a fish ladder, the extent of blockage (complete or partial) if any by species, and a short description of the aspect of the barrier that was causing it to block fish passage (e.g. culvert drop height).

Blockage extent information was broken into one of three categories:

- "Passable", meaning adult fish can successfully and routinely migrate upstream past the barrier,
- "Complete blockage", meaning fish cannot successfully migrate upstream past a barrier and no passage is allowed at any time,
- "Partial Blockage", meaning fish can successfully migrate upstream past a barrier at certain times, but are blocked at other times. If this category was used, data providers were asked to describe the conditions of the blockage (i.e. fish can migrate with human intervention, fish can migrate given proper flow conditions, etc.), or.
- "Unknown", meaning the level of impedance is not known.

A more detailed description of the Barrier data can be found in the 1:24K Project Procedures Manual (ODFW, 2001). Refer to the section titled *Barrier Data Outline* (page 10).

Documentation

The datasets developed during the 24K Project largely represent the best professional judgment of the people who collectively provided the information. However, data providers were given the opportunity to provide written documentation that confirmed the existence of fish in a particular location in a stream. Areas are considered to have "Documented" fish presence when written information exists to describe the observed life stage and/or behavior of a given species and run of fish in a specific stream. Examples might include spawning survey reports or accounts of snorkel survey results. All documentation records are stored in the Documentation database, separate from the Distribution database. However, documentation records that address the full extent of a distribution usetype record are also included in the Distribution database as a data quality rating. Documentation records that did not span the full extent of a single distribution usetype section were kept in a separate database.

The information must meet one of the following conditions to qualify as "documentation":

1) the observation data must have been made during the conduction of a research or monitoring effort with an established survey protocol, or
2) if the species was observed incidentally during an activity that lacked a survey protocol, the observation must have been made and reported, or verified by a natural resource agency, its staff members, or any other natural resource agency-affiliated professional.

The information is also required to contain certain specific information in order to be considered a documentation source:

1) Name of the stream or water body
2) Date of the observation
3) Species and run observed
4) Number and/or type (or unit) of observations (e.g. redds, total live fish, etc.)
5) Distance of the observed area
6) Exact location of the observation

Additional desired content for a documentation source includes:

7) Description of the extent to which the fish were seen throughout the observed area
8) Name of the professional who made the observation

Site and observation specific, site specific, and non-site specific data sources are coded differently within the Documentation database:

1) **Site and observation specific**: documents one or more observations of the mapped species *throughout* a specific area within a water body;
2) **Site specific**: documents one or more observations of the mapped species *somewhere within* a specific area within a waterbody, *but does not specify that the species was observed throughout the entire area observed*;
3) **Non-site specific**: documents one or more observations of the mapped species *somewhere within* a water body, *but information is not descriptive enough to determine the exact location or extent of the observation.*

Single-point observations that included specific information describing where the observation was made (usually location coordinates such as latitude and longitude) were considered to be Site and Observation Specific documentation, and were assigned a default record length of 0.1 miles. It was assumed that an observed fish could move at least 0.05 miles up or downstream of the observed location. However, if the observation recorded noted something to the contrary (i.e. a barrier prevented the upstream or downstream movement), then the full 0.1 mile length was denoted in the accessible direction.

For a more complete description of the Documentation data, see the 1:24K Project Procedures Manual (ODFW, 2001). Refer to the sections titled *Documentation Data Outline* (pages 12-13), and *Documentation Matrix* (page 14).

Life-Stage Timing

The life-stage timing data collected for the 24K Project includes the time of year that a particular life-stage and/or behavior of a species and run of fish occur in a specific geographic area. Life-stage timing data were collected for all anadromous salmonids, non-anadromous (resident, fluvial and adfluvial) trout species, and any other fish species that data providers had information for. Data providers were allowed to change the timing unit boundaries as necessary to more accurately reflect like-timing patterns within and between species – they were not restricted as to the size of the timing unit.

Life-stage timing categories that were captured for anadromous species include:

- Upstream adult migration
- Adult holding
- Adult spawning
- Egg incubation through fry emergence
- Juvenile rearing
- Downstream juvenile migration

Life-stage timing categories captured for non-anadromous species (resident, fluvial, adfluvial):

- Adult/sub-adult rearing
- Adult fluvial or adfluvial migration
- Adult spawning
- Egg incubation through fry emergence
- Juvenile rearing
- Juvenile/sub-adult migration

Complete definitions for each life-stage timing category are provided in **Appendix V**. They can also be found in the 1:24K Project Procedures Manual (ODFW, 2001). Refer to the *Glossary* section starting on page 33.

To increase the consistency between timing records, certain commonly used comments/conditions were standardized in the hopes of preventing misinterpretations as multiple

data providers reviewed the information, and as the information was migrated from the spreadsheets into database form. These standardized categories allowed data providers the opportunity to describe the status of a particular life-stage within a given timing unit. These life-stage activity status categories were:

1) Likely no use: the species of fish is currently not found within the geographic extent of a particular timing unit.
2) Not applicable: the species of fish does not display a particular life-stage within the geographic extent of a particular timing unit.
3) None observed: the species of fish has not been seen within the geographic extent of a particular timing unit, but potential presence exists.
4) Unknown: the life-stage timing is unknown; there is not enough information to describe the timing within the geographic extent of a particular timing unit.

Each two-week timing period for each life-stage was denoted as documented or undocumented based on the following definitions:

- Documented: written information describing the life stage and/or behavior of a given species and run of fish in a specific stream or area at a specific time of year, based on actual observation. Written opinions lacking supportive observation data, and previously existing timing charts without documented observation citations were not included as documentation.
- Undocumented: life-stage timing is based on best professional judgment.

These data were captured in two-week blocks of time and data contributors were encouraged to identify time periods when the greatest level of a particular activity took place as compared to timing when the activity intensity was reduced. Because this information was almost exclusively based on professional judgment, data contributors were allowed to define the proportions between "peak" and "lesser use" activity intensity time periods. However, data providers were also allowed to not identify any activity level if:

1) They could not distinguish between high and low use periods due to a lack of information, or
2) Use levels remain relatively stable throughout the timing period that an activity occurs.

A more detailed description of the Life-stage Timing data can be found in the 1:24K Project Procedures Manual (ODFW, 2001). Refer to the section titled *Life-stage Timing Data Outline* (pages 15-16).

Species Origin and Present Production

Species origin is defined as the initial detection or introduction of a species and run of fish into a specific stream, water body, or basin. It describes how the species and run originally came to exist in a given area. Present production describes the current production activity or activities that sustain a given species and run of fish in a specific stream, water body, or basin within the past five reproductive cycles. Species origin and present production information was captured primarily at the fourth HUC level (subbasin), and in some cases at the fifth- and sixth field levels

where barriers/dams affect specific populations (Figure 4). Interim species origin and present production categories were crafted for use during the initial phases of the 24K Project. However, final categories were never universally agreed upon and adopted during the course of the project, so the interim categories and definitions were used in lieu of final categories (see *Results and Discussion* for more details). The following interim categories were used for this effort:

Species origin categories:

1) Native: indigenous - a species and run of fish that was present within the subbasin prior to European settlement.
2) Non-native introduced: a species and run of fish that was established within the subbasin subsequent to European settlement.
3) Native reintroduced: an indigenous species and run of fish that has repopulated itself, or was repopulated through manipulation, within the subbasin after some period of non-productivity or extirpation.
4) Non-native reintroduced: a similar stock from outside the subbasin that has been introduced to re-establish the species and run distribution after the original population of fish was extirpated.

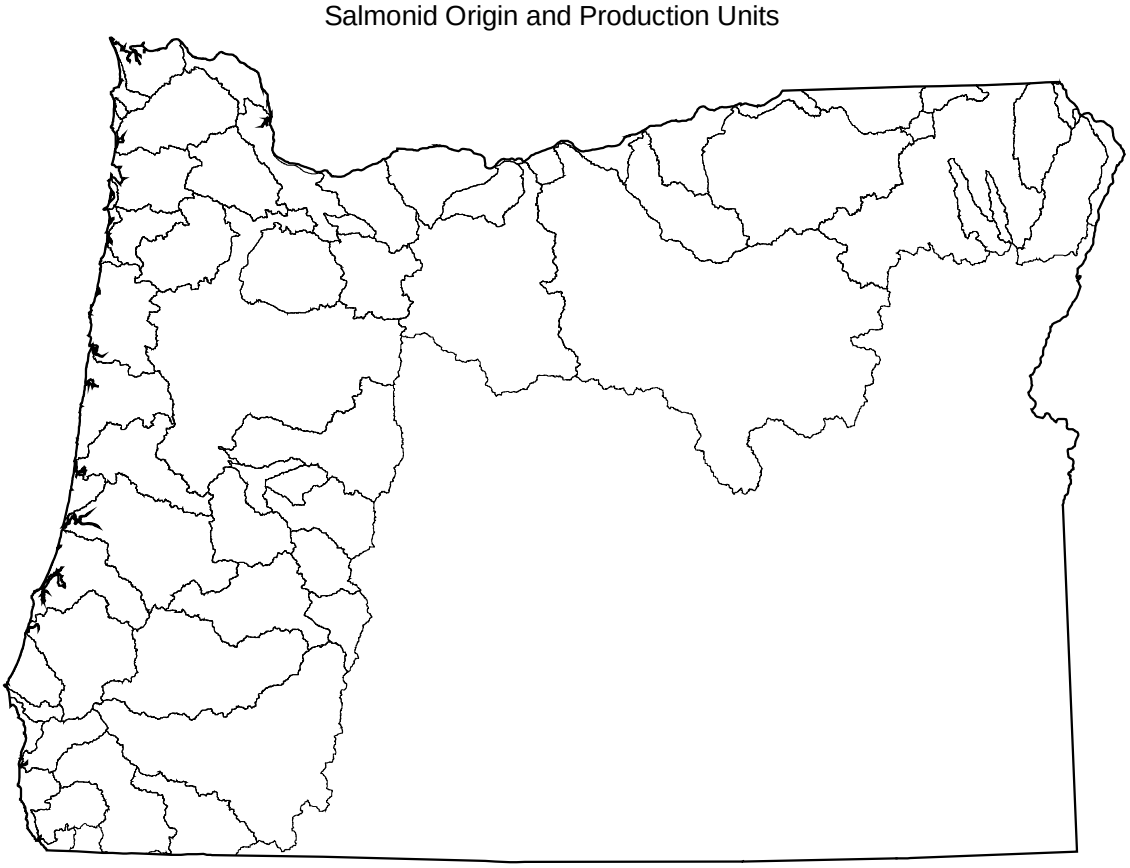

Figure 4. Species Origin and Present Production boundaries defined and used during the 24K Project.

Present production categories:

1) Native reproduction: a species and run of fish that was present within the subbasin prior to European settlement and is successfully reproducing in the wild, independent of management.
2) Wild/natural reproduction: non-native introduced or mixed native and non-native populations successfully reproducing in the wild, independent of management.
3) Mixed reproduction (hatchery and non-hatchery): Hatchery and wild/natural populations successfully reproducing in the wild.
4) Hatchery production: The species and run of fish are propagated in a hatchery environment and released into the wild.
5) Introduced production: Production is the result of routine introductions of a species with no stainable natural reproduction occurring.

A more detailed description of the Species Origin and Present Production data types can be found in the 1:24K Project procedures manual (ODFW, 2001). Refer to the sections titled *Origin Data Outline* (page 17), and Origin and Present Production Data Legend (page 26).

RESULTS AND DISCUSSION

This section summarizes the data, by type, that resulted from the 24K Project. Specific aspects are discussed in detail to describe major changes from previous datasets, identify deviations from established protocols, describe caveats and assumptions data users need to be aware of, and to point out data limitations that may not be apparent to unfamiliar data users. Fish habitat distribution results at the 100K (broad scale) and 24K (finer scale) resolutions are discussed separately because the final formats of the data are different (linear and point formats, respectively). A complete list of project objectives and summarized accomplishments can be found in **Appendix VIII**. A general description of how to access the data that are described in this section is located in **Appendix IX**.

Fish Habitat Distribution

100K Distribution

The 1:100,000 scale fish habitat distribution records that resulted from the 24K Project increased the total salmonid habitat distribution extent from 42,339 miles to 46,084 miles (Table 1). This total includes miles that may be counted more than once due to overlapping use by multiple species and runs. This excludes records categorized as Disputed, Absence, Unknown, and Previous/Historic habitat distribution, and therefore reflects what is believed to be the miles of suitable habitat in the anadromous zone of Oregon that is currently utilized by the species targeted during the 24K effort. The total habitat distribution increased for all species, with the exception of chum salmon. The decrease in chum distribution in Table 1 resulted from data providers changing chum distribution in the Siuslaw River from usetypes representing current distribution to “Previous/Historic”.

Previous efforts to relate distribution information with documented observations have shown that the distribution based on professional judgment is typically extended by documented observations (Brodeur, et. al., 1999, unpublished draft). The same held true during this project, in particular with resident species where existing documentation was limited prior to the start of the project. A comparison of the resident distribution miles in Table 1 with the miles of documented observations in **Appendix X** shows that many more miles of distribution exists than was reflected based on the judgment of the data contributors. This discrepancy can also be attributed to the fact that the majority of the documentation was collected after the distribution data were compiled. This discrepancy is further explained in the *Documentation* section below. This means the total value in Table 1 should be considered an underestimation of the available salmonid distribution.

Table 1: Summary of changes in 100K fish habitat distribution mileage in the anadromous zone of Oregon, by species and run (excludes Absence and Historic distribution mileage collected during the 24K Project). [a]

Species/Runs [b]	Pre-24K Project 100K Distribution (miles) [c]	100K Distribution changes during the 24K Project (miles)	Post-24K Project 100K Distribution (miles)
Brook Trout [d]	0	54	54
Bull Trout	1,711	156	1,867
Chum	546	-68	478
Coastal Cutthroat Trout [d, e]	0	447	447
Coho	10,027	14	10,041
Fall Chinook	4,627	142	4,769
Hybridized Resident Rainbow and Cutthroat Trout [d]	0	68	68
Lamprey [d]	0	7	7
Resident O. mykiss (Rainbow and Redband trout) [d]	0	1,386	1,386
Spring Chinook	4,930	406	5,336
Summer Steelhead	9,000	542	9,542
Winter Steelhead	11,498	591	12,089
Totals: [f, g]	42,339	3,745	46,084

[a] *Results should be considered an underestimation of the total available salmonid habitat distribution in the anadromous zone of Oregon due to the lack of comprehensive resident distribution information.*

[b] *Resident species distribution miles are summarized for current anadromous zone only.*

[c] *Pre-project miles are based on distribution data as of April 6, 2001.*

[d] *Resident species information in most areas was captured on a limited basis.*

[e] *Limited to the Scott Canyon forthfield hydrologic unit.*

[f] *Totals exclude distribution mileage categorized as Absent, Disputed, Historic, and Unknown that were collected during the 24K Project.*

[g] *Includes miles that may be counted more than once due to overlapping use by multiple species and runs.*

Significant edits were also made to habitat usetype information for each species and run (Table 2). The data in Tables 1 and 2 primarily reflect changes and additions for the six major anadromous species/runs (chum, coho, spring and fall chinook, summer and winter steelhead), targeted resident species (rainbow trout, redband trout, brook trout, and hybridized rainbow trout), and searun, resident, and mixed searun/resident forms of cutthroat trout (primarily in the Scott Canyon HUC). **Appendix XI-a** summarizes 100K fish habitat distribution miles by HUC, by species and run.

Table 2: Summary of changes in 100K fish habitat distribution by usetypes in the anadromous zone of Oregon.[1]

Usetype	100K Distribution pre-24K Project (miles)	100K Distribution Added During 24K Project (miles)	Total Existing 100K Distribution (miles)
Spawning and Rearing	28,690	798	29,488
Rearing and Migration	8,097	2,183	10,280
Migration	5,552	-1,435	4,117
Previous / Historic	507	1,379	1,885
Present - Usetype mixed or unknown	0	2,017	2,017
Absent	0	2,449	2,449
Unknown	0	6	6
Disputed	0	301	301
Outlier	0	198	198
Totals:	42,846	7,895	50,739

Table 2 reflects a net gain in mileage for all usetypes except Migration. The loss in Migration miles from 5,552 miles prior to the 24K Project to 4,117 miles after the completion of the 24K Project is likely attributed to more careful and consistent application of the Spawning and Rearing, and Rearing and Migration usetype definitions by the data contributors, but this is speculation based primarily on anecdotal feedback from the field data compilation crews. Most of the pre-existing Migration distribution was reassigned to one of these two usetypes, especially in the Upper and Mid Willamette River HUCs for coho, winter steelhead, and spring chinook, the Yamhill River HUC for coho and winter steelhead, the Lower John Day River HUC for spring chinook, and the Lower Rogue River HUC for summer steelhead. Additionally, the inclusion of mixed searun and resident cutthroat trout increased both the Spawning and Rearing, and Rearing and Migration categories by a total of 211.9 miles (**Appendix XII-a**).

Several usetype categories listed in Table 2 were added during the 24K Project to describe additional habitat uses that had been labeled differently in the past, or were left unrepresented in the dataset. These usetypes include “Present”, “Outlier”, “Historic/Previous”, “Absent”, “Unknown”, and “Disputed” (refer to the *Usetype Category* section on page 12 of this report for full descriptions of each usetype). Four of these categories represent something other than current habitat distribution (i.e. Historic/Previous, Absent, Unknown, and Disputed), and are therefore discussed separately in this section.

[1] Refer to **Appendix XII-a** to view summary tables showing 100K fish habitat distribution usetypes by species and run.

The "Present – usetype mixed or unknown" category was adopted during the 24K Project to allow data contributors to add presence distribution in places where they were unsure of how a species was using a particular area, or where other usetype definitions did not appropriately fit. Both conditions contributed to the use of this category. Present usetype distribution totaled 2,017 miles within the anadromous zone for both anadromous and resident species (**Appendix XII-a**).

The "Outlier" usetype was created after the development of the 24K Project procedures manual (ODFW, 2001) and also after most data collection had occurred. This usetype was added to resolve a number of disputes that were occurring as a result of routine observations of species in an area, but the observed fish were not thought to be at a sufficient level to support or sustain a viable population, possibly due to unsuitable habitat. The Outlier usetype was only applied to observations of the adult life-stage. As a result, the Outlier usetype accounted for only 198 miles of distribution and was applied to coho in the Chetco HUC, coho in Lobster Creek (and associated tributaries) in the Lower Rogue River HUC, and to summer steelhead in Drift Creek (and associated tributaries) in the Siletz River HUC. It is recognized that a process whereby repeated Outlier observations may ultimately be considered as part of the regular fish habitat distribution needs to be developed.

As was mentioned in the *Fish Habitat Distribution* data description (page 11), one set of usetypes was used for both anadromous and resident species. This occurred because a guiding decision was made during the pre-project workshop to align as many of the terms and definitions as possible with ongoing fish management and recovery efforts (e.g. NOAA Fisheries and US Fish and Wildlife Service species recovery planning, ODFW's Native Fish Conservation Policy, etc.) in order to achieve a greater level of consistency and universal agreement. Unfortunately, the timing of such efforts did not coincide with the schedule of this effort, consequently terms and definitions were not aligned with other efforts. In most cases, this did not appear to hamper, or influence the data providers' ability to provide resident distribution information. However, the result is some life-history strategies that are unique to resident salmonids are not reflected in the fish habitat distribution usetypes. Data users should keep this in mind when using the resident distribution data.

In addition to data being represented by usetype, undocumented fish distribution information, which is based on professional judgment, was further categorized according to the data contributor's degree of certainty that a species was present in a given area (Table 3). Refer to the *Data quality rating* section of this report on page 13 for a full description of the data confidence categories. Occasionally, data providers erroneously used the confidence rating field to describe their confidence in habitat usetype rather than presence. Unfortunately, field data compilers were often unable to discern and track these instances; therefore these data records are not distinguished or separated from records where the confidence rating was applied correctly.

Table 3: Summary of changes in data contributor confidence ratings summarized as miles of 100K fish habitat distribution [2]

Confidence Category	100K Distribution Confidence Ratings pre- 24K Project	100K Distribution Confidence Ratings post- 24K Project	Changes to 100K Confidence Ratings
Documented [a,b]	696	1,957	1,261
Present based on Undocumented Observation (PUO)	6,061	15,881	9,820
Present based on Strong Professional Opinion (PSO)	7,664	10,002	2,338
Present based on Modest Professional Opinion (PMO)	1,696	22,899	21,203
Unspecified	26,729	0 [c]	-26,729
Totals:	42,846	50,739	7,893

[a] *Most documented observation data have not been built into the distribution datasets due to issues with the way in which observation data are managed and the implications for how it would impact the management of the distribution data.*

[b] *Only includes those documentation records that span the full extent of a single distribution usetype section.*

[c] *All habitat distribution records with unspecified confidence ratings at the conclusion of the 24K Project were assigned to the lowest level that demonstrated some level of confidence, PMO.*

Confidence ratings were also not captured comprehensively for all newly added 100K habitat distribution. In some cases this was because data providers were confident they could provide qualified documentation but ultimately were unable to. In other cases, data providers assumed that this information was already contained in the dataset from previous distribution development efforts. A third reason can be attributed to a gap on data compilation procedure. Data compiler crews were not specifically instructed to ask for confidence/quality ratings for pre-existing habitat distribution that remained unchanged during the 24K Project. This is the reason why the post-24K Project value in the "unspecified" row in Table 3 is zero. Regardless of the cause, it made intuitive sense to believe that at least some level confidence existed if distribution information was provided at all. Based on this premise, all distribution records without a quality rating was populated with the lowest confidence rating, Present based on Moderate Professional Opinion (PMO). This approach was consistently adhered to, even if an upstream record had a higher confidence rating. We considered going back and asking for confidence rating for each individual record, but the project timeline did not afford us the opportunity. For this reason, it is advised that data users consider examining upstream confidence ratings when analyzing the potential for fish presence. This is particularly true when examining anadromous distribution

[2] Refer to **Appendix XIII** to view tables showing data contributor confidence in undocumented fish habitat distribution usetypes by species and run.

where it is known that the fish had to pass through the lower sections of a waterbody to get to an upstream section. See Table 11 below for a complete summary of documented observation records collected during the 24K Project.

