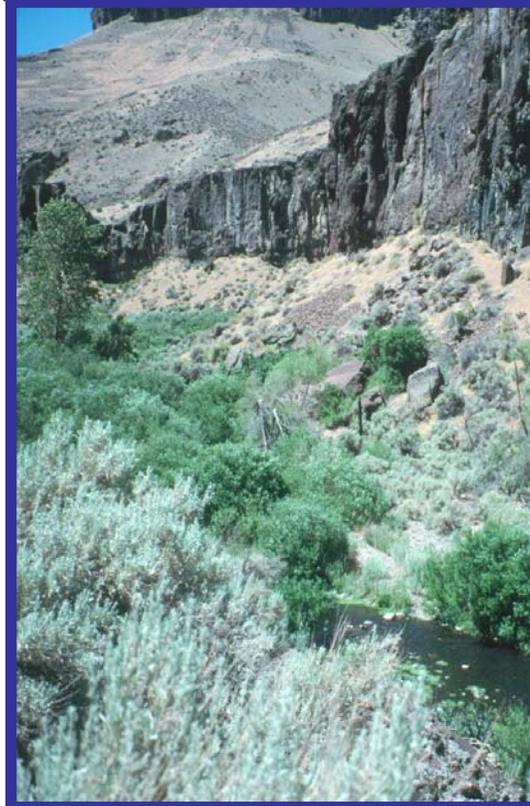
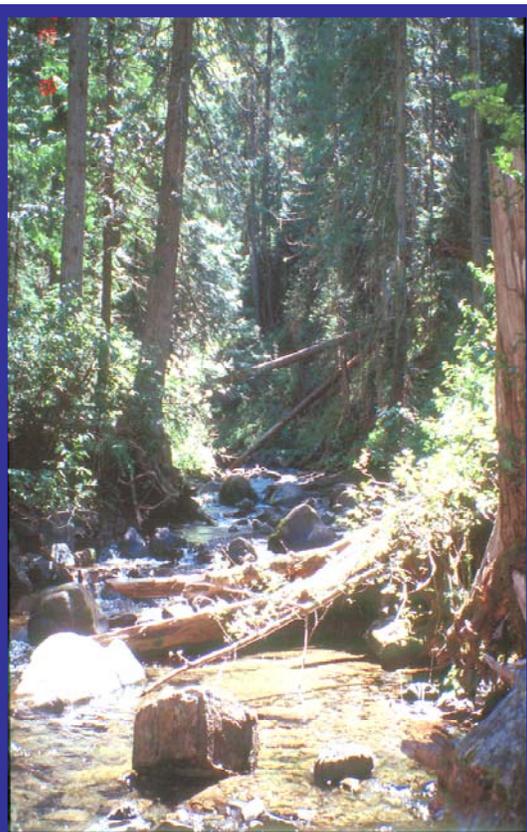
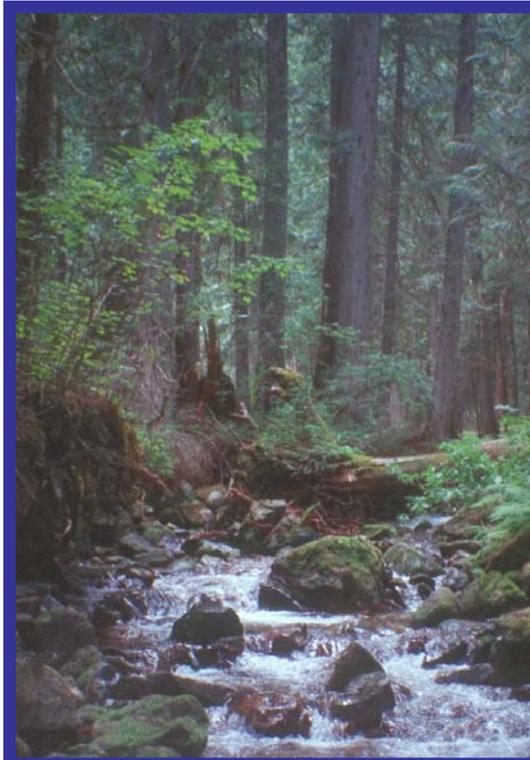


Selection of
Reference
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for Small
Streams in
Idaho:
a Systematic
Approach

Final



Idaho Department of Environmental Quality

**Selection of Reference Condition
for Small Streams in Idaho:
a Systematic Approach**

**April 2004
Final**

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Abstract

The Department of Environmental Quality (DEQ) used a systematic process to identify reference condition for small streams in Idaho. The process was similar to the regional reference condition approach described in Barbour et al. (1999) and Bryce et al. (1999). DEQ defined candidate area and site selection criteria, used GIS filters to evaluate human impacts, performed independent field validations, and documented the entire process. DEQ biologists calibrated their reference selection and rating techniques through deliberations and multiple reviews.

DEQ identified 165 candidate areas at the 5th field hydrologic unit code scale (10-digit code). Some of the candidate areas were clustered geographically with large areas having limited representation, particularly in southern Idaho. Additionally, DEQ identified, rated, and ranked about 140 reference sites using definitions of minimally and least disturbed conditions. Significantly more reference sites were identified for the mountain ecoregions. Presently, DEQ has selected 22 sites to be used in a reference trend network. These sites were most recently used in a variability study (2001-2002) of BURP monitoring protocols.

The reference data set will be used for a variety of purposes including bioassessment tool development and tracking natural variability. It will be important to continue calibrating rating techniques and verifying sites as conditions can change quickly (e.g., due to development, floods, fires, etc.). The development of reference condition continues to be an iterative process requiring refinement as DEQ gathers more information and has access to better analytical tools.

Front cover: reference sites included in the DEQ reference trend network. From left to right clockwise: Robin Creek (Lochsa watershed), Mosquito Creek (St. Joe watershed), Webber Creek (Medicine Lodge watershed), and Jarbidge River (Bruneau watershed).

Introduction

The Department of Environmental Quality (DEQ) uses ecological indicators, such as habitat attributes, periphyton, benthic macroinvertebrates, and fish, to evaluate water quality in Idaho, particularly for aquatic life use support. A stream is evaluated and compared to water quality levels needed for the protection and maintenance of viable communities of aquatic species. Specifically, DEQ uses bioassessment results in its integrated reports [305(b) report and 303(d) list] and in developing total maximum daily loads (TMDLs).

The question of how to compare and evaluate bioassessment data often arises. Traditionally, scientific methods have used controls to evaluate results from test conditions. In laboratory settings, it is relatively easy to control all the variables except the one of interest. However in field experiments, controlling all the variables is not practical (Reynoldson 1997). To address this issue, the U.S. Environmental Protection Agency (EPA) and current bioassessment literature recommend using the reference condition approach (Barbour 1999, Davis and Simon 1995, Wright 1995, Parsons and Norris 1996, Gerritsen 1995).

In the reference condition approach, a group of minimally or least disturbed (see Methods – definitions) sites organized by selected physical, chemical, and biological characteristics are compared to the biological attributes of test sites (Reynoldson et al. 1997). The strength of this approach is that it uses a range of biological conditions in a region to evaluate bioassessment status. In essence, test sites are compared to a group of regional reference sites to develop benchmarks and evaluate beneficial use support status for water bodies in that region.

Development of regional reference conditions for Idaho waters has been challenging. Historically, varying definitions and interpretations regarding reference condition led to inconsistent site selection methods. In 2000, DEQ began a systematic and consistent approach to improve the reference site selection process.

Background

The development of reference benchmarks for Idaho streams has required several iterations and refinements. Learning from past reference development lessons was important in creating the current systematic approach.

DEQ began using reference conditions during the development of bioassessment tools in the early 1990s. Idaho State University (ISU) was contracted to develop a rapid bioassessment tool for DEQ. As part of the project, ISU performed field visits to validate reference assumptions based on best professional judgement. In 1992, ISU delivered a multimetric macroinvertebrate index for two of Idaho's nine ecoregions (Middle Rockies and Snake River Basin/High Desert) (Robinson and Minshall 1998).

By 1995, reference selection was needed for the other seven ecoregions not addressed in the ISU project. DEQ selected reference using an *a posteriori* approach based on previously monitored sites. Unfortunately, the approach didn't always provide consistent or documented results; some statewide reference sites were questionable.

Imminent deadlines for the 1996 305(b) report and 303(d) list pressed DEQ to resolve the reference question. DEQ chose an empirical model for determining reference. The empirical model used the 95th percentile or best score for each metric in the Macroinvertebrate Biological Index (MBI). Since no one site can realistically consist of all the best values, it was apparent that this empirical model, referred to as the “Franken Stream” approach, was overly conservative.

DEQ was criticized internally and externally for the “Franken Stream” approach. Consequently, the staff tried an *a priori* approach in 1998, incorporating regional staff expertise and standardized criteria developed by Mebane (1998). The approach relied heavily on Beneficial Use Reconnaissance Program (BURP) habitat data collected on previously monitored sites. In 1999, DEQ contracted with Tetra Tech, Inc. to develop a new macroinvertebrate index. The regional biologists refined their reference site selections using more defined reference terms and guidance (Grafe 1999). There was also documentation of the best professional judgement process. To improve consistency in application, DEQ employed an even more systematic approach to be implemented before monitoring. This systematic approach is described in the following methods section.

Methods – Systematic Reference Selection Process

From previous experience, DEQ has learned that establishing definitions is an important first step in any process, particularly the reference selection process. The term “reference” is often used to describe very different water quality conditions. This varying interpretation of reference has proved challenging in consistently identifying statewide reference conditions. For instance, some individuals may interpret reference as simply supporting beneficial uses while others define reference as pristine.

Definitions

To reduce confusion and improve consistency in reference identification, DEQ uses several operational definitions (Larsen 2003 and EPA 2003). *Reference condition* encompasses several reference sites typical of a water body type. A *reference site* is a specific locality on a water body that is minimally or least disturbed (see below) and is representative (i.e., physical characteristics such as stream size, slope, etc.) of the water bodies located in that particular region. Although reference condition consists of a range of values, a single value (e.g., average or percentile) may be extracted from the distribution of reference values for scoring or benchmark purposes.

Larsen (2003) provides operational definitions for three types of reference condition. Figure 1 illustrates the relationship among these definitions.

- *Minimally Disturbed Condition*—this condition occurs in the absence of significant human disturbance (e.g., “natural,” “pristine,” or “undisturbed”). Some regions may have no sites that meet minimal disturbance criteria. It is understood that even minimally disturbed areas (e.g., wilderness areas) receive some disturbance through atmospheric deposition and other widespread impacts.

- *Least Disturbed Condition*—this condition is found in combination with the best available physical, chemical, and biological characteristics given the current state of the landscape. The least disturbed condition is relative. Regardless of the level of disturbance in a region, some sites are relatively less disturbed than others. For the least disturbed condition, it is possible to use a “proportion of the resource” criterion such as “the upper one percent of the resource that is least disturbed.”
- *Best Attainable Condition*—this condition is equivalent to the ecological condition of (hypothetical) least disturbed sites where the best possible management practices are in use. In some cases, this condition could be better than the least disturbed condition (see Figure 1). This condition can be determined using techniques such as historical reconstruction, best ecological judgment with modeling, restoration experiments, and/or inference from data distributions.

Application of Definitions - DEQ Policy

DEQ presently uses the definitions of minimally disturbed and least disturbed (Larsen 2003) to identify reference condition for bioassessment purposes. This is performed through the rating criteria technique described later in this document. DEQ biologists attempt to identify minimally disturbed reference sites first, but may resort to least disturbed sites if necessary. The definition of best attainable condition is not currently used in reference condition for bioassessment index development. However, best attainable conditions may be used for other purposes, such as TMDL or site-specific criteria development.

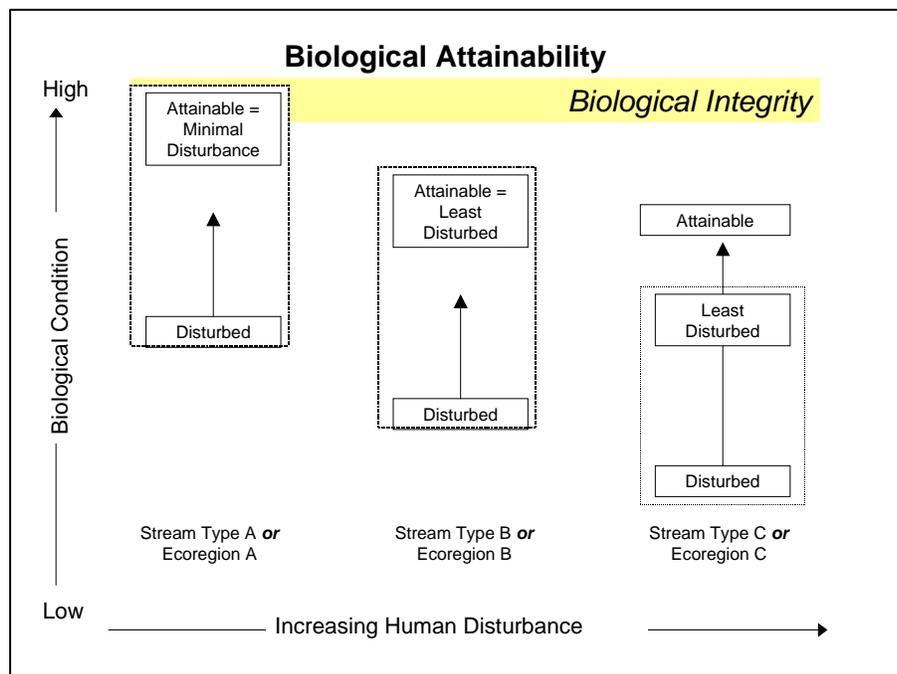


Figure 1 Relationship of reference condition definitions (Larsen 2003).

and Gerritsen (2000) found that groupings of ecoregions into bioregions were most appropriate for a statewide classification scheme. Their classification analysis was part of the SMI development analysis. **For classification purposes, DEQ uses three bioregions: northern mountains, central and southern mountains, and basins.** Ecoregions (Omernik 1986) were grouped or partitioned to develop these bioregions. Table 1 lists these bioregion groupings and Figure 3 illustrates the geographical boundaries of these bioregions.

