EXPLANATION OF 4 (FISH INFORMATION) DATABASES: CRBFISH6, CRBFISH5, CRBFISH4, and AQINTEG5 (Released as theme names: bdbfish6, bdbfish5, bdbfish4, bdbaqin5 respectively)

Users are encouraged to review the following document for description, development, appropriate use, context of use, and purpose of these databases: Lee, D.; Sedell, J.R.; Rieman, B.; [and others]. 19976. Broadscale assessment of aquatic species and habitats. In: Qiugley, Thomas M.; Arbelbide, S.J. Tech. Eds. An assessment of ecosystem components in the Interior Columbia Basin and portions of Klamath and Great Basins. General Technical Report. Portland, OR. USDA Forest Service, Pacific Northwest Research Station.

OVERVIEW OF APPROACH AND DATA SOURCES

We considered the fishes at three levels of detail:

1) Fish Species Assemblages- We summarized the known occurrence of all fish taxa, native and introduced, across the Basin. Species assemblages were defined by species composition and mapped by watershed across the Basin. Species richness and diversity indices were calculated for each species assemblage.

2) Sensitive Native Species- We compiled information for 38 taxa considered sensitive, threatened, endangered, or of special concern. We summarized current current knowledge regarding fish status relative to the historical range, biology and life history, and important threats to persistence. We used composite distributions of the most sensitive or narrowly distributed of these species indicate sensitive or otherwise important watersheds.

3) Key Salmonids- We considered seven select salmonids in the greatest detail: bull, westslope cutthroat, Yellowstone cutthroat, and redband trout; steelhead; and ocean-type (age-0 migrant)and stream-type (age-1 migrant) chinook salmon. We summarized the presence, absence, and status in subwatersheds that supported spawning and rearing habitat for each species or life history. Because existing information describing the occurrence and status of these salmonids is incomplete, we used classification trees to analyze patterns in the known distributions and to predict the occurrence and status in watersheds lacking such information. We also briefly considered the distribution of several introduced salmonids.

There are several reasons for focusing on these salmonids, other than their obvious social and cultural values. First, we know more about them, and are more likely to discern important environmental relationships. Second, they are or were widely distributed, which allows for broad-scale comparisons. Third, salmonids act as predators, competitors, and prey for a variety of other aquatic and terrestrial taxa. Thus, they are likely to influence the structure and function of aquatic ecosystems and may serve as critical links with energy and nutrient flows to terrestrial systems (Henjum and others 1994; Willson and Halupka 1995). Finally, the salmonids potentially are more sensitive to disturbance than other groups (Marcot and others 1994). Different species and life stages often use widely divergent habitats, exposing individual populations and native assemblages to a wide variety of environmental and habitat disturbances. Salmonids may therefore integrate the cumulative effects of environmental change over broad areas.

We developed two primary databases; one summarizing the current status of the selected Akey@ salmonids, and a second summarizing the reported presence of all native or introduced fish taxa. As part of each database, we also summarized the historical distributions for each key salmonid and species recognized as sensitive, threatened, endangered, or of special concern by state or federal agencies.

Key Salmonids Status Database (CRBFISH6), (released file bdbfish6)

The seven key salmonids include both distinct species and life-history forms. Bull, westslope cutthroat, and Yellowstone cutthroat trout are taxonomically and geographically distinct. Redband trout and chinook salmon, however, are each represented by two distinct life-history forms. Non-anadromous redband trout and anadromous steelhead are commonly recognized as interior rainbow trout, and occur both together in sympatry and in isolation from each other (allopatry) throughout a major portion of the Basin. For purposes of this analysis, redband trout designates the non-anadromous form. We adopted Gilbert (1912 cited by Matthews and Waples 1991) and Healeys' (1991) characterization of chinook salmon that migrate seaward primarily at age 1 as "stream-type" and those that migrate primarily as age 0 as "ocean-type".

The currentstatus database was developed through the classification of subwatersheds by private, agency, and tribal fishery biologists working throughout the Basin. The data were augmented with information from existing electronic databases maintained by state and federal agencies, and other sources (**Appendix 4.A**).

Biologists were asked to summarize the status of each of the key salmonids from existing data. We used a series of workshops to train facilitators who then trained or worked with other biologists from the study area. Each participant was responsible for an area familiar to them, where they either generated or maintained information or had access to the available data and expertise. Biologists worked in teams and incorporated information from other federal, state, private and tribal biologists and inventories. More than 150 biologists contributed to the project (**Appendix 4.A)**.

Our sample units were 6th code watersheds, also termed subwatersheds (see Section III of Lee and others 1996). Biologists classified the status of naturally reproducing populations only. If populations were supported solely by hatchery-reared fish, naturally spawning fish were considered absent. Biologists classified units where fish were present as follows: spawning and rearing habitat; overwintering and migratory-corridor habitat; or present but of unknown status. Subwatersheds supporting spawning and rearing habitat were further classified as strong or depressed. We asked biologists to judge strong or depressed status based on population characteristics, including life-history forms, recent trends in abundance, and current abundance. Status should not have been inferred from surrounding landscape characteristics or the occurrence or other species (for example, habitat condition or presence of introduced fishes). The following criteria guided classification:

Present strong- Strong watersheds include those with the following characteristics: 1) all major life histories (for example: stream resident or migratory) that historically occurred within the watershed are present; 2) numbers are stable or increasing, and the local population is likely to be at half or more of its historical size or density; and 3) the population or metapopulation within the subwatershed, or within a larger region of which the subwatershed is a part, probably contains at least 5,000 individuals or 500 adults.

Present depressed- Depressed watersheds include those with at least one of the following characteristics: 1) a major life-history component (for example, a migratory or resident form of westslope cutthroat trout) has been eliminated; 2) numbers within the subwatershed are declining, or the salmonid occurs in less than half of its historical habitat, or numbers are less than half of what the watershed supported historically; if historical information is unavailable, densities are less than half of what is found in comparable streams in an undisturbed condition where the species is well distributed; in cases with relatively strong numbers, but where a population was seriously hybridized with an introduced species or subspecies, the population representing the pure native species/subspecies was considered depressed; or 3) total abundance for the population or metapopulation within the subwatershed, or the larger region of which this subwatershed is a part, is less than 5,000 total fish or 500 adults; the fish within the subwatershed are isolated by distance or natural barriers from other populations that would collectively exceed these numbers.

Absent- The key salmonid is not present in this subwatershed. It is either extinct or never occupied the subwatershed. The subwatershed is located within the natural range of the species and colonization of the subwatershed was historically possible even though habitat or other environmental conditions might make the habitat unsuitable.

Present-unknown- The key salmonid is present, but there is no reliable information to determine current status.

Present, migration corridor- Migration corridors are habitats that do not support spawning or rearing, and function solely as routes or staging and wintering areas for migrating fish. If spawning or rearing are known to occur, the population status is judged as present-depressed, present-strong, or present-unknown. Many salmonids may disperse widely from natal habitats prior to maturation. Where a distinction could be made between areas that serve as initial rearing areas prior to migration and those that support transient or subadult fish (for example, mainstem rivers or lakes for bull trout), we considered the latter to be corridor habitat.

Unknown- No information exists regarding the current presence or absence of the species. Subwatersheds that were unclassified were considered unknown.

All status classifications were done by color coding maps of the subwatersheds. Data were entered in the currentstatus database and proofed against the original maps and against pre-existing databases **(Appendi**x **4.A**). We accepted classifications of absent from the pre-existing databases only when sampling was documented. Subwatersheds where the current and pre-existing databases conflicted regarding the known presence or absence of a species were classified as unknown. Rules employed for merging data sets and treatment of conflicting information are detailed in Appendix **4.A**.

Note: The biologists= classifications were updated 9/00 to help identify subwatersheds for including in the A1/A2 system in the ICBEMP FEIS. The same criteria (above) were used, but other procedures used in assembling the original database described above (e.g., mapping, proofing, merging with other databases) differed. For example, data were used from the Inland West Water Initiative for regions 1 and 4 of the Forest Service. These updated classifications are being released as a new theme "FEIS Key Salmonid Status Update (FSHFSHUP)". The updated classifications have not been used to re-calculate any of the other variables. In those cases where variables are a product of status classifications, the variables based on the original classifications were retained to accurately reflect the information presented in the aquatic assessment (Lee et al. 1997) and the ICBEMP DEIS and SDEIS.