24K Distribution

Prior to the commencement of the 24K Project, data contributors and data users expressed the need for spatial fish distribution data beyond what had been captured at the 100K scale. One concern that is consistently expressed is the 100K digital hydrography dataset is not adequate to capture information on smaller streams used by salmon and steelhead, especially for spawning and rearing purposes. Because a comprehensive 24K digital hydrography dataset did not exist for Oregon[3] prior to or during the project, 24K fish distribution data were collected as points rather than in a linear format. Once the 24K digital hydrography dataset becomes available, the 24K Project distribution points need to be converted to a linear format, similar to the 100K fish distribution information. It's important that this conversion be done for all the 24K data using a consistent approach (see *Project Challenges and Recommendations*). The total mileage of fish distribution on 1:24,000 scale streams during the 24K Project will remain undetermined until the 24K hydrography digital dataset, and the conversion of the 24K point data are completed.

A total of 1,921 24K fish distribution points were collected during the 24K Project for anadromous and resident species (Table 4). The prevailing opinion prior to the start of the 24K Project was that a great deal of untapped distribution information existed for 24K streams. The results of the 24K project suggest that less information was available than was initially believed. This appears to be the case because extensive 24K survey information did not exist across large portions of the project area. In areas where extensive surveys on 24K streams had occurred, a substantial amount of 24K distribution was added. If this relationship is consistent across areas with equivalent stream densities and access, it is appropriate to assume that more 24K distribution data would have been added had there been more 24K survey information available. The 24K fish distribution habitat as currently mapped likely underestimates the amount of actual distribution.

The differences in 24K point density across the target area (Figure 5) could be attributed to one, or more factors including, the differences in 24K stream density between western and eastern Oregon. However, an examination of the 24K points in western Oregon also illustrates the disparity in sampling intensity and/or knowledge of habitat distribution in smaller Oregon streams. Within western Oregon, very little 24K information was available east of the Coastal mountain range based on the results of this effort. The greatest density of 24K points east of the coastal mountain range exists in the Scott Canyon HUC where cutthroat distribution was targeted. The Willamette drainage was also surprisingly low given the intensity with which the Willamette is studied by various state, federal, and local agencies, along with the number of educational institutions located there. By far, the greatest concentrations of 24K points were in the mid- and mid-south coastal areas. Mid-coast Rapid Bio-Assessment 24K survey information

[3] Details and information on the progress of the cooperative development of the 1:24,000 scale digital hydrography dataset for Oregon can be found at http://www.or.blm.gov/gis/projects/water_resources/index.asp.

(Bio Surveys, 1998 and 1999) was inadvertently omitted from the distribution maps prior to them being reviewed by data contributors, however this information is not geographically extensive. This information will increase the already high concentration of 24K data in the mid-coast area that was added during 24K Project. It will be incorporated by December 2003. A summary of 24K points by HUC and by species and run is located in **Appendix XI-b**.

Table 4: Summary of 24K fish distribution points in the anadromous zone of Oregon, by species and run (includes Absence distribution points collected during the 24K Project). [a]

Species/Runs [b]	24K distribution points added during the 24K Project.
Bull Trout [c]	14
Brook Trout [c]	7
Chum	4
Coastal Cutthroat Trout [c, d]	73
Coho	737
Fall Chinook	44
Hybridized resident rainbow and cutthroat trout [c]	9
Lamprey	0
Resident O. mykiss (Rainbow and Redband trout) [c]	50
Spring Chinook	62
Summer Steelhead	179
Winter Steelhead	734
Westslope Cutthroat	8
Total	1,921

[a] *Results should be considered an underestimation of the total available salmonid habitat distribution in the anadromous zone of Oregon due to the lack of comprehensive resident distribution information.*

[b] *Resident species distribution miles are summarized for current anadromous zone only.*

[c] *Resident species information in most areas was captured on a limited basis.*

[d] *Limited to the Scott Canyon forthfield hydrologic unit.*

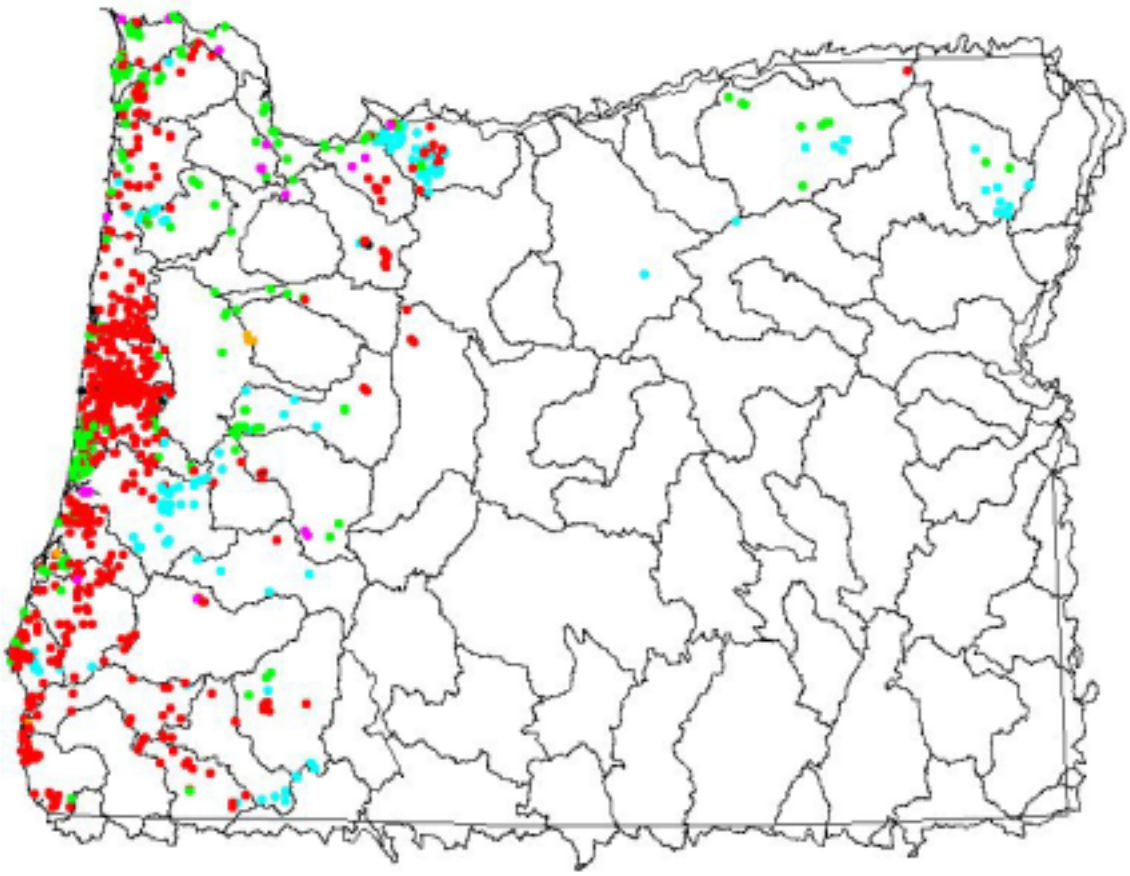

Figure 5. 24K fish habitat distribution points in the anadromous zone of Oregon for all species targeted during the 24K Project.

The disparity in the number of points between species is as much a reflection of available information, as it is an indication of which species inhabit smaller Oregon streams. Coho and Winter Steelhead 24K points made up the majority of the data in coastal basins (**Appendix XII-b**). However, the amount of information for resident species, which are known to inhabit smaller Oregon streams, was relatively low. It appears that information for resident species at the 24K scale is somewhat limited compared to anadromous species.

The same habitat usetypes used for the 100K distribution data collection were used to describe the 24K data (Table 5). Clearly, the majority of 24K habitat targeted during this project is used for spawning and rearing purposes. This would be expected in this dataset given the majority of 24K information is for coho and winter steelhead, which tend to spawn in smaller streams. A summary of 24K fish habitat distribution by usetype by species and run is provided in **Appendix XII-b**.

Table 5: Summary of 24K fish distribution points by habitat usetype in the anadromous zone.[4]

Usetype	24K distribution points added during the 24K Project.
Spawning and Rearing	1,254
Rearing and Migration	343
Migration	10
Previous / Historic	77
Present - Usetype mixed or unknown	185
Absent	33
Unknown	0
Disputed	19
Outlier – successful reproduction is questionable	0
Totals:	1,921

Present based on Undocumented Observation (PUO) represented the most prevalent quality rating for 24K point data, with Present based on Modest Professional Opinion (PMO) relatively close behind (Table 6). The high number of PMO points can again be attributed to our protocol of assigning the lowest confidence rating to records where the data contributor provided no confidence rating. There were no 24K points that were categorized as 'Documented' (Table 6). It is likely that some of the 24K points in the PUO category are documented, but the work to compare the 24K distribution with the information in the Documentation database has not yet been done. It is possible to have a 24K distribution record with a quality criteria rating other than "Documented", even when it is based on a direct observation. In accordance with our established definition of "Documented", the documentation information must span the full extent of the distribution record to qualify as "Documented" (see the *Quality Criteria* portion of the *Methods* section). Complete summaries of 100K fish habitat distribution miles and 24K distribution points by confidence rating by species and run is provided in **Appendix XIII-a** and **Appendix XIII-b**, respectively.

Previous/Historic, Absence, Unknown, and Disputed Distribution Usetypes

A total of 1,379 miles were added to the Previous/Historic category, mostly above large dams and reservoirs (Table 2). Data contributors often expressed that they did not have enough information to adequately describe the extent of previous/historic distribution above large barriers. Also, substantial areas of historic distribution were not delineated because they fell outside of the project area (Upper Deschutes, Upper Snake, etc.). Therefore, it is likely that the mileage reflected for this category has been underestimated, and should not be considered comprehensive for the Oregon anadromous zone.

[4] Refer to **Appendix XII-b** to view summary tables showing 24K fish habitat distribution usetypes by species and run.

Table 6: Summary of 24K points by data contributor confidence ratings for 24K fish habitat distribution.

Confidence Rating	Number of 24K Points
Present based on Undocumented Observation (PUO)	837 [a]
Present based on Strong Professional Opinion (PSO)	328
Present based on Modest Professional Opinion (PMO)	756
Documented (DOC)	0 [a]
Total	**1,921**

[a] *It is likely that some of the points in the PUO category are documented, but the work to compare the 24K distribution with the information in the Documentation database has not yet been done.*

Like Historic distribution, Absence distribution information was collected peripherally to presence, and should not be considered comprehensive for any species/run in the anadromous zone. A total of 2,448 miles of absence distribution were added during the 24K Project (Table 2). All data providers were given the opportunity to denote fish habitat 'absence', but only a few, primarily in the North Coast area (in and near the headwater areas of 100K streams) and in the Scott Canyon HUC (for coastal cutthroat trout in the West Fork of the Hood River) chose to do so. Limited absence distribution was also added above known natural barriers throughout the anadromous zone. Generally, 'Absence' distribution was not added above non-historic, blocking barriers (e.g. culverts, diversions, debris jam s, etc.). Many contributors declined to label habitat above complete blockage barriers because they didn't want to negatively influence of the possibility of those barriers being breached in the future. However some contributors did opt to add 'Absence' distribution above natural historic barriers, such as Wah Gunn Gunn Falls in the Hood River hydrologic unit (HUC #17070105).

Data contributors were faced with several challenges to identify locations that fish can't access, and have not accessed since the European settlement (which is one of the criteria for designating fish habitat absence), including:

- Lack of historic distribution information. As with all the data that were provided, a fairly high degree of certainty was necessary for anyone to feel comfortable lending his or her name and credibility to this usetype.
- Time involved in designating all 'absence' habitat, coupled with an unwillingness to identify only a portion of the habitat.
- The perception that identifying habitat as 'absence' would reduce or eliminate existing or future habitat protection measures.
- The very real possibility that future studies or investigations would avoid areas that have been designated as 'absence'.

- Contributors were not comfortable with limiting habitat availability above an obstacle that has the potential for removal, alteration and/or improvement.
- The perception that information had little value to the management of Oregon's natural resources, and therefore not worth the time to provide, relative to other data types.

The Unknown usetype was used where data contributors were unsure of species presence, but were convinced that it was an area that needed to be surveyed to confirm presence. Although it is not reflected in the summary Table 1, all 100K streams that do not have fish habitat distribution mapped on them should be considered 'unknown.' This is an important consideration for data users to remember as they attempt to use the data for assessing potential fish presence or habitat distribution. Only four miles of 100K streams were actually labeled as Unknown with respect to fish habitat distribution throughout the duration of the 24K Project (Table 2).

The Disputed category accounted for 300 miles of distribution where the usetype category was unresolved between data contributors. Under the protocol of the 24K Project, the data contributor holds the responsibility to produce supporting documentation for species habitat use when disputes arise. The field data compilers attempted to resolve all disputes prior to submitting the quad-map pairs to the GIS staff according to the Dispute Resolution Decision Tree (**Appendix VI**). Notable disputed areas include tributaries in the Lower Rogue HUC for coho and both runs of steelhead, the East Fork of the Hood River for summer steelhead and spring chinook (Scott Canyon HUC), and the West Fork of the Hood River for winter steelhead (Scott Canyon HUC).

Species Origin and Present Production

Species origin (e.g. how a species came to be in a particular area) and Present Production (e.g. how a species or population is sustained) information is commonly used to examine changes in production of a population over time, or in allocation of resources that may be earmarked for native, natural, or hatchery populations. This information is also important in the application of the Endangered Species Act, in that it can be used to determine or establish applicability to a given population. The data types are different, in that they represent different periods of time, but because they were compiled in the same way, using the same geographic boundaries (Figure 4), they are discussed together here.

Since the Origin / Production data relate directly to particular species and runs as well as specific geographic areas of their distribution, a decision was made to manage this information in association with the fish habitat distribution data. As the provider of the distribution and origin / production data were often the same, the Reference information typically served the purpose of identifying the source data providers for both sets of information.

Following the completion of the data compilation portion of the project, we discovered that none of the present production categories were applicable to habitat that had been given the usetype. "Previous/Historic", which should be viewed as extirpated populations. Therefore, a new

Present Production type was created called “extirpated”. A legal definition of ‘extirpated’ was sought for ODFW and/or the State of Oregon, but nothing was found. ODFW was supposed to develop guidelines for determining that a population has become extinct under the Wild Fish Management Policy Oregon Administrative Rule 635-07-529, but those guidelines were not finalized when this need arose. As a result, the ‘extirpated’ category was added, and should be viewed as representing habitat with the “Previous/Historic” usetype.

Origin and Present Production information was successfully compiled for the target area of the project. Data providers designated over half of the 100K stream miles in the anadromous zone as having native origin, but mixed current production (Table 7), which was by far the largest single category combination. This shift through time likely reflects past management strategies that called for widespread distribution of hatchery juveniles, both within and between watersheds. Also, over 1,800 miles of historically native habitat was labeled as “extirpated”. This origin and present production combination reflects the fish habitat distribution that had been given the Previous/Historic usetype (**Appendix XII-a)**. Nearly a third of the extirpated habitat was for historic bull trout populations, followed by historic coho distribution as the most abundant ‘extirpated’ habitat. ‘Absence’ fish habitat distribution was automatically coded as “N/A, or not applicable for these data categories. Origin and Present Production information was not developed for 201.4 miles of redband fish habitat distribution miles (Table 7). This was because the redband information was derived primarily from Aquatic Inventory Project Fish Presence survey data (ODFW, 1999) that was incorporated in a separate, but related effort during the timeframe of the project, rather than through the established procedures of the 24K Project. However, because this information was developed concurrently with the project, and was based exclusively on recorded observations, the data are included in this report as part of the 24K Project.

Similar results were derived for 24K streams, which is expected given the scale (primarily fourthfield HUC) at which this data was collected. The combination of native origin and present production represents approximately 20% of the 100K habitat mileage and 24K points (it’s unknown how many miles each point represents). The greatest difference between 100K and 24K streams occurred where the origin was native, but current production is mixed (52% and 71%, respectively).

In the *Description of Data Captured by Field Data Compilers* section of this report, it was noted that the categories used to designate species origin and present production were crafted on an interim basis until final criteria could be agreed upon, but that final categories were never adopted during the course of the project. Continual efforts were made to develop criteria and definitions that all could be agreed upon, both prior to initiation of the project, and as the project moved forward. For the most part, the two areas that prevented agreement were inconsistencies in the use of terms within and between management agencies, and an inability to develop a finite list of categories to address the varied ways a population might have been established and/or is being maintained currently. Ultimately, the lack of finalized categories did not hamper our ability to capture this information, but the applicability and usability of this information as a tool within and between management agencies is questionable, at best. It is recommended that efforts to standardize this data category continue, with the goal of drafting categories that all Oregon Plan participants can agree to. Subsequent to this, efforts should be made to revise where

necessary, the current designations for fish habitat. Until that time, potential data users should review and consider carefully the definitions of each category, and should make a concerted effort to clearly document how these definitions are interpreted for their use.

Table 7: Summary of 100K fish habitat distribution stream miles for unique Origin and Present Production designations compiled during the 24K Project.

Origin	Present Production	100K Stream Miles
Native	Native	10,322.3
Native	Wild/Natural	3,933.7
Native	Mixed	26,097.2
Native	Extirpated	1,861.9
Native	Unknown	98.1
Non-native introduced	Wild/Natural	1,421.6
Non-native introduced	Mixed	223.3
Non-native introduced	Hatchery	931.9
Non-native introduced	Introduced	146.8
Non-native introduced	Extirpated	20.9
Non-native introduced	Unknown	4.3
Non-native reintroduced	Wild/Natural	55.9
Non-native reintroduced	Mixed	317.8
Non-native reintroduced	Hatchery	337.7
Non-native reintroduced	Extirpated	1.7
Unknown	Wild/Natural	362.9
Unknown	Extirpated	0.6
N/A	N/A	2,448.1 [a]
Unknown	Unknown	2,152.3
TOTAL		50,739.0

[a] *Represents 100K fish habitat distribution miles coded as 'Absence' usetype.*

Barriers

Eighty-one dams, and eight hundred and twenty-two other barriers were added to the Barrier and Dam Database during the 24K Project. Table 9 illustrates the contents of the barrier database prior to, and at the conclusion of the 24K Project, by barrier type. The majority of large and medium sized dams and many small dams had previously been incorporated into this database. We believe the dams represented in this database are relatively comprehensive, with the exception of small dams. Waterfalls were the most common barrier type added, followed by 'culverts'. A significant number of tidegates and hatchery-related barriers were also added during the project.

Table 8: Summary of 24K fish habitat distribution stream points for unique Origin and Present Production designations compiled during the 24K Project.

Origin	Present Production	Number of 24K Points
Native	Native	380
Native	Wild/Natural	44
Native	Mixed	1,301
Native	Extirpated	77
Native	Unknown	2
Non-native introduced	Wild/Natural	3
Non-native introduced	Mixed	9
Non-native introduced	Hatchery	14
Non-native introduced	Introduced	5
Non-native reintroduced	Wild/Natural	1
Non-native reintroduced	Mixed	4
Non-native reintroduced	Hatchery	5
NA	NA	33 [a]
Unknown	Wild/Natural	3
Unknown	Unknown	40
TOTAL		1,921

[a] Represents the 24K points that are coded as "Absent" usetype.

The number of culverts that resulted from this project is minimal relative to the number that are known to exist. State and county culverts that existed in ODFW's Culvert database were plotted onto the quadrangle map pairs, and presented to data providers for reference, but were not incorporated into the resulting 24K Project database in an effort to avoid duplication of information when the two datasets are merged. Other existing digital culvert datasets were not included on these maps, because:

- There were too many separate databases to acquire and integrate prior to hardcopy map production.
- The incompatibility that existed between agencies' databases could not be resolved within the scope of this project.
- There was an expectation that contributors would include their agency or entity's information directly on the mylar overlays.

It is clear that many more culverts would have been added had we been able to plot all existing information onto the initial maps. However, data provided onto the mylar overlays during the data compilation process were incorporated and are reflected in the summary Table 9.

Table 9: Summary of fish passage barrier and dam records added during the 24K Project.

Barrier Type	# of Barrier Records pre 24K Project	# of Barrier Records post 24K Project	Barrier records added during the 24K Project
Dam	1,229	1,310	81
Culvert	85	327	242
Insufficient Flow	4	8	4
Water Diversion	17	19	2
Hatchery-related	23	55	32
Falls	1,061	1,447	386
Cascades/Gradient/Velocity	150	242	92
Debris jam	7	21	14
Tidegate	4	39	35
Unknown	15	40	25
Totals:	2,595	3,508	913

The potential exists to automate the assimilation of other existing culvert databases into the database that resulted from this effort, if the issues listed above can be resolved. Plans are underway to incorporate the ODFW state and county culvert database into the barrier database that resulted from this project. Once completed, the possibility exists for merging culvert databases developed by the US Forest Service and Bureau of Land Management into this database thereby creating a more comprehensive database of culverts within Oregon. Until these other databases are incorporated, users should be aware that the barrier database resulting from the 24K Project primarily contains dams and natural obstructions with only a few culverts that were specifically identified by the data providers for incorporation into the Barrier database. It is unclear what proportion of existing impediment structures are contained in this dataset, and the only way to know precisely would be to conduct an extensive physical survey of all Oregon streams. This type of an effort is not currently being undertaken, and likely will not be in the near future. Therefore, no attempt is made here to estimate how complete this dataset is. All barriers and dams in the Barrier database at the conclusion of the 24K Project are illustrated in Figure 6.

As with the fish distribution information, barrier and dam digitization was accomplished using the Data Capture Tool with the USGS DRG images as a backdrop (see *Fish Habitat Distribution and Barrier Data Entry Procedures*). The 1:100,000 scale barrier and dam spatial data exist as point events (or electronic occurrences), which rely on two components to plot accurately on a map. Those components are:

1) the routed stream Longitude/Latitude identifier (LLID, a unique identification number assigned to each stream in the 1:100,000 scale hydrography), and
2) a route measure (the distance from the mouth of the stream).