Table 1 List of ecoregion groupings (Level III Omernik 1987) into three bioregion classifications: northern mountains, central and southern mountains, and basins.

| Northern Mountains Bioregion | Central and Southern Mountains Bioregion | Basins Bioregion |
|-------------------------------------|---|--------------------------|
| Northern Northern Rockies | Southern Northern Rockies | Snake River Basin |
| | Blue Mountains | Northern Basin and Range |
| | Middle Rockies | Columbia Plateau |
| | Wasatch and Uinta Mountains | Wyoming Basin |

II. Select candidate areas

In general, candidate areas are the foundation for identifying reference conditions within a bioregion. DEQ used three methods to justify the selection of candidate areas: 1) literature citations, 2) standardized rating criteria, 3) recommendations from outside experts. These selection methods used both qualitative and quantitative information and required varying degrees of effort. Each selection method that applied to a candidate area was separately documented so that justifications were accurately tracked. For instance, a candidate area might be documented from a literature source and recommended by an outside agency expert. Appendix A provides the candidate area form and directions.

Method 1: Literature citations

In this method, regional staff used published information to identify high quality areas throughout Idaho. Examples of such areas include: Wilderness, Outstanding Resource Waters (currently only nominations), Wild and Scenic Rivers, aquatic research natural areas, areas with sensitive species (e.g., bull trout), and public water supply watersheds that preclude or limit activity. Sources used by DEQ include the *Idaho Natural Areas Directory* (Hilty and Moseley 1991), *Aquatic Natural Areas in Idaho* (Rabe and Savage 1977), and *Riparian Reference Areas in Idaho: a Catalog of Plant Associations and Conservation Sites* (Jankovsky-Jones et al. 1999). Generally, the high quality areas were associated with defined hydrological unit codes (HUCs) at the 5th or 6th field level.

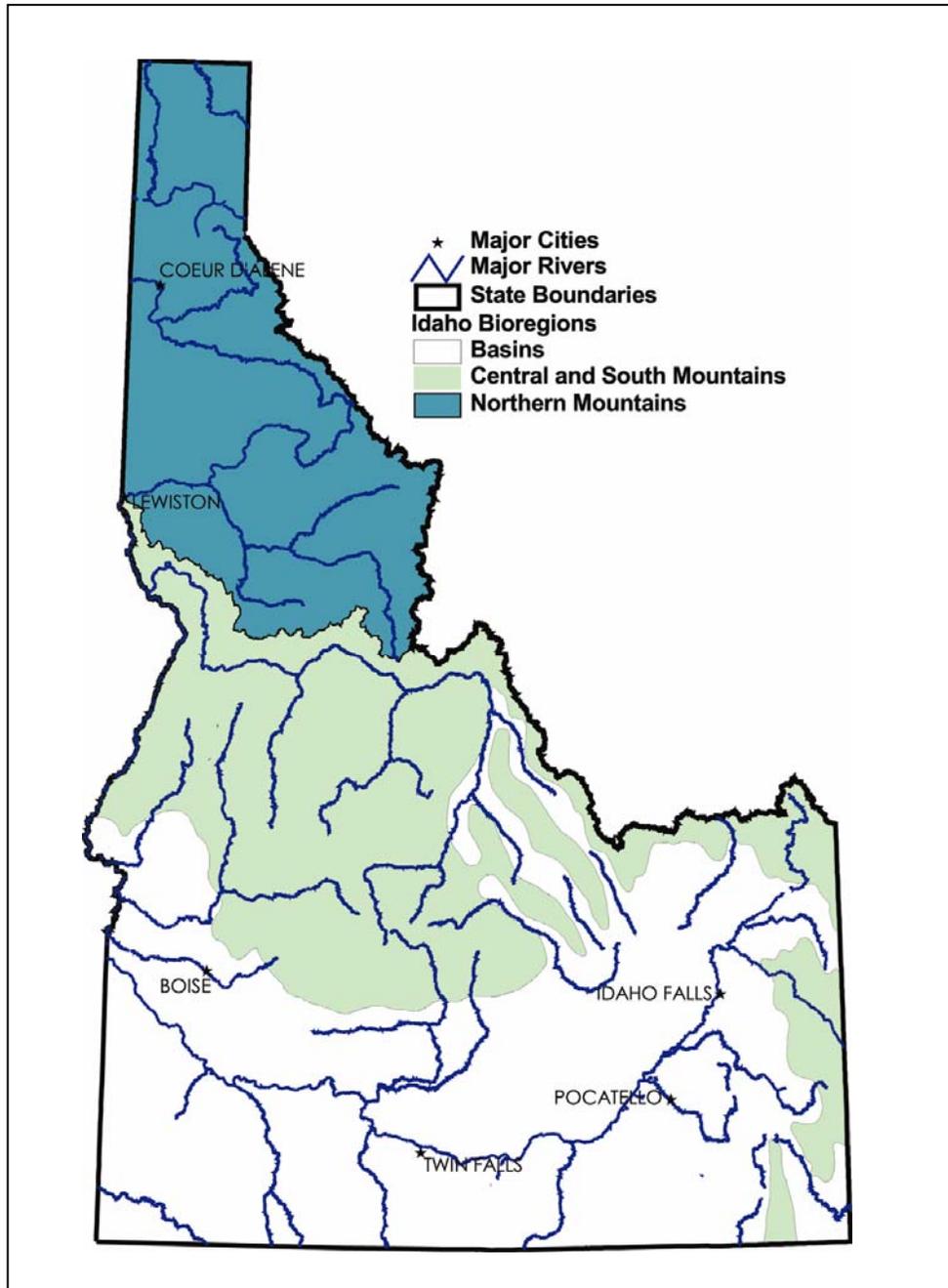


Figure 3 Map of bioregion classification (Jessup and Gerritson 2000).

Method 2: Candidate area criteria

In Method 2, DEQ regional biologists used the watershed scale criteria (Table 2) to select candidate areas. Regional staff used ArcView themes for Resource Conservation and Recovery Act (RCRA), National Pollutant Discharge Elimination System (NPDES), and land use to assist this criteria evaluation. The rating criteria identified in Table 2 were primarily used by DEQ staff to justify the selection of a candidate area, particularly if literature sources weren't available. The regional

biologists rated each criterion from 1 to 5, with 5 indicating excellent condition for that criterion. Additionally, the biologists often provided comments justifying the ratings. Candidate area criteria evaluation was usually considered at the 5th or 6th field HUC scales.

Table 2 Watershed criteria for selecting candidate areas (EPA 1996).

| Criteria | Criteria Guidance |
|--|--|
| 1. No known discharges, NPDES permits or contaminants in place. | Use the NPDES ArcView theme (available at DEQ) to identify areas with discharges. |
| 2. No known spills or other pollution incidents. | Consult with regional environmental managers from other agencies to determine. |
| 3. Low human population density. | Several areas throughout Idaho have low human population density, particularly in areas with small streams. Use city GIS coverage (available at DEQ) or documents available at the library ¹ . |
| 4. Low agricultural activity. | This will be difficult when identifying sites in some classification schemes. For instance, there is high agricultural activity in the valleys, particularly in the Snake River Basin/High Desert. Review the GIS land use coverage (available at DEQ) or documents available at the library. Highlight areas with relatively low percentages of land use devoted to agriculture according to the classification. |
| 5. Low road and highway density. | Again, this may be difficult when identifying sites in certain classifications. Some areas have significant present/historical timber harvests or urbanization. Review the GIS road coverage (available at DEQ or a particular National Forest office) and highlight areas with relatively low percentages of area devoted to roads. Some of this information may also be obtained from reviewing topographical maps. Candidate areas may be selected based on relative percentages in the potential classification. |
| 6. Minimal nonpoint source problems (e.g., agriculture, grazing, urban, logging, mining, feedlots, etc.) | This may be identified from previously noted high quality areas, reviewing GIS coverages (e.g., land use, RCRA, etc.), examining aerial photos, and reviewing topographical maps. Candidate areas may be selected based on relative percentages in the classification scheme. |

¹ Documents available at the library: County Profiles of Idaho (Idaho Department of Commerce 1998), Idaho Statistical Abstract (wai 1996), and 1997 County Economic Forecast: 1996-2015 (Idaho Power 1996).

Method 3: Recommendations by land resource managers and biologists outside DEQ

Method 3 entailed consulting with land resource managers and biologists familiar with stream conditions in their regions. These individuals were provided with the watershed and site-specific rating criteria noted in Tables 2 and 3 along with rating guidelines to improve consistency. These individuals also offered invaluable historical information about the region to help define an acceptable reference condition.

Candidate area distribution

Regional and state office staff separately compared the candidate areas to the bioregion classifications to obtain an adequate distribution of candidate areas. The staff often used ArcView capabilities by overlaying candidate areas onto the bioregion classification map. If candidate areas were concentrated in geographical clusters or limited due to sparse representation, then the search criteria were applied to a smaller scale such as a particular stream. For example, the Basins bioregion had only a few candidate areas, requiring DEQ biologists to identify the “best of what’s left” areas. Often, the biologists could only identify reference sites on streams, rather than watersheds. DEQ intends to revise candidate areas as needed and as more information becomes available.

III. Select potential reference sites

Once DEQ identified candidate areas, staff then selected potential reference sites within those areas. Regional staff documented selection of potential reference sites using best professional judgement and habitat-type data. DEQ biologists attempted to identify sites representing the bioregion classification. The goal was to identify streams ranging in stream order and Rosgen channel types. First order or headwater streams were flagged to ensure associated data were used appropriately.

IV. Filter sites using desktop tools

To reduce resources needed for field verification, the DEQ used filtering techniques provided by ArcView capabilities. A GIS specialist depicted important information such as watershed boundaries, NPDES sites, RCRA sites, Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) sites, mines, roads, landfills, dams, diversions, and DEQ BURP sites on maps. Using satellite imagery (Landsat 1997-98 Bands 1, 2, 3), DEQ biologists were allowed to further evaluate land use activities such as mining and timber harvesting. Appendix B provides an illustration of this technique. Presently, DEQ has used this technique for sites in the trend monitoring network and the reference set for SMI development. If available, DEQ also reviewed aerial photographs to further evaluate watershed characteristics.

V. Perform field verification on core group of sites

DEQ used field verification for two different objectives. For the potential reference sites, regional field crews collected BURP data to verify current conditions and

provide information for rating reference criteria. This information could also be used to refine candidate area selection. For reference sites that were selected for a statewide reference network, the state program staff performed independent field verifications. The purpose of the field verification was to test how consistently DEQ biologists rated reference criteria. The staff also verified site information and directions. DEQ biologists met in March 2003 to evaluate the differences in ratings, foster discussion, calibrate rating techniques, and improve consistency.

During field verification, it was very important for field crews to provide extensive, descriptive information regarding human disturbance and land use. For instance, written information included descriptions of visible recreation pressures, point sources, and farm types nearby. During the field verification of the statewide reference network, staff photographed important stream and watershed features. An example of the information derived from the independent field verifications is found in Appendix C.

VI. Rate sites based on criteria

Once field verifications were completed, the next step was to rate the site using standardized criteria. Regional biologists filled in the site criteria documentation form for each potential reference site, often using BURP field data if available. The criteria are described in Table 3 and include evaluation of road distance, riparian vegetation extensiveness, variety, and maturity; riparian structure complexity; natural channel morphology and amount of shoreline modifications; channel complexity; habitat structure complexity; impacts from chemical stressors; channel/flow manipulations; substrate heterogeneity; diversions; and nonpoint source impacts (Mebane 1998 and Hughes 1995). Appendix D provides the form and detailed instructions along with the BURP habitat evaluation referred to in the criteria guidance (see Table 3). Evaluators interpreted BURP and/or third-party data to rate the criteria. Each criterion was rated from 1 to 5, with 5 indicating excellent condition for that criterion. Regional staff provided comments in the appropriate section to document their ratings.

Because evaluators were asked to rate what they observed, some sites may have received lower ratings for impacts caused by natural events. DEQ is considering flagging sites impacted by natural events (e.g., fires, floods, etc.) and using them in separate reference condition comparisons (see Recommendations, page 15). In some cases, some bioregions contained reference sites with exceptional criteria ratings, while other bioregions barely met the criteria either due to natural or human induced conditions. Overall, there were more reference sites in the montane bioregions than the basins bioregion.

A few previously rated reference sites were re-evaluated to document any changes in land use activities or natural conditions. For example, grazing allotment changes could easily change reference site potential. For reference trend sites, state office staff performed field verifications and provided separate criteria ratings. The regional and state biologists then met and discussed criteria ratings differences to improve consistency. In some cases, regional ratings were revised. Criteria ratings were then totaled and a percent of total possible points was calculated.