Species-assemblage Database (CRBFISH5) (released file bdbfish5)

The species-assemblage database was developed at the same time as the currentstatus database. For this database the sample units were 5th code watersheds (see Section III). The biologists recorded the known presence of all potential fish species in each watershed. They used a master list of all taxa (that is, native and introduced) expected within the Basin, with a unique numeric code for each taxa. Biologists characterized watersheds where they were knowledgable about all species, but they were also asked to use professional judgement to provide as complete a classification as possible. For example, where available data indicated a common species complex in some watersheds but data were limited in other watersheds, biologists were encouraged to extrapolate species occurrence to similar, adjacent waters. Where sampling, records, or personal experience where too limited to include all likely species, watersheds were classified as unknown even though some species were known present. The assemblage database was proofed in the same manner as the currentstatus database. We compared our database to the pre-existing databases maintained by each state and the Oregon State University collection records. If any database included a species as present, it was included as present in the final assemblage database. Additional records of introduced species were added at the subbasin level using data provided by the National Biological Service's Southeastern Biological Science Center.

Historical Ranges

Historical ranges were defined for the seven key salmonids and, whenever possible, for all species, subspecies, or races recognized as sensitive, threatened, endangered or otherwise of special concern. We defined historical as prior to European settlement whenever such inference was possible. Ranges were characterized from the historical distributions in the pre-existing databases and augmented through published and anecdotal accounts. We did not accept all accounts as correct, but reviewed and revised distributions whenever possible. The Wilderness Society (1993) distribution of several salmon species, for example, was based on the range of contiguous waters that were historically accessable and not on specific species accounts.

For many fish species, the historical ranges remain speculative and more accurately represent the potential range rather than an actual historical distribution. Few records are available to ascertain the historical range of steelhead and salmon throughout the Bruneau River subbasin, for example, because access was blocked early in the century and prior to any detailed population survey. Some species like bull trout are also unlikely to occupy all reaches or all accessible streams within the watersheds of the historical range. Distributions may be restricted by elevation, temperature, and local channel features. Because we mapped historical ranges at the watershed scale, the entire watershed was included in the historical range, even where species may have occurred in only a portion of a watershed. In some cases, the historical range may be overestimated because of the loss of resolution.

The historical ranges of redband trout and steelhead are ambiguous where the two co-occur (see species narrative for redband trout). Although all native non-anadromous rainbow trout were considered redband trout in our summary, we believe that populations isolated from steelhead in recent geologic history may represent evolutionarily distinct subgroups of the species. Such isolation may result in substantial genetic divergence between groups, representing important genetic variability for the species. For this reason, we identified two historical ranges for redband trout, those isolated from (allopatric) and those contiguous with (sympatric) the historical distribution of steelhead.

Historical ranges were merged with the currentstatus and species-assemblage databases. A summary and documentation of the defined historical ranges is presented in **appendix 4.B.**

APPENDIX IV.A.   FISH STATUS AND DISTRIBUTION DATABASES

The information conveyed in Section 4 of Lee and others (1996) on fish assemblages and key salmonids is available in a series of four electronic databases. The discussion below and accompanying tables supplement the information given in Section 4 regarding derivation of the fisheries data and provide a guide to the databases. The sources for data contained therein were available from preexisting databases and from professional biologists throughout the Basin. Databases were compiled for subbasins, watersheds, and subwatersheds in the following manner.

Status Database (CRBFISH6) (released file bdbfish6)

Preexisting Data- The following databases were available at the initiation of this effort: the River Information Systems (RIS) databases for Washington (WARIS), Oregon (ORIS), Montana (MRIS) and Idaho (IRIS); the Oregon State University fish collection data base; the Coordinated Information System (CIS) database for anadromous fish maintained by the Pacific States Marine Fisheries Commission , and the Wilderness Society distributions of anadromous salmonids. The RIS and CIS databases were attributed to stream segments based on the EPA river- reach codes. The Wilderness Society database was represented by GIS coverages that were used only in development of the historical ranges. We worked with the State agencies to update RIS information for the key salmonids in Idaho and Montana; biologists in both states reviewed and updated existing information regarding known presence or absence of key species.

Data aquisition was closed in June 1995 to begin proofing and analysis. Data that were not incorporated because of delayed availability include: the Washington Department of Fisheries and Wildlife Streams and Lakes Fish Database; Oregon Department of Fish and Wildlife database for the distribution of bull trout; Oregon Department of Fish and Wildlife database for habitat and fish inventory sampling; University of Washington collection records; Oregon State University collection records; and the Plum Creek Timber Company bull trout inventories. This information is not included in the current database, but can be incorporated in future versions. Relevant portions of these data were used in a validation exercise (Section 4 of Lee and others 1996).

Biologists' Classifications- Biologists (more than 140 participated, **table 4.A.1**) from throughout the Basin were asked to classify the distribution and status of each of the key salmonids within subwatersheds. Possible classifications included strong or depressed in spawning and rearing areas, present but status unknown, migration corridor, absent, or unknown. Proofing of the status calls was initiated where a second opinion was possible; changes in the original classifications generally were confirmed with the biologists that made the original classifications. Corridor habitats were added in the proofing process where the oversight was obvious (for example, missing segments for anadromous or non-anadromous species that are known to move completely through entire rivers or river segments).

Merging- We merged the status classification calls with preexisting data to produce as comprehensive a database as possible. In most cases, the RIS and CIS databases were limited to presence/absence information. In some cases (MRIS all species, IRIS for bull and cutthroat trout), additional information was available for classification of status and/or life history stage. Rules for interpretation of data from IRIS and MRIS are summarized in **table 4.A.2.** All RIS data were attributed to the corresponding subwatershed. A "present" call implies presence in any stream reach within the unit; status reflects the predominant status among all reaches. The biologists' judgements were merged with the RIS data sets using the rules in **table 4.A.3**. In cases where species classifications differed between presence and absence, the final classification was "unknown " unless we could clearly resolve the inconsistency with recent data. Where differences were in status, the most recent information was used. The final database includes summaries of the number of key salmonids classified as strong, strong or depressed, present, and unknown, all within the potential historical range. **Table 4.A.4.** documents the format for the current status database, CRBFISH6. In addition to the status calls, the database also includes predicted status based on the landscape data and classification trees developed by the aquatics team (see Section 4 of Lee and others 1996), and historical-range information.

<u>Limitations of the Database</u>**-** The framework of the assessment required that the species status information be summarized by subwatersheds rather than stream reaches. With limited time for development, it was necessary to classify subwatersheds directly, rather than first classifying all stream reaches and then attributing subwatersheds. This limits further analysis. Because many subwatersheds contain a combination of small, first- and second-order streams with a section of a larger river or stream, the type or quality of habitat available to a species or life stage may vary widely. In these cases, distinguishing migration corriders from spawning and rearing areas may have been confusing. This is a particular problem for westslope cutthroat trout that often use small tributaries in direct association with mainstem areas.

It often was necessary to extrapolate status from information limited to only a few sites. In watersheds that vary widely in habitat type or condition, such classification may not be representative of the watershed. It was not always possible to access all or the most recent information sources, and information sources varied in quality. It is difficult to judge the status of a population if historical or basin-wide data are limited. For species like bull trout, there is often little information available to judge whether current densities are high or low. Sampling methods vary in their efficiencies making comparisons across broad scales difficult. Rare species may be missed by limited sampling, and sampling protocols rarely address that error in existing inventories (see Rieman and McIntyre 1995 for one example). As a result, classifications of a species' presence are likely to be more robust than those of absence, classification of strong and depressed may be equivocal and perhaps inconsistent from one region to another.