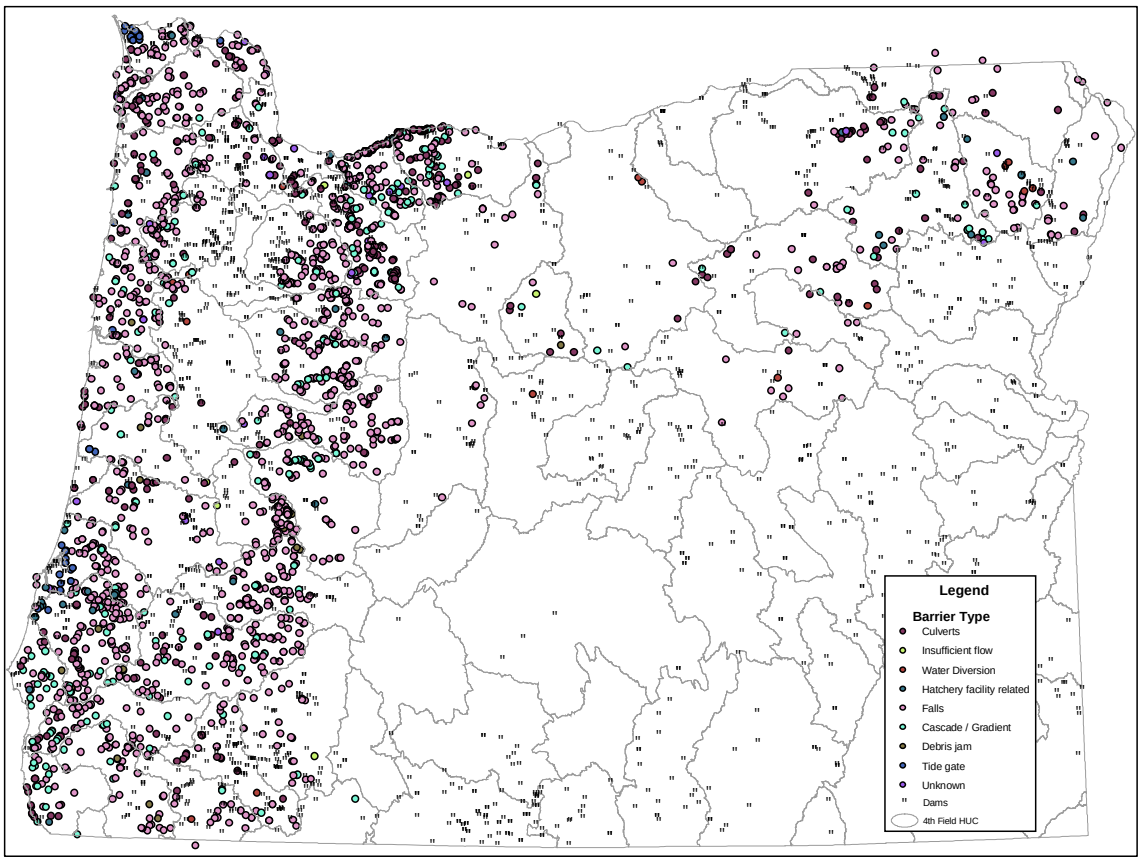

Figure 6. Barriers and dams on 1:100,000 and 1:24,000 scale streams in the ODFW Barrier database following the completion of the 1:24,000 Fish Habitat Distribution Development Project.

The 1:24,000 scale points were 'heads-up' digitized directly into a shapefile based on the location of the visible streams on the DRG image. The need exists to convert these 1:24,000 scale points into point events, with unique identifiers and route measures once the 24K hydrography is routed and approved for Oregon.

Fish passage information in relation to the barriers was also collected. Passage information describes whether a particular barrier constitutes a complete or partial blockage by species. For new barriers that were added, species-specific passage information was provided. However, many of the barriers and dams in the database have no blockage information. These are either pre-existing records where this information was not provided during the 24K Project, or they do not completely or partially block passage of any of the project target species. Artificial structures and natural formations that do not impede fish passage are maintained in the database because the focus to date has been on adult passage issues, and it is recognized that some of these may impact other life-stages. In some cases, the degree of blockage, if any, for the species

was not captured on the mylar overlays or within the associated notes. Also, there are still some cases where barrier location has not been finalized. Consequently, existing fish passage information should not be considered comprehensive for the entire Oregon anadromous zone.

Barriers that impact winter steelhead account for the greatest number of records in the passage component of the Barrier database; with most being complete barriers (Table 10). For all species combined, there are only slightly more partial barriers as there are barriers with blockage extent information listed as 'unknown'. This may be due to the subjectivity associated with assessing partial blockage. In some many cases, determining partial impedance would require direct observations and counts of fish below and above barrier structures. In other cases, it is a judgment decision as to whether a partial designation is appropriate. This will become even more complicated when the blockage extent at other life-stages is added to the database in the future. For this reason, when a structure was labeled as a 'partial' barrier, data providers were asked to provide an explanation. This information is maintained in the barrier dataset as a separate attribute (or data field).

Table 10. Summary of fish passage data in the Barrier and Dam Database at the conclusion of the 24K Project, by species and blockage extent.

Species/Run	Complete	Partial	Unknown	Total
Spring Chinook	75	2	13	90
Fall Chinook	73	11	13	97
Coho	299	35	31	365
Summer Steelhead	204	25	14	243
Winter Steelhead	412	46	26	484
Chum	5	1	3	9
Coastal Cutthroat	35	1	0	36
Rainbow	4	1	3	8
Total	1,107	122	103	1,332

All of the barriers and dams that were added or edited during the 24K Project were rectified regarding end of fish habitat distribution, if appropriate. However, if the pre-existing distribution was unchanged during the scope of the project, it was almost certain that the pre-existing barriers corresponding with that distribution were also unchanged. For this reason, some blocking barrier and dam measures may not exactly match the end of distribution for a particular species. Users should always consult the 'Comments' field and blockage extent information for the barrier or dam record in question, as well as the 'Comments' field for the corresponding distribution record to fully understand the relationship between the two data types.

At least one quality assurance effort has been performed on the barrier information since the conclusion of data collection for the 24K Project. This was done to resolve questions associated with dam locations and end of distribution. A visual quality assurance review was conducted

using ArcMap to compare dam locations with the upper limits of fish habitat distribution, and how this corresponded with our blockage extent by species (fish passage) data. Fish passage records were then updated where necessary based on this assessment. This review also identified 58 dams that will need to be reviewed further in terms of species-specific passage. Several potential adjustments to the fish habitat distribution data were also identified – these are mostly minor adjustments to ensure that distribution records that overlap or fall short of an impediment are properly mapped. In order to better understand those dams that have direct impacts on passage, we have added a new field to the Barrier and Dam database to flag off-channel dams. There is also a need to perform a similar quality check on fish passage barriers other than dams, but this effort was not accomplished before completion of the 24K Project. This effort will be more challenging because barriers other than dams are not typically denoted on DRG map images, and therefore may require field verification to ensure locational accuracy.

Life-stage Timing

Most of the primary data types targeted by this project are spatial in nature. However, identifying when fish are present is an important complement to knowing where fish habitat and barriers occur. Fish occurrence information by life-stage provides the temporal information that, when used in conjunction with fish habitat distribution, informs the establishment of temperature standards, time periods that a target species might be observed for scientific study, when a species might be avoided while performing activities that may be hazardous to the fish or habitat, or aids in a number of other uses. A specific application of this type of information can be found in DEQ's development of water quality temperature standards in the Hood River basin (ODEQ, 2000). DEQ's need to develop temperature standards throughout Oregon provided the impetus and financial support for capturing life-stage timing information at a finer resolution than was originally planned during the 24K Project. As a result, life-stage timing information was compiled for 210 independent timing units (Figure 7), rather than 49 fourthfield HUCs in the anadromous zone, as was originally planned.

The original project procedure called for capturing timing information in a database format. However, time constraints brought on by DEQ's need to make progress on developing statewide temperature criteria necessitated capturing data in a spreadsheet format, which is shown in Figure 2, rather than waiting until the database structure (called the *Timing Trakker*) was completed. The database structure was developed and completed while the timing data was being collected in spreadsheet format. Ultimately, the data was transferred into the database near the conclusion of the timing component of the project, in March 2003. Because the Timing Trakker was designed primary to capture, manage, and edit timing information, but not as a data distribution tool, the database outputs the final timing data back into spreadsheet format for distribution purposes.

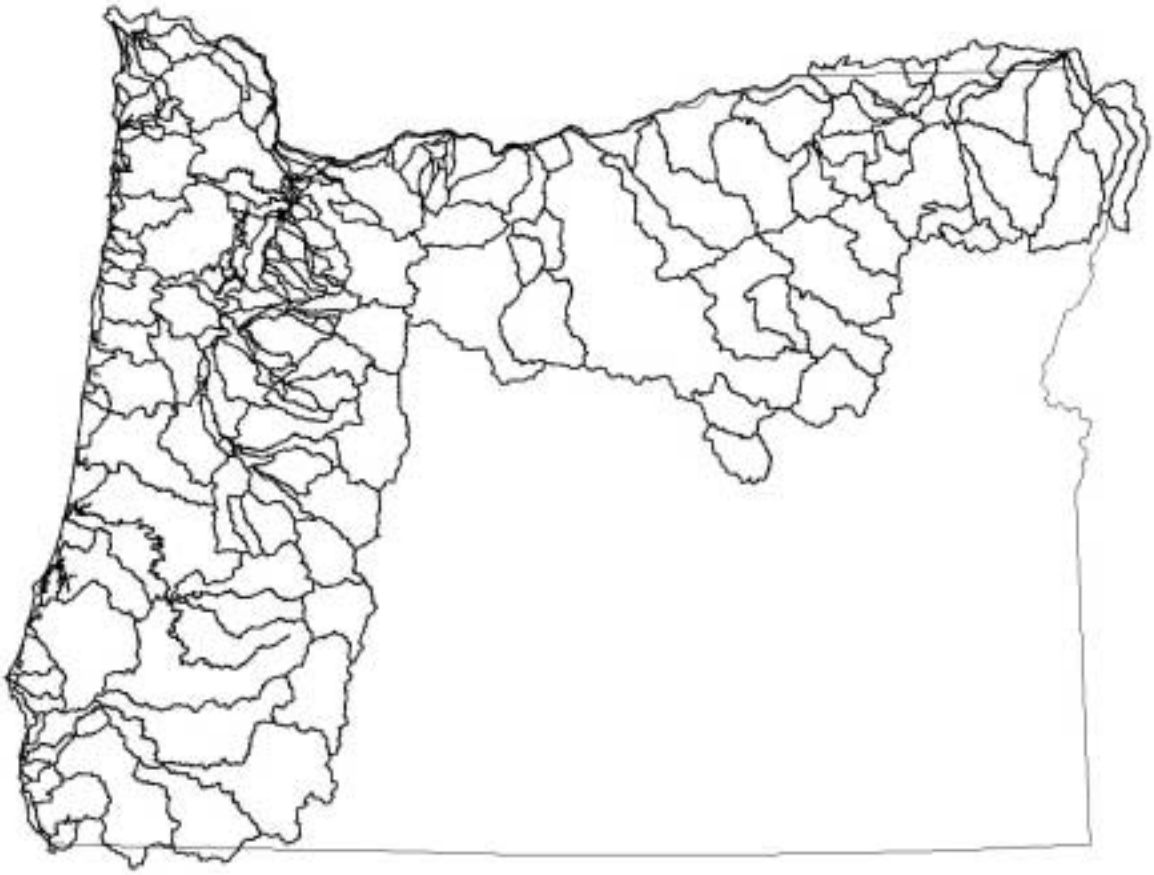

Figure 7. Map depicting life-stage timing units developed during the 24K Project.

Data collection procedures called for data compilers to work with data contributors during in-person interviews following the review of fish habitat distribution maps. However, after spending what amounted to many hours pouring over numerous maps, most data contributors expressed a preference for working independently, outside of the distribution gathering meetings. Data providers also felt that spreadsheets pre-populated with timing information based on the inverse of Oregon's in-water timing guidelines (ODFW, 2000), which is described above in the *Methods* section, was usually not helpful to the completion of the spreadsheets. As a result, blank spreadsheets were left with or delivered via email to ODFW Fish District Biologist for initial population. These blank spreadsheets were packaged with written instructions and definitions on how to complete the spreadsheets (**Appendix V**), as well as the pre-populated spreadsheets, just in case they were of some use. Once the spreadsheets were populated by ODFW District staff, they were returned to the project Data Compilers for redistribution to other geographically appropriate entities such as those listed in **Appendix IV,** for review and data input. These changes in protocol unfortunately led to a number of data quality issues that didn't become apparent until the data were transferred into a database format:

1. **Inconsistent application:** All data providers were given the opportunity to denote peak and lesser use designations for life-stage timing data but this information was not always

provided. Also, the phrases "Likely No Use", "Not Applicable", and "None Observed" were often used interchangeably or the information was left off entirely.

2. **Limited documentation:** Very little documentation information was provided to support the professional judgment information that was provided. It was fairly consistent with all data categories, not just timing information, that documentation was not provided unless data compilers specifically requested copies of data that was mentioned or referred to during data compilation meetings. Most of the life-stage timing documentation that was obtained was captured prior to distributing the timing spreadsheets to the data providers.
3. **Incomplete review:** In many instances, the data was returned by initial contributors late in the project, which led to data tables not being reviewed by other data providers.
4. **Inconsistent review:** In many instances, potential data providers opted to defer to the information provided by ODFW biologists. These deferrals were not consistently recorded, making it difficult to say exactly who was contacted regarding timing information.
5. **Data Gaps:** Polygons delineating the timing units were developed based on text descriptions written mostly by the data providers. However, some areas were not included within the descriptions.
6. **Relative abundance:** At the start of the project, DEQ requested this information be included "if time permitted", but this information was not provided by any of the data providers.

The original timing unit boundaries were developed and delineated based on text descriptions in ODFW's In-Water Timing Guidelines (ODFW, 2000), augmented by modifications provided by the data providers. Unfortunately, these descriptions, when mapped as timing units polygons had apparent gaps, meaning timing information for some (mostly small) areas was not provided during the project. Therefore, the unit boundaries had to be re-reviewed by the data providers, and additional data had to be sought after the 'official' conclusion of the 24K Project.

A limited number of life-stage timing spreadsheets that resulted from the 24K Project were originally posted on the web in April 2003, but were quickly removed following the discovery of the issues described above. However, electronic copies of the spreadsheets were provided to DEQ, along with a notice of these deficiencies, so the information could be appropriately used during their Revision of Water Quality Criteria for Temperature process, which was brought about by the court case NWEA v EPA (March 2003). As a result of these issues, and to ensure a more accurate response to the directives of the court case, DEQ hired a person to perform quality checks on the timing information in all 210 units. It is anticipated that final life-stage timing information will be made available via the web as they are finalized. The complete set should be available by January 2004. Therefore the results provided in this report should be viewed as preliminary.

Users should understand that the scale of the timing information compiled during this effort cannot definitively be used to determine the exact timing in individual streams or segments of streams within a timing unit. For a particular stream, a life-stage will be exhibited during at least a portion of the time period that is specified, but may not occur throughout the entire time period specified. For site-specific applications, the timing information should be used in conjunction with the distribution data. The timing of certain life-stages coincides with particular distribution use-types. When using the Timing Unit dataset to correlate the life stage timing tables with the

salmonid distribution data, we recommend the following crosswalk between distribution usetypes and life stages:

Life Stage	:	Usetype(s)
Upstream Adult Migration	:	Rearing and Migration and also Migration
Adult Holding	:	Rearing and Migration and also Migration
Adult Spawning	:	Spawning and Rearing
Egg Incubation through Fry Emergence	:	Spawning and Rearing
Juvenile Rearing	:	Spawning and Rearing, and Rearing and Migration
Downstream Juvenile Migration	:	Rearing and Migration and also Migration

Users of this data should also be aware that any or all life stages may occur where the Distribution Usetype has been designated as Present (usetype mixed or unknown) or Outlier. The suggested crosswalk should be used for general guidance only since the correlation between the life stages and the distribution usetypes is not exact. For example, some "Adult Holding" may occur in areas that are mapped with the Usetype of "Spawning and Rearing".

Documentation

A number of different data types (distribution, barriers, life-stage timing, origin, and present production), which are primarily based on professional judgment were targeted during the 24K Project. Written information that supports or confirms these data types can lend greater credibility and usability to the resulting datasets. In general terms a substantial amount of documentation was collected that supports distribution data. Documentation supporting barrier and timing data was collected on a much more limited basis. Origin and present production data remain undocumented. These results are further discussed by data type in this section.

Although this effort resulted in the compilation of a substantial number of documents, which verify fish habitat distribution, barriers and timing, much remains to be collected and compiled. The incorporation of additional documents, electronic datasets and survey data that was collected after the 24K Project will serve to build upon what has been collected to date. However, previous efforts indicate that, as the percentage of documented distribution increases, it becomes progressively more difficult to find data sources that verify distribution for areas that are not already documented (Brodeur, et al, 1999, unpublished draft). This concept likely holds true for all the data types targeted by this effort.

Specific documentation criteria were only finalized for distribution and barrier data. Criteria for documentation related to timing, origin or present production data remained in preliminary form throughout the project. Identifying documentation for timing, origin, and present production information had not been previously attempted by ODFW. This led an underestimation of the time needed to evaluate the preliminary criteria that had been proposed during the pre-project workshop, against existing literature. Specific issues and questions concerning the finalization of the documentation criteria for these data types remain, and are outlined below.

Hard-copy documents that were collected and recorded in the Reference database as documentation have been submitted to the StreamNet Library, and can be made available through Library procedures. A total of 195 documents were obtained and referenced as documentation during this project. These documents may contain additional information for species not targeted during the 24K Project, and need to be reviewed with this in mind.

The GIS locations of documented observations may vary from their "on the ground" locations. The primary reason is that the measure system built into the digital streams data differs from real, "on the ground" measures derived from field data collection. Most of the documented observation records that were collected during this project were derived from written reports that describe stream surveys where fish were observed. These descriptions typically include the stream name and also the starting point and ending point of the survey in a river mile measure. These measure values can be derived from 1:24,000 scale quad maps in some cases and in other cases by actual measurements taken along the stream.

In contrast, the 1:100,000 scale streams data used as a template to attach this information, has a built in set of measures that represent the actual digital line (or linework). This linework, and thus its corresponding measure, is more generalized and less sinuous than streams that are represented on 1:24,000 scale maps. Consequently, deriving a set of river mile measures from a report and applying them to the 1:100,000 scale stream network can result in mapping the surveyed stream segment, further upstream than where the actual observation occurred. This problem is most pronounced in streams of significant length and also in streams that are highly sinuous. As an example: a spawning survey on a highly sinuous stream that begins at the mouth and proceeds upstream 1 mile to the 'X' tributary, may be displayed as a 1 mile documentation record that extends beyond 'X' tributary because 1 mile of the linework does not accurately reflect 1 mile on the actual stream.

For cases where documented observations extend upstream of the distribution data, we have chosen not to extend the distribution data to the observation location due to the issue described above. We conducted a preliminary review of this problem during the project, and found that each of these situations needs to be reviewed on a case-by-case basis in order to reconcile the discrepancies that exist between the documented observations and the fish habitat distribution data.

Documentation of Fish Habitat Distribution:

For distribution data, it is possible to document two components of the data: fish presence and fish use of the habitat (referred to as 'usetype' in the report). For the purposes of the 24K Project, the decision was made to only target documentation related to fish presence. This was done because:

1) presence must first be established before use can be determined, and
2) previous reviews of written information suggested that only rarely did documents contain the necessary information to clearly determine what the fish observed were doing.

Three types of documentation (Observation and Site Specific, Site Specific, and Non-Site Specific) were obtained for fish habitat distribution, as described in the *Description of Data Captured by Field Data Compilers* section of this report. These types describe the specificity of the information provided. The results presented here are categorized by documentation type. Data users should consider carefully the documentation type when using this information to confirm fish presence. For some uses, knowing the specific location of individual fish may be required, whereas for other uses, it may only be necessary to know that fish are confirmed present somewhere within a stream.

One task that was identified during the pre-project workshop was to assign a quality rating to each reference document related to fish habitat distribution, based on an established matrix (see *the 24K Procedures Manual, page 14*). However, once the project started, we chose not to collect this information. Extensive review of each document was required in order to determine if a rating could be assigned. Additionally, a great majority of the documents gathered lacked the necessary information to assign a rating. The decision was made that time would be better spent obtaining more documentation than rating the documentation available. Data users who believe this kind of information would be important to determining the usability of this dataset are encouraged to obtain a copy of the document and conduct an independent review, possibly using the matrix contained in the 24K Procedures Manual (ODFW, 2001).

Numerous users of the Distribution and Documentation data have expressed confusion over the fact that these datasets are maintained separately. When users look to the quality criteria field within the distribution data, they expect that this attribute will provide a comprehensive measure of the data quality. Given the way the data are currently managed it is not possible to get a comprehensive picture of the data quality from the distribution dataset alone. The user must refer to the Documentation dataset in addition to the Distribution dataset in order to understand all of the reaches in which a particular species has been directly observed. These datasets have been maintained separately primarily due to the complex issues related to managing an integrated dataset.

Our current data management protocol requires that a documented observation record completely encompass a pre-existing distribution record for it to be assigned a quality criteria value of "documented". If a documented observation record only partially overlaps a distribution record then the quality criteria rating for that distribution record remains at the rating that was assigned by the area biologist. Additionally, the existence of an upstream documented observation (for anadromous species) does not change the quality criteria rating for any downstream distribution records. Both of these very common scenarios give a false impression that the data quality is often lower than it actuality is.