Table 3 Site criteria to characterize and select sites using best professional judgment and available BURP data (Mebane 1998).

| Criteria (stream scale) | Criteria Guidance |
|--|--|
| 1. Roads, distant | Not constraining riparian zone, crossings are infrequent, no evidence of road associated failures from culverts or gullies to streams. “Disruptive pressures” and riparian “zone of influence” should be rated optimal (9-10), or if sub-optimal, roads not listed as a factor. |
| 2. Riparian vegetation extensive, varied and mature | Riparian growth is considered extensive when it occurs all along the shoreline and is capable of shading the stream and buffering human influences. It is considered varied when different types of vegetation are present and mature when it overhangs the stream or deposits large woody debris (bank vegetation protection >70% [sub-optimal or above] or canopy cover shading >25%). |
| 3. Riparian structure complex | Complexity characterized by presence of a canopy, understory, and groundcover (trees, shrubs, and groundcover) (Review site photos, notes). |
| 4. Natural channel morphology and minimal shoreline modification with stable banks. | Evidence of riprap, channel straightening, vegetation removal or other disturbances absent or minimal. “Disruptive pressures” should be rated optimal (9-10). |
| 5. Channel complex | Mixture of habitat types (Longitudinal habitat distribution rated sub-optimal or optimal). |
| 6. Habitat structure complex | Substrate heterogeneous (site rated as having >30% stable instream fish cover). |
| 7. Chemical stressor minimal | Likely sources of chemical stress are few (e.g. unbuffered croplands, irrigation returns, active or in-active mining areas, regulated discharges), or if potential sources present, adequate chemical monitoring data show standards or guidelines met, and thus effects are unlikely. |
| 8. Channel/flow manipulation minimal; natural hydrography | Upstream impoundments absent. Irrigation withdrawal or other diversions absent, or if present, likely cause minimal disruption of hydrologic cycle (i.e., acknowledging that almost all streams located in the semi-arid basin/lowland ecoregions will have some water withdrawals). |
| 9. Evidence of excessive sedimentation absent; relatively high heterogeneity of substrate materials. | Apparent anthropogenic sediment increases not noted (e.g., crop or road gullies, livestock bank trampling, mass wasting). No field notes of highly turbid conditions. No indications from habitat variables of excessive sedimentation (e.g., no “poor” qualitative cobble embeddedness estimates ($\leq 75\%$), channel substrate <50% fine sediments (measured as bankfull). |

| Criteria (stream scale) | Criteria Guidance |
|---|---|
| 10. Pipes, drains, ditches and tile absent | “Disruptive pressures” and riparian “zone of influence” should be rated optimal (9-10), or if sub-optimal, pipes, drains, ditches, and/or tile not listed as a factor. |
| 11. Minimal evidence of nonpoint source problems from human disturbance (e.g., agriculture, urban, timber harvests, mining, feedlots, grazing etc.) | “Disruptive pressures” should be rated optimal (9-10), absence of laid back, trampled, or unstable banks (No “poor” ratings for channel shape, bank vegetative protection, bank stability). If sub-optimal, these human disturbances should not be listed as a factor. Review field notes and photos. |

VII. Rank sites based on ratings

Once reference sites were verified and rated, DEQ staff ranked the sites according to percent of total possible points. These rankings were revised based on any changes to the criteria ratings.

VIII. Use results according to project needs

Although DEQ uses reference condition ratings and rankings predominately for bioassessment development purposes, this information can also be used for a variety of other projects. Upper tiers might be used to refine the reference trend monitoring network or multimetric indices. A larger range of reference conditions might be used to evaluate multivariate models such as RIVPACS.

Results

In 2000, DEQ identified 165 candidate areas at the 5th field HUC (10-digit code) scale. These areas are illustrated in Figure 4 and listed in Appendix E. The map shows how candidate areas are clustered geographically with large areas having limited representation, particularly in southern Idaho, DEQ believes that montane regions in both southern and northern Idaho have adequate representation to meet the definition of minimally disturbed condition. This is due to several wilderness and roadless areas located throughout these regions. The reference condition for the basins bioregion generally reflects the definition of least disturbed.

DEQ identified, rated, and ranked about 140 reference sites in 2001. Some of these sites were used in bioassessment analysis and will also be used in RIVPACS model development. A map of these sites is shown in Figure 5 and a site list is provided in Appendix F. Appendix G summarizes the criteria ratings for the reference sites. If the reference sites were located near each other, than they were grouped and rated as one stream.

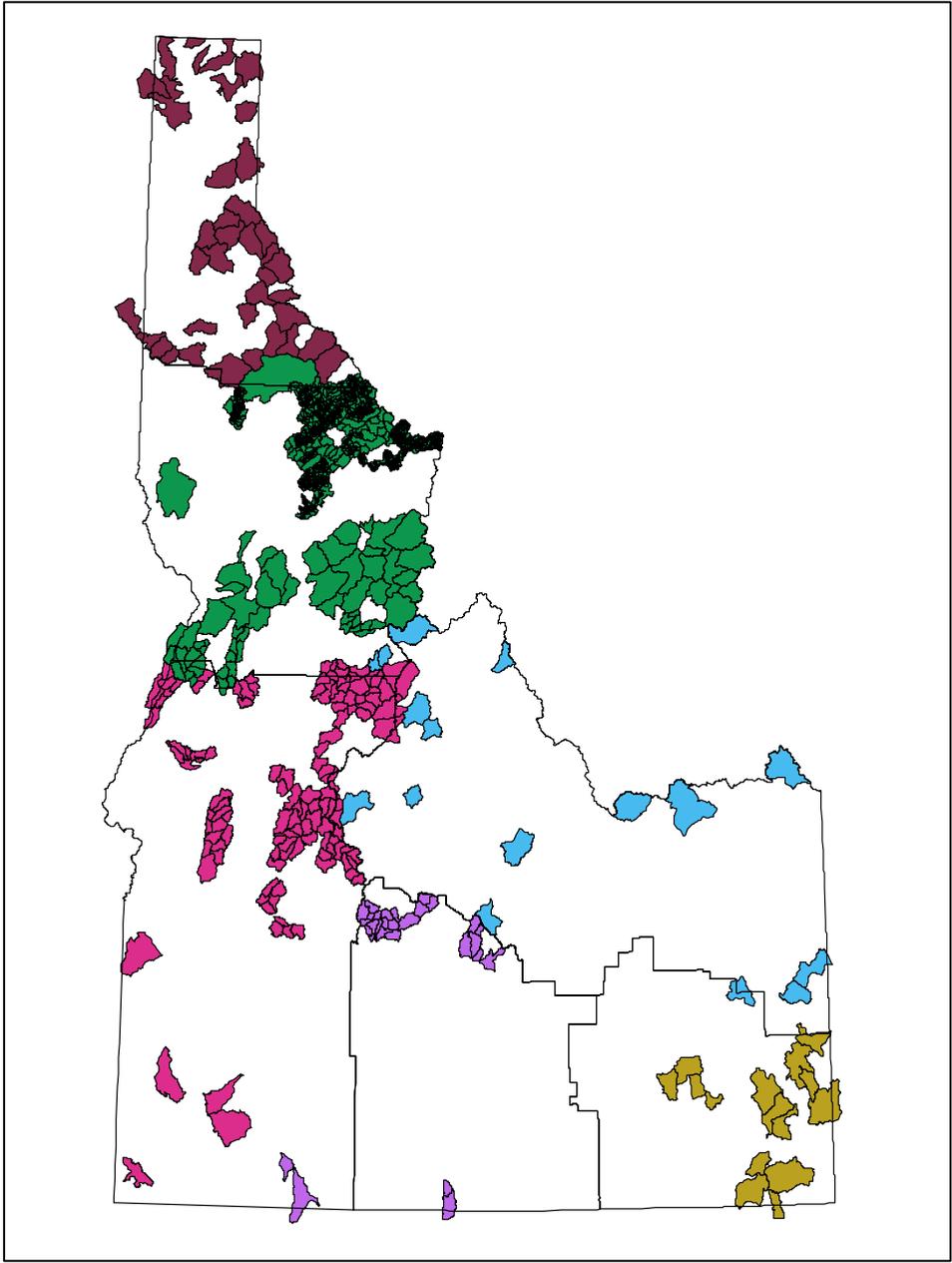


Figure 4 Map of Idaho candidate areas selected by DEQ regional biologists in 2000.

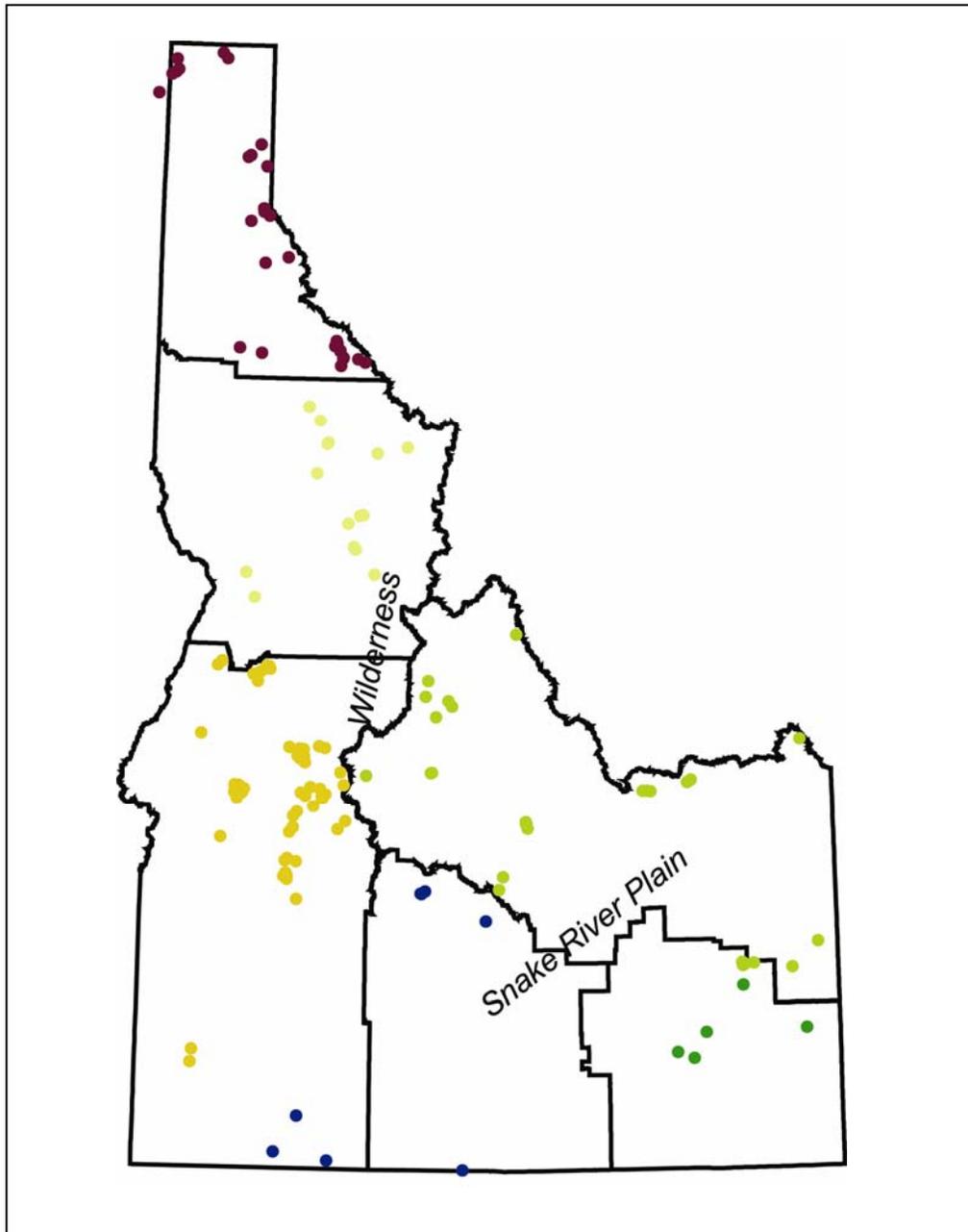


Figure 5 Map of potential reference sites selected by DEQ regional biologists in 2001. It may appear that there are less than 140 sites due to the map scale and clustering in some areas.

In 2001, DEQ also selected 22 sites to be used in the reference trend network (Figure 6). Approximately five sites were chosen for four major ecoregions resulting in six sites in the central and southern mountains bioregion, six sites in the northern mountains bioregion, and ten sites in the basins bioregion (see Appendix H). These sites were randomly selected from the potential reference set and were most recently used in a variability study of BURP monitoring protocols (Fore and Grafe 2001).

The variability analysis, conducted in 2001-2002, found that reference criteria for habitat condition could be defined as a Stream Habitat Index (SHI) value between 60–100 (Fore 2003). Additionally, Fore (2003) did not find annual variability to be an important influence on the SHI or its component metrics. Fore (2003) notes however, that this might not hold true in cases of extreme conditions such as the severe drought experienced in 2003. The DEQ intends to expand the network to provide better representation and additional benchmark information for special projects.

Appendix H lists the sites currently included in the network along with an example site information sheet. A site information sheet was prepared for each reference trend site. The sheet includes information such as latitude, longitude, pertinent maps, public land survey, directions to the monitoring site, and photographs.

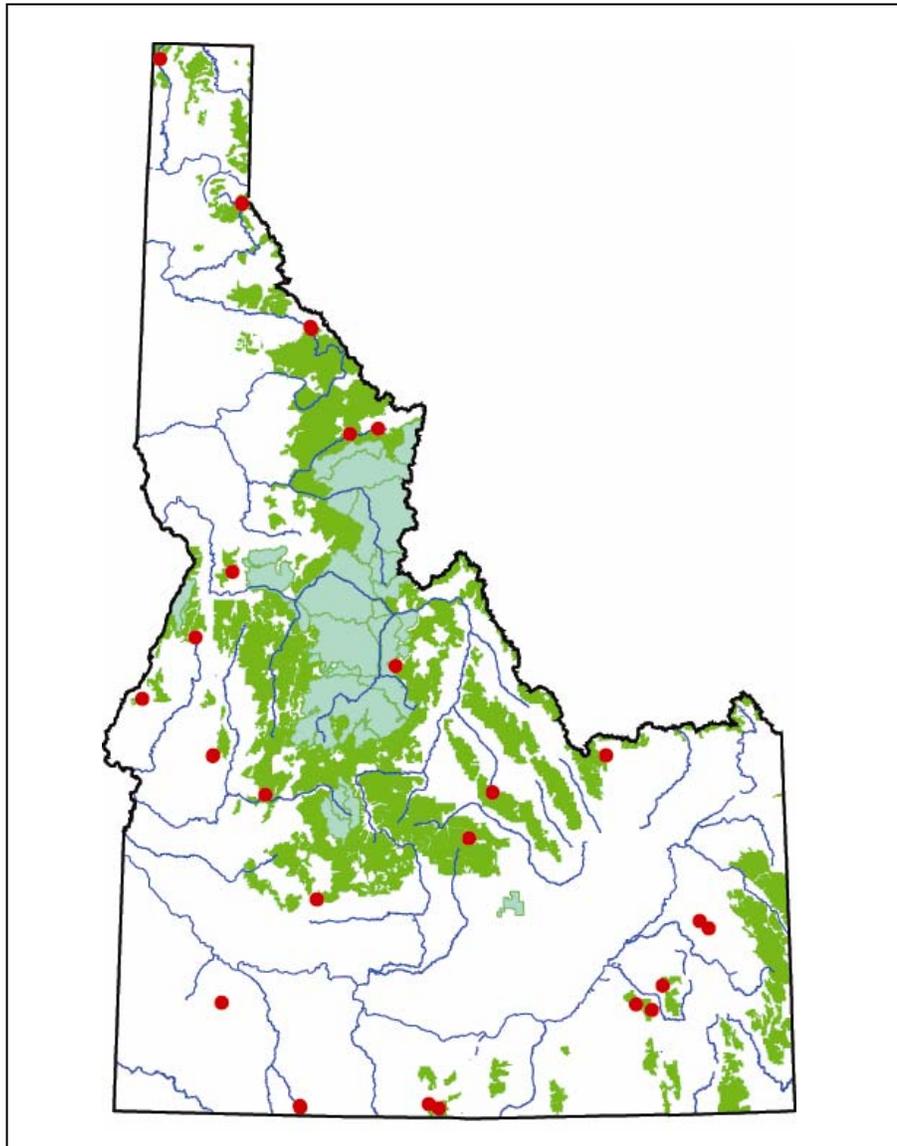


Figure 6 Map of 2002 reference trend network.