Despite the limitations we believe these data provide an accurate representation of current distributions at the broad scale. We were conservative in the development of the database by cross checking sources and by encouraging biologists to rely on empirical information when making classifications. We accepted classifications of absent from RIS databases only where sampling was documented. A number of subwatersheds were classified as unknown because of conflicting information from RIS databases and biologists' designations: 23 for Yellowstone cutthroat trout, 163 for westslope cutthroat trout, 160 for redband trout, 92 for summer steelhead, 16 for ocean-type chinook salmon, 106 for stream-type chinook salmon, and 323 for bull trout. While the status calls retain an element of subjectivity and inconsistency, the professional biologists who classified watersheds generally hold the best understanding of current distributions and relative status for these species. There is simply no other way to provide a current and comprehensive assessment of fish distribution than to rely on the existing but often unpublished information that can be summarized by these people. Although some classifications may be equivocal, we anticipate no consistent bias. The overall patterns should reflect important characteristics of the species distributions and the current state of our collective knowledge. The database can be useful for interpreting broad patterns in distribution and general relationships with landscape characteristics. These data should not be used to draw detailed conclusions about extinctions where historical ranges are uncertain (for example, bull trout, redband trout, cutthroat trout), and should not be used for project-level management decisions without local review and validation.

Other Databases (CRBFISH5, CRBFISH4, AQINTEG5) (released files bdbfish5, bdbfish4, and bdbaqin5)

Derivation of the species-assemblage database (CRBFISH5) is described in Section 4 of Lee and others 1996. It includes information on 127 species and 15 species groups at the watershed level **(table 4.A.5).** Presence/absence for the key salmonid species at the watershed level were derived by summing over subwatersheds using the current-status database. In a similar fashion, a presence/absence database at the subbasin level (CRBFISH4, **table 4.A.6**) was constructed by summing over watersheds within each subbasin. The subbasin-level databases contains information on additional species that were not reported at smaller scales.

The measures of community integrity described in Section 4 of Lee and others (1996) are available in a separate database (AQINTEG5, **table 4.A.7**). Values are expressed at the watershed level.

APPENDIX IV.B. HISTORICAL RANGES DEFINED FOR THE KEY SALMONIDS WITHIN THE BASIN

Key Salmonids

Our estimates of the historical ranges of the key salmonids were based on known historical distributions in published literature, available historical accounts, and speculative distributions as summarized in the Idaho, Montana, Oregon, and Washington River Information System databases (see appendix 4.A), expanded to include any natural (non-introduced) occurrences in the status survey that were not included in the historical distributions.

<u>Bull Trout</u>

This range was based on the known historical or speculative distributions for bull trout from the individual state accounts as summarized in the 1994-95 updates for the Oregon bull trout distribution database, IRIS, and MRIS, and the Washington status review (Mongillo 1992), but expanded to include any occurrences in the status survey that were not included in the historical distributions. The historical accounts from WARIS have not been updated because the Washington stream and lakes data base was not available at the time of this analysis. Where bull trout are known to have occurred within a subbasin we generally included the entire subbasin as part of the historical range if access was likely. Occasional reports from agency sampling and anecdotal accounts suggest that bull trout still occur in the mainstem Columbia and Snake rivers; we therefore included other mainstems below known historical or current occurrences as part of the historical range assuming that fish moved through these areas. There are no available records to indicate occurrence of bull trout in the Sanpoil or Colville river subbasins, but both are close to known distributions. There is no historical barrier known for the Sanpoil river but there is an impassable falls near the mouth of the Colville River that might have excluded bull trout (T. Shuhda, Colville National Forest, Colville, Washington, personal communication). Because both basins have streams that should have been suitable for bull trout based on models of occurrence with elevation and latitude, they are included in the historical range, but recognized as speculative. The occurrence of bull trout within the more isolated Upper Snake River/Rock Creek and Salmon Falls Creek subbasins are also apparently based on anecdotal information (B. Horton, Idaho Department of Fish and Game, Boise, personal communication) and should also be considered speculative.

<u>Yellowstone Cutthroat Trout</u>

Data sources include summaries provided by Bruce May (Gallatin National Forest, Bozeman, Montana, personal communication of unpublished data) and Behnke (1992). Two disjunct populations were known to exist outside the core in the headwaters of the Snake and Missouri rivers: 1) Crab Creek in Washington, and 2) Waha Lake in Idaho near Lewiston in the Clearwater drainage (Behnke 1992). The species is believed extinct in both of these areas. Above Shoshone Falls the Yellowstone cutthroat trout was known in all waters directly connected to the Snake River except those between Jackson Lake and Palisades Reservoir, where the closely allied fine-spotted Snake River cutthroat trout was thought to be native (Behnke 1992). We recognized both forms as Yellowstone cutthroat trout because the Snake River form has not received formal taxonomic recognition. It is unclear which form (Yellowstone or finespotted) was native to Jackson Lake. Populations of both occur in the Gros Ventre River drainage (B. Gresswell, U.S. Fish and Wildlife Service, Corvallis, Oregon, personal communication). The range of Yellowstone cutthroat trout represents most of the Snake River Basin above Shoshone Falls, but excludes the Sinks drainages and the Wood River basin. The history of the Sinks drainages is unclear; Hubbs and Miller (1948) believed cutthroat trout were native but it is not clear whether they were the westslope or Yellowstone subspecies. Thurow and others (1988) reported Yellowstone cutthroat trout in the Sinks drainages, but it is unknown if they were the result of introductions. We relyed on Behnke (1992) to place the Sinks drainages outside the Snake zoogeographic basin so did not include them in the Yellowstone cutthroat trout historical range. Yellowstone cutthroat trout have been widely introduced to high lakes and other areas. Observations outside this defined range are considered as an introduced species.

Westslope Cutthroat Trout

The historical range of westslope cutthroat trout is based largely on current distribution in the database and accounts from Behnke (1992) and Mullan et al. (1992). Gilbert and Evermann (1894) reported Acut-throat@ in the Little Spokane River, and we assume those to have been westslope cutthroat trout and have included them here. The status of cutthroat trout in the Lost rivers and in other sink drainages in Idaho are uncertain. There is no known documentation of occurrence but Behnke (1992) speculates westslope cutthroat trout may have been in some of those drainages because of the apparent headwater capture of other species such as bull trout. The historical distribution of westslope cutthroat trout in the Snake River drainage between the Salmon River and Shoshone Falls is unclear. Although Gilbert and Evermann (1894) reported cutthroat trout in the Wood River, Idaho, Behnke (1992) examined three museum specimens and reported all as redband trout. Jordan and Evermann (1902) mention cutthroat trout in the same paragraphs that they refer to Afine trout fishing@ in Payette and Redfish lakes. It is not clear whether they meant that cutthroat were found in both lakes, but other accounts make it clear that cutthroat trout did occur in the river basin of the latter. Because redband trout often exhibit a cutthroat-like red/orange slash under the jaw, and were termed Acutthroat@ in other popular accounts, it is possible the reference in the Payette River was actually for redband trout. Westslope cutthroat trout have persisted well throughout much of the known portions of the historical range but have not been confirmed from any samples above the mouth of the Salmon River that cannot be attributed to recent introduction. For these reasons we did not include any of the Snake River drainage above the mouth of the Salmon River as part of the historical range for this fish. We conclude that any cutthroat trout in the Payette drainage are the results of high lake introductions, or introductions to Deadwood Reservoir (IDFG records, Nampa, Idaho). The historical distribution of westslope cutthroat trout along the Eastern slope of the Cascades is problematic. Behnke (1992) suggests that populations were native to the Wenatchee, Methow, and Entiat river drainages. Other evidence indicates historical occurrence in Ahtanum Creek, a tributary to the lower Yakima River, and the Chelan River basin (Behnke 1992). Mullan et al. (1992) indicate that stocking of westslope cutthroat trout in mountain lakes led to the establishment of the species throughout many of the mid Columbia River tributary systems. Given the very broad occurrence currently we assume that the native range included all of the previously mentioned drainages but recognize the uncertainty in how complete that distribution may have been.