Consequently, we are considering a partial integration of the two datasets. If this is done, documented observation data would continue to be maintained separately, but a fifth quality criteria category would be created within the distribution data. That category would be specifically for anadromous species and would identify areas that are "downstream of documented observations". This will, in effect enable the data user to get a more comprehensive understanding of the data quality related to anadromous distribution data. Specific issues related

to the "uppermost" documented observations and how to best integrate them with the distribution data will need to be addressed. Depending upon the nature of those observations (e.g. documentation extent) and their overlap with distribution records, the new quality criteria category of "downstream of observation" will likely be applied beginning at different locations. For example, site and observation specific documentation proves presence throughout a particular reach, while site-specific documentation only proves presence "somewhere" within a particular reach. Distribution data extending to the upstream limit of a 'site and observation specific' documentation record will be considered for this new quality criteria category, while only distribution data that extends to the downstream end of a site specific documentation record would be considered.

Documentation of 100K Fish Habitat Distribution:

Overall, 9,702.5 fish habitat distribution miles were documented as a result of this effort (Table 11). This amount more than doubles the amount that existed prior to the 24K project. As a result, nearly 32% of the 50,739 miles of 100K fish habitat distribution is supported and confirmed by some level of documentation, compared to the 13% documentation rate that existed prior to this effort. The success rate achieved during this effort also far exceeded the results of similar localized pilot documentation efforts that were conducted in the past, which resulted in less than 15% documentation (Brodeur, 1999, unpublished draft).

Table 11: Summary of documented observation data compiled during the 24K Project for 100K streams, in miles, by documentation type.

Documentation Type	Pre-24K Project documented 100K stream miles	Documented 100K stream miles added during the 24K Project	Post-24K Project documented 100K stream miles
Site and Observation Specific	915.4	6,368.8	7,284.2
Site Specific Only	5629.0	3,037.6	8,666.6
Non Site-Specific	114.0	296.1	410.1
Totals:	6,658.4	9,702.5	16,360.9

Prior to this effort, the vast majority of the documentation was comprised of "Site Specific" information. However, 24K Project Data Compilers were able to obtain significantly more "Observation and Site Specific" information than existed previously, and twice the amount when compared to the "Site Specific" information that was captured. This result, along with the relatively low amount of "Non-site Specific" documentation that was obtained, may reflect the priority that was placed on locating high-quality documentation, or maybe it reflects the completeness of the information outside of the areas targeted in past efforts. Over 3000 miles of "Site Specific" documentation was also compiled during the project.

It was noted previously in the 100K Fish Habitat Distribution results section that there was a wide discrepancy between the amount of fish habitat distribution data that was added for resident species, and the amount of documentation that was obtained. This occurred because the majority of the documentation was input into the database after the distribution data was digitized off the mylar overlays. As was mentioned previously, fish habitat distribution was not automatically extended to documented observations that occurred outside existing distribution. The effort to reconcile both anadromous and resident distributions with documented observations remains to be completed. For this reason, users are advised to review both datasets in order to get a complete assessment of the presumed and observed fish habitat distribution.

Documentation of 24K Fish Habitat Distribution:

For a variety of reasons, none of the 1,921 24K fish habitat distribution points were categorized as documented. However, documented observations were entered into the Documentation database that could not be associated with the 1:100,000 scale streams layer. At least some of these records apply to streams that fall outside of the 100K stream layer. Unfortunately, no mechanism was built into the database to specifically flag documentation records as representing 24K streams. It's possible that these observation records in the database would qualify as species-specific documented observations, but this analysis did not occur during the 24K Project.

Other issues that contributed to this result include:

1) data compiler crews were not able to locate very many documents that addressed streams at this scale. It's unclear if this was because of the difficulty of associating documented observations with 24K streams, or because the documents didn't exist;
2) most documents that did address 24K streams lacked the information necessary to qualify as documentation, based on the criteria laid out for this project; and
3) Due to the issues related to reconciling digital datasets (consistency of coding, completeness, data quality, etc.), several known digital datasets that contain observations in 24K streams were not incorporated. This has been identified as a task that ODFW will do to enhance this dataset.

Documentation of Barriers:

As is the case with fish habitat distribution, many aspects of the barrier database could have been targeted for documentation, including the location, blockage type, height, etc. The original intent was to identify "written information describing the extent, location, and/or description of a barrier to upstream migration." Therefore, for the purposes of the 24K Project, confirmation of an impediment problem and the extent of that impediment were considered to be enough information to qualify as documentation for a barrier. However, during the project, data compilers found that most barriers referenced in written documents, did not adequately identify the species or extent of impact by the impediment. Based on this fact, the protocol was modified to allow documented barriers in the database to be confirmed either through a written document, or the barrier could be referenced to a data provider who identified and/or confirmed the

existence of the impediment. As a result, only 15 barriers and 12 dams remain without a documented reference, out of 3,508 barriers and dams currently maintained within the dataset following this effort. This high success rate was undoubtedly due in large part to the relatively lenient criteria for barrier documentation as compared to the fish habitat distribution documentation criteria. Future fieldwork should be done to confirm the existence, and blockage extent by species/run (if possible) of each of the barriers that are referenced to a data provider. This work should also include the precise location of the barrier, and a photograph so other data users can examine the blockage type visually.

Documentation of Life-stage Timing:

Life-stage timing is another data type where any number of pieces of information can be targeted for documentation. "Written information describing the life stage and/or behavior of a given species and run of fish in a specific stream or area at a specific time of year (meaning month or date) based on actual observation" was defined as the target documentation information. Written opinions lacking supportive observation data were specifically prohibited from being used as documentation. A great deal of the documents reviewed for life-stage timing information contained written opinions that were not supported with observation data, and therefore much of it was not usable for this dataset. Confirmation of a written opinion by a data provider was also not considered to be 'documentation'. Also, it is far easier to confirm or refute the existence of the barrier through field observation than it is for life-stage timing information (i.e. if the life-stage is not there at a particular time during a particular year, it does not refute the opinion of the data providers). Documentation was applied across two-week intervals in the database because that's how the timing data were captured in the periodicity tables (Figure 2). This did not prove to be a problem since the interval of most documentation data spanned complete months, or was provided on a weekly basis.

At the conclusion of the 24K Project, 13.4% of the 20,309 species/life-stage/two-week time interval records were documented. Collection of life-stage timing documentation was hindered primarily by a lack of time, caused by a number of the timing spreadsheets being submitted and finalized in the later stages of the project, after the data compilers had completed their work. However, the proportion of documented two-week timing intervals will be much higher than what is reported here, due to the work being done by DEQ. This information is expected to be available in its entirety via the web by January 2004, with individual tables being released as they are finalized. As was stated earlier for life-stage timing information, the results provided in this report should be viewed as preliminary.

Documentation of Origin and Present Production:

The criteria for identifying and categorizing supporting documentation were never finalized during the project. The following were interim criteria that resulted from the pre-project workshop:

- Origin Documentation: written information describing the initial discovery or introduction of a given species and run of fish in a specific stream or area.
- Present Production Documentation: written information describing the current production activity or activities that are being employed to support or sustain a given species and run of fish in a specific stream or area.

The interim criteria for origin documentation were found to lack sufficient descriptive detail to be applied, as documents were being reviewed. It was challenging to develop these criteria because we couldn't identify the detail needed to qualify as documentation. Historic accounts based on anecdotal information were obtained and reviewed, but appeared to represent professional opinion rather than proven fact. Documenting present production was less challenging, particular for production types that involved artificial propagation due to the availability of information. Documenting present 'native' production was still somewhat challenging as genetic sampling was limited, but was probably the best form of documentation. Since these data types were addressed concurrently, and questions about origin data category definitions (discussed earlier in this report) and qualifications for documentation remained, documentation of these data types were prioritized lower than other data types. As a result documentation information relating specifically to origin and production data was not collected during the course of this project. Without these standards in place the draft data categories were used and all of the information collected were based on professional judgment.

Future Database Updates, Maintenance, and Needs

Maintaining data that were developed during the 24K Project is as important as developing the data. Routine maintenance enables data to reflect the current state of knowledge, as opposed to representing a snapshot in time. The data developed as part of this project were not intended to be final, but rather a foundation that could be built upon over time. ODFW has been, and continues to be committed to the concept of long-term maintenance of these data products. However, at this time funding to continue updating the database is a concern. Currently there is little funding available to update, add new information or modify existing information. There are limited opportunities for ODFW to modify the information, which will be discussed below. ODFW will continue to seek funding and resources to maintain the database over the long term so it does not become date.

The original project proposal stated that, "During the scope of this project, all attributes will be maintained and updated as new information become available." Objective 7 of that same proposal added the following caveat to this commitment, "…depending on budgetary constraints". Under the consensus-based data compilation strategy that was employed, data sets needed to be identified during the interview process to be included in the database. Because of budget and time constraints we were not able to revisit areas when new data sets were developed or found because of the extended process needed to incorporate the information into the database. Several datasets were not incorporated during the timeframe of the project due to the constraints previously described.

The lack of long-term stable funding continues to limit ODFW's ability to maintain and update this information. The following paragraphs outline the level of maintenance that ODFW is committed to, what it will not be able to perform under current funding, and describes some enhancements to the data base that would extend its capabilities and provide additional functionality should funding become available.

ODFW is committed to doing the following:

1. Errors of Omission: Errors related to transcription, omission or misinterpretation of source data that occurred during the 24K Project will be corrected as soon as possible upon notification or discovery of the error(s). Corrected information will be posted on the 24K Project website. Changes that are deemed significant will be broadcast via email to those who are signed up on our 24K Project or GIS User Group email update lists. Data contributors who identify an error must provide sufficient information to describe the error and the correction(s) that are necessary either to the spatial or related data. This input will be reviewed against the source data and the appropriate data steward within NRIMP will make any changes that are necessary within the applicable database(s). Information regarding corrections may be sent either in electronic or hardcopy format to the Natural Resources Information Management Program at the ODFW Corvallis Research Lab, 28655 Hwy 34, Corvallis, OR 97333 (Fax: 541-757-4263; email: cooneyc@fsl.orst.edu).

2. Developing modification protocols and procedures: A draft protocol for updating fish habitat distribution data is currently under development. Other update protocols for fish observations, passage barriers, timing and origin / production data will follow. Protocols will be the set of rules that guide changes to the data. Once completed and adopted by ODFW staff, all corrections, updates, and additions must meet the criteria within the protocol. This will be true for ODFW and non-ODFW modification requests. The procedure for requesting changes has not yet been finalized, but the long-term goal is to provide a range of options. However, under the current funding scenario, the first option will likely involve hardcopy forms and maps, and progress to an electronic form. As these protocols and procedures are completed they will be posted to the web site.

Within the extent of the project area (current anadromous zone of Oregon), all proposed changes to data that were collected during the 24K Project must be based on proof. For non-targeted datasets, and for new historic and resident data, proposed changes that are based on professional judgment will likely still be considered, but the condition for which this would occur will be spelled out within the update protocols that are specific to each data type.

3. Limited updates and maintenance: ODFW has limited resources to update/modify data provided during the 24K Project. Until we can obtain additional funding to maintain the database, we will make these kinds of changes only under limited conditions. Within the limits of ODFW's StreamNet contract, proposed changes within the Columbia Basin that affect data directly related to 1:100,000 scale streams will be solicited, and evaluated to determine whether the criteria spelled out in the appropriate protocol document have been met. Provided the update requirements are satisfied, these changes will be implemented. These requested changes will generally require documentation to make the change (refer to the protocol section above to determine which changes will require proof versus which will not). Modification requests should be submitted to NRIMP, and as resources allow, changes will be made. Discussions related to 1:24,000 scale data development have begun within StreamNet. Should the StreamNet mission expand to include this scale of data, ODFW will broaden our update and maintenance efforts to include data at this scale. In the interim, proposed changes that affect data directly related to 1:24,000 scale streams, will be accepted and catalogued for future reference, but will not be implemented until adequate funding can be secured. Proposed changes outside of the Columbia basin will also be catalogued and will require additional funding to be addressed.

Resources and Funding Needs

To address the aforementioned maintenance and development issues over the long term, one FTE (full-time equivalent) should be funded and given direct responsibility for coordinating the maintenance and further development of all data types targeted during the 24K Project. This data coordinator could also develop data that were not targeted during this effort. Additional technical staff would also be required as some of the data types developed during this project (e.g. fish passage barriers and life-stage timing) are rather significant in scope, are in their early stages of compilation and development, and will likely require additional tools for efficient and effective data management.

With additional funding, other more efficient options for requesting changes could be explored. These may include distributing the databases and associated tools to enable more direct input by contributing biologists. This option would likely require extensive training and technical support to implement and may only be feasible where significant changes are necessary. The final, most preferred, and least expensive option for the long term would be to develop an online, map-based system to facilitate the process of submitting changes. This option could be scalable and expandable to include data types beyond those collected during the 24K Project. This option would also allow integration with current data collection and monitoring efforts.

Specific Future Needs**

The following is a list of as yet unfunded tasks that need to be accomplished to keep the 24K Project products relevant and credible to data users, and to build upon the foundation that was established:

- Convert 1:24,000 scale fish habitat distribution point data into a linear event format associated with 1:24,000 scale routed hydrography.
- Translate the 1:100,000 scale fish habitat distribution event data to the 1:24,000 scale hydrography and merge with the original point data into a single compatible format.
- Reconcile the location of fish passage barriers in relation to the fish habitat distribution data.
- Develop comprehensive barrier location and fish passage information statewide. This effort would include all culverts, other barriers affecting resident fish as well as passage information for all species and life stages interact with a particular barrier. A significant portion of this effort will entail coordinating with federal, state and county agencies that also develop this type of data.
- Complete the development of statewide resident species habitat distribution data including Redband and Coastal Cutthroat.
- Develop statewide fish habitat distribution information for non-game and non-native fish species.
- Documentation criteria for life-stage timing, origin, and present production data need to be finalized, with efforts targeted at increasing the amount of documentation contained in the various datasets.
- Complete development of comprehensive historic fish habitat distribution data.
- Complete development of life-stage timing information in the non-anadromous zone.
- Reconcile distribution and documented observation information.
- Conduct periodic reviews of the data to insure that it remains current.
- Perform extensive quality assurance / quality control on all data.

** Costs associated with these needs cannot be accurately estimated without understanding the

1) data compilation approach,
2) level of locational accuracy and completeness required,
3) level of detail needed to adequately describe the data (e.g. professional judgment of fish passage versus knowing the full hydrologic characteristics of the passage barrier),
4) time frame in which the work would occur, or
5) amount of supporting documentation that is required.

ODFW is willing to work with funding sources to define funding proposals for any or all of the needs listed above and can develop and provide the detail to flesh out any proposals.

Project Challenges and Recommendations

This section is provided to inform data users and/or readers of this report of some of the anticipated and unanticipated challenges that were encountered during the 1:24,000 Fish Habitat Distribution Development Project, and how these might be resolved, or handled differently if the opportunity presented itself in the future.

Challenge - No 24K Hydrography: The project to cooperatively develop the 1:24,000 scale digital hydrography proceeded concurrently with this project. Distribution data associated with 24K streams were developed in point, rather than linear format because the 1:24,000 scale routed hydrography was not finalized before the completion of the 24K Project. Consequently, the point data were not converted into a linear "event" format. Distribution data that originated at different scales (1:24,000 and 1:100,000) continue to be maintained in point and linear formats respectively, which limits the utility of the information, and the ability to improve it is reduced.

Recommendation for "No 24K Hydrography":

The 1:24,000 scale fish habitat distribution point data should be converted into a linear event format associated with 1:24,000 scale routed hydrography. The 1:100,000 scale fish habitat distribution event data should be translated to the 1:24,000 scale hydrography and merged with the original point data into a single compatible format. An issue associated with converting the 24K points is further discussed under the, *Early conversion of 24K distribution points* challenge below.

Challenge - Conversion of 24K distribution points: Once the 24K digital hydrography dataset becomes available, the 24K distribution point data need to be converted to a linear format. It is important that this conversion be done using a consistent approach. The possibility exists that individual data users will convert the 24K distribution data points into linear format using methods to suite their needs. In fact, NOAA Fisheries has already conducted an effort to develop static, 24k linear coverages representing a significant portion of the 24k distribution points. These coverages are not representative of the complete set of 24k distribution points, however. Additionally, they were not developed as events tied to routed 24K stream linework and thus are not compatible with the existing event format in which ODFW manages its 1:100,000 scale distribution data. ODFW assisted NOAA with this effort but has not comprehensively reviewed NOAA's 24K linear datasets. Other efforts may also be underway to do the same work, possibly using erroneous or inconsistent methods.

Recommendations for "Conversion of 24K distribution points":

Ideally, funding would be acquired to develop consistent linear coverages of the 24K and 100K distribution data as soon as the official 24K routed hydrography becomes available. At that time, ODFW should make it a priority to convert ALL of the agency's distribution data into a single, consistent event format at the 24K scale.

If funding issues cannot be worked out, ODFW would have no way to prevent data users from converting the habitat distribution point data into linear format. However, a proactive approach to prevent conversion errors would be to limit the availability of the dataset to those who choose to convert the data in a way that is consistent with other 24K Project datasets. This would also facilitate proper interpretation of the data. We could also offer to work cooperatively with users to insure that the linear datasets being developed accurately represent ODFW's 24K point datasets. If multiple users choose to convert the data into a linear format, ODFW could serve a coordination role to prevent duplication of effort.

Challenge - Lack of resources to include all species across the state: We were unable to include comprehensive cutthroat trout data collection, which is the most widely dispersed species of concern and often represents the uppermost-distributed species.

Recommendation for "Lack of resources to include all species across the state:

Develop an online, map-based system to facilitate the process of submitting changes, and allow data contributors to submit additions to the existing cutthroat information, as well as distribution for other species that were not targeted or comprehensively developed during the 24K Project.

Challenge - Lack of resources to maintain and update the information: It was our hope that once this information became available, users would recognize its value, and provide long-term support to maintain and update the information. While the verbal support has been plentiful, the funding has not materialized. Without funding, this information could quickly become outdated. Current resources that exist to maintain the data include monies from StreamNet to maintain 1:100,000 scale data within the Columbia basin. Funding for maintenance of data at larger scales or for areas outside of the Columbia basin have not yet been identified.

Recommendations for "Lack of resources to maintain and update the information":

Many opinions persist about how to address this challenge. The ideal scenario would have all agencies and entities that utilize the information jointly fund its maintenance, and commit staff to provide documented updates (if applicable). See "*Data compilation approach*" below for a description of the recommended model for obtaining updated information.

Challenge – Policy, political, and/or regulatory hindrances: Certain entities were hesitant to share their information, or declined to participate in the project. This was caused by a number of reasons, including:

- organizational policies that restrict data sharing,
- the perception that the information could be used against them through regulatory actions,
- the mission or current priority of the organization focused on species and/or areas that were not targeted by this effort, and/or,

- concerns over the potential increased workload as a result of sharing information, either through the maintenance of the data, or through increased information requests.

This challenge is brought up, not to identify, and thereby draw attention to these entities, but to inform others who may take on an effort like this, and to enlighten data users that this did result in data gaps in some areas.

Recommendations for addressing "Policy, political, and/or regulatory hindrances":

The best solution might be to draft a memorandum of agreement that calls for full and complete participation and information disclosure, and request that all entities that might have information to contribute, sign on, or officially decline to participate. This would help avoid withholdings of information, or at least identify in advance, where data gaps would persist. It would also allow opportunity for discussions that could foster and establish more cooperative relationships.

Challenge - Working around the schedules of the data providers: Data providers weren't always available when the data compiler crews were ready to compile their data. Also, there were often significant time gaps between data compilation meetings for a given area. Many data providers were interviewed during their regular field season (spring, summer and fall months), and were unable to dedicate the time and/or focused attention during the data collection interviews.

Recommendation for "Working around the schedules of the data providers":

If in-person interviews are used again as a method for compiling fish habitat distribution (which we do not recommend; see *"Lack of resources to include all species across the state"* above), schedule the interviews during the winter months as much as possible.

Challenge - Unresolved disputes: Data providers didn't always agree on one or more aspects of the data types that were compiled. Disputes primarily related to the presence and/or usetype of a species in a particular area. Without proof, neither opinion could take precedence, resulting in distribution that remains in dispute at the conclusion of the project. While these disputes did not hinder the progress of the 24K Project, they leave unresolved questions that could hinder the application of the for certain applications, such as designation of critical habitat.

Recommendation for resolving "Disputes":

For disputes between individuals from the same agency or entity, a decision should be made that best represents that agency or entity's judgment, and/or efforts should be made to field verify which assessment is correct. For disputes between individuals from different agencies/entities, discussion of the dispute should continue, but if resolution cannot be reached, efforts should be made to jointly field verify which assessment is correct.

Challenge - Inadequate Documentation: The majority of Oregon's fish observation data exists on raw data forms or in field notes, which are located in the field offices. Most of these forms and notes lack sufficient information to allow the identification of the specific location in finer detail than the stream level, and rarely does one data source verify a considerable portion of the distribution within a stream for a particular species. Many of the reports that were reviewed were determined to contain insufficient information to qualify as documented fish observations.

Recommendation for addressing "Inadequate Documentation":

Establish data standards requiring the collection of more specific information describing the location of the survey/observation, species, run and the extent of their distribution within the surveyed reach. This information would lead to a more extensive and consistent base of knowledge that supports fish habitat distribution mapping efforts.

Challenge - Inconsistent application: Data providers did not provide information consistently across all usetypes. As an example, all providers were given the opportunity to denote species absence using the "Absent" usetype designation, but only a single provider in the northwest portion of the state provided what he considered to be a comprehensive assessment of this type of habitat. The same circumstance occurred with the historic distribution designation. Comments made by data providers indicate that historic distribution was not provided because of a lower level of certainty, whereas "Absent" information was not provided because of a lack of historic distribution information, the amount of time it would take, the perceived low level of importance, and the impact that such a designation might have on the management of the habitat (i.e. no one would ever look to see if the habitat had become usable, or to see if fish actually utilize it currently).

Other forms of inconsistencies also made their way into the data compilation process, but these did not become apparent until distribution data between basins was compared. One such inconsistency was the general level of confidence in the information. Some areas clearly have uniformly high or low data qualify ratings. This may be directly related to how long a data provider has worked in his/her area and/or how often they personally get into the field. Data providers who worked in the same area for significant amounts of time may have had a higher level of familiarity and knowledge within their area. Other data providers who were newer to their area were more reluctant to provide information because their level of confidence was lower. However, the relationship between timing working in the area and general data quality rating did not hold true everywhere.