Discussion

Identifying reference condition for Idaho's waters has not been easy. The process has evolved to a systematic approach. DEQ has learned several lessons throughout the reference development process. In particular, DEQ biologists require guidance and structure in identifying and rating reference sites to provide consistent information statewide. Even more importantly, staff need to discuss their thought processes and calibrate their reference selection and rating techniques. Additionally, it will be important to continue to verify sites as conditions can change quickly (e.g., development, floods, fires, etc.). It is important to remember that the development of reference condition is an iterative process requiring refinement as DEQ gathers more information and has access to better analytical tools.

Recommendations

DEQ's reference approach continues to evolve and improve. In the spring of 2003, DEQ biologists discussed some of the issues yet to be addressed and provided the following recommendations:

1. Ensure DEQ staff are selecting sites that are representative of the ecoregion or bioregion upstream of the site.
2. Revisit the standardized criteria and revise to reflect more issues found in Idaho. Consider guidance relative to particular bioregions.
3. Establish a policy concerning whether DEQ biologists should rate criteria without having specific data/information (e.g., chemical stressors).
4. Provide guidance regarding the starting point for rating criteria. Determine whether staff should downgrade from a "5" or upgrade from a "1" when rating each criterion. Ensure staff implement the procedures consistently for different impacts.
5. Provide guidance on how to handle impacts from natural disturbance. Determine whether these streams should be rated according to what's currently observed or the potential conditions. Determine whether naturally disturbed streams should be flagged and used as separate benchmarks for other similarly impacted streams.
6. Place permanent monuments or markers for the reference trend sites to ensure the same starting point for replicate sites.
7. Develop a database of all the selected sites for ease of documentation and use.
8. Ensure reference information is available on the DEQ Web site.
9. Increase the total number of sites in the reference trend network with monitoring occurring on a rotational basis.

Glossary

A priori: A decision making process based on preconceived information and theories.

A posteriori: A decision making process based on data that have been collected.

Beneficial use: Any of the various uses that may be made of water, including, but not limited to, aquatic biota, recreation in or on the water, water supply, wildlife habitat, and aesthetics.

Best attainable condition: A condition that is equivalent to the ecological condition of (hypothetical) least disturbed sites where the best possible management practices are in use. This condition can be determined using techniques such as historical reconstruction, best ecological judgement and modeling, restoration experiments, or inference from data distributions (Larsen 2003).

Best professional judgement: A trained and/or technically competent individual applies interpretation and synthesizes information to derive a conclusion and/or interpretation.

Channelization: Straightening and deepening streams so water will move faster; a marsh-drainage tactic that can interfere with waste assimilation capacity, disturb fish and wildlife habitats, and aggravate flooding.

Contaminant: Any physical, chemical, biological, or radiological substance or matter that has an adverse effect on air, water, or soil.

Criteria: Descriptive factors used by DEQ to evaluate reference candidate areas and rate reference sites. DEQ uses standardized criteria to select reference conditions consistently statewide.

Designated uses: Those water uses identified in state water quality standards that must be achieved and maintained as required under the Clean Water Act.

Discharge: The amount of water flowing in the stream channel at the time of measurement. Usually expressed as cubic feet per second (cfs).

Disturbance: Any event or series of events that disrupt ecosystem, community, or population structure and alter the physical environment.

Diversity: Variation that occurs in plant and animal taxa (i.e., species composition), habitats, or ecosystems within a geographic location.

Ecoregion: An area defined by similarity of climate, landform, soil, potential natural vegetation, hydrology, or other ecologically relevant variables.

Environmental indicator: A measurement, statistic, or value that provides a proximate gauge or evidence of the effects of environmental management programs or of the state or condition of the environment.

EPA: United States Environmental Protection Agency.

Erosion: Wearing away of soil by water, wind, or ice; erosion is the process by which the earth's surface is shaped and occurs even in remote, uninhabited areas at a slow rate (geologic erosion); of more concern is accelerated erosion caused by people's activities.

Floodplain: The flat or nearly flat land along a river or stream or in a tidal area that is covered by water during a flood.

Gradient: (1) General slope, or the change in vertical elevation per unit of horizontal distance, of the water surface in a flowing stream (2) Rate of change of any characteristic per unit of length.

Habitat: The place where a population (e.g., human, animal, plant, microorganism) lives and its surroundings, both living and non-living.

Heavy metals: Metallic elements with high atomic weights (e.g., mercury, chromium, cadmium, arsenic, and lead); can damage living things at low concentrations and tend to accumulate in the food chain.

Historical data: Data existing from previous studies; the data can range from handwritten field notes to published journal articles.

HUC: Hydrologic unit catalog system developed by the U.S. Geological Survey.

Human made: Relating to or resulting from the influence of human beings on nature. Anthropogenic. Includes waterways such as canals, flumes, ditches, and similar structures constructed for the purpose of water conveyance.

Hydrology: The science dealing with the properties, distribution, and circulation of water.

Impairment of beneficial use: Not meeting reference conditions for a designated or existing use as determined through the *Water Body Assessment Guidance* (Grafe et al. 2002). Use adversely impacted to the point of no longer being supported.

Impoundment: A body of water or sludge confined by a dam, dike, floodgate, or other barrier.

Least disturbed condition: A condition that is found in combination with the best available physical, chemical, and biological characteristics given the current state of the landscape (Larsen 2003).

Minimally disturbed condition: A condition that occurs in the absence of significant human disturbance (e.g., "natural," "pristine," or "undisturbed") (Larsen 2003).

Montane: Pertaining to mountains or mountainous areas.

Non point sources: Diffuse pollution sources (i.e., without a single point of origin or not introduced into a receiving stream from a specific outlet). The pollutants are generally carried off the land by storm water. Common non point sources are agriculture, forestry, urban, mining, construction, dams, channels, land disposal, saltwater intrusion, and city streets.

NPDES: National Pollutant Discharge Elimination System.

Nutrient pollution: Contamination of water resources by excessive inputs of nutrients. In surface waters, excess algal production is a major concern.

Nutrient: Any substance assimilated by living things that promotes growth. In water, the term is generally applied to nitrogen and phosphorus, but is also applied to other essential and trace elements.

Point source: A stationary location or fixed facility from which pollutants are discharged; any single identifiable source of pollution.

Pollutant: Generally, any substance introduced into the environment that adversely affects the usefulness of a resource or the health of humans, animals, or ecosystems.

Qualitative: Descriptive of kind, type, or direction, as opposed to size, magnitude, or degree.

Quantitative: Descriptive of size, magnitude, or degree.

Reconnaissance: An exploratory or preliminary survey of an area.

Reference site: A specific locality on a water body that is minimally disturbed or least disturbed and is representative of the water bodies located in the bioregion.

Reference condition: A set of selected measurements or conditions of minimally disturbed or least disturbed water bodies characteristic of a water body type in a bioregion.

Riparian vegetation: Vegetation growing on or near the banks of a stream or other water body that is more dependent on water than vegetation that is found further upslope.

Stressors: Physical, chemical, or biological entities that can induce adverse effects on ecosystems or human health.

Water body: A homogeneous classification that can be assigned to rivers, lakes, estuaries, coastlines, or other water features.

Water quality: A term used to describe the biological, chemical, and physical characteristics of water with respect to its suitability for a beneficial use.

Water quality standards: State-adopted and EPA-approved ambient standards for water bodies. The standards prescribe the use of the water body and establish the water quality criteria that must be met to protect designated uses.

Watershed: The land area that drains into a stream. An area of land that contributes runoff to one specific delivery point; large watersheds may be composed of several smaller “subwatersheds,” each of which contributes runoff to different locations that ultimately combine at a common delivery point.

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Appendix A. Reference Candidate Area Guidelines and Forms



DEQ Least Impacted Waterbody Database Candidate Area Identification Information and Rating Form

| | |
|-----------|----------------------|
| I. | Candidate ID: |
|-----------|----------------------|

| | | | | |
|------------|-------------|--|------------------|--|
| II. | HUC4 | | HUC4 Name | |
| | HUC5 | | | |
| | HUC6 | | | |

| | | |
|-------------|---------------------------|--|
| III. | Source (C,Q. or R) | |
|-------------|---------------------------|--|

| | | |
|------------|--|--|
| IV. | Table 1 Criteria: | |
| | 1) Known Discharges: No known discharges (NPDES) or contaminants in place: | |
| | 2) No known spills or other pollution incidents: | |
| | 3) Low human population density: | |
| | 4) Low Agricultural Activity: | |
| | 5) Low Road and Highway Density: | |
| | 6) Minimal Non-point Source problems (ag, urban, mining, logging, feedlots): | |

| | | | |
|---------------------------|--|-------|--|
| V. Recommended by: | | | |
| First Name | | | |
| Last Name | | | |
| Address | | | |
| City | | State | |
| Zip | | | |

| | |
|------------------------------------|--|
| VI. Literature Information: | |
| First Name | |
| Last Name | |
| Title | |
| Year | |
| Available | |

| | | | |
|-----------------------------------|--|----------------------|---------------------------|
| VII. Location Information: | | | |
| Map Name | | OR GIS/GPS File Name | |
| Map Scale | | | (* .cor, *.shp, or *.apr) |

| | |
|-----------------------|--|
| VIII. Done by: | |
|-----------------------|--|

| | |
|------------------|--|
| IX. Date: | |
|------------------|--|

Form purpose

This form will be used to document candidate areas which are considered minimally disturbed for a particular region. The form provides a consistent documentation process for each candidate area.

Form sections

I. Candidate Area ID

Be sure to list the 10-digit hydrologic unit code on the form. The convention will use the following protocol:

- 10-digit hydrologic unit code
- 1 character for documentation method
- 2 digits for sequence number

Table A-1 Character code for documentation/justification method

| Reason | Database Code |
|----------------------------|----------------------|
| Table 1 Watershed Criteria | C |
| High Quality Area | Q |
| Recommended | R |

II. HUC information

This identifies the location of your candidate area using the 10-digit hydrologic unit code (5th field HUC). You may have an area that should be delineated smaller than a code 5th field HUC. However, until GIS coverages are more consistent statewide for finer scale hydrologic units, we will use 5th field HUCs.

III. Source

There are 3 methods for justifying the candidate area:

1. Table 1 watershed criteria ratings determined by DEQ (C)
2. High quality areas identified in the literature (Q)
3. Recommendations from other agencies (R)

A candidate area must be justified using at least one of the above methods. In some cases, more than one method may be used to justify the candidate area. For instance, the area may have a high integrity rating and was recommended by the USFS. In these cases, fill out 2 separate forms—one for each method used to justify the selection. Also, there may be more than one literature cite or person recommending a candidate area. Again, fill out a separate form for each area for tracking purposes in the reference database.

1. Table 1 Watershed Criteria

Table 1 watershed criteria is used when DEQ staff identify an area as minimally disturbed or to refine the ICBEMP candidate area. DEQ staff may also provide this criteria to the recommender to guide their recommendations. See Section V. regarding the procedure for rating each of the 6 criteria.

2. High Quality Areas

There are several documents that identify high quality areas in Idaho. Justify a particular candidate area by citing this information. If there is more than one citation, use a separate form and different sequence numbers in the candidate ID (see Candidate ID naming convention). See Section VI regarding the procedure for citations.

3. Recommendations

Recommendations are from outside the agency. If DEQ staff have recommendations, they must use the Table 1 watershed criteria method. Similar to 3 above, if there is more than one recommender for a particular candidate area, then use a separate form and different sequence numbers in the Candidate ID. Also, a recommender may suggest more than one area; again, a separate form identifying each candidate area is needed. See Section VII regarding the procedure for citing recommenders.

IV. Table 1 Watershed Criteria

Rate the potential of the entire candidate area. There may be some water bodies that are heavily impacted, but the rest of the area is minimally disturbed. This will probably come up often, particularly for point discharges in mining areas. The ratings and associated potentials are as follows:

| Rating | Approximate Potential |
|--------|-----------------------|
| 1 | 0-15% |
| 2 | 15-35% |
| 3 | 35-60% |
| 4 | 60-85% |
| 5 | 85-100% |

Place your ratings in the boxes to the right of the criteria. Put any comments or explanation in the boxes below the criteria.

Remember, this effort is just to identify the candidate area and focus our efforts later in selecting potential water bodies. There are several steps yet before finally selecting the minimally disturbed water bodies. Therefore, the entire area does not have to be without impacts, just to find the minimally disturbed areas in your region.

V. Recommendation

Fill in the standard name and address information for the recommender. If the candidate area has more than one recommender, fill out a separate form for each recommender and be sure to change the Candidate ID sequence number to reflect the different recommenders.

VI. Literature Information

Fill in the standard citation information. Similar to the recommendation section, a separate form is needed for different literature that cites the same candidate area. Fill in where the literature is located, such as the regional office or state office, in the “Available” box.