Redband Trout

We identified two forms of redband trout within the the Basin, allopatric and sympatric. We considered allopatric redband trout those fish outside the historical range of steelhead. We assumed the allopatric form was genetically and evolutionarily distinct from other redband trout because of isolation from steelhead. We considered sympatric redband trout to be the non-anadromous form historically derived from or associated with steelhead. Historically redband trout were widely distributed (Behnke 1992) occupying most accessible waters from the southern desert basins to the high mountain coniferous forests (Cope 1879; Cope 1889; Jordan 1892; Gilbert and Evermann 1894; Jordan and Evermann 1896; Snyder 1908; Jordan et.al. 1930; Behnke 1992). Because of the broad distribution and occurrence over the widest range of conditions evident for any of the salmonids, we assumed that redband trout occurred historically in all of the drainages contiguous with the current distribution in the database. They are known to occur throughout the Kootenai River basin below Kootenai Falls (unpublished records, Idaho Fish and Game Coeur d= Alene, Idaho; D. Perkinson Kootenai National Forest, Libby, Montana, personal communication of unpublished data). A barrier falls below Klamath Lake separated interior redband trout from coastal rainbow trout (Behnke 1992). The only major portions of the Basin not believed to support redband trout are the Snake River upstream from Shoshone Falls, tributaries to the Spokane River above Spokane Falls, Eastern Rocky Mountain basins in Montana, and portions of the northern Great Basin in Oregon. We relied on knowledge of established barriers to anadromy to define the range for the allopatric form (see the discussion of steelhead). The distribution of small populations of allopatric redband trout isolated from, but within the general range of steelhead (for example, above natural barriers in 2nd and 3rd order streams) was poorly documented and not considered here. The historical sympatric redband trout range is assumed to include everything within the range of steelhead. There is no clear distinction between steelhead and nonanadromous redband trout throughout the range of steelhead. Because redband trout that have been isolated from steelhead by geologic processes (natural barriers) may be evoluntionarily distinct while those overlapping in distribution may be different life histories of the same populations, we have identified two historical ranges (isolated from and overlapping with the historical range of steelhead). Redband trout also had access to most of the rest of the the Basin with the exception of the Upper Snake zoogeographic basin. All redband trout found within the Upper SnakeBasin are assumed to be introduced coastal rainbow trout.

Steelhead

Data sources for Idaho included Evermann (1896), Chapman (1940), Parkhurst (1950), Gebhards (1959), Fulton (1970), NWPPC (1986), IDFG (1992), and F. Partridge, IDFG, Jerome, personal communication. Summer steelhead were found in all accessible reaches of the Snake River and tributaries in Idaho downstream from Shoshone Falls. Steelhead were also found in the Bruneau and Owyhee rivers, and Salmon Falls Creek drainages in Nevada. Cold water temperatures at high elevations may have restricted the upper limit of steelhead (Mullan et al. 1992) but this limit is not well defined. Natural barriers limited the distribution in certain areas within the historical range but most inaccessible areas are at the subwatershed scale or smaller. We were conservative in the development of historical ranges for areas with little formal documentation.

Data for Washington were compiled primarily by K. MacDonald, Wenatchee National Forest, Wenatchee, Washington and T. Shuhda, Colville National Forest, Colville, Washington. Data sources included Sholz et. al. (1985), Ashe and Sholz (1992), Chance (1986), Fulton (1970), and Mullan (1986). Some information was based on interviews with tribal elders who fished streams in the upper Columbia River above what is now Grand Coulee Dam. Including conversations with Chuck Jones, Jerry Marcot, Joe Peone of the Colville Confederated Tribes, and Bill Touhey and Dean Osterman of the Kalispel Tribes. Other interviewees included A. Sholz, Eastern Washington Biology Department, Cheney, Washington; J. Nisbet, historian and author; and, D. Mattson, archeologist, Colville National Forest. Data for Oregon were compiled primarily by P. Howell, Umatilla National Forest, Ukiah, Oregon. Information sources for Oregon included Fulton (1968, 1970); ODFW, Portland, unpublished data; Howell and others (1985); Bakke and Felstner (1990); and personal communications with various biologists recorded by P. Howell, Umatilla National Forest.

Stream-Type Chinook Salmon

Data sources for Idaho included Evermann (1896), Chapman (1940), Schoning (1947), Miller and Miller (1948), Parkhurst (1950), Gebhards (1959), Fulton (1968), and IDFG (1992). Thompson (1951) reported that prior to overfishing and environmental alterations, the runs of chinook salmon in the Columbia River formed a continuum from early spring to late fall. Similar to summer steelhead, stream-type chinook salmon were found in all accessible reaches of the Snake River and tributaries in Idaho downstream from Shoshone Falls. Stream-type chinook salmon were also found in the Bruneau and Owyhee rivers, and Salmon Falls Creek drainages in Nevada. Cold water temperatures at high elevations and the presence of suitable spawning reaches may have restricted the upper limit of salmon but this limit is not well defined. Natural barriers limited the distribution in certain areas within the historical range but most inaccessible areas are at the subwatershed level or smaller.

Data for Washington were compiled primarily by K. MacDonald, Wenatchee National Forest, Wenatchee, Washington and T. Shuhda, Colville National Forest, Colville, Washington. Data sources were similar to those cited for steelhead. Data for Oregon were compiled primarily by P. Howell, Umatilla National Forest, Ukiah, Oregon. Information sources for Oregon were similar to those cited for steelhead in addition to Thompson and Haas (1960). Howell also stated that stream-type chinook were widely distributed but probably had more limited distribution and were farther downstream in watersheds compared to the distribution of steelhead.

Ocean-Type Chinook Salmon

Data sources for Idaho included Evermann (1896), Chapman (1940), Schoning (1947), Parkhurst (1950), Gebhards (1959), Fulton (1968), Irving and others (1981), IDFG (1992), and J. Chandler, Idaho Power Company, Boise, and B. Connor, U. S. Fish and Wildlife Service, Orofino, Idaho, personal communications. Ocean-type (fall) chinook salmon spawning areas in Idaho appear to have been

confined to the mainstem Snake River. Information suggests that suitable spawning areas for fall chinook salmon are restricted to mainstem reaches where at least 960 temperature units accumulate from November 15 (spawning) to a late April-early May emergence. In the Snake River near Marshing, formerly an important fall chinook salmon spawning area, reconstruction of historical temperature data suggests fry emerged primarily in April. Fry that emerge after mid-May may not be large enough to smolt in late may-early June and begin their downstream migration as age zero fish, a characteristic of fall chinook salmon. Because of these potential temperature constraints, it is likely that fall-spawning chinook salmon observed in higher elevation basins including the Clearwater and South Fork Salmon rivers were actually late spawning stream-type (summer) chinook salmon.
Data for Washington were compiled primarily by K. MacDonald, Wenatchee National Forest, Wenatchee, Washington and T. Shuhda, Colville National Forest, Colville, Washington. Data sources were similar to those cited for steelhead. Data for Oregon were compiled primarily by P. Howell, Umatilla National Forest, Ukiah, Oregon. Information sources for Oregon were similar to those cited for steelhead in addition to Thompson and Haas (1960) and USFWS-NMFS (1981).

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References:

References for citations may be found in Lee, D.; Sedell, J. R.; Rieman, B.; and others. 1996. Broadscale assessment of aquatic species and habitats. In: Quigley, Thomas M.; Arbelbide, S.J. Tech. eds. An assessment of ecosystem components in the Interior Columbia Basin and portions of Klamath and Great Basins. General Technical Report. Portland, OR. USDA Forest Service, PNW.

For more information, contact the Interior Columbia Basin Ecosystem Management Project, 12 East Poplar, Walla Walla, WA 99362, (509) 522-4030.

FILENAME: CRBFISH6 (released file bdbfish6)

Table 4.A.4-- Format of the database describing status of key salmonids in subwatersheds (HUC6).