A time related challenge also led to some inconsistencies (or inequities) in the data across the anadromous zone. Oregon's severe fire season, which occurred during the height of the data compilation period, hindered our ability to meet with some data providers, particularly district staff from the Oregon Department of Forestry (ODF), because they were working on the fire lines, or were on on-call to respond to fire dangers. Data compilation was either delayed or less detailed than desired from ODF staff because of this unavoidable distraction.

Recommendations for addressing "inconsistent application":

Inconsistencies that come from an inability or unwillingness to provide information are unavoidable in project of this magnitude and scope. The data need to be as reliable as possible, meaning only data that is supported (by best professional judgment, or documentation) should be included. However, it is possible to avoid or reduce inconsistencies caused by a lack of time. Should in-person interviews be used again as a method for compiling fish habitat distribution (which we do not recommend; see *"Lack of resources to include all species across the state"* above), interviews should be scheduled during the winter months as much as possible. Data compilation efforts that occur during winter and early spring months would avoid conflicts with fire-related and other field project responsibilities. Also, prioritize the target information so the most important information is compiled first, should time become limited for other reasons. Lastly, clearly document which data providers were short on time, and allow more time to revisit them when they are available again. An alternative approach would be to provide a mechanism for data providers to review existing information and provide documented updates, as their schedules allowed.

Challenge – Inconsistent data collection formats: Delays in hiring contributed to not being able to adequately field test data compilation approaches for timing, origin, and present production data. Timing data was compiled in spreadsheets rather than a database structure with built-in error checking. This led to data gaps that had to be rectified, as well as other issues described in this report. Origin and present production data were compiled on mylars in some instances, and in field notes in others. Inconsistencies in origin and present production data collection format led to challenges in translating the data into final electronic format, as well as data gaps that had to be rectified. Also, field notes were not taken in a standardized format, so when questions arose about a particular piece of data or data contributor, and a search of the field notes was required, it was difficult locate the information.

Recommendations for "inconsistent data collection formats":

Develop and field test standardized data structures, in advance of starting the project. A standardized database for storing and managing origin and production information would have streamlined the development of this data and it would have minimized areas of overlap and confusion. A standardized format (database) for storing the field notes would have facilitated better access to the "supporting" information that emerged from the data collection meetings.

Challenge – Data compilation approach: In person interviews and hardcopy maps with mylars were used to compile most of the data from the 24K Project. This required the production of over 1,900 maps, and 35 rolls of mylar. This approach is expensive, requires a lot of personnel, and is relatively inefficient when compared to electronic techniques now available.

Recommended "Data compilation approach":

In person interviews and hardcopy maps should not be used again as an approach to compile fish habitat distribution and associated data. Our suggestion would be to establish update protocols and criteria that allow data providers to submit new or updated information, either via the web,

or in hardcopy format, or both. We were unable to develop and test a prototype approach of this model, but examples do exist in other states, that can be examined for applicability to Oregon's needs. A model similar to that used to update the draft 24K hydrography, whereby the data are 'checked-out' from the data 'library' and updated using specific procedures and protocols, including documentation requirements, is another approach that could be explored.

Challenge – Project Coordinator role: During the 24K Project, the Assistant Project Leader was responsible for coordinating the activities of the data compiler crews, while at the same time, participating as a member of one of the crews. This may have contributed to number of the data-related issues not being discovered and rectified prior to conclusion of the project.

Recommendation – Project Coordinator role:

The Project Coordinator's data compilation duties should kept to a minimum. The responsibility of coordinating the project should be kept separate from primary data compilation duties. It's important that the Project Coordinator understand the effectiveness all processes and procedures of the project in real-word situations, it would best if the Project Coordinator spent the majority of his/her time on tasks that ensure consistency between the crews and ensuring adherence to project protocols.

Challenge - Hiring project staff: There were many challenges associated with hiring project staff, mainly attributable to internal ODFW issues. Delays caused by hiring challenges contributed to a number of other challenges list in this section. However, the most significant challenge related to hiring project staff was finding people who were willing, qualified, and capable of doing the work. Data compilers need to people with strong biological backgrounds, basic computer skills, and a demeanor suitable to working with many different personalities, while being restricted primarily to an office setting. Finding people with these qualifications becomes even more challenging when the jobs are in locations that are less populated or appealing to live in. It is important that data compilers be as qualified and well trained as possible, because they will generally be less experienced than the people they are interviewing, which can lead to missed opportunities to obtain important information (by asking or not asking the right or wrong questions).

Recommendations for "Hiring project staff":

Suggestions to address hiring issues are fairly well known, and center around offering a competitive salary, in locations where people want to work, doing a job that is interesting, challenging, and allows people to grow professionally and personally. Suggestions specific to the 24K Project might be to hire and train staff before commencing the project, and not identifying a firm project timeline prior to hiring and training staff.

Summary

The 1:24,000 Fish Habitat Distribution Development Project successfully achieved the majority of the stated goals and objections, as is summarized in **Appendix VIII,** and resulted in a tremendous amount of useful information. This project was intended from it's inception to be the first step in the long and difficult process of establishing consistent and comprehensive baseline information related to where and when fish might occur in Oregon rivers and streams. It was always understood that these datasets would be dynamic, ever changing as new information became available. Therefore, none of the datasets that were developed or updated through this process should be considered 'final'.

Some of the results that were achieved by this effort include:

- Over 46,000 miles of current 1:100,000 scale fish habitat distribution have been identified by species and run (species and life-history for resident populations), and delineated by usetype, how the current population is being sustained, and how that population came to be in a given area originally.
- 1,921 24K fish habitat distribution points were obtained, and delineated in the same way as the 100K miles.
- Increasing the amount of documentation supporting the total 100K fish habitat distribution miles by over 200%.
- Nearly 1,400 100K stream miles, and 77 24K points representing previous/historic fish habitat distribution have been identified.
- 913 artificial and natural impediments to adult fish migration were identified and incorporated into the dataset, bringing the total to over 3,500 - over 1,100 of these have been categorized as complete blockages to adult migration.
- 20,309 species/life-stage/two-week time interval records throughout 210 life-stage timing geographic units, 13% of which is supported by documented observations.
- 195 newly identified documents/documentation data sources that verify various aspects of the data types targeted during this effort.

Since this data was first released for public access in October 2002, data download statistics have consistently indicated that hundreds of users download all or part of these datasets each quarter. This high level of data access and use further supports the notion that, while the data are not complete, they are extremely valuable to cooperators of the Oregon Plan for Salmon and Watersheds, and others whose work or interest would benefit from having the types of information that were compiled during the 24K Project. Also, it can be assumed that the quality of the data is high since there have been no reported occurrences of data translation errors (errors associated with transferring distribution and barrier information from hardcopy maps and mylars into electronic format). Hardcopy maps/mylars that were used during the 24K Project are being stored at ODFW's Corvallis Research Lab, and are available for consultation if data translation errors are suspected. ODFW anticipates keeping these maps/mylars for the foreseeable future, and at least until enough of the datasets are superceded by updated information to render the maps no longer valuable as reference.

Most of the people who worked on this project would probably agree that calling this project, extremely complex, is an understatement. The data management alone, caused by having multiple datasets that were all inter-related with one another, called for a level of expertise and attention to detail that most will never experience or fully understand. The anticipated, and unanticipated challenges highlighted earlier in this report illustrate just some of the issues were faced during this effort. At times, the work that was initially envisioned had to be refined or modified as the project progressed to address these challenges. In some cases, agreed upon protocols had to be altered, and in other cases, new protocols had to be established. There is no question that hindsight affords the opportunity to see where pivotal decisions affected the outcome and results of the project, but it is also clear that the concerted efforts that were made during the planning stages and at the outset of the project to anticipate, account for, and avoid issues and challenges (through workshop the consensus process, coordination with the project oversight team, and regular communiqués that were distributed to interested parties and individuals) were fruitful and contributed greatly to the success that was realized through this effort.

Users of this information are encouraged to understand that the amount and quality of information are not determined solely by the efforts of this work. The intensity and focus of field data collections and the information that's recorded, agency/entity priorities and missions, the knowledge and experience level of the data contributors, and the contributor's willingness to give time and information all greatly influenced the outcome of this project. No single individual, group, or agency knows everything about every fish species, in every habitat type, which is datasets that are cooperatively developed using consistent methods, such as those developed by this effort, are the best way examine a broad view of the landscape, or when desiring to compare information between areas. The information obtained through the 24K Project should be viewed as ODFW's official datasets. We acknowledge that there are other datasets available that contain similar information that may not match our, including some datasets within ODFW. These datasets were often developed for specific purposes, and it is not our intention to replace them. We do, however, hope that the information these disparate systems can one day be merged in such a way as to more comprehensively inform other uses, while at the same time maintaining the consistency and integrity of all the data available. Users are strongly encouraged to rely on the metadata to understand how the data was derived, what it constitutes, what the limitations are, what the terms mean, and who to contact if they have questions, as this is where updated information will be provided. Also, because the data are dynamic, users are cautioned to consult the metadata each time the data are used, rather than assuming that what they have is the latest information. A summary of key caveats and assumptions associated with 24K Project datasets is provided in **Appendix XIV**.

The single most significant challenge before us is finding a way to maintain and update this information so that it remains relevant and useful to those who need it. ODFW is committed to do this work (see the *Future Database Updates, Maintenance, and Needs* section of this report), but the lack of funding is a major obstacle. This will undoubted require the collective financial, in-kind, and/or moral support of all who need this type of information. The only way to achieve the greatest level of success, and benefit the resource to the maximum amount possible, will be for everyone concerned to work together.

Acknowledgements

We would like to thank all the agencies, organizations, entities and individuals who participated in the pre- and post-project workshops, and who contributed their time, knowledge, and experience to the data compilation portion of this effort. Without you, this project could not have succeeded. We also thank the data compilers and data technicians; Eric Brown, Stacy Carpenter, Scott Eden, Scott Groth, Dave Hering, and Andy Solcz, for all your hard work, and long hours. Special appreciation also goes to Natural Resources Information Management Program members; Susan Brodeur, Bill Herber, and Shannon Hurn for your technical support, leadership, webmastery, database development and data management contributions. Thank you to Ken Bierly and Kelly Moore (OWEB), Bruce McIntosh (ODFW), Liz Dent (ODF), Manette Simpson and Debra Sturdevant (ODEQ), Dru Keenan (EPA), and Bruce Schmidt (PSMFC) for leading your respective agencies in providing funding support and/or project oversight. Our gratitude also goes to Rick Kepler for his reviews of this document, his overall project oversight, and generally going-to-bat for the project when needed, and to Steve Williams for his foresight in recognizing the value of this effort and supporting it from the very beginning.

Special recognition goes to Jon Bowers and Bill Herber for developing the Data Capture Tool, which has proven itself to be useful for more than just the 24K Project, and to Jennifer Lloyd for handling nearly all the GIS chores associated with this effort.

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Appendices

Appendix 1. History of ODFW fish distribution development efforts.

The Oregon Department of Fish and Wildlife's (ODFW) initial effort to map statewide anadromous salmonid habitat distribution occurred as part of the development of the Oregon Rivers Information System (ORIS) through the early 1990s at the 1:250,000 scale (250K). Between 1995 and 1997, ODFW improved on the initial effort by collecting spatial fish distribution data at the 1:100,000 scale (100K). Unfortunately, this effort lacked distinctive definitions for habitat usetypes and other key terms, and included other deficiencies as well. The habitat distribution information was primarily gathered from ODFW sources, which led to limited utility across the user community. Additionally, no emphasis was placed on collecting documented observations. While the effort served as a fruitful beginning, it resulted in data that were inconsistent and less credible than what was desired. Habitat typing was questionable in some areas and other areas were missed or otherwise inadequately mapped. After the completion of these initial efforts, the data developers recognized that a comprehensive revision of the data would be necessary to prevent the information from becoming outdated. Revisions and updates were made to the fish habitat distribution datasets on an as-needed and opportunistic basis over the next several years.

Late in 1998, ODFW was funded to improve the 100K fish habitat distribution dataset in the Rogue area under the Documentation of Essential Salmonid Habitat (R-DESH) Project. Shortly after the completion of the R-DESH project, ODFW's Natural Resources Information Management Program (NRIMP) found funding to develop a similar project in the Willamette basin (W-DESH Project, 1999). The DESH projects were designed to accomplish four objectives: 1) comprehensive updates to the 1995-96 100K distribution for anadromous salmonids, 2) the development of distribution data in a standardized format so that spawning, rearing, and migratory habitats were depicted and defined consistently across the range of each species and run, 3) documentation of the source of information used to determine distribution and habitat use for all streams with species presence, and 4) the publishing of the updated digital spatial distribution information on the internet to enable access to the information by all interested users, including fish and wildlife managers.

Further updates were performed to the 100K fish habitat distribution and documentation datasets in 1999 under the Conservation Reserve Enhancement Program (CREP), including some 24K distribution data development. The CREP was initiated in response to an increase in the number of native Oregon fishes that were listed or proposed for listing as threatened or endangered in agricultural areas. The program was designed to alleviate listed fish habitat loss due to the impact of agricultural activities in riparian corridors and so included detailed mapping focused in the Umpqua, Hood, Lower Deschutes, Trout Creek, and Lower John Day areas.

Extensive revisions to the 100K fish distribution and documentation datasets were also made based on data collected during visits with ODFW biologists in the North, Mid, and South Coast areas between 1998 and 2001. The fish habitat distribution information in the northeastern portion of Oregon's anadromous zone, including the Grande Ronde River, Walla Walla River, Wallowa River, Imnaha River, and Snake River HUCs, remained largely un-revised, except for summer steelhead distribution, during the100K distribution revisions prior to 2001.

The Natural Resources Information Management Program initiated yet another effort in February 2001 to develop fish habitat distribution information throughout Oregon's current anadromous zone at the 1:24,000 scale (24K); hence the 1:24K Fish Habitat Distribution Development Project (referred to hereafter as the 24K Project). This most recent effort has involved compiling information from state and federal natural resource management agencies, Native American Tribes, local watershed councils, soil and water conservation districts, and major private timber operators to ensure a comprehensive dataset at a finer scale than the previous efforts. Further, standardized definitions were developed to describe documentation and distribution, including distinct habitat designations (usetypes) additional to those defined in the DESH Projects.

In addition to habitat distribution data, the 24K Project also enabled the collection of barrier and dam data which both supplemented and updated existing data. ODFW first initiated the development of a Barrier database in the mid 90's. ODFW's Fish Passage program, the National Inventory of Dams and numerous published reports served as the primary sources for this database. From 1996 to 2001, in association with fish habitat distribution update efforts, significant numbers of records for both natural and artificial barriers have been entered based on the best professional judgment of ODFW district biologists. Information regarding species-specific fish passage has also been incorporated.

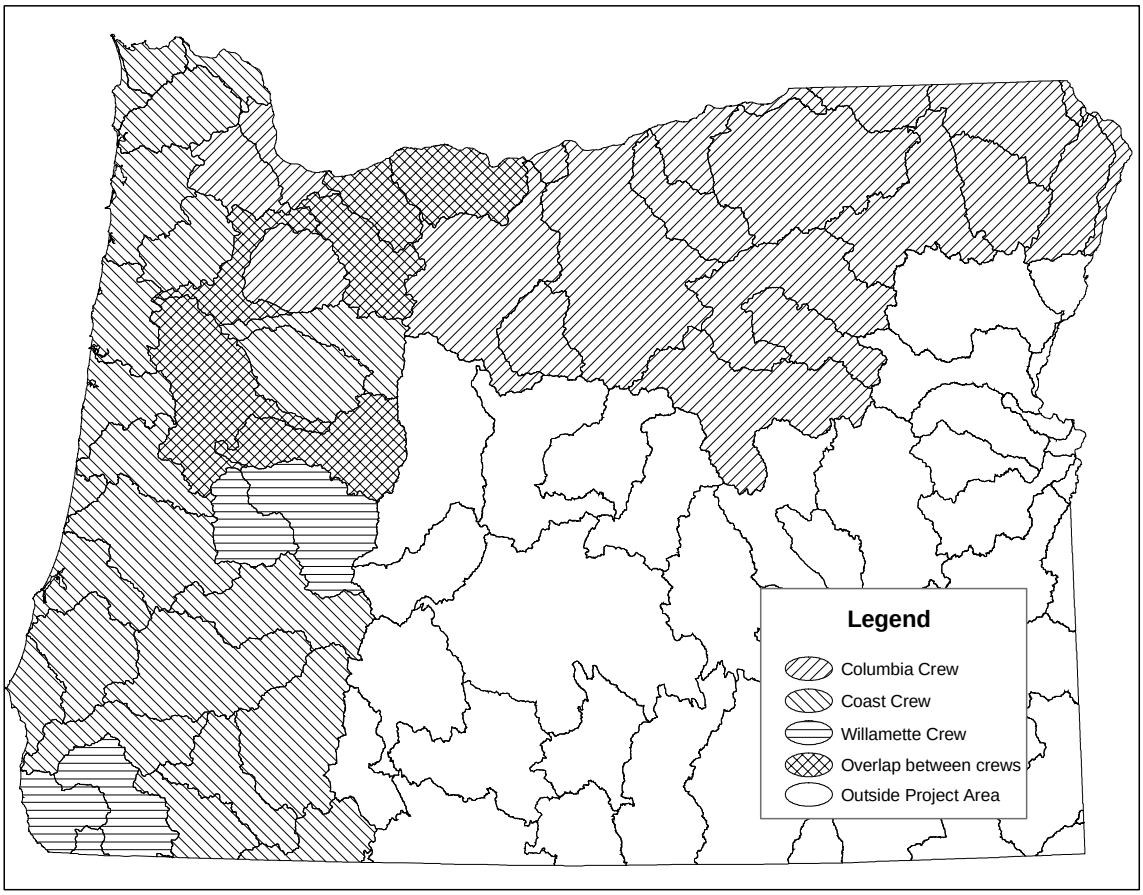
Appendix II. 24K Project Chronology.

- April 2000: Funding proposal submitted.
- June 2000: The modified funding proposal is approved and funding is authorized.
- June 2000: EPA and ODEQ commit additional funds to compile higher resolution life stage timing data.
- September 2000: StreamNet commits additional funds to compile coastal cutthroat fish habitat distribution in the Scott Canyon hydrologic unit.
- September 2000: Contract/interagency agreement completed and signed.
- October 2000 through August 2001: Identified and hired project staff.
- January through May 2001: Pre-project preparations:
    - Accumulating project supplies
    - Designing and developing tools
    - Developing training materials
    - Pre-project workshop preparations
    - Internal ODFW project procedure consensus building.
- May 2001: Held the Pre-project Workshop
- June through August 2001: Staff development and project initiation:
    - Staff training
    - Scheduling initial meetings with data contributors
    - Compiling observation documentation
    - Printing existing information on hardcopy maps.
- July 2001 through February 2002: Data acquisition, conversion, QA, and delivery:
    - Interviewed data contributors and acquired targeted project information.
    - Continued printing hardcopy maps
    - Converted newly acquired distribution and barrier edits and additions into electronic format
    - Prepared available information for public distribution.

  Note: Data Compilers complete their employment in February 2002.
- March through December 2002: Data conversion, QA, and data delivery continue:
    - Asst. Project Leader continued to review and finalize outstanding data
    - Outline of the Project Completion Report is drafted.
    - GIS Coordinator continued converting distribution, barrier, and origin/present production edits and additions into electronic format
    - Make data available via the web as it was finalized.

  Note: Asst. Project Leader completes his employment in July; GIS Coordinator completes her employment in December.
- January through April 2003: Data conversion, QA, completion report, and data delivery continue:
    - NRIMP staff work to complete the Project Completion Report, fill data gaps, and perform QA/QC on existing data.

Appendix III. Map depicting the approximate areas of responsibility for the three 24K Project data compiler crews.



Appendix IV. 24K Project Data Contributors: agencies/entities who actually contributed data and/or information during the data compilation portion of the project, and the city where they are located.

Applegate Watershed Council	Jacksonville
Audubon Society	Yachats
BLM	Ashland
BLM	Coos Bay
BLM	Eugene
BLM	Grants Pass
BLM	Medford
BLM	Prineville
BLM	Roseburg
BLM	Salem
BLM	Tillamook
BLM	Veneta
Boise Cascade	Monmouth
Cleanwater Services	Tigard/Hillsboro
Consultant-Bio Surveys, Inc.	Alsea
Grande Ronde Model Watershed Program	
Grande Ronde Tribe	
Lincoln Soil and Water Conservation Board	Newport
Lower Nehalem Watershed Council	Vernonia
Lower Rogue Watershed Council	Gold Beach
Nehalem River Fishing Guide	Nehalem
Nez Perce Tribe	Enterprise
ODFW	Astoria

ODFW Research	Charleston
ODFW Research	Newport
Oregon Dept. of Forestry	Roseburg
Oregon Dept. of Forestry	Veneta
Oregon State University	Corvallis
Plum Creek Timber	Coos Bay
Portland General Electric	Clackamas
Portland Water Bureau	Portland
Sherman County Soil & Water Conservation District	Moro
South Slough National Estuarine Research Reserve	Charleston
The Nature Conservancy	Enterprise
Trout Unlimited	Portland
Umatilla Tribes	
USFS	Columbia Gorge National Scenic Area
USFS	Estacada
USFS	Hood River RD
USFS	Klamath NF, Scott Salmon Ranger District
USFS	Malheur NF (John Day)
USFS	Pendleton
USFS	Rogue River NF, Applegate District
USFS	Siskiyou NF, Grants Pass
USFS	Siskiyou NF, Powers Ranger District
USFS	Siuslaw NF, Waldport Ranger District

Appendix IV continued.