VII. Location Information

Similar to how we provide BURP site information on a map, provide a map or GIS shape file identifying the candidate area. If you are supplying a hard copy of a map, then please provide the map name and scale.

VIII. Done by

Please fill in your name. If more than one person contributed to the process, then fill in the person who performed the most work and is responsible for the justification.

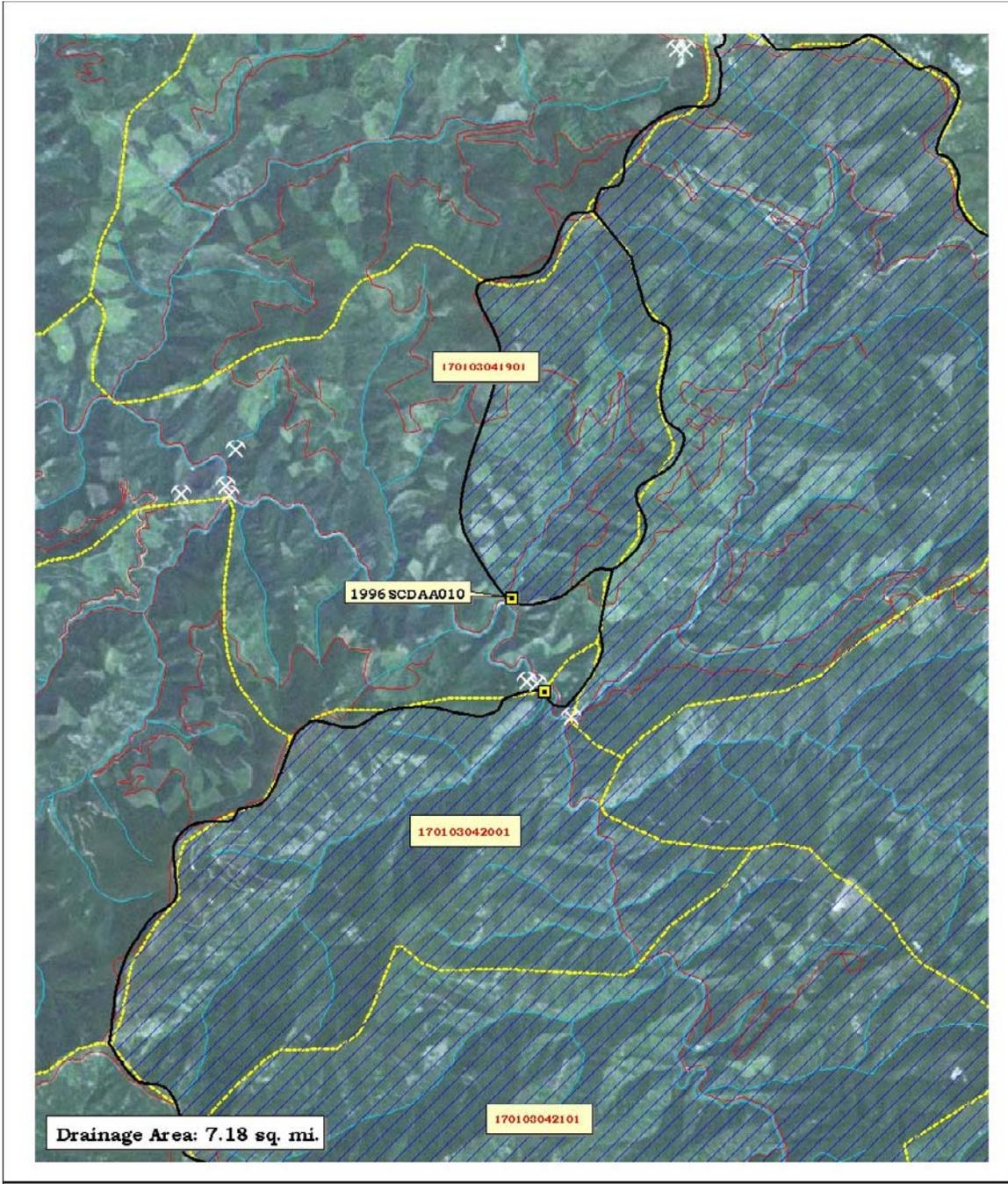
IX. Date

Please use the standard date format used in BURP: year, month, date (991115).

Reminder

We are trying to find candidate areas statewide and for different classification groups such as forest and rangeland. In many cases, you will be hard pressed to find anything for a particular classification. Do the best you can and choose what you think is the “best of what’s left” in your region. Be sure to reflect this in your ratings for Table 1 watershed criteria as well as in your comments.

Appendix B. Filter Example Using ArcView Capabilities



Reference Sites

1996SCDAA010

Bruin Creek

0 1 2 Miles



| LEGEND | | | |
|--------|-----------------|--|---------------|
| | Reference Sites | | Streams |
| | HUC 6 Boundary | | Drainage Area |
| | Mines | | WIAP |
| | Roads | | NPDES |
| | | | RCKA |
| | | | CERCLA |

Appendix C. Example of Reference Trend Network Field Verification

**DEQ Reference Trend Monitoring Network
Site Criteria Rating and Documentation Form**

| | | | |
|--|--|--------------------------------------|--|
| I. WATERBODY NAME: BELL MARSH CREEK | | II. PRIOR YEAR BURP ID: | |
| III. CANDIDATE AREA ID(S): | | IV. 5th FIELD HUC: | |
| 1. | | | |
| 2. | | V. WBID: | |

| |
|--|
| VI. REASONS FOR SELECTING SITE: |
|--|

| VII. CRITERIA (SITE SCALE) NOTE: IF BLANK, THEN UNABLE TO RATE. | RATING (1-5) 1=LOW 5=HIGH |
|---|--|
| 1. Roads – distant | 4 |
| There is an ATV/mountain bike trail that parallels Bell Marsh for some distance. However, this trail is not used by vehicles and its impact is minimal. There is a crossing above current site. Would suggest moving site above this minor influence in future. | |
| 2. Riparian vegetation – extensive, varied, and mature | 4 |
| The riparian vegetation is extensive as the flood plain allows and mature for this bioregion. Extent of vegetation does not appear to be comprised at the site. | |
| 3. Riparian structure – complex | 5 |
| There is a good mixture of types and height, from ground cover to mature brush. | |
| 4. Channel morphology – natural and minimal shoreline modification with stable banks. | 3 |
| While channel appears stable now, there does appear to be some old evidence of an old diversion. There is no diversion structure now, only depositional area where it existed along with old ditch on south side of creek (see photos). | |
| 5. Channel – complex | 4 |
| Good mixture of habitat types and medium sinuosity. Bottom exhibits good mixture of substrate sizes, though boulders are not well represented. | |
| 6. Habitat structure – complex | 4 |
| Riffles, pools, and runs evident. No one predominates. | |

| VII. CRITERIA (SITE SCALE) | | RATING (1-5) 1=LOW 5=HIGH |
|---|---|--|
| NOTE: IF BLANK, THEN UNABLE TO RATE. | | |
| 7. | Chemical stressors – minimal | 5 |
| | No evidence noted, none detected on GIS coverage. | |
| 8. | Channel/flow manipulation – natural hydrography or minimal | 4 |
| | Possible old impact from diversion, though time has given this stream back to a natural flow regime for this bioregion. | |
| 9. | Substrate materials – relatively high heterogeneity, evidence of excessive sedimentation absent. | 4 |
| | See above. Good mixture and proportions. | |
| 10. | Pipes, drains, ditches, and tile – absent | 4 |
| | Old diversion ditch and structure. Ditch is stable and vegetated with small conifers. Not used for many years. Original diversion structure is gone, no evidence beyond gravel bar. | |
| 11. | Evidence of nonpoint source problems from human disturbance – minimal | 3 |
| | I would change this to a 4 if I could confirm that grazing allotment is below site. Definite evidence of cows below site at end of road. | |
| TOTAL SCORE | | 44 |
| PERCENT | | 80 |

| | | | |
|-----------------------|------------------|-----------------|----------|
| VIII. DONE BY: | Michael McIntyre | IX. DATE | 11/21/02 |
|-----------------------|------------------|-----------------|----------|

| |
|--|
| RECOMMENDATIONS: |
| Keep site as reference. Confirm status of grazing allotment with Charibou NF. Suggest moving site above trail crossing and old gravel bar. |

| |
|------------------|
| COMMENTS: |
| |

Appendix D. Site Criteria Evaluation Form and BURP Habitat Assessment Forms

**DEQ Least Impacted Waterbody Data Base
Potential Lease Impacted Site Criteria Rating and Documentation Form**

| | | | |
|--|--|---|--|
| I. WATERBODY NAME: | | II. BURP ID: | |
| VIII. CANDIDATE AREA ID(S): 1. 2. 3. 4. | | IX. 5th FIELD HUC: X. WBID: | |

| |
|--|
| XI. REASONS FOR SELECTING SITE: |
|--|

| XII. CRITERIA (SITE SCALE) | RATING (1-5) |
|---|---------------------|
| 1. Roads – distant | |
| | |
| 2. Riparian vegetation – extensive, varied, and mature | |
| | |
| 3. Riparian structure – complex | |
| | |
| 4. Channel morphology – natural and minimal shoreline modification with stable banks. | |
| | |
| 5. Channel – complex | |
| | |

| XII. CRITERIA (SITE SCALE) | RATING (1-5) |
|---|-----------------|
| 6. Habitat structure – complex | |
| | |
| 7. Chemical stressors – minimal | |
| | |
| 8. Channel/flow manipulation – natural hydrography or minimal | |
| | |
| 9. Substrate materials – relatively high heterogeneity, evidence of excessive sedimentation absent. | |
| | |
| 10. Pipes, drains, ditches, and tile – absent | |
| | |
| 11. Evidence of nonpoint source problems from human disturbance – minimal | |
| | |

| | | | |
|----------------|--|----------|--|
| VIII. DONE BY: | | IX. DATE | |
|----------------|--|----------|--|

Appendix E. Candidate Areas Selected in 2000

Table E-1 List of 165 candidate areas, 5th field HUC scale, selected by DEQ regional biologists in 2000. The candidate areas were the starting point for selecting reference sites. After further investigation, there were some candidate areas that did not contain streams meeting reference criteria. Not all 5th field HUCs (HUC5CODE or 10-digit HUC) have corresponding names. For those HUC names with an asterick (), stream names within the HUC are provided for location information only.*

| REG OFF | HUC4CODE | HUC4NAME | HUC5CODE | HUC5NAME |
|---------------|----------|--------------------------|------------|--------------------------------|
| Pocatello | 16010201 | BEAR LAKE | 1601020101 | Alexander Reservoir |
| Pocatello | 16010201 | BEAR LAKE | 1601020102 | Bear River |
| Pocatello | 16010201 | BEAR LAKE | 1601020103 | Big Canyon |
| Pocatello | 16010201 | BEAR LAKE | 1601020108 | Bear Lake Outlet |
| Pocatello | 16010202 | MIDDLE BEAR | 1601020203 | Cub River |
| Pocatello | 16010202 | MIDDLE BEAR | 1601020209 | Oneida |
| Pocatello | 16010203 | LITTLE BEAR-LOGAN | 1601020306 | Beaver Creek |
| Coeur d'Alene | 17010104 | LOWER KOOTENAI | 1701010402 | Mission Creek |
| Coeur d'Alene | 17010104 | LOWER KOOTENAI | 1701010404 | Kootenai River |
| Coeur d'Alene | 17010104 | LOWER KOOTENAI | 1701010407 | Boulder Creek |
| Coeur d'Alene | 17010104 | LOWER KOOTENAI | 1701010411 | Long Canyon Creek |
| Coeur d'Alene | 17010104 | LOWER KOOTENAI | 1701010413 | Boundary Creek |
| Coeur d'Alene | 17010105 | MOYIE | 1701010501 | Lower Moyie River |
| Coeur d'Alene | 17010213 | LOWER CLARK FORK | 1701021302 | Lightning Creek |
| Coeur d'Alene | 17010214 | PEND OREILLE LAKE | 1701021408 | Hope |
| Coeur d'Alene | 17010215 | PRIEST | 1701021506 | Granite Creek |
| Coeur d'Alene | 17010215 | PRIEST | 1701021508 | Upper Priest Lake |
| Coeur d'Alene | 17010215 | PRIEST | 1701021513 | Priest Lake |
| Coeur d'Alene | 17010301 | UPPER COEUR D'ALENE | 1701030102 | North Fork Coeur d'Alene River |
| Coeur d'Alene | 17010301 | UPPER COEUR D'ALENE | 1701030103 | Cabin Creek |
| Coeur d'Alene | 17010301 | UPPER COEUR D'ALENE | 1701030104 | Independence Creek |
| Coeur d'Alene | 17010301 | UPPER COEUR D'ALENE | 1701030105 | Upper Coeur d'Alene River |
| Coeur d'Alene | 17010301 | UPPER COEUR D'ALENE | 1701030106 | Shoshone Creek |
| Coeur d'Alene | 17010301 | UPPER COEUR D'ALENE | 1701030107 | Lost Creek |
| Coeur d'Alene | 17010301 | UPPER COEUR D'ALENE | 1701030108 | Prichard Creek |
| Coeur d'Alene | 17010301 | UPPER COEUR D'ALENE | 1701030109 | Beaver Creek |
| Coeur d'Alene | 17010301 | UPPER COEUR D'ALENE | 1701030112 | Tepee Creek |
| Coeur d'Alene | 17010301 | UPPER COEUR D'ALENE | 1701030113 | Downey Creek |
| Coeur d'Alene | 17010302 | SOUTH FORK COEUR D'ALENE | 1701030202 | Middle South Fork Coeur DAlene |
| Coeur d'Alene | 17010302 | SOUTH FORK COEUR D'ALENE | 1701030204 | Upper South Fork Coeur d'Alene |
| Coeur d'Alene | 17010303 | COEUR D'ALENE LAKE | 1701030302 | Wolf Lodge Creek |
| Coeur d'Alene | 17010304 | ST. JOE | 1701030404 | Big Creek |
| Coeur d'Alene | 17010304 | ST. JOE | 1701030407 | Loop Creek |
| Coeur d'Alene | 17010304 | ST. JOE | 1701030409 | Bluff Creek |
| Coeur d'Alene | 17010304 | ST. JOE | 1701030410 | Below Red Ives |
| Coeur d'Alene | 17010304 | ST. JOE | 1701030412 | Sisters Creek |
| Coeur d'Alene | 17010304 | ST. JOE | 1701030413 | Avery |
| Coeur d'Alene | 17010304 | ST. JOE | 1701030414 | Upper Marble Creek |
| Coeur d'Alene | 17010304 | ST. JOE | 1701030417 | Upper Saint Maries River |
| Coeur d'Alene | 17010304 | ST. JOE | 1701030419 | Santa Creek |