Variable	Field type/size[1]	Range of values	Definition
HUC4	N/8	16040201 - 18080001	subbasin identifier
HUC5	N/10	1604020102 - 1808000101	watershed identifier
HUC6	N/12	160402010201 - 180200011204	subwatershed identifier
ERU	N/2	1 - 13[2]	Ecological reporting unit
YCT_STAT	N/1	1 - 7 [3]	Yellowstone cutthroat trout status
WCT_STAT	N/1	1 - 7[3]	Westslope cutthroat trout status
RBT_STAT	N/1	1 - 7 [3]	Native rainbow/redband trout status
STH_STAT	N/1	1 - 7 [3]	Summer steelhead status
OTC_STAT	N/1	1 - 7 [3]	Ocean-type chinook salmon status
STC_STAT	N/1	1 - 7[3]	Stream-type chinook salmon status
BTR_STAT	N/1	1 - 7[3]	Bull trout status
YCT_HIST	N/1	0, 14	Historical range for Yellowstone cutthroat trout
WCT_HIST	N/1	0, 14	Historical range for westslope cutthroat trout
RBT_HIST	N/1	0, 14	Historical range for native rainbow/redband trout
STH_HIST	N/1	0, 14	Historical range for summer steelhead
OTC_HIST	N/1	0, 14	Historical range for ocean-type chinook salmon
STC_HIST	N/1	0, 14	Historical range for stream-type chinook salmon
BTR_HIST	N/1	0, 14	Historical range for bull trout
BTR_POT	N/1	0, 14	Potential range for bull trout
STH_WILD	N/1	0, 15	Wild indigenous steelhead
OTC_WILD	N/1	0, 15	Wild indigenous ocean-type chinook salmon
STC_WILD	N/1	0, 15	Wild indigneous stream-type chinook salmon
BTR_PRB	N/8	0-1	Probability of bull trout presence from model
BTR_PRD	A/2	PA, PD, PS [6]	Predicted status of bull trout from model
BTR_PV1	N/2	0-1	Known and predicted probability of bull trout presence
BTR_PV2	A/2	A, D, S, PA, PD, PS[7]	Known and predicted bull trout status

OTC_PRB	N/8	0-1	Probability of ocean-type chinook salmon presence from model
OTC_PRD	A/2	PA, PD, PS, PM[6]	Predicted status of ocean-type chinook salmon from model
OTC_PV1	N/2	0-1	Known and predicted probability of ocean-type chinook salmon presence
OTC_PV2	A/2	A, D, S, M, PA, PD, PS, M[7]	Known and predicted ocean-type chinook salmon status
RBT_PRB	N/8	0-1	Probability of native rainbow/redband trout presence from model
RBT_PRD	A/2	PA, PD, PS [6]	Predicted status of native rainbow/redband trout from model
RBT_PV1	N/8	0-1	Known and predicted probability of native rainbow/redband trout presence
RBT_PV2	A/4	A, D, S, PA, PD, PS[7]	Known and predicted native rainbow/redband trout status
STC_PRB	N/8	0-1	Probability of stream-type chinook salmon presence from model
STC_PRD	A/3	PA, PD, PS, PM[6]	Predicted status of stream-type chinook salmon from model
STC_PV1	N/8	0-1	Known and predicted probability of stream-type chinook salmon presence
STC_PV2	A/2	A, D, S, M, PA, PD, PS, M [7]	Known and predicted stream-type chinook salmon status
STH_PRB	N/8	0-1	Probability of summer steelhead presence from model
STH_PRD	A/2	PA, PD, PS, PM[6]	Predicted status of summer steelhead from model
STH_PV1	N/8	0-1	Known and predicted probability of summer steelhead presence
STH_PV2	A/2	A, D, S, M, PA, PD, PS, M [7]	Known and predicted summer steelhead status
WCT_PRB	N/8	0-1	Probability of westslope cutthroat trout presence from model
WCT_PRD	A/2	PA, PD, PS[6]	Predicted status of westslope cutthroat trout from model
WCT_PV1	N/8	0-1	Known and predicted probability of westslope cutthroat trout presence

WCT_PV2	A/2	A, D, S, PA, PD, PS[7]	Known and predicted westslope cutthroat trout status
YCT_PRB	N/8	0-1	Probability of Yellowstone cutthroat trout presence from model
YCT_PRD	A/2	PA, PD, PS[6]	Predicted status of Yellowstone cutthroat trout from model
YCT_PV1	N/8	0-1	Known and predicted probability of Yellowstone cutthroat trout presence
YCT_PV2	A/2	A, D, S, PA, PD, PS[7]	Known and predicted Yellowstone cutthroat trout status
HISTORIC	N/1	0-7	Number of key salmonids historically present
PRESENT	N/1	0-7	Number of key salmonids present within their historical range
STRONG	N/1	0-7	Number of key salmonids with strong status
STR_DEP	N/1	0-7	Number of key salmonids with strong or depressed status
STR_PRD	N/1	0-7	Number of key salmonids with strong status (known and predicted)
TOT_REM	N/1	0-6	Number of key salmonids remaining from historical within subwatershed (known and predicted)
TOT_PRD	N/1	0-6	Total number of key salmonids now present (known and predicted)

1 - Field type/size values: N=Numeric; A=Alphanumeric

2 - ERU range of values: 1=Northern Cascades; 2=Southern Cascades; 3=Upper Klamath; 4=Northern Great Basin; 5=Columbia Plateau; 6=Blue Mountains; 7=Northern Glaciated Mountains ; 8=Lower Clark Fork; 9=Upper Clark Fork; 10=Owyhee Uplands; 11=Upper Snake; 12=Snake Headwaters; 13=Central Idaho Mountains.

3 - Species' status range of values: 1=strong; 2=depressed; 3=known absent; 4=present but status unknown; 5=migration corridor; 6=no classification; and 7=introduced.

4 - 0=Outside historical range, 1=within historical range.

5 - 0=Presumed hatchery influence, 1=No known hatchery influence.

6 - Species' predicted status range of values: PA=Predicted absent; PD=Predicted depressed; PS=Predicted strong; and PM (foranadromous species)=Predicted migratory corridor.

7 - Species_PV2 range of values: A=Absent; D=Depressed; S=Strong; M (for anadromous species)=Migratory corridor; PA=Predicted absent; PD=Predicted depressed; PS=Predicted strong; and PM (for anadromous species)=Predicted migratory corridor.

FILENAME: CRBFISH5 (released as bdbfish5)

Table 4.A.5-- Format of the database describing species' presence within watersheds (HUC5).

Variable	Field type/size [1]	Range of values	Definition
HUC4	N/8	16040201-18080001	subbasin identifier
HUC5	N/10	1604020102 -1808000101	watershed identifier
ERU	N/2	1 - 13 [2]	Ecological reporting unit
CLASS	A/1	A-P, Z	Species assemblage designation (Z indicates no information)
GRP1	N/1	0, 13	Suckers
GRP2	N/1	0, 13	Dace
GRP3	N/1	0, 13	Sculpins
GRP4	N/1	0, 13	Shiners
GRP5	N/1	0, 13	Chubs
GRP6	N/1	0, 13	Crappie
GRP7	N/1	0, 13	bullheads
GRP8	N/1	0, 13	Lampreys
GRP9	N/1	0, 13	Cutthroat
GRP10	N/1	0, 13	Trout
GRP11	N/1	0, 13	Whitefish
GRP12	N/1	0, 13	Steelhead
GRP13	N/1	0, 13	Rainbow
GRP14	N/1	0, 13	Chinook
GRP15	N/1	0, 13	Sunfish
HD_1	N/1	0, 14	Historical range for white sturgeon
HD_8	N/1	0, 14	Historical range for Goose Lake sucker
HD_11	N/1	0, 14	Historical range for Klamath largescale sucker
HD_13	N/1	0, 14	Historical range for Warner sucker
HD_15	N/1	0, 14	Historical range for shortnose sucker
HD_16	N/1	0, 14	Historical range for Lost River sucker
HD_20	N/1	0, 14	Historical range for Malheur sculpin
HD_21	N/1	0, 14	Historical range for piute sculpin

HD_22	N/1	0, 14	Historical range for slimy sculpin
HD_23	N/1	0, 14	Historical range for shorthead sculpin
HD_24	N/1	0, 14	Historical range for Shoshone sculpin
HD_27	N/1	0, 14	Historical range for Wood River sculpin
HD_28	N/1	0, 14	Historical range for margined sculpin
HD_29	N/1	0, 14	Historical range for reticulate sculpin
HD_30	N/1	0, 14	Historical range for pit sculpin
HD_32	N/1	0, 14	Historical range for torrent sculpin
HD_33	N/1	0, 14	Historical range for slender sculpin
HD_37	N/1	0, 14	Historical range for Alvord chub
HD_40	N/1	0, 14	Historical range for Sheldon tui chub
HD_41	N/1	0, 14	Historical range for Oregon Lakes tui chub
HD_42	N/1	0, 14	Historical range for Catlow tui chub
HD_43	N/1	0, 14	Historical range for Hutton tui chub
HD_44	N/1	0, 14	Historical range for Summer Basin tui chub
HD_48	N/1	0, 14	Historical range for Goose Lake tui chub
HD_50	N/1	0, 14	Historical range for leatherside chub
HD_51	N/1	0, 14	Historical range for pit roach
HD_59	N/1	0, 14	Historical range for foskett speckeled dace
HD_64	N/1	0, 14	Historical range for burbot
HD_66	N/1	0, 14	Historical range for sand roller
HD_67	N/1	0, 14	Historical range for River lamprey
HD_68	N/1	0, 14	Historical range for Pit Klamath brook lamprey
HD_71	N/1	0, 14	Historical range for Klamath River lamprey
HD_72	N/1	0, 14	Historical range for Pacific lamprey
HD_73	N/1	0, 14	Historical range for Goose Lake lamprey
HD_74	N/1	0, 14	Historical range for Yellowstone cutthroat trout
HD_75	N/1	0, 14	Historical range for Coastal cutthroat trout
HD_76	N/1	0, 14	Historical range for Lahontan cutthroat trout
HD_77	N/1	0, 14	Historical range for westslope cutthroat trout
HD_79	N/1	0, 14	Historical range for chum salmon
HD_80	N/1	0, 14	Historical range for coho salmon
HD_81	N/1	0, 14	Historical range for native rainbow/redband trout
HD_82	N/1	0, 14	Historical range for summer steelhead
HD_86	N/1	0, 14	Historical range for sockeye (kokanee) salmon