ODFW	Central Point
ODFW	Charleston
ODFW	Clackamas
ODFW	Columbia River Mgmt., Astoria
ODFW	Columbia River Mgmt., Clackamas
ODFW	Corvallis Research Lab
ODFW	Eagle Creek Hatchery
ODFW	Enterprise
ODFW	Gold Beach
ODFW	Heppner
ODFW	John Day
ODFW	La Grande
ODFW	Mapleton
ODFW	Newport
ODFW	Pendleton
ODFW	Roseburg
ODFW	Salem District
ODFW	South Willamette Watershed District
ODFW	Springfield
ODFW	The Dalles
ODFW	Tillamook

USFS	Umatilla NF (Heppner)
USFS	Umatilla NF (Pendleton)
USFS	Umatilla NF (Ukiah)
USFS	Umatilla NF (Walla Walla District)
USFS	Umpqua NF, Cottage Grove Ranger District
USFS	Umpqua NF, Roseburg
USFS	Umpqua NF, Tiller Ranger District
USFS	Wallowa-Whitman NF (Baker City)
USFS	Wallowa-Whitman NF (Enterprise)
USFS	Wallowa-Whitman NF (La Grande)
USFS	Willamette NF
USFS	Willamette NF, Detroit Ranger District
USFS	Willamette NF, McKenzie River Ranger District
USFS	Willamette NF, Middle Fork Ranger District
USFS	Zigzag
Williams Creek Watershed Council	

Appendix V. Life stage Timing Criteria, Definitions, & Questions given to data providers during the 24K Project.

For the questions that follow, please give your best professional opinion along with any supporting documentation. Where documentation is not available, it is our goal that all contributors support the information in the tables at the conclusion of our meeting. For the purposes of this exercise, only consider wild populations of resident, fluvial, adfluvial and anadromous salmonids.

Important Terms & Definitions

It is very important that the definition of each life stage description be extremely clear and consistent for our purposes. Please base your answers on the following definitions:

General definitions:

Anadromous: Populations that migrate from salt water to fresh water to spawn.

Non-Anadromous Fish: Populations that don't migrate from salt water to fresh water to spawn. This includes resident, adfluvial and fluvial populations.

Resident: Populations that confine their migration within their natal stream or watershed.

Fluvial: Populations that generally migrate between smaller streams used for spawning and early juvenile rearing and larger rivers used for adult rearing.

Adfluvial: Populations that generally migrate between smaller streams used for spawning and juvenile rearing and lakes or reservoirs used for adult rearing.

Anadromous life-stage definitions:

Upstream Adult Migration: the time in which adults and/or jacks move between the ocean or adult holding areas and natal spawning areas.

Adult Holding: a natural interruption of migration while waiting for appropriate physiological and/or environmental conditions which causes them to move.

Adult Spawning: the time in which eggs are being deposited into redds and fertilized.

Egg Incubation through or Fry Emergence: the period from the time the eggs are deposited in the gravel to the time when the yolk sack is fully absorbed and the fry are out or up from the gravel into the free-flowing water column.

Juvenile Rearing: the time juvenile fish spend feeding in nursery areas of rivers, lakes, streams and estuaries prior to migration to the ocean.

Downstream Juvenile Migration: the time in which juveniles are actively moving downstream with the purpose of getting out of the system and to the ocean.

Non-Anadromous life-stage definitions:

Adult/Sub-Adult Rearing: General time that fish are present for the purposes of feeding and self-preservation.

Adult Fluvial or Adfluvial Migration: the time in which adults move between adult rearing areas to natal spawning areas.

Adult Spawning: the time in which eggs are being deposited into redds and fertilized.

Egg Incubation through Fry Emergence: the period from the time the eggs are deposited in the gravel to the time when the yolk sack is fully absorbed and the fry are out or up from the gravel into the free-flowing water column.

Juvenile Rearing: the time juvenile fish spend feeding in nursery areas of rivers, lakes and streams prior to migration or establishment of residence.

Juvenile/ Sub-Adult Migration: the time in which juveniles are actively moving with the purpose of getting to adult rearing areas. Not applicable for resident populations.

Periodicity Chart definitions:

Likely No Use: Species of fish is currently not found within a geographic location.

Not Applicable: Species of fish does not display a particular life-stage within a geographical location.

None Observed: Species of fish has not been seen in geographic location but potential presence exists.

Unknown: Life stage timing is unknown. Not enough information to speculate timing data.

Documentation: any written information describing the life stage and/or behavior of a given species and run of fish in a specific stream or area based on actual observation.

Geographic Delineation:

It is suggested that life-stage timing information be provided based on natural (geographic) breaks in the timing behavior of a species. While we understand fish activity and timing can change from tributary to tributary, the 6th field hydrologic unit code is the smallest geographic area that should be considered for this exercise unless specific circumstances warrant something smaller. Please provide information based on the larger geographic area possible without supernaturally blending natural breaks in fish activity timing.

Unless otherwise noted, timing periods provided for each area refers to named streams, all upstream tributaries, and associated lakes within the watershed unless.

Activity Intensity:

If distinctions between peak and lesser use periods can be made, you are encouraged to provide such information. This information should be provided in the form of a percentage (e.g. peak use equates to *x*%, lesser use equates to *y*% of the activity). If this information is provided, the criteria used to distinguish peak and lesser periods would be left to the data providers and would be recorded for each distinct area.

Documented accounts, such as an observation of adult spawners during survey data collection which provides peak counts, mark-recapture work which provides percent of spawners during a given period of time, or smolt trap passage information all provide valid intensity information and may be used to support this type of information.

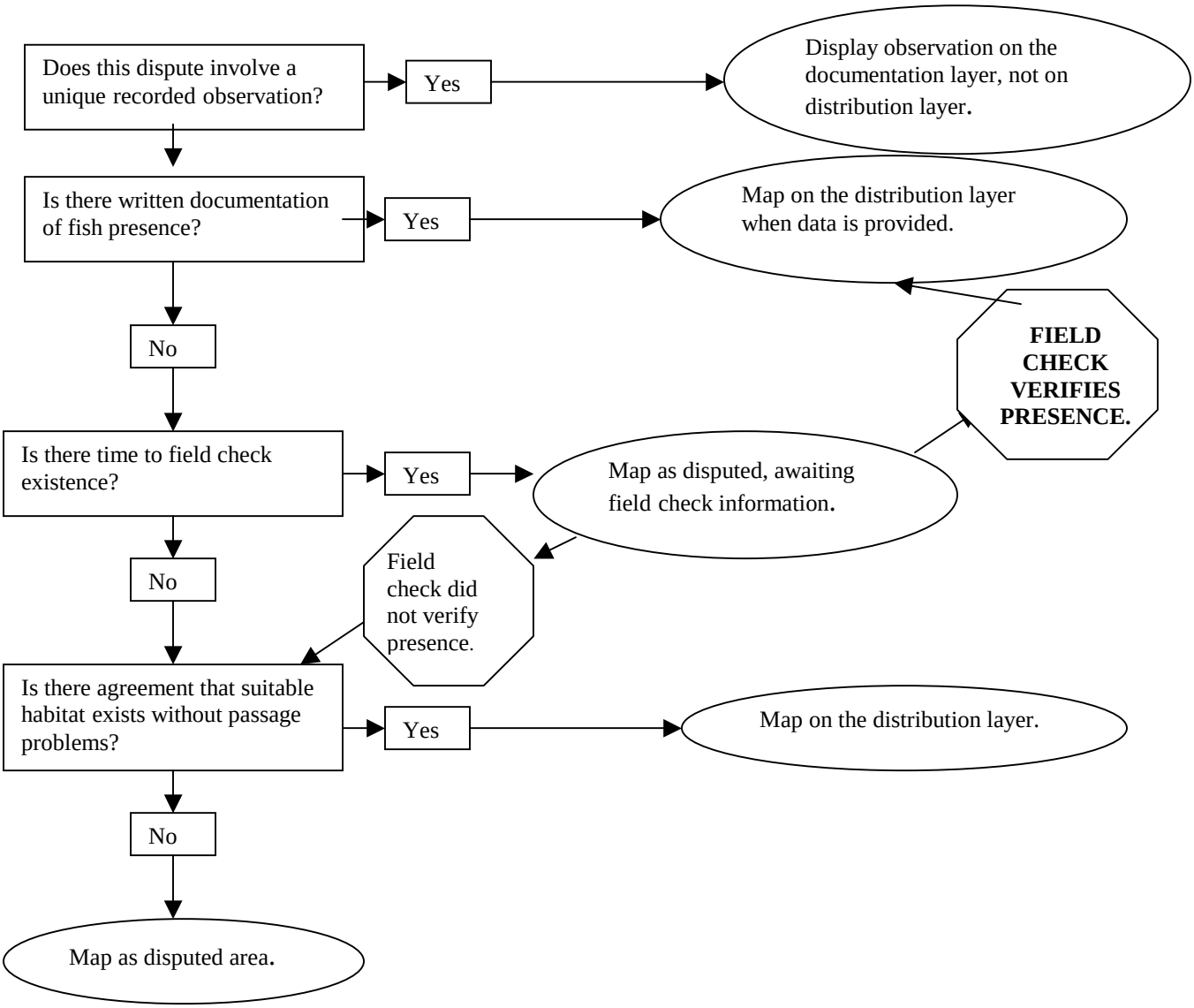
Relative abundance:

If time permits, please provide documented or agreed upon professional opinions as to the relative abundance (or health) of the species in the designated geographic areas relative to historic levels.

a) What is the relative abundance of each population?
   1) Abundant – at or above capacity; an ample amount.
   2) Common – Widespread.
   3) Uncommon – Not ordinarily encountered.
   4) Rare- Seldom occurring or found.
   5) Present intermittently – present during some years, but not consistently present annually.
   6) Unknown/undetermined.

b) Are there stocked populations that are not self-sustaining with out human intervention? (Example: Fed fry were released and come back as adults but natural spawning from these adults does not sustain a viable population.)

Appendix VI. 24K Project Dispute Resolution Decision Tree



Appendix VII. 24K Project data attribute list.

Field	Description
Distribution	
SpeciesID	Code for species identification.
RunID	Code for run identification.
LLID	Latitude Longitude Identifier of the stream route.
Begmeas	Begin measure.
Endmeas	End measure.
LifeHistoryID	Code for the life history of the fish.
UseType	Code describing primary fish use.
Feat_name	Stream name.
Date	Date data was recorded.
Year	Year that data was recorded.
Comment	Comments.
RefID	Reference Identifier.
Src_Name	Primary person who provided the data.
Src_Agen	Agency that provided the data.
Qualcrit	Quality rating of the data.
Status_Fed	Federal ESA status.
Status_OR	State ESA status.
HUC	4th field hydrologic unit code.
OriginID	Genetic Origin.
ProductionID	Present Production.
Barriers	
BarrierID	This field uniquely identifies a barrier identified by a particular agency.
HUC	Hydrologic Unit Code associated with the project.
LLID	Latitude Longitude Identifier of the stream route.
BegMeas	The beginning stream mile location that a document reported for the barrier.
GISMeas	The stream mile location used for mapping to accurately place the barrier onto a 1:100k scale map.
EndMeas	The ending stream mile location of the barrier.
Latitude	The latitude location of the barrier.
Longitude	The longitude location of the barrier.
BarrierOwner	The barrier owner.
BarrierOwnerTypeID	The institutional status of the land owner (Private, Federal, State, etc.).
OwnerTypeID	Code for the institutional status of the land owner.
Year_Initiated	The year construction began.
Year_Comp	The year the barrier was completed.
Year_Removed	The year the barrier was removed (if applicable).
BarrierTypeID	Code for the type of barrier.
HatchID	The hatchery ID code for BarrierCategory=5.
FishWayID	Code for the presence of fish passage facilities.

FishWayTypeID	Code for the type of fishway.
RefID	The primary reference number for the barrier.
BarrierName	Name of barrier, if applicable.
Height	Height of barrier in feet.
StateID	The StateID for the State the barrier is located in.
Comments	Special purposes, special conditions, etc. Comments related to the barrier.
Flag24k	Flag field. Yes=On a 24k stream, No=Not on a 24k stream.

Dams

DamID	The DamID number for the dam.
NIDDamID	The DamID number from the National Inventory of Dams.
NID_#	The National Inventory of Dams ID number.
RRN	The 1:250,000 scale EPA River Reach number, cross reference to Reach table.
Prop	Distance of dam from the base of the EPA reach, measured as a percentage of the total.
Provisional	If yes (-1), indicates the assigned measure along the stream may not be the exact location of the dam, if no (0), indicates the location has been verified.
HUC	Hydrologic Unit Code associated with the project.
LLID	Latitude Longitude Identifier of the stream route.
BegMeas	The beginning stream mile location that a document reported for the dam.
GISMeas	The stream mile location used for mapping to accurately place the dam onto a 1:100k scale map.
Dam_Name	The name of the dam.
StateID	The StateID for the State the dam is located in.
FishWayID	Code describing presence or status of fish passage facilities at dam.
FishWayTypeID	Code describing the type of fishway.
Owner	The dam owner.
DamOwnerTypeID	The institutional status of the dam owner.
OwnerTypeID	Code for the institutional status of the land owner (Private, Federal, or State, etc.).
Year_Initiated	The year construction began.
Year_Comp	The year the dam was completed.
Year_Removed	The year the dam was removed (if applicable).
Dam_Length	Dam crest length in feet (length of dam along stream surface).
NID_Height	The maximum of dam, structure, or hydraulic height in feet from the National Inventory of Dams.
Height	Height of dam in feet from a source other than the National Inventory of Dams.
Norm_Stor	The normal storage capacity of the reservoir in acre feet.
Max_Stor	The maximum storage capacity of the reservoir in acre feet.
Longitude	Longitude location of the project in decimal degrees.
Latitude	Latitude location of the project in decimal degrees.
Comments	Comments related to the dam.
RefID	The primary reference number for the source of the Dam information.
Flag24k	Flag field. Yes=On a 24k stream, No=Not on a 24k stream.
OffChannel	Flag field to indicate whether a dam is located on-channel (not checked) or off-channel (checked).

Documentation

LLID	Latitude Longitude Identifier of the stream route.
LATITUDE	Latitudinal coordinates.
LONGITUDE	Longitudinal coordinates.
STR_LENGTH	Stream length.
TRIB_OF	Name of the stream into which the stream for this record flows into.
STREAM	Stream name
HUC	Hydrologic Unit Code.
BEGMEAS	This is the beginning measurement of the survey
ENDMEAS	This is the end measurement of the survey
SPECIESID	Code for species identification.
RUNID	Code for run identification.
SUBRUN	Code for sub-run identification.
USETYPE	Code describing primary fish use.
SURVEY DATE	The date the actual survey was conducted
REFID	The reference ID assigned to the document from which the data was obtained
YEAR	The year surveyed
COMMENTS	Place the page number from which the data was located. Also note any comments that are of interest to the record.
EntererID	Name of data entry person.
DateEntered	Date the data were entered or updated.
Doc_CategoryID	Category: Full or Gray (Undocumented presence)
Doc_ExtentID	Documentation extent.
UTM Zone	UTM Zone
Easting	UTM Easting
Northing	UTM Northing.
DocQualCrit	Documentation Quality Control (not implemented).

Appendix VIII. 24K Project goals, objectives, specific accomplishments, deviations, and unfinished tasks.

Overarching Goal: Develop baseline datasets at the 24K scale with universal input and agreement.

- Bring all 1:100K streams up to current standards.
- Develop fish distribution information at the1:24K scale.
    - populate all current distribution attributes at this scale
    - use all sources of distribution information (State, Federal, tribal, private, Watershed Councils, etc.)
- Expand our database of documented observation records that verify distribution (*documentation of presence, not use*)
- Enhance the utility of the data by compiling related information
    - life-stage timing
    - Historic and present origin (*now called origin and present production*)
- Expand our barrier database, including fish passage information.

Objectives:

As was noted in the original project proposal, some objectives and/or tasks would be (were) conducted concurrently. The objectives of the 24K Project were to:

1) Develop tabular data structures to capture target information
2) Capture readily available observation data documentation
3) Compile fish distribution data compatible with the 1:100,000 scale routed stream layer and the 1:24,000 scale digital raster graphic (DRG) quadrangles
4) Translate the compiled data into electronic format
5) Complete the final review of the distribution maps
6) Make final distribution and ancillary information available
7) Maintain and update distribution data layers, as new information becomes available

Final Products:

The final products of the 24K Project were outlined as:

1) 1:100,000 scale routed fish habitat distribution (event) data for all salmonids (except cutthroat) in the anadromous zone of Oregon, including habitat use-type for anadromous species, origin and present production data, and supporting documentation. (*Note: this product was expanded to include the development of coastal cutthroat distribution in the Scott Canyon 4th field hydrologic unit, using funds provided by StreamNet.*)
2) 1:24,000 scale fish habitat distribution represented by point data (at a minimum), which can be overlaid onto digital topographic images. Efforts will also be made to convert 24K point data into line (event) data as routing of 4th field HUCs are completed.
3) ODFW will host a workshop on how the data was captured and how it can be accessed for all interested parties.
4) Point or event data illustrating biologist's level of certainty of species absence (where available and appropriate).
5) A database of observation records that documents distribution.

6) Copies of literature used to obtain observation records available for viewing from the StreamNet Library in Portland.
7) Polygon coverages outlining timing of occurrence by life-stage information. (*Note: this product was expanded to include life-stage timing periodicity tables outlining timing and occurrence by species by life-stage by 4th field hydrologic unit in the Hood, Imnaha and Middle and Upper John Day basins, using funding provided by the Environmental Protection Agency and Oregon Department of Environmental Quality.*)
8) Information on the location, and blockage extent (by species) of barriers to adult migration.

Specific accomplishments, deviations, and unfinished tasks:

In response to **Objective 1**, *Develop tabular data structures to capture target information*, the following tables and databases were designed and/or developed to facilitate data entry, storage, and dissemination of the data captured during the 24K Project:

- Distribution database, for maintaining 100K and 24K distribution, as well as usetype, origin, present production, quality rating, and reference data (see **Appendix VII** for a list of data attributes).
- Data Capture Tool (DCT) – an ArcView / Microsoft Access interface designed to capture spatial and tabular information simultaneously while visually verifying the locational accuracy of digitized information.
- Documentation database, for capturing information related documents and other reference sources (see **Appendix VII** for a list of data attributes).
- Barrier database, including a fish passage table for capturing information related to barriers and dams (see **Appendix VII** for a list of data attributes).
- Life-stage timing periodicity spreadsheets, and database, known as the *TimingTrakker* (developed in consultation with Oregon Department of Environmental Quality) to capture life-stage timing periodicity information.
- Development of a decision tree to arbitrate disputed distribution.
- Project tracking procedure that included a online status maps for each major data type to allow others to track the progress of this project. Also, routinely distributed email updates to 95 individuals who requested updates, representing 32 agencies/entities.

Objective 1 Deviations:

- Life-stage timing data were captured directly into spreadsheets rather than the timing database.
- Criteria for documentation related to timing, origin or present production data remained in preliminary form throughout the project.
- Definitions for origin and present production categories were not finalized.
- One set of usetypes was used for both anadromous and resident species.

Objective 1 Unfinished Tasks:

- None.

In response to **Objective 2**, *Capture readily available observation data documentation*, the following were accomplished:

- Increased the amount of documentation supporting the total 100K fish habitat distribution miles to 16,361 miles, representing 32% of the total mileage.
- Only 15 barriers and 12 dams remain without a documented reference, out of 3,508 barriers and dams currently maintained within the dataset following this effort.
- 13.4% of the 20,309 species/life-stage/two-week time interval records were documented.
- Full review of existing StreamNet tabular data and other readily available observation data including literature from StreamNet, ODFW and public library resources.
- The Documentation Database was populated with 195 newly identified documents/documentation data sources that verify various aspects of the data types targeted during this effort were obtained. **This satisfies final product #5.**
- Data contained in the documentation database was sent to the GIS staff, and included on original 1:24,000 fish distribution maps. All references were assigned appropriate StreamNet catalog numbers.
- Revised documentation data was submitted to the 24K Fish Distribution Coordinator for inclusion on the 1:24,000 scale fish distribution maps.

Objective 2 Deviations:

- Copied versions of all references were delivered to the StreamNet Library for cataloging and shelving after the conclusion of the project.
- Most documentation records derived from newly acquired hardcopy documents were not sent to the GIS staff for inclusion on with 1:24,000 fish distribution maps.
- Origin and present production data are being maintained as an attribute within the distribution dataset, and therefore remain undocumented.
- Quality ratings were not assigned to each reference (as was requested during the pre-project workshop) due to a lack of information and time constraints.

Objective 2 Unfinished Tasks:

- Analysis to determine if unassigned observation records in the Documentation database qualify as site-specific records for 24K distribution points.
- Due to the issues related to reconciling digital datasets (consistency of coding, completeness, data quality, etc.), several known digital datasets that contain observations in 24K streams were not incorporated.
- Fish habitat distribution was not automatically extended to documented observations that occurred outside existing distribution. The effort to reconcile both anadromous and resident distributions with documented observations remains to be completed.

In response to **Objective 3**, *Compile fish distribution data compatible with the 1:100,000 scale routed stream layer and the 1:24,000 scale digital raster graphic (DRG) quadrangles*, the following were accomplished:

(Note: Accomplishments, deviations, and unfinished tasks related to documentation are outlined under objective 2.)

- All existing 100K and 24K electronic species distribution data layers, documentation, dams and barriers were compiled from both internal and external sources and plotted on 1:24,000 scale DRG quad map pairs and submitted to the 24K Project field staff.
- All maps were examined by 24K Project field staff; placement of distribution, documentation, and barriers on maps was verified.
- The 24K Project field staff interviewed each ODFW district, regional and field office, and other federal and state natural resources entities to:
    a) use the maps described above to compile 100K and 24K information on the known and/or suspected anadromous salmonid distribution by habitat usetype including collection of resident salmonid data and barriers where available
    b) identify and catalog the most recent written documentation of the existence of a particular species in a given area, consistent with previously determined criteria and definitions
    c) compile life-stage timing, species origin and present production information for all anadromous salmonids
- The 24K Project field staff rectified most discrepancies or disagreements that arose during the interviewing process with regard to species distribution and barrier placement by using established documentation and a pre-determined arbitration decision tree.
- The 24K Project field staff returned the maps to the 24K Fish Distribution GIS Coordinator for processing of hardcopy information to an electronic format.
- Compiled life-stage timing for 210 geographically distinct units across the anadromous zone.