| REG OFF | HUC4CODE | HUC4NAME | HUC5CODE | HUC5NAME |
|---------------|----------|---------------------|------------|---------------------------|
| Coeur d'Alene | 17010304 | ST. JOE | 1701030421 | Thorn Creek |
| Coeur d'Alene | 17010306 | HANGMAN | 1701030610 | Middle Hangman Creek |
| Idaho Falls | 17040104 | PALISADES | 1704010407 | Palisades Creek |
| Idaho Falls | 17040104 | PALISADES | 1704010409 | Bear Creek |
| Pocatello | 17040105 | SALT | 1704010507 | Crow Creek |
| Pocatello | 17040105 | SALT | 1704010509 | Tincup Creek |
| Idaho Falls | 17040202 | UPPER HENRYS | 1704020205 | Henrys Lake |
| Idaho Falls | 17040205 | WILLOW | 1704020508 | Middle Willow (Bone) |
| Pocatello | 17040207 | BLACKFOOT | 1704020711 | Lanes Creek |
| Pocatello | 17040207 | BLACKFOOT | 1704020712 | Diamond Creek |
| Pocatello | 17040208 | PORTNEUF | 1704020802 | Inkom |
| Pocatello | 17040208 | PORTNEUF | 1704020803 | Roberts Roost |
| Pocatello | 17040208 | PORTNEUF | 1704020804 | Old Lava |
| Pocatello | 17040208 | PORTNEUF | 1704020818 | Mink |
| Twin Falls | 17040211 | GOOSE | 1704021115 | Upper Goose Creek |
| Idaho Falls | 17040214 | BEAVER-CAMAS | 1704021405 | Upper Beaver Creek |
| Idaho Falls | 17040215 | MEDICINE LODGE | 1704021505 | Divide Creek |
| Idaho Falls | 17040218 | BIG LOST | 1704021809 | Muldoon Canyon |
| Twin Falls | 17040219 | BIG WOOD | 1704021914 | Baker-North Fork Big Wood |
| Twin Falls | 17040221 | BIG WOOD | 1704022106 | Muldoon Creek |
| Twin Falls | 17040221 | BIG WOOD | 1704022106 | Upper Little Wood River |
| Twin Falls | 17050102 | BRUNEAU | 1705010210 | Jarbidge River |
| Twin Falls | 17050102 | BRUNEAU | 1705010212 | Middle Jarbidge River |
| Boise | 17050102 | BRUNEAU | 1705010234 | Duncan Creek |
| Boise | 17050102 | BRUNEAU | 1705010235 | Little Jacks Creek |
| Boise | 17050103 | MIDDLE SNAKE-SUCCOR | 1705010302 | Jump Creek |
| Boise | 17050105 | SOUTH FORK OWYHEE | 1705010501 | South Fork Owyhee River |
| Boise | 17050108 | JORDAN | 1705010807 | Triangle Reservoir |
| Boise | 17050112 | BOISE-MORES | 1705011207 | Elk Creek |
| Boise | 17050112 | BOISE-MORES | 1705011208 | Upper Mores Creek |
| Boise | 17050112 | BOISE-MORES | 1705011209 | Sheep-Logging |
| Twin Falls | 17050113 | SOUTH FORK BOISE | 1705011312 | Upper SF Boise River |
| Twin Falls | 17050113 | SOUTH FORK BOISE | 1705011313 | Big Smoky Creek |
| Boise | 17050120 | SOUTH FORK PAYETTE | 1705012002 | Big Pine |
| Boise | 17050120 | SOUTH FORK PAYETTE | 1705012003 | Lower Deadwood |
| Boise | 17050120 | SOUTH FORK PAYETTE | 1705012004 | Whitehawk |
| Boise | 17050120 | SOUTH FORK PAYETTE | 1705012005 | Upper Deadwood |
| Boise | 17050120 | SOUTH FORK PAYETTE | 1705012007 | Clear Creek |
| Boise | 17050120 | SOUTH FORK PAYETTE | 1705012008 | Wapiti |
| Boise | 17050120 | SOUTH FORK PAYETTE | 1705012009 | Warm Spring |
| Boise | 17050120 | SOUTH FORK PAYETTE | 1705012010 | Canyon Creek |
| Boise | 17050120 | SOUTH FORK PAYETTE | 1705012011 | Upper SF Payette River |
| Boise | 17050122 | PAYETTE | 1705012209 | Sweet |
| Boise | 17050122 | PAYETTE | 1705012210 | Ola Valley |
| Boise | 17050122 | PAYETTE | 1705012211 | Cottonwood |
| Boise | 17050122 | PAYETTE | 1705012212 | Second Fork |
| Boise | 17050122 | PAYETTE | 1705012213 | Upper Squaw |
| Boise | 17050122 | PAYETTE | 1705012214 | Little Squaw |
| Boise | 17050123 | NORTH FORK PAYETTE | 1705012307 | Upper NF Payette River |
| Boise | 17050124 | WEISER | 1705012408 | Goodrich-Bacon |

| REG OFF | HUC4CODE | HUC4NAME | HUC5CODE | HUC5NAME |
|-------------|----------|-------------------------------|------------|--------------------------------|
| Boise | 17050201 | BROWNLEE RESERVOIR | 1705020101 | Indian-McGraw |
| Boise | 17060101 | HELLS CANYON | 1706010103 | Granite-Bush |
| Lewiston | 17060101 | HELLS CANYON | 1706010103 | Granite-Bush |
| Boise | 17060101 | HELLS CANYON | 1706010103 | Upper Hells Canyon |
| Lewiston | 17060101 | HELLS CANYON | 1706010103 | Upper Hells Canyon |
| Idaho Falls | 17060201 | UPPER SALMON | 1706020126 | Upper Yankee Fork |
| Idaho Falls | 17060202 | PAHSIMEROI | 1706020206 | Headwaters Pahsimeroi River |
| Idaho Falls | 17060203 | MIDDLE SALMON- PANTHER | 1706020308 | Carmen Creek |
| Boise | 17060205 | UPPER MIDDLE FORK SALMON | 1706020500 | <i>*Loon Creek</i> |
| Idaho Falls | 17060205 | UPPER MIDDLE FORK SALMON | 1706020504 | Marsh Creek |
| Boise | 17060205 | UPPER MIDDLE FORK SALMON | 1706020508 | Bear Valley |
| Boise | 17060205 | UPPER MIDDLE FORK SALMON | 1706020509 | Elk Creek |
| Boise | 17060206 | LOWER MIDDLE FORK SALMON | 1706020601 | Lower Middle Fork Salmon River |
| Boise | 17060206 | LOWER MIDDLE FORK SALMON | 1706020603 | Brush Creek |
| Idaho Falls | 17060206 | LOWER MIDDLE FORK SALMON | 1706020604 | Yellowjacket Creek |
| Idaho Falls | 17060206 | LOWER MIDDLE FORK SALMON | 1706020605 | Silver Creek |
| Boise | 17060206 | LOWER MIDDLE FORK SALMON | 1706020609 | Sheep Creek |
| Boise | 17060206 | LOWER MIDDLE FORK SALMON | 1706020610 | Cabin-Canyon |
| Boise | 17060206 | LOWER MIDDLE FORK SALMON | 1706020611 | Rush Creek |
| Boise | 17060206 | LOWER MIDDLE FORK SALMON | 1706020612 | Crooked-Buck |
| Boise | 17060206 | LOWER MIDDLE FORK SALMON | 1706020613 | Monumental Creek |
| Boise | 17060206 | LOWER MIDDLE FORK SALMON | 1706020614 | Beaver-Gold |
| Boise | 17060206 | LOWER MIDDLE FORK SALMON | 1706020615 | Upper Big Creek |
| Lewiston | 17060207 | MIDDLE SALMON- CHAMBERLAIN | 1706020702 | Wind Creek |
| Lewiston | 17060207 | MIDDLE SALMON- CHAMBERLAIN | 1706020708 | Big Mallard Creek |
| Lewiston | 17060207 | MIDDLE SALMON- CHAMBERLAIN | 1706020709 | Bargamin Creek |
| Lewiston | 17060207 | MIDDLE SALMON- CHAMBERLAIN | 1706020709 | Dillinger-Big Squaw |
| Idaho Falls | 17060207 | MIDDLE SALMON- CHAMBERLAIN | 1706020713 | Cottonwood Creek |
| Idaho Falls | 17060207 | MIDDLE SALMON- CHAMBERLAIN | 1706020713 | Cottonwood Creek |
| Idaho Falls | 17060207 | MIDDLE SALMON- CHAMBERLAIN | 1706020713 | Horse Creek |
| Boise | 17060208 | SOUTH FORK SALMON | 1706020811 | Upper SF Salmon |

| REG OFF | HUC4CODE | HUC4NAME | HUC5CODE | HUC5NAME |
|----------|----------|-----------------------------|------------|--|
| Lewiston | 17060209 | LOWER SALMON | 1706020906 | White Bird Creek |
| Lewiston | 17060209 | LOWER SALMON | 1706020907 | Skookumchuck Creek |
| Lewiston | 17060209 | LOWER SALMON | 1706020908 | Slate Creek |
| Lewiston | 17060209 | LOWER SALMON | 1706020909 | John Day Creek |
| Lewiston | 17060209 | LOWER SALMON | 1706020911 | Partridge-Kelly |
| Lewiston | 17060210 | LITTLE SALMON | 1706021003 | Hazard Creek |
| Boise | 17060210 | LITTLE SALMON | 1706021007 | Boulder Creek |
| Lewiston | 17060210 | LITTLE SALMON | 1706021008 | Rapid River |
| Lewiston | 17060301 | UPPER SELWAY | 1706030101 | Pettibone Creek |
| Lewiston | 17060301 | UPPER SELWAY | 1706030102 | Bear Creek |
| Lewiston | 17060301 | UPPER SELWAY | 1706030103 | White Cap Creek |
| Lewiston | 17060301 | UPPER SELWAY | 1706030104 | Indian Creek |
| Lewiston | 17060301 | UPPER SELWAY | 1706030105 | Deep Creek |
| Lewiston | 17060301 | UPPER SELWAY | 1706030106 | Upper Selway River |
| Lewiston | 17060301 | UPPER SELWAY | 1706030107 | Salmander Creek |
| Lewiston | 17060301 | UPPER SELWAY | 1706030108 | Running Creek |
| Lewiston | 17060301 | UPPER SELWAY | 1706030109 | Boxer Creek |
| Lewiston | 17060301 | UPPER SELWAY | 1706030110 | Middle Selway River |
| Lewiston | 17060302 | LOWER SELWAY | 1706030203 | Mink Creek |
| Lewiston | 17060302 | LOWER SELWAY | 1706030211 | Upper Meadow Creek |
| Lewiston | 17060302 | LOWER SELWAY | 1706030212 | Lower Meadow Creek |
| Lewiston | 17060303 | LOCHSA | 1706030300 | *Lochsa River, Bimerick, and Coldwater Creeks |
| Lewiston | 17060303 | LOCHSA | 1706030312 | *Fish and Hungery Creeks |
| Lewiston | 17060303 | LOCHSA | 1706030324 | *Weir Creek |
| Lewiston | 17060303 | LOCHSA | 1706030330 | *Lochsa River, Walton, Cliff, Jay, Wendover, Badger, and Postoffice Creeks |
| Lewiston | 17060303 | LOCHSA | 1706030339 | *Brushy Fork, Spruce, Crooked Fork, and Boulder Creeks |
| Lewiston | 17060305 | SOUTH FORK CLEARWATER | 1706030502 | Meadow Creek |
| Lewiston | 17060305 | SOUTH FORK CLEARWATER | 1706030503 | Middle South Fork Clearwater River |
| Lewiston | 17060305 | SOUTH FORK CLEARWATER | 1706030506 | American River |
| Lewiston | 17060305 | SOUTH FORK CLEARWATER | 1706030507 | Red River |
| Lewiston | 17060305 | SOUTH FORK CLEARWATER | 1706030509 | Tenmile Creek |
| Lewiston | 17060305 | SOUTH FORK CLEARWATER | 1706030510 | John Creek |
| Lewiston | 17060305 | SOUTH FORK CLEARWATER | 1706030512 | Threemile Creek |
| Lewiston | 17060306 | CLEARWATER | 1706030645 | *Lapwai, Mission, Webb, East Fork Sweetwater |
| Lewiston | 17060307 | UPPER NORTH FORK CLEARWATER | 1706030700 | *NF Clearwater, Rock, Sprague, Larson, and Cold Springs Creeks |
| Lewiston | 17060307 | UPPER NORTH FORK CLEARWATER | 1706030710 | *Collins and Skull Creeks |
| Lewiston | 17060307 | UPPER NORTH FORK CLEARWATER | 1706030720 | *Quartz and Cougar Creeks |

| REG OFF | HUC4CODE | HUC4NAME | HUC5CODE | HUC5NAME |
|----------------|-----------------|--------------------------------|-----------------|--|
| Lewiston | 17060307 | UPPER NORTH FORK CLEARWATER | 1706030730 | *Elizabeth, Lake, Long, and Meadow Creeks |
| Lewiston | 17060307 | UPPER NORTH FORK CLEARWATER | 1706030740 | *Gravey, Cayuse, Toboggan, SF Kelley, Little Moose, and Osier Creeks |
| Lewiston | 17060307 | UPPER NORTH FORK CLEARWATER | 1706030760 | *Weitas, Hemlock, Middle, and Windy Creeks |
| Lewiston | 17060307 | UPPER NORTH FORK CLEARWATER | 1706030770 | *Cache, Orogrande, and French Creeks |
| Lewiston | 17060308 | LOWER NORTH FORK CLEARWATER | 1706030815 | *Elk, Bull Run, and Shattuck Creeks |
| Lewiston | 17060308 | LOWER NORTH FORK CLEARWATER | 1706030835 | *Isabella Creek |