HD_87	N/1	0, 14	Historical range for ocean-type chinook salmon
HD_88	N/1	0, 14	Historical range for stream-type chinook salmon
HD_89	N/1	0, 14	Historical range for pygmy whitefish
HD_91	N/1	0, 14	Historical range for bull trout
SPC_1	N/1	0, 13	White sturgeon
SPC_2	N/1	0, 13	Utah sucker
SPC_3	N/1	0, 13	Longnose sucker
SPC_4	N/1	0, 13	Bridgelip sucker
SPC_5	N/1	0, 13	Bluehead sucker
SPC_6	N/1	0, 13	Largescale sucker
SPC_7	N/1	0, 13	Sacramento sucker
SPC_8	N/1	0, 13	Goose Lake sucker
SPC_9	N/1	0, 13	Mountain sucker
SPC_10	N/1	0, 13	Klamath smallscale sucker
SPC_11	N/1	0, 13	Klamath largescale sucker
SPC_12	N/1	0, 13	Tahoe sucker
SPC_13	N/1	0, 13	Warner sucker
SPC_14	N/1	0, 13	Sucker, generic
SPC_15	N/1	0, 13	Shortnose sucker
SPC_16	N/1	0, 13	Lost River sucker
SPC_17	N/1	0, 13	Coastrange sucker
SPC_18	N/1	0, 13	Prickly sculpin
SPC_19	N/1	0, 13	Mottled sculpin
SPC_20	N/1	0, 13	Malheur sculpin
SPC_21	N/1	0, 13	Piute sculpin
SPC_22	N/1	0, 13	Slimy sculpin
SPC_23	N/1	0, 13	Shorthead sculpin
SPC_24	N/1	0, 13	Shoshone sculpin
SPC_25	N/1	0, 13	Riffle sculpin
SPC_26	N/1	0, 13	Marbled sculpin
SPC_27	N/1	0, 13	Wood River sculpin
SPC_28	N/1	0, 13	Margined sculpin
SPC_29	N/1	0, 13	Reticulate sculpin
SPC_30	N/1	0, 13	Pit sculpin
SPC_31	N/1	0, 13	Klamath Lake sculpin

SPC_32	N/1	0, 13	Torrent sculpin
SPC_33	N/1	0, 13	Slender sculpin
SPC_34	N/1	0, 13	Sculpin, generic
SPC_35	N/1	0, 13	Pacific staghorn sculpin
SPC_36	N/1	0, 13	Chiselmouth
SPC_37	N/1	0, 13	Alvord chub
SPC_38	N/1	0, 13	Utah chub
SPC_39	N/1	0, 13	Tui chub
SPC_40	N/1	0, 13	Sheldon tui chub
SPC_41	N/1	0, 13	Oregon Lakes tui chub
SPC_42	N/1	0, 13	Catlow tui chub
SPC_43	N/1	0, 13	Hutton tui chub
SPC_44	N/1	0, 13	Summer Basin tui chub
SPC_45	N/1	0, 13	Warner Basin tui chub
SPC_46	N/1	0, 13	XL Spring tui chub
SPC_47	N/1	0, 13	Goose Lake tui chub
SPC_48	N/1	0, 13	Borax Lake chub
SPC_49	N/1	0, 13	Blue chub
SPC_50	N/1	0, 13	Leatherside chub
SPC_51	N/1	0, 13	Pit roach
SPC_52	N/1	0, 13	Peamouth
SPC_53	N/1	0, 13	Northern squawfish
SPC_54	N/1	0, 13	Umpqua squawfish
SPC_55	N/1	0, 13	Longnose dace
SPC_56	N/1	0, 13	Leopard dace
SPC_57	N/1	0, 13	Speckeled dace
SPC_58	N/1	0, 13	Klamath speckled dace
SPC_59	N/1	0, 13	Foskett speckled dace
SPC_60	N/1	0, 13	Dace, generic
SPC_61	N/1	0, 13	Redside shiner
SPC_62	N/1	0, 13	Lahontan redside shiner
SPC_63	N/1	0, 13	Shiner perch
SPC_64	N/1	0, 13	Burbot
SPC_65	N/1	0, 13	Three spine stickelback
SPC_66	N/1	0, 13	Sand roller

SPC_67	N/1	0, 13	River lamprey
SPC_68	N/1	0, 13	Pit Klamath brook lamprey
SPC_69	N/1	0, 13	Miller Lake Lamprey
SPC_70	N/1	0, 13	Western brook lamprey
SPC_71	N/1	0, 13	Klamath river lamprey
SPC_72	N/1	0, 13	Pacific lamprey
SPC_73	N/1	0, 13	Goose Lake lamprey
SPC_74	N/1	0, 13	Yellowstone cutthroat trout
SPC_75	N/1	0, 13	Coastal cutthroat trout
SPC_76	N/1	0, 13	Lahontan cutthroat trout
SPC_77	N/1	0, 13	Westslope cutthroat trout
SPC_78	N/1	0, 13	Cutthroat trout, generic
SPC_79	N/1	0, 13	Chum salmon
SPC_80	N/1	0, 13	Coho salmon
SPC_81	N/1	0, 13	Interior redband trout
SPC_82	N/1	0, 13	Summer steelhead
SPC_83	N/1	0, 13	Winter steelhead
SPC_84	N/1	0, 13	Catlow Valley redband trout
SPC_85	N/1	0, 13	Warner Valley redband trout
SPC_86	N/1	0, 13	Sockeye (kokanee) salmon
SPC_87	N/1	0, 13	Ocean-type chinook salmon
SPC_88	N/1	0, 13	stream-type chinook salmon
SPC_89	N/1	0, 13	Pygmy whitefish
SPC_90	N/1	0, 13	Mountain whitefish
SPC_91	N/1	0, 13	Bull trout
SPC_92	N/1	0, 13	White sucker
SPC_93	N/1	0, 13	Green sunfish
SPC_94	N/1	0, 13	Pumpkinseed
SPC_95	N/1	0, 13	Warmouth
SPC_96	N/1	0, 13	Bluegill
SPC_97	N/1	0, 13	Smallmouth bass
SPC_98	N/1	0, 13	Largemouth bass
SPC_99	N/1	0, 13	White crappie
SPC_100	N/1	0, 13	Black crappie
SPC_101	N/1	0, 13	American shad