Objective 3 Deviations:

- The "outlier" usetype was added during the project.
- Data providers were allowed to work independently (outside of in-person interviews) to provide life-stage timing data.
- ODFW and other agency culvert information was included on the hardcopy update maps, but was not incorporated into ODFW's barrier database.
- Resident rainbow distribution was primarily obtained in areas outside steelhead distribution because maps specific to rainbow were not produced.
- 'Absence' distribution was not added above non-historic, blocking barriers.
- 'Absence' distribution was primarily denoted in the North Coast area.
- 'Previous/Historic distribution was not compiled comprehensively.

Objective 3 Unfinished Tasks:

- Mid-coast Rapid Bio-Assessment 24K survey information (Bio Surveys, 1998 and 1999) was inadvertently omitted from the distribution maps prior to them being reviewed by data contributors.
- Known resident rainbow distribution data were not compiled comprehensively. ODFW will pursue development of this data, focusing on easily accessible existing information.
- We were never able to acquire funding to include cutthroat as a comprehensive target for this project.

In response to **Objective 4**, *Incorporate compiled data into electronic format*, the following were accomplished:

- The 24K Project GIS staff used the DCT to capture 100K hardcopy species distribution and barrier information into the Distribution Database (100K table) and the Barrier Database, respectively, using the electronic 100K routed hydrography.
- 3,745 miles of current 1:100,000 scale fish habitat distribution have been identified by species and run (species and life-history for resident populations), and delineated by usetype. This includes 447 miles of coastal cutthroat information. Species origin and present production information was compiled for 50,739. **This satisfies final product #1.**
- The 24K Project GIS staff used the DCT and the heads-up digitizing method with the DRG images as backdrop in ArcView to capture the 24K fish distribution and barrier information into the Distribution database (24K table) and the Barrier database, respectively.
- 1,921 24K fish habitat distribution points were obtained, and delineated in the same way as the 100K miles. Species origin and present production information was compiled for all 24K fish habitat distribution points.{convert 24K points} **This satisfies the primary portion of final product #2.**
- Nearly 1,400 100K stream miles, and 77 24K points representing previous/historic fish habitat distribution have been identified.
- 2,449 100K miles 33 24K points were designated as 'absent' habitat. **This satisfies final product #4.**
- Data contributor confidence ratings were obtained or assigned to all fish habitat distribution data.
- A total of 1,379 miles and 77 24K points were added to the Previous/Historic category, mostly above large dams and reservoirs.
- 913 artificial and natural impediments to adult fish migration were identified and incorporated into the dataset, bringing the total to over 3,500 - over 1,100 of these have been categorized as complete blockages to adult migration. **This satisfies final product #8.**
- The 24K Project field staff incorporated additional observation verification data provided during the map reviews into the Documentation database. The tabular documentation information was converted to GIS coverages by the 24K Project GIS staff and published at the NRIMP website: http://osu.orst.edu/dept/nrimp/information/fishsightingsdata.htm. **This satisfies final product #5.**
- The 24K Fish Distribution GIS Coordinator periodically converted the tabular event data for the 100K species distribution from event format to arc coverages and shapefiles and made them available with event tables and metadata at the NRIMP website: http://osu.orst.edu/dept/nrimp/information/fishdistdata.htm. The 24K species distribution point shapefiles and coverages were also published on the site with associated metadata.
- The 24K Project field staff coordinated the biologists' entry of life-stage timing information into the Life-Stage Timing database. The 24K Project GIS staff processed

the collected life-stage timing information and developed a GIS polygon coverage depicting life-stage units. **This satisfies a portion of final product #7.**
- Life-stage timing information was compiled for 1,015 timing unit/species combinations. **This satisfies a portion of final product #7.**
- The 24K Project GIS staff compiled the collected species origin and present production information and developed a GIS polygon coverage depicting species origin and present production units.

Objective 4 Deviations:

- Pre-existing barriers and dams associated with unchanged pre-existing distribution most likely remained unchanged as well in terms of being rectified with the end of the distribution data.
- 1:100,000 and 1:24,000 scale fish distribution maps were not reprinted for review purposes. Maps were also not reprinted for review of origin and present production data.
- Print separate 1:100,000 scale fish distribution maps reflecting genetic origin, production origin, and life-stage timing information for final review.
- Documentation that was only specific to a waterbody, with no other information was collected, but not included in the final electronic dataset.

Objective 4 Unfinished Tasks:

- Efforts to convert 24K fish habitat distribution points to a linear format did not occur because the routed 24K digital hydrography did not exist (**part of Final Product #2**).

In response to **Objective 5**, *Complete the final review of the distribution maps*:

- Project staff reviewed distribution maps and data forms for obvious omissions or errors and contact field biologists via phone to resolve discrepancies.
- All final reviews by the data providers were performed on the original maps and mylar overlays.
- All errors discovered by species habitat distribution and barrier data users were considered and rectified within the databases and published datasets as necessary.
- In the absence of a formal review of the electronic data with data contributors, project GIS staff conducted a series of spot-checks to evaluate the accuracy of data transcription (from the mylars to digital databases). During this review, no errors were found. Subsequent to the release of the data, users have not identified any errors that relate back to the transcription of the data.
- Data (distribution, and other datasets) without rectification issues were stamped as "final".
- GIS staff reprinted maps of life-stage timing units for final review by data providers, where necessary.

Objective 5 Deviations:

- A lack of time and resources prevented additional hard copy maps depicting newly added/edited species habitat distribution, documentation, and barriers from being created and resubmitted to data providers for final review. The 1900+ hardcopy maps were not reprinted following electronic conversion of the data.

Objective 5 Unfinished Tasks:

- Following the conversion of hardcopy maps into electronic format, no formal review with data contributors was initiated to confirm the data had been transcribed properly.

In response to **Objective 6**, *Make final distribution and ancillary information available*, the following were accomplished:

- Zipped coverages, shapefiles, event tables (100K only) and associated metadata for all species distribution, documentation, barriers, and other ancillary information developed during the 24K Project were created, finalized, and made available from: http://osu.orst.edu/dept/nrimp/information/index.htm. Ancillary information includes life-stage timing, and species origin and present production information.
- 8-1/2" x 11" images (.pdf format) of each fourthfield hydrologic unit (HUC) depicting species distribution by usetype and full and partial blocking barriers were developed and made available from: http://osu.orst.edu/dept/nrimp/information/fishdistmaps.htm. Note: historic, absence, outlier, and disputed distribution were omitted from these maps.
- State and federal agencies, tribes, watershed councils, and other interested parties were notified via e-mail of the availability of the datasets and how to access them.
- Versions of original hard-copy documents for all references were submitted to the StreamNet Library for cataloging and shelving. **This satisfies final product #6.**
- A final workshop was held on February 19, 2003 to describe the development process, highlight available data features, outline strengths and weaknesses of the data, provide instructions on how to access the data, address questions and concerns regarding the available datasets, this final report, and all other aspects regarding the completion of the 24K Project. **This satisfies final product #3.**

Objective 6 Deviations:

- The original proposal for the 1:24,000 Fish Habitat Distribution Development Project also stated, "It is anticipated that once the 1:24,000 stream coverages are available for entire 4th field HUCs, information resulting from this proposal will be incorporated onto the new 1:24,000 map layers as lines rather than points. Routed hydrography at a 1:24,000 scale or larger had not been finalized before the project was completed. Consequently, the point data were not converted into a linear "event" format and we were unable to complete even a limited conversion of the data as anticipated.
- The original proposal also stated, "Until (the point data resulted from this effort could be converted to linear format), information from both scales will be combined and overlaid onto digital topographic map images called digital raster graphics (DRGs)." Some test map images, which included the 100K and 24K distribution data overlaid on the DRG images, were created but a full set was never produced because of issues related to file size, "downloadability" and lack of space on our server. Once the distribution datasets

were completed, they were made available directly in GIS format via the ODFW NRIMP web site.

Objective 6 Unfinished Tasks:

- None.

In response to **Objective 7**, *Maintain and update distribution data layers, as new information becomes available (***depending on budgetary constraints)**:

- Some data have been updated since the completion of the project, and information has been made available via the web with revised update dates to reflect the latest version.
- Data users have been instrumental in providing feedback on other data anomalies that have been discovered, and project staff have worked to correct these issues as they are brought forward.

Objective 7 Deviations:

- Due to time and funding restraints, NRIMP was unable to develop and test a procedure for field personnel (e.g. fish biologists, natural resources managers) to submit new species distribution and/or barrier information to modify the existing datasets. Ideally, the distribution and barrier edits/additions could be updated and submitted electronically via the Internet.
- A method has not been fully developed to automate the conversion of the 24K distribution (point) data to linear format once the 1:24,000 scale hydrography becomes available for Oregon.
- Maintenance and updates to the distribution datasets will be limited to what falls within the scope of NRIMP's StreamNet work plan, unless other funding becomes available. NRIMP is not adequately funded to maintain all of the data that were developed as part of the 24K Project. StreamNet will only fund NRIMP to maintain the 1:100,000 scale data within the Columbia basin.

Objective 7 Unfinished Tasks:

- All tasks were unfinished.

Appendix IX. Instructions for Accessing Digital Data and Maps.

Data that were developed during the 24K Project have been posted on an ODFW server and can be accessed via a web browser at: http://oregonstate.edu/dept/nrimp/information/index.htm
The Data Resources web page serves as an entry point to all of the data that ODFW's Natural Resource Information Mgt. Program makes available electronically. This table provides links to other web pages where either GIS data or maps can be accessed. All tables containing GIS data have an associated link for metadata where the details of each dataset can be found.

At the bottom of each GIS data page is a link to the Reference Information page http://oregonstate.edu/dept/nrimp/information/refid.htm. The Reference Information page contains a comprehensive list of the documents and memos that served as the primary basis for the development of the data. Documents can be requested from the StreamNet Library at http://www.fishlib.org, or (503) 731-1304.

At the bottom of each Map page there is a link to the StreamNet Interactive Mapping web site at: http://www.streamnet.org/mapper.html which enables users to create their own maps online.

Contact information for the Natural Resource Information Management Program staff can be found at: http://oregonstate.edu/dept/nrimp/contacts/staff.htm

Fish Habitat Distribution

Within the Fish sub-section of the Data Resources table, the Distribution / Habitat category provides separate links for GIS data and maps.

On the Fish Distribution / Habitat GIS Data page (http://oregonstate.edu/dept/nrimp/information/fishdistdata.htm) the datasets are separated into two sub-sections, one for 1:24,000 scale (point) data and the other for 1:100,000 scale (line) data. The data are provided in both coverage and shapefile format and may also have status and/or snapshot images available. The datasets are versioned and include the date when they were last updated. Additionally, for 1:100,000 scale datasets, event tables are available. These tables link to the 1:100,000 PNW River Reach hydrography data that can be found at: ftp://rainbow.dfw.state.or.us/pub/gis/k100/cover/rivers/. The direct link on the Data Resources page can be found under the Habitat sub-section, Rivers category.

On the Fish Distribution / Habitat Maps page (http://oregonstate.edu/dept/nrimp/information/fishdistmaps.htm) the maps are separated into two sub-sections. The first table provides links to species / run-specific "clickable" watershed maps that facilitate access to 8.5 x 11 inch maps in pdf format that can be viewed online and easily printed. Maps are currently available only for chinook, coho, chum and steelhead and include the date when they were last updated.
The second table provides links to maps that are served on the StreamNet web site, and are not related to the data compiled during the 24K Project.

Fish Passage Barriers

Within the Fish sub-section of the Data Resources table there are three separate categories for fish passage barriers: Barriers, Culverts and Dams.

The Barrier GIS Data page (http://oregonstate.edu/dept/nrimp/information/fishbarrierdata.htm) contains a single GIS dataset available in both coverage and shapefile format. This dataset includes all types of fish passage barriers (falls, cascades, culverts, etc…) with the exception of dams. Also included on this page is a table of related records for fish passage that are species and run specific.

The Dam GIS Data page (http://oregonstate.edu/dept/nrimp/information/damdata.htm) contains a single GIS dataset available in both coverage and shapefile format. This dataset includes only dams. All other fish passage barriers are stored in the Barriers dataset. Also included on this page is a table of related records for fish passage that are species and run specific.

The Dam Maps page (http://oregonstate.edu/dept/nrimp/information/dammaps.htm) contains a limited number of maps that include mostly major dams.

Fish Observations (Documentation)

Within the Fish sub-section of the Data Resources table, the Observations / Sightings category provides a single link to GIS data.

The Fish Observations / Sightings GIS Data page (http://oregonstate.edu/dept/nrimp/information/fishsightingsdata.htm) contains observation datasets for anadromous salmonids as well as Bull Trout. The page also contains snapshot images of the data as well as a date the data were last updated. Currently we are not making observation data available for several resident species pending completion of more comprehensive distribution datasets. This information can be requested from the GIS Manager listed on the contacts page referred to at the beginning of this appendix.

Timing

Within the Fish sub-section of the Data Resources table, the Timing category provides separate links for GIS data and Tables.

The Timing Unit GIS Data page (http://oregonstate.edu/dept/nrimp/information/timing/TimingGISData.htm) contains a single GIS dataset available in both coverage and shapefile format. This dataset contains the boundaries of the units for which data on species / run / life-stage specific timing were collected.

The Timing Unit Data page (http://oregonstate.edu/dept/nrimp/information/timing/TimingData.htm) provides links to the available timing data tables in spreadsheet format. These data are currently undergoing an extensive q/a review process and will be made available as they are finalized. The complete set should be available by January 2004.

Origin / Production

Genetic Origin and Present Production data are currently available only within the GIS datasets for anadromous species and Bull Trout found at:
http://oregonstate.edu/dept/nrimp/information/fishdistdata.htm

Appendix X. Summary table of documented 100K observation records, in miles, by species and run (for anadromous species) and species and life-history type (for resident species), by documentation type.

Species and Run or Life-history Combinations	Observation and Site-Specific	Site-Specific	Non Site-Specific	Total Miles
Brook Lamprey (resident)	1.4			1.4
Brook trout (resident)	122.3	51.8	0.4	174.5
Brown Trout (resident)	3.6			3.6
Bull Trout (resident)	31.0			31.0
Bull Trout (unknown/unspecified life-history)	640.1	271.7	21.7	933.5
Chum	15.1	132.4	0.4	147.9
Coastal Cutthroat (mixed searun and resident)	48.8			48.8
Coastal Cutthroat (searun)	17.4	17.8		35.2
Coastal Cutthroat (unknown/unspecified life-history)	640.3	780.5	59.3	1,480.0
Coho	776.4	2,075.4	42.9	2,894.7
Fall Chinook	205.6	1,499.2	188.0	1,892.8
Kokanee (unspecified run)		3.0		3.0
Lamprey (unknown/unspecified life-history)	25.1	80.5	5.3	110.8
O.Mykiss (unknown/unspecified life-history)	1,537.9	353.2	9.0	1,900.1
Pacific Lamprey (unknown/unspecified life-history)	1.7	15.0	0.7	17.3
Rainbow (mixed anadromous and resident)	111.7			111.7
Rainbow (unknown/unspecified life-history)	758.4	894.6	14.9	1,667.9
Rainbow Cutthroat hybrid (unknown/unspecified life-history)	1.4			1.4
Redband (resident)	31.3			31.3
Redband (unknown/unspecified life-history)	13.9			13.9
Sockeye		0.3		0.3
Spring Chinook	783.4	910.4	22.0	1,715.8
Summer Steelhead	991.5	792.2	18.2	1,801.9
Westslope (resident)	43.0	31.3	0.4	74.6
Winter Steelhead	483.1	757.4	27.2	1,267.7
Total	7,284.2	8,666.6	410.1	16,360.9

Appendix XI. Fish Habitat Distribution by Hydrologic Unit, by species and run.

Appendix XI-a. Summary of 100K fish habitat distribution miles by HUC by species and run.

HUC	HUC_Name	Total	Spring Chinook	Fall Chinook	Coho	Summer Steelhead	Winter Steelhead	Sockeye	Chum
17050201	Brownlee Reservoir	0.2				0.2			
17060101	Hells Canyon	152.5	58.8	3.4		75.4			
17060102	Imnaha	738.7	168.5	17.9		354.1			
17060103	Lower Snake-Asotin	246.0	49.4	49.4		52.0			
17060104	Upper Grande Ronde	1405.1	228.1			808.2			
17060105	Wallowa	875.7	174.0	25.7	92.1	262.4		55.2	
17060106	Lower Grande Ronde	1086.9	151.5	80.8	80.4	559.9		44.6	
17070101	Middle Columbia-Lake Wallula	390.7	106.3	106.6	71.6	106.3			
17070102	Walla Walla	450.1				198.0			
17070103	Umatilla	1065.5	141.1	87.0	141.6	497.7			
17070104	Willow	1.3							
17070105	Middle Columbia-Hood	1792.7	220.4	114.3	193.8	228.6	337.5		
17070201	Upper John Day	1086.0	146.9			802.9			
17070202	North Fork John Day	1506.6	195.7			942.5			
17070203	Middle Fork John Day	641.9	122.9			391.3			
17070204	Lower John Day	1053.3	181.8			833.6			
17070306	Lower Deschutes	874.6	221.9	99.5		357.7			
17070307	Trout	150.7				126.5			
17080001	Lower Columbia-Sandy	1092.2	178.3	119.5	240.2	184.8	299.6		55.0
17080003	Lower Columbia-Clatskanie	668.9	56.2	97.5	201.1	56.2	175.1		82.6
17080006	Lower Columbia	1176.6	28.0	280.9	336.6	28.0	195.5		307.5
17090001	Middle Fork Willamette	863.2	269.3			102.0	148.7		
17090002	Coast Fork Willamette	393.7	90.5			70.8	92.6		
17090003	Upper Willamette	938.1	223.2	84.8	202.9	78.4	337.0		
17090004	Mckenzie	904.5	259.0			236.6			
17090005	North Santiam	565.4	121.1	62.6	40.0	97.5	157.2		
17090006	South Santiam	620.0	199.0	19.1		69.5	273.1		

Appendix XI-a. Continued.

HUC	HUC_Name	Total	Spring Chinook	Fall Chinook	Coho	Summer Steelhead	Winter Steelhead	Sockeye	Chum
17090007	Middle Willamette	722.3	159.0	120.8	139.6	101.0	202.0		
17090008	Yamhill	601.8	70.0		216.9		313.4		
17090009	Molalla-Pudding	746.8	180.3	37.2	192.9	52.9	283.5		
17090010	Tualatin	582.6		0.5	254.3		321.2		
17090011	Clackamas	943.1	141.2	38.4	240.0	189.5	272.0		
17090012	Lower Willamette	549.9	48.9	90.5	185.4	49.1	176.0		
17100201	Necanicum	368.9	21.1	103.5	101.4		66.3		76.4
17100202	Nehalem	2984.3	585.2	406.5	715.4		419.1		858.0
17100203	Wilson-Trask-Nestucca	2243.3	149.8	411.7	631.4	256.3	638.8		155.3
17100204	Siletz-Yaquina	1884.6	92.1	356.1	597.0	149.0	599.6		90.8
17100205	Alsea	1427.8	98.9	242.6	526.2		532.0		27.2
17100206	Siuslaw	1785.6		359.5	699.2		654.7		71.6
17100207	Siltcoos	165.9			105.5		60.4		
17100301	North Umpqua	1116.9	107.4	63.0	178.4	303.7	379.0		
17100302	South Umpqua	2148.6	182.1	171.7	744.5		1049.2		
17100303	Umpqua	2858.3	109.8	343.4	1065.8	109.3	1230.1		
17100304	Coos	1329.7		210.0	522.7		597.0		
17100305	Coquille	1623.6	158.1	298.3	536.2		590.7		
17100306	Sixes	625.1		129.7	193.1		273.5		
17100307	Upper Rogue	827.2	71.4	48.5	180.7	297.9	175.4		
17100308	Middle Rogue	819.0	37.2	82.7	162.6	311.2	200.0		
17100309	Applegate	809.7	46.8	86.1	166.6	253.8	247.9		
17100310	Lower Rogue	1195.9	95.1	172.7	262.4	285.7	380.1		
17100311	Illinois	894.6	5.2	173.5	286.2	5.3	413.4		
17100312	Chetco	614.6		147.8	158.1		308.7		
18010101	Smith	95.8	13.2	19.2	18.0		45.3		
18010206	Upper Klamath	32.2		2.5	7.5		22.2		
Total		50739.2	5964.6	5365.4	10688.1	9885.6	12468.0	99.8	1724.5

Appendix XI-a. Continued.

HUC	HUC_Name	Total	Cutthroat (resident)	Cutthroat (run unknown)	Rainbow (resident)	Rainbow (mixed anadromous and resident)	Rainbow (unknown run)	Brook (resident)	Brook (unknown run)
17050201	Brownlee Reservoir	0.2							
17060101	Hells Canyon	152.5							
17060102	Imnaha	738.7							
17060103	Lower Snake-Asotin	246.0							
17060104	Upper Grande Ronde	1405.1						4.3	
17060105	Wallowa	875.7						14.8	
17060106	Lower Grande Ronde	1086.9							
17070101	Middle Columbia-Lake Wallula	390.7							
17070102	Walla Walla	450.1							
17070103	Umatilla	1065.5							
17070104	Willow	1.3							
17070105	Middle Columbia-Hood	1792.7	13.1	42.7	20.8	9.1	1.5	3.4	
17070201	Upper John Day	1086.0						3.3	
17070202	North Fork John Day	1506.6						27.8	0.1
17070203	Middle Fork John Day	641.9							
17070204	Lower John Day	1053.3							
17070306	Lower Deschutes	874.6							
17070307	Trout	150.7							
17080001	Lower Columbia-Sandy	1092.2			0.6				
17080003	Lower Columbia-Clatskanie	668.9							
17080006	Lower Columbia	1176.6							
17090001	Middle Fork Willamette	863.2			48.9	149.3	2.4		
17090002	Coast Fork Willamette	393.7			36.6	102.0	1.2		
17090003	Upper Willamette	938.1							
17090004	Mckenzie	904.5			8.4	227.4	14.2		
17090005	North Santiam	565.4			21.5				

17090006	South Santiam	620.0		35.6					
17090007	Middle Willamette	722.3							
17090008	Yamhill	601.8							
17090009	Molalla-Pudding	746.8							
17090010	Tualatin	582.6							
17090011	Clackamas	943.1		4.8					
17090012	Lower Willamette	549.9							
17100201	Necanicum	368.9							
17100202	Nehalem	2984.3							
17100203	Wilson-Trask-Nestucca	2243.3							
17100204	Siletz-Yaquina	1884.6							
17100205	Alsea	1427.8							
17100206	Siuslaw	1785.6							
17100207	Siltcoos	165.9							
17100301	North Umpqua	1116.9		85.4					
17100302	South Umpqua	2148.6							
17100303	Umpqua	2858.3							
17100304	Coos	1329.7							
17100305	Coquille	1623.6							
17100306	Sixes	625.1							
17100307	Upper Rogue	827.2		53.3					
17100308	Middle Rogue	819.0		25.4					
17100309	Applegate	809.7		8.6					
17100310	Lower Rogue	1195.9							
17100311	Illinois	894.6		11.0					
17100312	Chetco	614.6							
18010101	Smith	95.8							
18010206	Upper Klamath	32.2							
Total		50739.2	13.1	42.7	361.0	487.7	19.3	53.6	0.1

Appendix XI-a. Continued.