Appendix F. Potential Reference Sites Selected in 2001

Table F-1 List of 141 potential reference sites selected by DEQ regional biologists in 2001. This list contains previously monitored sites; some have been screened using ArcView information and have received additional field verification.

| BURPID ¹ | STREAM | STR_ORDR ² | HUC4 CODE | HUC4NAME | ECO_REG ³ | BIO_REG ⁴ |
|---------------------|---------------------------|-----------------------|-----------|---------------------|----------------------|----------------------|
| 1994SCDAA029 | Long Canyon Creek | 2 | 17010104 | Lower Kootenai | Northern Rockies | NM |
| 1994SCDAA030 | Parker Creek | 2 | 17010104 | Lower Kootenai | Northern Rockies | NM |
| 1999SCDAA008 | East Fork East Fork Creek | 2 | 17010213 | Lower Clark Fork | Northern Rockies | NM |
| 1999SCDAA009 | Lightning Creek | 2 | 17010213 | Lower Clark Fork | Northern Rockies | NM |
| 1997SCDAA034 | Trestle Creek | 1 | 17010214 | Pend Oreille Lake | Northern Rockies | NM |
| 1994SCDAA007 | Trestle Creek | 2 | 17010214 | Pend Oreille Lake | Northern Rockies | NM |
| 1998SCDAA023 | Gold Creek | 3 | 17010215 | Priest | Northern Rockies | NM |
| 1998SCDAB034 | Gold Creek | 3 | 17010215 | Priest | Northern Rockies | NM |
| 1998SCDAB040 | South Fork Granite Creek | 2 | 17010215 | Priest | Northern Rockies | NM |
| 1994SCDAA022 | Upper Priest River | 3 | 17010215 | Priest | Northern Rockies | NM |
| 1994SCDAA021 | Upper Priest River | 3 | 17010215 | Priest | Northern Rockies | NM |
| 1998SCDAB045 | Blacktail Creek | 2 | 17010301 | Upper Coeur d'Alene | Northern Rockies | NM |
| 1999SCDAA006 | Deer Creek | 3 | 17010301 | Upper Coeur d'Alene | Northern Rockies | NM |
| 1998SCDAB011 | Graham Creek | 3 | 17010301 | Upper Coeur d'Alene | Northern Rockies | NM |
| 1999SCDAA007 | Independence Creek | 2 | 17010301 | Upper Coeur d'Alene | Northern Rockies | NM |
| 1999SCDAA005 | Jordan Creek | 2 | 17010301 | Upper Coeur d'Alene | Northern Rockies | NM |
| 1998SCDAB005 | West Fork Eagle Creek | 2 | 17010301 | Upper Coeur d'Alene | Northern Rockies | NM |
| 1998SCDAB046 | Whitetail Creek | 2 | 17010301 | Upper Coeur d'Alene | Northern Rockies | NM |
| 1996SCDAA010 | Bruin Creek | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1994SCDAA054 | Copper Creek | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1994SCDAA055 | Copper Creek | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1994SCDAA044 | Fly Creek | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1994SCDAA045 | Fly Creek | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1999SCDAA018 | Hobo Creek | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1999SCDAA019 | Mosquito Creek | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1994SCDAA047 | Mosquito Creek | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1994SCDAA046 | Mosquito Creek | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1997SCDAA040 | Olson Creek | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1994SCDAA051 | Saint Joe River | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1994SCDAA050 | Saint Joe River | 4 | 17010304 | St. Joe | Northern Rockies | NM |

¹ BURP site identification code

² Stream order (Strahler)

³ Ecoregion (Level III)

⁴ Bioregion (Jessup and Gerritsen 2000)

| BURPID ¹ | STREAM | STR_ORDR ² | HUC4_CODE | HUC4NAME | ECO_REG ³ | BIO_REG ⁴ |
|---------------------|--------------------------|-----------------------|-----------|--------------------|-------------------------------|----------------------|
| 1999SCDAA020 | Timber Creek | 2 | 17010304 | St. Joe | Northern Rockies | NM |
| 1996SIDFY015 | Bear Creek | 2 | 17040104 | Palisades | Middle Rockies | CSM |
| 1996SIDFZ125 | Palisades Creek | 4 | 17040104 | Palisades | Middle Rockies | CSM |
| 1994SIDFA006 | Targhee Creek | 3 | 17040202 | Upper Henrys | Middle Rockies | CSM |
| 1995SIDFB023 | Mud Creek | 3 | 17040205 | Willow | Northern Basin and Range | CSM |
| 1995SIDFB017 | Sellars Creek | 2 | 17040205 | Willow | Northern Basin and Range | CSM |
| 1996SIDFZ003 | Sellars Creek | 1 | 17040205 | Willow | Northern Basin and Range | CSM |
| 1996SIDFZ002 | South Fork Sellars Creek | 1 | 17040205 | Willow | Northern Basin and Range | CSM |
| 1996SPOCA025 | Horse Creek | 2 | 17040207 | Blackfoot | Northern Basin and Range | CSM |
| 1997SPOCA052 | Sheep Creek | 3 | 17040207 | Blackfoot | Northern Basin and Range | CSM |
| 1995SPOCA003 | Bell Marsh Creek | 2 | 17040208 | Portneuf | Northern Basin and Range | CSM |
| 1997SPOCA067 | Webb Creek | 2 | 17040208 | Portneuf | Northern Basin and Range | CSM |
| 1997SPOCA004 | West Fork Mink Creek | 2 | 17040208 | Portneuf | Northern Basin and Range | CSM |
| 1997STWFA070 | Goose Creek | 4 | 17040211 | Goose | Northern Basin and Range | CSM |
| 1996SIDFZ059 | Pleasant Valley Creek | 1 | 17040214 | Beaver-camas | Middle Rockies | CSM |
| 1996SIDFZ069 | Pleasant Valley Creek | 2 | 17040214 | Beaver-camas | Middle Rockies | CSM |
| 1997SIDFM134 | Webber Creek | 2 | 17040215 | Medicine Lodge | Northern Rockies | CSM |
| 1998SIDFA041 | Webber Creek | 2 | 17040215 | Medicine Lodge | Northern Rockies | CSM |
| 1998SIDFB033 | Webber Creek | 3 | 17040215 | Medicine Lodge | Northern Rockies | CSM |
| 1994SIDFA023 | Star Hope Creek | 2 | 17040218 | Big Lost | Northern Rockies | CSM |
| 1994SIDFA024 | Star Hope Creek | 3 | 17040218 | Big Lost | Northern Rockies | CSM |
| 1999STWFA032 | Badger Gulch | 1 | 17040219 | Big Wood | Northern Rockies | CSM |
| 1999STWFA030 | Cunard Gulch | 1 | 17040219 | Big Wood | Northern Rockies | CSM |
| 1998STWFA047 | Norton Creek | 3 | 17040219 | Big Wood | Northern Rockies | CSM |
| 1996STWFA048 | Little Wood River | 4 | 17040221 | Little Wood | Northern Rockies | CSM |
| 1997STWFA032 | Jarbidge River | 4 | 17050102 | Bruneau | Snake River Basin/high Desert | SRB |
| 1997STWFB033 | Jarbidge River | 4 | 17050102 | Bruneau | Snake River Basin/high Desert | SRB |
| 1998SBOIB011 | Rock Creek | 3 | 17050108 | Jordan | Snake River Basin/high Desert | SRB |
| 1998SBOIB012 | Rock Creek | 3 | 17050108 | Jordan | Snake River Basin/high Desert | SRB |
| 1996SBOIA033 | Bannock Creek | 1 | 17050112 | Boise-Mores | Northern Rockies | CSM |
| 1996SBOIA034 | Bannock Creek | 2 | 17050112 | Boise-Mores | Northern Rockies | CSM |
| 1997SBOIC003 | Browns Creek | 1 | 17050112 | Boise-Mores | Northern Rockies | CSM |
| 1996SBOIA091 | Elk Creek | 2 | 17050112 | Boise-Mores | Northern Rockies | NBR |
| 1996SBOIA092 | Elk Creek | 3 | 17050112 | Boise-Mores | Northern Rockies | NBR |
| 1996SBOIA031 | Granite Creek | 1 | 17050112 | Boise-Mores | Northern Rockies | CSM |
| 1996SBOIA052 | Mores Creek | 2 | 17050112 | Boise-Mores | Northern Rockies | CSM |
| 1996SBOIA053 | Mores Creek | 3 | 17050112 | Boise-Mores | Northern Rockies | NBR |
| 1996SBOIB054 | Basin Creek | 2 | 17050120 | South Fork Payette | Northern Rockies | NBR |

| BURPID ¹ | STREAM | STR_ORDR ² | HUC4_CODE | HUC4NAME | ECO_REG ³ | BIO_REG ⁴ |
|---------------------|----------------------------|-----------------------|-----------|--------------------------|-------------------------------|----------------------|
| 1996SBOIB046 | East Fork Big Pine Creek | 1 | 17050120 | South Fork Payette | Northern Rockies | NBR |
| 1997SBOIC028 | Fox Creek | 1 | 17050120 | South Fork Payette | Northern Rockies | CSM |
| 1997SBOIC030 | MacDonald Creek | 2 | 17050120 | South Fork Payette | Northern Rockies | CSM |
| 1996SBOIB047 | Middle Fork Big Pine Creek | 2 | 17050120 | South Fork Payette | Northern Rockies | NBR |
| 1996SBOIB044 | Scott Creek | 1 | 17050120 | South Fork Payette | Northern Rockies | NBR |
| 1996SBOIB045 | Scott Creek | 2 | 17050120 | South Fork Payette | Northern Rockies | NBR |
| 1996SBOIB056 | Whitehawk Creek | 2 | 17050120 | South Fork Payette | Northern Rockies | CSM |
| 1996SBOIB053 | Wilson Creek | 2 | 17050120 | South Fork Payette | Northern Rockies | NBR |
| 1996SBOIB055 | Wilson Creek | 1 | 17050120 | South Fork Payette | Northern Rockies | NBR |
| 1997SBOIA047 | Big Cottonwood Creek | 2 | 17050122 | Payette | Snake River Basin/high Desert | SRB |
| 1997SBOIA051 | Cottonwood Creek | 1 | 17050122 | Payette | Snake River Basin/high Desert | SRB |
| 1997SBOIA054 | Joes Creek | 1 | 17050122 | Payette | Blue Mountains | CSM |
| 1997SBOIA055 | Joes Creek | 1 | 17050122 | Payette | Blue Mountains | CSM |
| 1997SBOIA019 | Second Fork Squaw Creek | 3 | 17050122 | Payette | Snake River Basin/high Desert | SRB |
| 1997SBOIA018 | Third Fork Squaw Creek | 3 | 17050122 | Payette | Blue Mountains | CSM |
| 1997SBOIA056 | Woody Creek | 1 | 17050122 | Payette | Blue Mountains | CSM |
| 1998SBOIB034 | Fisher Creek | 2 | 17050123 | North Fork Payette | Northern Rockies | CSM |
| 1998SBOIB035 | Fisher Creek | 2 | 17050123 | North Fork Payette | Northern Rockies | CSM |
| 1998SBOIB033 | Pearl Creek | 2 | 17050123 | North Fork Payette | Northern Rockies | CSM |
| 1998SBOIB059 | Twentymile Creek | 2 | 17050123 | North Fork Payette | Northern Rockies | CSM |
| 1998SBOIB060 | Twentymile Creek | 2 | 17050123 | North Fork Payette | Northern Rockies | CSM |
| 1997SBOIB025 | Twentymile Creek | 2 | 17050123 | North Fork Payette | Northern Rockies | CSM |
| 1999SBOIA019 | Twentymile Creek | 3 | 17050123 | North Fork Payette | Northern Rockies | CSM |
| 1998SBOIB058 | Twentymile Creek | 3 | 17050123 | North Fork Payette | Northern Rockies | CSM |
| 1997SBOIB024 | Twentymile Creek | 3 | 17050123 | North Fork Payette | Northern Rockies | CSM |
| 1995SBOIB036 | Johnson Creek | 3 | 17050124 | Weiser | Blue Mountains | CSM |
| 1998SIDFA080 | McKay Creek | 1 | 17060201 | Upper Salmon | Northern Rockies | CSM |
| 1998SIDFA081 | McKay Creek | 2 | 17060201 | Upper Salmon | Northern Rockies | CSM |
| 1998SIDFB124 | East Fork Pahsimeroi River | 2 | 17060202 | Pahsimeroi | Northern Rockies | CSM |
| 1998SIDFB125 | Pahsimeroi River | 3 | 17060202 | Pahsimeroi | Northern Rockies | CSM |
| 1995SIDFA086 | Pahsimeroi River | 3 | 17060202 | Pahsimeroi | Northern Rockies | CSM |
| 1998SIDFB123 | West Fork Pahsimeroi River | 2 | 17060202 | Pahsimeroi | Northern Rockies | CSM |
| 1994SIDFA043 | Carmen Creek | 2 | 17060203 | Middle Salmon-panther | Northern Rockies | CSM |
| 1997SIDFL108 | Bear Creek | 2 | 17060205 | Upper Middle Fork Salmon | Northern Rockies | CSM |
| 1997SBOIB068 | Bear Valley Creek | 2 | 17060205 | Upper Middle Fork Salmon | Northern Rockies | CSM |