SPC_102	N/1	0, 13	Goldfish
SPC_103	N/1	0, 13	Finescale dace
SPC_104	N/1	0, 13	Carp
SPC_105	N/1	0, 13	Spottail shiner
SPC_106	N/1	0, 13	Fathead minnow
SPC_107	N/1	0, 13	Tench
SPC_108	N/1	0, 13	Northern pike
SPC_109	N/1	0, 13	Black bullhead
SPC_110	N/1	0, 13	Yellow bullhead
SPC_111	N/1	0, 13	Brown bullhead
SPC_112	N/1	0, 13	Channel catfish
SPC_113	N/1	0, 13	Tadpole madtom
SPC_114	N/1	0, 13	Flathead catfish
SPC_115	N/1	0, 13	Yellow perch
SPC_116	N/1	0, 13	Walleye
SPC_117	N/1	0, 13	Variable platyfish
SPC_118	N/1	0, 13	Lake whitefish
SPC_119	N/1	0, 13	Golden trout
SPC_120	N/1	0, 13	Rainbow trout
SPC_121	N/1	0, 13	Kamloops trout
SPC_122	N/1	0, 13	Atlantic salmon
SPC_123	N/1	0, 13	Brown trout
SPC_124	N/1	0, 13	Sunapee char
SPC_125	N/1	0, 13	Brook trout
SPC_126	N/1	0, 13	Lake trout
SPC_127	N/1	0, 13	Arctic grayling
TOT_SPC	N/2	-1, 0-465	Total number of species present
TOT_GRP	N/2	-1, 0-145	Total number of groups present
TOT_NAT	N/2	-1, 0-295	Total number of native species present
TOT_EXOT	N/2	-1, 0-195	Total number of exotic species present
PCT_NAT	N/8	0-1	Fraction of total comprised of native species
PCT_EXOT	N/8	0-1	Fraction of total comprised of exotic species
FEDLIST	N/2	0-3	Number of Federally listed species
SENLIST	N/2	0-10	Number of designated sensitive species

1 - Field type/size values: N=Numeric; A=Alphanumeric

2 - ERU range of values: 1=Northern Cascades; 2=Southern Cascades; 3=Upper Klamath; 4=Northern Great Basin; 5=Columbia Plateau; 6=Blue Mountains; 7=Northern Glaciated Mountains; 8=Lower Clark Fork; 9=Upper Clark Fork; 10=Owyhee Uplands; 11=Upper Snake; 12=Snake Headwaters; 13=Central Idaho Mountains.

3 - 0=Not reported as present, 1=reported as present.

4 - 0=Outside historical range, 1=within historical range.

5 - A value of -1 indicates insufficient information for estimation.

FILENAME: CRBFISH4 (released as bdbfish4)

Table 4.A.6-- Format of the database describing species' presence within subbasins (HUC4).

Variable	Field type/size [1]	Range of values	Definition
ERU	N/2	1 - 13 [2]	Ecological reporting unit
HUC4	N/8	16040201 - 18080001	subbasin identifier
HD_1	N/1	0, 13	Historical range for white sturgeon
HD_8	N/1	0, 13	Historical range for Goose Lake sucker
HD_11	N/1	0, 13	Historical range for Klamath largescale sucker
HD_13	N/1	0, 13	Historical range for Warner sucker
HD_15	N/1	0, 13	Historical range for shortnose sucker
HD_16	N/1	0, 13	Historical range for Lost River sucker
HD_20	N/1	0, 13	Historical range for Malheur sculpin
HD_21	N/1	0, 13	Historical range for piute sculpin
HD_22	N/1	0, 13	Historical range for slimy sculpin

HD_23	N/1	0, 13	Historical range for shorthead sculpin
HD_24	N/1	0, 13	Historical range for Shoshone sculpin
HD_27	N/1	0, 13	Historical range for Wood River sculpin
HD_28	N/1	0, 13	Historical range for margined sculpin
HD_29	N/1	0, 13	Historical range for reticulate sculpin
HD_30	N/1	0, 13	Historical range for pit sculpin
HD_32	N/1	0, 13	Historical range for torrent sculpin
HD_33	N/1	0, 13	Historical range for slender sculpin
HD_37	N/1	0, 13	Historical range for Alvord chub
HD_40	N/1	0, 13	Historical range for Sheldon tui chub
HD_41	N/1	0, 13	Historical range for Oregon Lakes tui chub
HD_42	N/1	0, 13	Historical range for Catlow tui chub
HD_43	N/1	0, 13	Historical range for Hutton tui chub
HD_44	N/1	0, 13	Historical range for Summer Basin tui chub
HD_48	N/1	0, 13	Historical range for Goose Lake tui chub
HD_50	N/1	0, 13	Historical range for leatherside chub
HD_51	N/1	0, 13	Historical range for pit roach
HD_59	N/1	0, 13	Historical range for foskett speckeled dace
HD_64	N/1	0, 13	Historical range for burbot
HD_66	N/1	0, 13	Historical range for sand roller
HD_67	N/1	0, 13	Historical range for River lamprey
HD_68	N/1	0, 13	Historical range for Pit Klamath brook lamprey
HD_71	N/1	0, 13	Historical range for Klamath River lamprey
HD_72	N/1	0, 13	Historical range for Pacific lamprey
HD_73	N/1	0, 13	Historical range for Goose Lake lamprey
HD_74	N/1	0, 13	Historical range for Yellowstone cutthroat trout
HD_75	N/1	0, 13	Historical range for Coastal cutthroat trout
HD_76	N/1	0, 13	Historical range for Lahontan cutthroat trout
HD_77	N/1	0, 13	Historical range for westslope cutthroat trout
HD_79	N/1	0, 13	Historical range for chum salmon
HD_80	N/1	0, 13	Historical range for coho salmon
HD_81	N/1	0, 13	Historical range for native rainbow/redband trout
HD_82	N/1	0, 13	Historical range for summer steelhead
HD_86	N/1	0, 13	Historical range for sockeye (kokanee) salmon
HD_87	N/1	0, 13	Historical range for ocean-type chinook salmon

HD_88	N/1	0, 13	Historical range for stream-type chinook salmon
HD_89	N/1	0, 13	Historical range for pygmy whitefish
HD_91	N/1	0, 13	Historical range for bull trout
SPC_1	N/1	0, 14	White sturgeon
SPC_2	N/1	0, 14	Utah sucker
SPC_3	N/1	0, 14	Longnose sucker
SPC_4	N/1	0, 14	Bridgelip sucker
SPC_5	N/1	0, 14	Bluehead sucker
SPC_6	N/1	0, 14	Largescale sucker
SPC_7	N/1	0, 14	Sacramento sucker
SPC_8	N/1	0, 14	Goose Lake sucker
SPC_9	N/1	0, 14	Mountain sucker
SPC_10	N/1	0, 14	Klamath smallscale sucker
SPC_11	N/1	0, 14	Klamath largescale sucker
SPC_12	N/1	0, 14	Tahoe sucker
SPC_13	N/1	0, 14	Warner sucker
SPC_14	N/1	0, 14	Sucker, generic
SPC_15	N/1	0, 14	Shortnose sucker
SPC_16	N/1	0, 14	Lost River sucker
SPC_17	N/1	0, 14	Coastrange sucker
SPC_18	N/1	0, 14	Prickly sculpin
SPC_19	N/1	0, 14	Mottled sculpin
SPC_20	N/1	0, 14	Malheur sculpin
SPC_21	N/1	0, 14	Piute sculpin
SPC_22	N/1	0, 14	Slimy sculpin
SPC_23	N/1	0, 14	Shorthead sculpin
SPC_24	N/1	0, 14	Shoshone sculpin
SPC_25	N/1	0, 14	Riffle sculpin
SPC_26	N/1	0, 14	Marbled sculpin
SPC_27	N/1	0, 14	Wood River sculpin
SPC_28	N/1	0, 14	Margined sculpin
SPC_29	N/1	0, 14	Reticulate sculpin
SPC_30	N/1	0, 14	Pit sculpin
SPC_31	N/1	0, 14	Klamath Lake sculpin
SPC_32	N/1	0, 14	Torrent sculpin

SPC_33	N/1	0, 14	Slender sculpin
SPC_34	N/1	0, 14	Sculpin, generic
SPC_35	N/1	0, 14	Pacific staghorn sculpin
SPC_36	N/1	0, 14	Chiselmouth
SPC_37	N/1	0, 14	Alvord chub
SPC_38	N/1	0, 14	Utah chub
SPC_39	N/1	0, 14	Tui chub
SPC_40	N/1	0, 14	Sheldon tui chub
SPC_41	N/1	0, 14	Oregon Lakes tui chub
SPC_42	N/1	0, 14	Catlow tui chub
SPC_43	N/1	0, 14	Hutton tui chub
SPC_44	N/1	0, 14	Summer Basin tui chub
SPC_45	N/1	0, 14	Warner Basin tui chub
SPC_46	N/1	0, 14	XL Spring tui chub
SPC_47	N/1	0, 14	Goose Lake tui chub
SPC_48	N/1	0, 14	Borax Lake chub
SPC_49	N/1	0, 14	Blue chub
SPC_50	N/1	0, 14	Leatherside chub
SPC_51	N/1	0, 14	Pit roach
SPC_52	N/1	0, 14	Peamouth
SPC_53	N/1	0, 14	Northern squawfish
SPC_54	N/1	0, 14	Umpqua squawfish
SPC_55	N/1	0, 14	Longnose dace
SPC_56	N/1	0, 14	Leopard dace
SPC_57	N/1	0, 14	Speckeled dace
SPC_58	N/1	0, 14	Klamath speckled dace
SPC_59	N/1	0, 14	Foskett speckled dace
SPC_60	N/1	0, 14	Dace, generic
SPC_61	N/1	0, 14	Redside shiner
SPC_62	N/1	0, 14	Lahontan redside shiner
SPC_63	N/1	0, 14	Shiner perch
SPC_64	N/1	0, 14	Burbot
SPC_65	N/1	0, 14	Three spine stickelback
SPC_66	N/1	0, 14	Sand roller
SPC_67	N/1	0, 14	River lamprey