HUC	HUC_Name	Total	Bull Trout	Lamprey	Coastal Cutthroat (resident)	Coastal Cutthroat (mixed sea-run and resident)	Coastal Cutthroat (unknown run)	Redband (resident)	Redband (mixed anadromous and resident)
17050201	Brownlee Reservoir	0.2							
17060101	Hells Canyon	152.5	2.7					12.3	
17060102	Imnaha	738.7	191.7					3.6	
17060103	Lower Snake-Asotin	246.0	78.4					16.7	
17060104	Upper Grande Ronde	1405.1	276.6					67.2	
17060105	Wallowa	875.7	202.5					39.4	0.4
17060106	Lower Grande Ronde	1086.9	157.2					5.9	
17070101	Middle Columbia-Lake Wallula	390.7							
17070102	Walla Walla	450.1	209.1					41.7	
17070103	Umatilla	1065.5	110.7					79.2	1.9
17070104	Willow	1.3							
17070105	Middle Columbia-Hood	1792.7	39.0		146.8	278.5	143.2		
17070201	Upper John Day	1086.0	80.4					46.3	
17070202	North Fork John Day	1506.6	232.1					37.1	23.6
17070203	Middle Fork John Day	641.9	122.1						
17070204	Lower John Day	1053.3	15.0					19.3	3.6
17070306	Lower Deschutes	874.6	194.8						
17070307	Trout	150.7	9.1					15.1	
17080001	Lower Columbia-Sandy	1092.2			14.3				
17080003	Lower Columbia-Clatskanie	668.9							
17080006	Lower Columbia	1176.6							
17090001	Middle Fork Willamette	863.2	142.5	0.0					
17090002	Coast Fork Willamette	393.7		0.0					
17090003	Upper Willamette	938.1	11.8						
17090004	Mckenzie	904.5	158.9						
17090005	North Santiam	565.4	65.5						

17090006	South Santiam	620.0	23.6	0.1					
17090007	Middle Willamette	722.3							
17090008	Yamhill	601.8			1.5				
17090009	Molalla-Pudding	746.8							
17090010	Tualatin	582.6		6.6					
17090011	Clackamas	943.1	57.2						
17090012	Lower Willamette	549.9							
17100201	Necanicum	368.9							
17100202	Nehalem	2984.3							
17100203	Wilson-Trask-Nestucca	2243.3							
17100204	Siletz-Yaquina	1884.6							
17100205	Alsea	1427.8			0.8				
17100206	Siuslaw	1785.6		0.5					
17100207	Siltcoos	165.9							
17100301	North Umpqua	1116.9							
17100302	South Umpqua	2148.6			1.1				
17100303	Umpqua	2858.3							
17100304	Coos	1329.7							
17100305	Coquille	1623.6							
17100306	Sixes	625.1			1.1				
17100307	Upper Rogue	827.2							
17100308	Middle Rogue	819.0							
17100309	Applegate	809.7							
17100310	Lower Rogue	1195.9							
17100311	Illinois	894.6							
17100312	Chetco	614.6							
18010101	Smith	95.8							
18010206	Upper Klamath	32.2							
Total		50739.2	2381.0	7.2	165.6	278.5	143.2	383.6	29.4

Appendix XI-a. Continued.

HUC	HUC_Name	Total	Redband (unknown run)	Rainbow Cutthroat Hybrid (resident)	Rainbow Cutthroat Hybrid (mixed anadromous and resident)	Golden Trout (resident)			
17050201	Brownlee Reservoir	0.2							
17060101	Hells Canyon	152.5							
17060102	Imnaha	738.7	2.9						
17060103	Lower Snake-Asotin	246.0							
17060104	Upper Grande Ronde	1405.1	20.8						
17060105	Wallowa	875.7	9.0			0.3			
17060106	Lower Grande Ronde	1086.9	6.6						
17070101	Middle Columbia-Lake Wallula	390.7							
17070102	Walla Walla	450.1	1.2						
17070103	Umatilla	1065.5	6.4						
17070104	Willow	1.3	1.3						
17070105	Middle Columbia-Hood	1792.7							
17070201	Upper John Day	1086.0	6.2						
17070202	North Fork John Day	1506.6	47.6						
17070203	Middle Fork John Day	641.9	5.7						
17070204	Lower John Day	1053.3							
17070306	Lower Deschutes	874.6	0.7						
17070307	Trout	150.7							
17080001	Lower Columbia-Sandy	1092.2							
17080003	Lower Columbia-Clatskanie	668.9							
17080006	Lower Columbia	1176.6							
17090001	Middle Fork Willamette	863.2							
17090002	Coast Fork Willamette	393.7							
17090003	Upper Willamette	938.1							

17090004	Mckenzie	904.5							
17090005	North Santiam	565.4							
17090006	South Santiam	620.0							
17090007	Middle Willamette	722.3							
17090008	Yamhill	601.8							
17090009	Molalla-Pudding	746.8							
17090010	Tualatin	582.6							
17090011	Clackamas	943.1							
17090012	Lower Willamette	549.9							
17100201	Necanicum	368.9							
17100202	Nehalem	2984.3							
17100203	Wilson-Trask-Nestucca	2243.3							
17100204	Siletz-Yaquina	1884.6							
17100205	Alsea	1427.8							
17100206	Siuslaw	1785.6							
17100207	Siltcoos	165.9							
17100301	North Umpqua	1116.9							
17100302	South Umpqua	2148.6							
17100303	Umpqua	2858.3							
17100304	Coos	1329.7							
17100305	Coquille	1623.6		40.3					
17100306	Sixes	625.1		23.1	4.6				
17100307	Upper Rogue	827.2							
17100308	Middle Rogue	819.0							
17100309	Applegate	809.7							
17100310	Lower Rogue	1195.9							
17100311	Illinois	894.6							
17100312	Chetco	614.6							
18010101	Smith	95.8							
18010206	Upper Klamath	32.2							
Total		50739.2	108.5	63.3	4.6	0.3			

Appendix XI-b. Summary of 24K fish habitat distribution points by HUC by species and run.

HUC	HUC Name	Total	Spring Chinook	Fall Chinook	Coho	Summer Steelhead	Winter Steelhead	Chum	Rainbow (resident)	Rainbow (mixed anadromous and resident)	Brook (resident)
17060102	Imnaha	3				3					
17060104	Upper Grande Ronde	3				3					
17060105	Wallowa	21	3			5					2
17060106	Lower Grande Ronde	4				4					
17070102	Walla Walla	1									
17070103	Umatilla	28	4		5	14					
17070105	Middle Columbia-Hood	80	1		2	3	8		1		5
17070201	Upper John Day	21				13					
17070202	North Fork John Day	9				8					
17070203	Middle Fork John Day	9	4			5					
17070204	Lower John Day	8				7					
17070301	Upper Deschutes	3									
17080001	Lower Columbia-Sandy	43	2	11	13		14				
17080003	Lower Columbia-Clatskanie	4		1	3						
17080006	Lower Columbia	30		8	19		1	2			
17090001	Middle Fork Willamette	19	3			5	4			4	
17090002	Coast Fork Willamette	11				1	5			5	
17090003	Upper Willamette	9	6			1	2				
17090004	Mckenzie	34	17			8			1	4	
17090005	North Santiam	9	4			2	3				
17090006	South Santiam	8	4			2	2				
17090007	Middle Willamette	3					3				
17090008	Yamhill	21	1				8				
17090010	Tualatin	9			3		6				

HUC	HUC Name	Total	Spring Chinook	Fall Chinook	Coho	Summer Steelhead	Winter Steelhead	Chum	Rainbow (resident)	Rainbow (mixed anadromous and resident)	Brook (resident)
17090011	Clackamas	35	4		17	3	8		3		
17090012	Lower Willamette	11		3	4		4				
17100201	Necanicum	27			24		2	1			
17100202	Nehalem	72		2	60		9	1			
17100203	Wilson-Trask-Nestucca	40	1	3	15		21				
17100204	Siletz-Yaquina	110			66		44				
17100205	Alsea	237		1	136		100				
17100206	Siuslaw	191		2	178		11				
17100207	Siltcoos	69			68		1				
17100301	North Umpqua	42				10	30		2		
17100302	South Umpqua	45					45				
17100303	Umpqua	233	8	8	52	7	158				
17100304	Coos	117			29		88				
17100305	Coquille	51		1	13		35				
17100306	Sixes	85		2	20		56				
17100307	Upper Rogue	44			5	29	4		5		
17100308	Middle Rogue	32			1	22	4		5		
17100309	Applegate	29			2	15	11		1		
17100310	Lower Rogue	31		1	1	9	19		1		
17100311	Illinois	2			1		1				
17100312	Chetco	28		1			27				
	Total	1921	62	44	737	179	734	4	19	13	7

Appendix XI-b. Continued.

HUC	HUC Name	Total	Bull Trout	Coastal Cutthroat (resident)	Coastal Cutthroat (mixed sea-run and resident)	Coastal Cutthroat (unknown run)	Westslope Cutthroat (resident)	Westslope Cutthroat (unknown)	Redband (resident)	Rainbow Cutthroat Hybrid (resident)	Total
17060102	Imnaha	3									3
17060104	Upper Grande Ronde	3									3
17060105	Wallowa	21							11		21
17060106	Lower Grande Ronde	4									4
17070102	Walla Walla	1	1								1
17070103	Umatilla	28							5		28
17070105	Middle Columbia-Hood	80	3	24	24	9					80
17070201	Upper John Day	21					7	1			21
17070202	North Fork John Day	9							1		9
17070203	Middle Fork John Day	9									9
17070204	Lower John Day	8							1		8
17070301	Upper Deschutes	3	3								3
17080001	Lower Columbia-Sandy	43		3							43
17080003	Lower Columbia-Clatskanie	4									4
17080006	Lower Columbia	30									30
17090001	Middle Fork Willamette	19	3								19
17090002	Coast Fork Willamette	11									11
17090003	Upper Willamette	9									9
17090004	Mckenzie	34	4								34
17090005	North Santiam	9									9
17090006	South Santiam	8									8
17090007	Middle Willamette	3									3
17090008	Yamhill	21				12					21
17090010	Tualatin	9									9

HUC	HUC Name	Total	Bull Trout	Coastal Cutthroat (resident)	Coastal Cutthroat (mixed sea-run and resident)	Coastal Cutthroat (unknown run)	Westslope Cutthroat (resident)	Westslope Cutthroat (unknown)	Redband (resident)	Rainbow Cutthroat Hybrid (resident)	Total
17090011	Clackamas	35									35
17090012	Lower Willamette	11									11
17100201	Necanicum	27									27
17100202	Nehalem	72									72
17100203	Wilson-Trask-Nestucca	40									40
17100204	Siletz-Yaquina	110									110
17100205	Alsea	237									237
17100206	Siuslaw	191									191
17100207	Siltcoos	69									69
17100301	North Umpqua	42									42
17100302	South Umpqua	45									45
17100303	Umpqua	233									233
17100304	Coos	117									117
17100305	Coquille	51								2	51
17100306	Sixes	85								7	85
17100307	Upper Rogue	44		1							44
17100308	Middle Rogue	32									32
17100309	Applegate	29									29
17100310	Lower Rogue	31									31
17100311	Illinois	2									2
17100312	Chetco	28									28
	Total	1921	14	28	24	21	7	1	18	9	1921

Appendix XII. Fish habitat distribution summary tables by usetype by species and run.

Appendix XII-a. 100K fish habitat distribution miles by usetype by species and run.

Species	Spawning and Rearing	Rearing and Migration	Migration	Previous / Historic	Present (Usetype mixed or unknown)	Absent	Unknown	Disputed	Outlier	Total
Spring Chinook	2180.2	2486.2	643	143.2	26.5	444.5	0.4	40.5		5964.5
Fall Chinook	3559	787.4	412.8	77.3	9.9	495.6	1.4	22.1		5365.5
Coho	6522	2646.7	688.8	359.2	8.1	207.6	0.9	78.9	175.8	10688.0
Summer Steelhead	6971	1460.6	958.5	218.2	129.5	39.8		86.1	21.8	9885.5
Winter Steelhead	9212	2152.9	683.4	286	40.9	25	0.9	66.7		12467.8
Sockeye				99.8						99.8
Chum	160.6	173.4	138.8	193.3	5.3	1053				1724.4
Cutthroat (year-round resident)					13.1					13.1
Cutthroat (unknown run)					42.7					42.7
Rainbow (year-round resident)					357.5			3.4		360.9
Rainbow (mixed anadromous and resident)					487.7					487.7
Rainbow (unknown run)					17.7			1.6		19.3
Brook (year-round resident)					53.6					53.6
Brook (run n/a)		0.1								0.1
Bull Trout	697.1	546.9	591.7	508	30.8	5.1		1.2		2380.8
Lamprey	0.1				7.1					7.2
Coastal Cutthroat (year-round resident)					147.6	18				165.6
Coastal Cutthroat (mixed sea-run and resident)	186.6	25.3			37.5	29.5				278.9
Coastal Cutthroat (unknown run)					12.3	130.8	2.7			145.8
Westslope Cutthroat (year-round resident)					383.2			0.4		383.6
Redband (year-round resident)					29.4					29.4
Redband (mixed anadromous and resident)					108.4					108.4
Redband (unknown run)					63.3					63.3
Rainbow Cutthroat Hybrid (year-round resident)					4.6					4.6
Rainbow Cutthroat Hybrid (mixed anadromous and resident)					0.3					0.3
Golden Trout (year-round resident)										
Total	29,488.6	10,279.5	4,117	1,885	2,017	2,448.9	6.3	300.9	197.6	50,739.2

Appendix XII-b. 24K fish habitat distribution points by usetype by species and run.

Species / Run	Spawning and Rearing	Rearing and Migration	Migration	Previous / Historic	Present (Usetype mixed or unknown)	Absent	Disputed	Total
Spring Chinook	15	35	1	9	2			62
Fall Chinook	10	21		11		2		44
Coho	448	223	1	17	10	22	16	737
Summer Steelhead	134	7	3	22	13			179
Winter Steelhead	630	52	5	16	30		1	734
Chum		1				3		4
Rainbow (year-round resident)					17		2	19
Rainbow (mixed anadromous and resident)					13			13
Brook (year-round resident)					7			7
Bull Trout	8	4		2				14
Coastal Cutthroat (year-round resident)					26	2		28
Coastal Cutthroat (mixed sea-run and resident)	9				15			24
Coastal Cutthroat (run unknown)					17	4		21
Westslope Cutthroat (year-round resident)					7			7
Westslope Cutthroat (unknown run)					1			1
Redband (year-round resident)					18			18
Rainbow Cutthroat Hybrid (year-round resident)					9			9
Total	1,254	343	10	77	185	33	19	1,921

Appendix XIII. Summary tables of fish habitat distribution miles by data contributor confidence rating by species and run.

Appendix XIII-a. Summary of 100K fish habitat distribution miles by confidence rating by species and run.

Species	PUO	PSO	PMO	DOC	Total
Spring Chinook	1454.1	1056.0	3075.0	379.6	5964.6
Fall Chinook	1331.7	1113.3	2746.0	174.4	5365.4
Coho	3913.2	2199.5	4107.7	467.7	10688.1
Summer Steelhead	2561.5	1582.5	5314.6	427.1	9885.6
Winter Steelhead	3693.4	3011.9	5276.5	486.1	12468.0
Sockeye			99.8		99.8
Chum	232.9	133.7	1339.4	18.5	1724.5
Cutthroat (year-round resident)			13.1		13.1
Cutthroat (unknown run)			42.7		42.7
Rainbow (year-round resident)	242.6	60.7	54.1	3.5	361.0
Rainbow (mixed anadromous and resident)	129.7	163.3	194.7		487.7
Rainbow (unknown run)	8.2	8.2	2.9		19.3
Brook (year-round resident)	8.7		44.8		53.6
Brook (run n/a)	0.1				0.1
Bull Trout	1904.0	377.0	100.0		2381.0
Lamprey	4.9		2.3		7.2
Coastal Cutthroat (year-round resident)	47.7	87.4	30.6		165.6
Coastal Cutthroat (mixed sea-run and resident)	63.4	110.0	105.1		278.5
Coastal Cutthroat (unknown run)	2.4	6.1	134.7		143.2
Redband (year-round resident)	167.7	83.3	132.7		383.6
Redband (mixed anadromous and resident)	28.2	1.2			29.4
Redband (unknown run)	22.4	5.4	80.7		108.5
Rainbow Cutthroat Hybrid (year-round resident)	59.7	2.2	1.4		63.3
Rainbow Cutthroat Hybrid (mixed anadromous and resident)	4.6				4.6
Golden Trout (year-round resident)			0.3		0.3
Total	15,881.1	10,001.6	22,899.3	1956.9	50,739.2

Appendix XIII-b. Summary of 24K fish distribution points by species and run, by confidence rating.

SPECIES	PUO	PSO	PMO	DOC	Total
Spring Chinook	23	15	24	0	62
Fall Chinook	17	4	23	0	44
Coho	346	120	271	0	737
Summer Steelhead	90	37	52	0	179
Winter Steelhead	292	132	310	0	734
Chum	1	0	3	0	4
Rainbow	18	9	5	0	32
Brook	0	3	4	0	7
Bull Trout	10	2	2	0	14
Coastal Cutthroat	24	6	43	0	73
Westslope Cutthroat	0	0	8	0	8
Redband	8	0	10	0	18
Rainbow / Cutthroat hybrid	8	0	1	0	9
Total	814	328	756	0	1,921

Appendix XIV. Summary of caveats and assumptions associated with 24K Project data.

1. Distribution coded with Disputed, Absence, Unknown, or Previous/Historic usetypes should be excluded when assessing what is believed to be the miles of suitable habitat that is currently utilized by the species targeted during the 24K effort in the anadromous zone of Oregon.
2. Total resident salmonid distribution based on the 24K effort alone, should be considered an underestimation of the available resident salmonid habitat distribution. Cutthroat distribution in particular is far from being complete.
3. "Absent" and "Previous/Historic" habitat distribution is far from comprehensive.
4. Data users should never make the assumption that a lack of habitat distribution means no fish – rather, no distribution is equivalent to "unknown" distribution. The only streams that should be viewed as "no use" for a given species are labeled with the "Absent" usetype.
5. The Natural Resources Information Management Program (ODFW) makes no statement as to the validity of species absence in any particular area unless the record is accompanied by a confidence rating (PUO, PSO, PMO) and the name of the biologist who contributed the information.
6. Areas displayed may not be used by a species of fish on an annual basis due to natural variations in run size, water conditions, and other environmental factors.
7. Data quality ratings for undocumented observations are assumed to represent the data contributor's degree of certainty that a species is present in a given area based on his/her professional judgment. The data quality rating should always be used to qualify any results or conclusions one may derive from 24K Project data.
8. It was decided to assign all unqualified distribution records the lowest confidence rating, Present based on Moderate professional Opinion (PMO), based on the assumption that at least some level of confidence exists if distribution information was provided. This was done even if an upstream record had a higher confidence rating. For this reason, it is advised that data users consider examining upstream confidence ratings when analyzing presence. This is particularly true when examining anadromous distribution where it is known that the fish had to pass through the lower sections of a waterbody to get to an upstream section.
9. The Quality Criteria field (within the distribution data) is coded with the highest confidence level of "documented" only when the observation record completely encompasses the distribution record. Distribution records were not subdivided based on documented observation records. Therefore, it is possible to have significant lengths of distribution records that have their quality criteria field coded at a lower confidence level than "documented", but SOME overlap exists with a documented observation. In order to understand the complete set of documented observations, it is necessary to work with BOTH the distribution and observation datasets.
10. A limited number of fish observation records extend above current distribution data. Some observation records are based on ground measurements, which may not precisely match the measures that are built into the routed streams GIS layer. For streams of significant length, the "ground" measures can sometimes be greater than the GIS measures that are built into the

stream route system, thus placing the observation upstream of mapped distribution. Without specific references to known locations such as road crossings, etc… it is difficult to reconcile the difference between the two sets of measures.

11. Fish passage barrier data are not comprehensive. For example, very few culverts have been incorporated into the database at this time.
12. Some fish passage barriers in the ODFW Barrier database may be considered passable to all adult salmonids that are present at that location.
13. Fish passage records, which provide detail of species-specific passage at each barrier, are not comprehensive relative to the full set of barriers in the database.
14. Data describing fish passage for juvenile life stages were not compiled as part of this effort.
15. Observation records are not comprehensive. The 24K Project data compilers reviewed a significant number of reports containing observation information, but many additional reports exist both within and outside ODFW that were not reviewed as part of the project.
16. The distribution datasets represent the most comprehensive statewide compilation of anadromous fish habitat distribution data available, however the datasets continue to evolve as more information becomes available.
17. Observation data provide proof of presence and were not used to develop levels of confidence for the Usetypes that were mapped.
18. Resident species data were collected using anadromous usetype categories. Draft data structures were developed to describe the life history characteristics of resident species, but these were not implemented as part of this project.
19. Disputed distribution data exist where data contributors were unable to provide proof of presence / absence of the species in question within the scope of the project.