SPC_68	N/1	0, 14	Pit Klamath brook lamprey
SPC_69	N/1	0, 14	Miller Lake Lamprey
SPC_70	N/1	0, 14	Western brook lamprey
SPC_71	N/1	0, 14	Klamath river lamprey
SPC_72	N/1	0, 14	Pacific lamprey
SPC_73	N/1	0, 14	Goose Lake lamprey
SPC_74	N/1	0, 14	Yellowstone cutthroat trout
SPC_75	N/1	0, 14	Coastal cutthroat trout
SPC_76	N/1	0, 14	Lahontan cutthroat trout
SPC_77	N/1	0, 14	Westslope cutthroat trout
SPC_78	N/1	0, 14	Cutthroat trout, generic
SPC_79	N/1	0, 14	Chum salmon
SPC_80	N/1	0, 14	Coho salmon
SPC_81	N/1	0, 14	Interior redband trout
SPC_82	N/1	0, 14	Summer steelhead
SPC_83	N/1	0, 14	Winter steelhead
SPC_84	N/1	0, 14	Catlow Valley redband trout
SPC_85	N/1	0, 14	Warner Valley redband trout
SPC_86	N/1	0, 14	Sockeye (kokanee) salmon
SPC_87	N/1	0, 14	Ocean-type chinook salmon
SPC_88	N/1	0, 14	stream-type chinook salmon
SPC_89	N/1	0, 14	Pygmy whitefish
SPC_90	N/1	0, 14	Mountain whitefish
SPC_91	N/1	0, 14	Bull trout
SPC_92	N/1	0, 14	White sucker
SPC_93	N/1	0, 14	Green sunfish
SPC_94	N/1	0, 14	Pumpkinseed
SPC_95	N/1	0, 14	Warmouth
SPC_96	N/1	0, 14	Bluegill
SPC_97	N/1	0, 14	Smallmouth bass
SPC_98	N/1	0, 14	Largemouth bass
SPC_99	N/1	0, 14	White crappie
SPC_100	N/1	0, 14	Black crappie
SPC_101	N/1	0, 14	American shad
SPC_102	N/1	0, 14	Goldfish

SPC_103	N/1	0, 14	Finescale dace
SPC_104	N/1	0, 14	Carp
SPC_105	N/1	0, 14	Spottail shiner
SPC_106	N/1	0, 14	Fathead minnow
SPC_107	N/1	0, 14	Tench
SPC_108	N/1	0, 14	Northern pike
SPC_109	N/1	0, 14	Black bullhead
SPC_110	N/1	0, 14	Yellow bullhead
SPC_111	N/1	0, 14	Brown bullhead
SPC_112	N/1	0, 14	Channel catfish
SPC_113	N/1	0, 14	Tadpole madtom
SPC_114	N/1	0, 14	Flathead catfish
SPC_115	N/1	0, 14	Yellow perch
SPC_116	N/1	0, 14	Walleye
SPC_117	N/1	0, 14	Variable platyfish
SPC_118	N/1	0, 14	Lake whitefish
SPC_119	N/1	0, 14	Golden trout
SPC_120	N/1	0, 14	Rainbow trout
SPC_121	N/1	0, 14	Kamloops trout
SPC_122	N/1	0, 14	Atlantic salmon
SPC_123	N/1	0, 14	Brown trout
SPC_124	N/1	0, 14	Sunapee char
SPC_125	N/1	0, 14	Brook trout
SPC_126	N/1	0, 14	Lake trout
SPC_127	N/1	0, 14	Arctic grayling
SPC_128	N/1	0, 14	Shortnose sucker
SPC_129	N/1	0, 14	Rock Bass
SPC_130	N/1	0, 14	Sacramento perch
SPC_131	N/1	0, 14	Redear sunfish
SPC_132	N/1	0, 14	Tambaqui
SPC_133	N/1	0, 14	Convict cichlid
SPC_134	N/1	0, 14	Tilapia
SPC_135	N/1	0, 14	Oriental weatherfish
SPC_136	N/1	0, 14	Loach
SPC_137	N/1	0, 14	Grass carp

SPC_138	N/1	0, 14	Tiger barb
SPC_139	N/1	0, 14	Grass pickerel
SPC_140	N/1	0, 14	Gar
SPC_141	N/1	0, 14	Striped bass
SPC_142	N/1	0, 14	Rainbow smelt
SPC_143	N/1	0, 14	Saddleback gunnel
SPC_144	N/1	0, 14	Mosquitofish
SPC_145	N/1	0, 14	Green swordtail
SPC_146	N/1	0, 14	Shortfin molly
SPC_147	N/1	0, 14	Guppy
SPC_148	N/1	0, 14	Artic char
TOT_EXOT	N/2	-1, 0-235	Number of exotic species present
TOT_NAT	N/2	-1, 0-375	Number of native species present
TOT_SPC	N/2	-1, 0-585	Total number of species present
PCT_EXOT	N/8	0-1	Percent of species present made up of exotics
PCT_NAT	N/8	0-1	Percent of species present made up os native species
SENLIST	N/2	0-11	Number of sensitive species present
FEDLIST	N/2	0-3	Number of federally listed species present

1 - Field type/size values: N=Numeric; A=Alphanumeric

2 - ERU range of values: 1=Northern Cascades; 2=Southern Cascades; 3=Upper Klamath; 4=Northern Great Basin; 5=Columbia Plateau; 6=Blue Mountains; 7=Northern Glaciated Mountains; 8=Lower Clark Fork; 9=Upper Clark Fork; 10=Owyhee Uplands; 11=Upper Snake; 12=Snake Headwaters; 13=Central Idaho Mountains.

3 - 0=Outside historical range, 1=within historical range.

4 - 0=Not reported as present, 1=reported as present.

5 - A value of -1 indicates insufficient information to judge.

FILENAME: AQINTEG5 (released as bdbaqin5)

Table 4.A.7-- Format of the database of aquatic integrity measures for watersheds (HUC5).

Variable	Field type/size[1]	Range of values	Definition
ERU	N/2	1 - 13[2]	Ecological reporting unit
HUC5	N/10	1604020102 - 1808000101	Watershed identifier
CLASS	A/1	A-P, Z	Species assemblage designation (Z indicates no information)
FEDLIST	N/2	0-3	Number of Federally listed species
SENLIST	N/2	0-10	Number of designated sensitive species
WILD_AND	N/1	0-2	Number of genetically pure anadromous populations
ENDEMIC	N/1	0-5	Number of narrow-endemic species present
STRIDX	N/8	0-1	Relative index of strong populations of key salmonids
INT_EVN	N/8	0-1	Realtive index of the ratio of native species diversity to total species diversity, multiplied by native species eveness
RICH4	N/2	0-1	Relative index of species richness within parent subbasin
INTEG	N/8	0-1	Composite index of fish community integrity = average of STRIDX, INT_EVN, and RICH4

1 - Field type/size values: N=Numeric; A=Alphanumeric

2 - ERU range of values: 1=Northern Cascades; 2=Southern Cascades; 3=Upper Klamath; 4=Northern Great Basin; 5=Columbia Plateau; 6=Blue Mountains; 7=Northern Glaciated Mountains; 8=Lower Clark Fork; 9=Upper Clark Fork; 10=Owyhee Uplands; 11=Upper Snake; 12=Snake Headwaters; 13=Central Idaho Mountains.