| BURPID ¹ | STREAM | STR_ORDR ² | HUC4_CODE | HUC4NAME | ECO_REG ³ | BIO_REG ⁴ |
|---------------------|-------------------------------|-----------------------|-----------|-----------------------------|----------------------|----------------------|
| 1997SBOIB069 | Bearskin Creek | 2 | 17060205 | Upper Middle Fork Salmon | Northern Rockies | CSM |
| 1997SBOIB070 | Cub Creek | 1 | 17060205 | Upper Middle Fork Salmon | Northern Rockies | CSM |
| 1997SBOIB071 | Dagger Creek | 2 | 17060205 | Upper Middle Fork Salmon | Northern Rockies | CSM |
| 1997SBOIA069 | Fir Creek | 2 | 17060205 | Upper Middle Fork Salmon | Northern Rockies | CSM |
| 1997SBOIA068 | Sheep Trail Creek | 2 | 17060205 | Upper Middle Fork Salmon | Northern Rockies | CSM |
| 1997SIDFM118 | Hoodoo Creek | 1 | 17060206 | Lower Middle Fork Salmon | Northern Rockies | CSM |
| 1997SIDFM115 | Hoodoo Creek | 2 | 17060206 | Lower Middle Fork Salmon | Northern Rockies | CSM |
| 1997SIDFM095 | Silver Creek | 2 | 17060206 | Lower Middle Fork Salmon | Northern Rockies | CSM |
| 1997SIDFM094 | Silver Creek | 3 | 17060206 | Lower Middle Fork Salmon | Northern Rockies | CSM |
| 1997SIDFM101 | Silver Creek | 3 | 17060206 | Lower Middle Fork Salmon | Northern Rockies | CSM |
| 1999SLEWA005 | Bargamin Creek | 4 | 17060207 | Middle Salmon-chamberlai | Northern Rockies | NM |
| 1997SBOIA024 | Bear Creek | 2 | 17060208 | South Fork Salmon | Northern Rockies | CSM |
| 1997SBOIA025 | Bear Creek | 2 | 17060208 | South Fork Salmon | Northern Rockies | CSM |
| 1997SBOIB056 | Lodgepole Creek | 2 | 17060208 | South Fork Salmon | Northern Rockies | CSM |
| 1997SBOIB057 | Lodgepole Creek | 2 | 17060208 | South Fork Salmon | Northern Rockies | CSM |
| 1998SBOIA063 | Rice Creek | 1 | 17060208 | South Fork Salmon | Northern Rockies | CSM |
| 1998SBOIA064 | Rice Creek | 2 | 17060208 | South Fork Salmon | Northern Rockies | CSM |
| 1997SBOIB051 | Sand Creek | 2 | 17060208 | South Fork Salmon | Northern Rockies | CSM |
| 1997SBOIB052 | Sand Creek | 2 | 17060208 | South Fork Salmon | Northern Rockies | CSM |
| 1998SBOIA066 | Trail Creek | 1 | 17060208 | South Fork Salmon | Northern Rockies | CSM |
| 1998SBOIA065 | Tyndall Creek | 1 | 17060208 | South Fork Salmon | Northern Rockies | CSM |
| 1999SLEWA024 | North Fork Van Buren Creek | 2 | 17060209 | Lower Salmon | Northern Rockies | NM |
| 1999SLEWA023 | South Fork Skookumchuck Creek | 2 | 17060209 | Lower Salmon | Columbia Plateau | CSM |
| 1995SBOIC022 | Boulder Creek | 2 | 17060210 | Little Salmon | Blue Mountains | CSM |
| 1995SBOIC023 | Boulder Creek | 3 | 17060210 | Little Salmon | Blue Mountains | CSM |
| 1998SLEWA033 | Ballinger Creek | 2 | 17060302 | Lower Selway | Northern Rockies | NM |
| 1999SLEWA032 | Butte Creek | 2 | 17060302 | Lower Selway | Northern Rockies | NM |
| 1998SLEWA036 | Cupboard Creek | 2 | 17060302 | Lower Selway | Northern Rockies | NM |
| 1998SLEWA035 | Meadow Creek | 4 | 17060302 | Lower Selway | Northern Rockies | NM |
| 1999SLEWA031 | Sable Creek | 3 | 17060302 | Lower Selway | Northern Rockies | NM |
| 1999SLEWA030 | Simmons Creek | 2 | 17060302 | Lower Selway | Northern Rockies | NM |
| 1998SLEWA015 | Fish Creek | 2 | 17060303 | Lochsa | Northern Rockies | NM |
| 1998SLEWA031 | Robin Creek | 2 | 17060303 | Lochsa | Northern Rockies | NM |
| 1998SLEWA003 | Weir Creek | 1 | 17060303 | Lochsa | Northern Rockies | NM |
| 1999SLEWB006 | Burst Creek | 1 | 17060307 | Upper North Fork Clearwater | Northern Rockies | NM |
| 1999SLEWB007 | Hemlock Creek | 2 | 17060307 | Upper North Fork Clearwater | Northern Rockies | NM |
| 1999SLEWA001 | Siwash Creek | 1 | 17060307 | Upper North Fork Clearwater | Northern Rockies | NM |

| BURPID¹ | STREAM | STR_ ORDR² | HUC4 CODE | HUC4NAME | ECO_REG³ | BIO_REG⁴ |
|---------------------------|-------------------------|--|----------------------------|--------------------------------|----------------------------|----------------------------|
| 1998SLEWB015 | Sheep Mountain Creek | 2 | 17060308 | Lower North Fork Clearwater | Northern Rockies | NM |

Appendix G. Summary of Reference Site Ratings (2001)

| Water Body Name | Site ID | Reference Site Criteria Ratings (11 criteria) | | | | | | | | | | | Total Points | Total Points Possible | Percent | Comments | |
|----------------------------|--|---|------------------------|-----------------------|-----------------------|------------|----------------------|-----------------------|------------------------------|------------------------|----------------------------------|---|--------------|-----------------------|---------|---|--|
| | | 1. Roads | 2. Riparian Vegetation | 3. Riparian Structure | 4. Channel Morphology | 5. Channel | 6. Habitat Structure | 7. Chemical Stressors | 8. Channel/Flow Manipulation | 9. Substrate Materials | 10. Pipes, Drains, Ditches, Tile | 11. Evidence of Nonpoint Source Problems From Human Disturbance | | | | | |
| BOISE | | | | | | | | | | | | | | | | | |
| Little Jacks Creek | 1993SBOIA049 2001SBOIA059 2001SBOIV007 2002SBOIV001 2002SBOIA040 | 5 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 5 | 5 | 4 | 50 | 55 | 90.91 | | |
| Johnson Creek | 1995SBOIB036 | 4 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 42 | 55 | 76.36 | | |
| Boulder Creek | 1995SBOIC022 2001SBOIA051 2001SBOIV005 2002SBOIA045 2002SBOIV005 | 1 | 3 | 3 | 4 | 4 | 3 | 5 | 4 | 2 | 4 | 2 | 35 | 55 | 63.64 | Doesn't fit "minimally disturbed," drop site. | |
| Granite Creek | 1996SBOIA031 | 3 | 4 | 4 | 4 | 4 | 3 | 3 | 4 | 3 | 3 | 3 | 38 | 55 | 69.09 | | |
| Bannock Creek | 1996SBOIA033 | 4 | 5 | 4 | 5 | 3 | 2 | 3 | 4 | 2 | 4 | 4 | 40 | 55 | 72.73 | | |
| Bannock Creek | 1996SBOIA034 | 3 | 4 | 4 | 4 | 3 | 4 | 3 | 4 | 4 | 4 | 3 | 40 | 55 | 72.73 | | |
| Mores Creek | 1996SBOIA052 | 3 | 4 | 4 | 4 | 2 | 3 | 3 | 4 | 5 | 4 | 3 | 39 | 55 | 70.91 | | |
| Mores Creek | 1996SBOIA053 | 3 | 3 | 4 | 4 | 3 | 2 | 3 | 4 | 3 | 4 | 3 | 36 | 55 | 65.45 | | |
| Elk Creek | 1996SBOIA091 | 4 | 3 | 4 | 5 | 4 | 4 | 3 | 4 | 4 | 3 | 4 | 42 | 55 | 76.36 | | |
| Elk Creek | 1996SBOIA092 | 3 | 2 | 3 | 4 | 3 | 3 | 3 | 4 | 3 | 4 | 3 | 35 | 55 | 63.64 | | |
| Scott Creek | 1996SBOIB044 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 3 | 40 | 55 | 72.73 | | |
| Scott Creek | 1996SBOIB045 | 3 | 4 | 4 | 3 | 2 | 4 | 4 | 4 | 3 | 4 | 3 | 38 | 55 | 69.09 | | |
| East Fork Big Pine Creek | 1996SBOIB046 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 41 | 55 | 74.55 | | |
| Middle Fork Big Pine Creek | 1996SBOIB047 2001SBOIA047 2001SBOIV001 2002SBOIV003 2002SBOIA037 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 42 | 55 | 76.36 | | |
| Wilson Creek | 1996SBOIB053 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 43 | 55 | 78.18 | | |
| Basin Creek | 1996SBOIB054 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 42 | 55 | 76.36 | | |
| Wilson Creek | 1996SBOIB055 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 43 | 55 | 78.18 | | |
| Whitehawk Creek | 1996SBOIB056 | 4 | 5 | 4 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 43 | 55 | 78.18 | | |
| Third Fork Squaw Creek | 1997SBOIA018 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 43 | 55 | 78.18 | | |
| Second Fork Squaw Creek | 1997SBOIA019 2001SBOIA054 2001SBOIV003 2002SBOIV004 2002SBOIA047 | 2 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 41 | 55 | 74.55 | | |
| Bear Creek | 1997SBOIA024 | 2 | 3 | 4 | 3 | 3 | 2 | 4 | 4 | 4 | 4 | 4 | 37 | 55 | 67.27 | | |
| Bear Creek | 1997SBOIA025 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 41 | 55 | 74.55 | | |
| Big Cottonwood Creek | 1997SBOIA047 | 3 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 40 | 55 | 72.73 | | |
| Cottonwood Creek | 1997SBOIA051 | 3 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 3 | 4 | 4 | 39 | 55 | 70.91 | | |

| Water Body Name | Site ID | Reference Site Criteria Ratings (11 criteria) | | | | | | | | | | | Total Points | Total Points Possible | Percent | Comments |
|-----------------------|--|---|------------------------|-----------------------|-----------------------|------------|----------------------|-----------------------|------------------------------|------------------------|----------------------------------|---|--------------|-----------------------|---------|----------|
| | | 1. Roads | 2. Riparian Vegetation | 3. Riparian Structure | 4. Channel Morphology | 5. Channel | 6. Habitat Structure | 7. Chemical Stressors | 8. Channel/Flow Manipulation | 9. Substrate Materials | 10. Pipes, Drains, Ditches, Tile | 11. Evidence of Nonpoint Source Problems From Human Disturbance | | | | |
| Joes Creek | 1997SBOIA054 | 3 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 3 | 4 | 3 | 38 | 55 | 69.09 | |
| Joes Creek | 1997SBOIA055 | 3 | 4 | 4 | 3 | 3 | 3 | 4 | 4 | 3 | 4 | 3 | 38 | 55 | 69.09 | |
| Woody Creek | 1997SBOIA056 | 3 | 4 | 4 | 3 | 4 | 3 | 4 | 4 | 3 | 4 | 4 | 40 | 55 | 72.73 | |
| Sheep Trail Creek | 1997SBOIA068 | 4 | 3 | 5 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 43 | 55 | 78.18 | |
| Fir Creek | 1997SBOIA069 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 43 | 55 | 78.18 | |
| Twentymile Creek | 1997SBOIB024 | 5 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 48 | 55 | 87.27 | |
| Twentymile Creek | 1997SBOIB025 | 4 | 4 | 4 | 4 | 4 | 3 | 5 | 5 | 4 | 5 | 4 | 46 | 55 | 83.64 | |
| Sand Creek | 1997SBOIB051 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 42 | 55 | 76.36 | |
| Sand Creek | 1997SBOIB052 | 3 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 39 | 55 | 70.91 | |
| Lodgepole Creek | 1997SBOIB056 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 2 | 4 | 4 | 41 | 55 | 74.55 | |
| Lodgepole Creek | 1997SBOIB057 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 2 | 4 | 4 | 42 | 55 | 76.36 | |
| Bear Valley Creek | 1997SBOIB068 | 4 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 42 | 55 | 76.36 | |
| Bearskin Creek | 1997SBOIB069 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 43 | 55 | 78.18 | |
| Cub Creek | 1997SBOIB070 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 43 | 55 | 78.18 | |
| Dagger Creek | 1997SBOIB071 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 44 | 55 | 80.00 | |
| Browns Creek | 1997SBOIC003 | 3 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 41 | 55 | 74.55 | |
| Fox Creek | 1997SBOIC028 | 3 | 4 | 3 | 3 | 3 | 2 | 4 | 4 | 3 | 4 | 3 | 36 | 55 | 65.45 | |
| MacDonald Creek | 1997SBOIC030 | 3 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 3 | 4 | 3 | 38 | 55 | 69.09 | |
| Lime Creek | 1993SBOIA001 1998SBOIA062 1999SBOIA040 2001SBOIA034 2002SBOIV006 | 4 | 3 | 2 | 4 | 3 | 4 | 5 | 5 | 4 | 5 | 4 | 43 | 55 | 78.18 | |
| Rice Creek | 1998SBOIA063 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 43 | 55 | 78.18 | |
| Rice Creek | 1998SBOIA064 | 3 | 4 | 3 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 40 | 55 | 72.73 | |
| Tyndall Creek | 1998SBOIA065 | 4 | 4 | 4 | 4 | 3 | 3 | 4 | 4 | 4 | 4 | 4 | 42 | 55 | 76.36 | |
| Train Creek | 1998SBOIA066 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 4 | 43 | 55 | 78.18 | |
| Rock Creek | 1998SBOIB011 | 3 | 2 | 3 | 3 | 5 | 3 | 4 | 4 | 3 | 4 | 4 | 38 | 55 | 69.09 | |
| Rock Creek | 1998SBOIB012 | 4 | 3 | 4 | 4 | 5 | 4 | 5 | 5 | 4 | 4 | 4 | 46 | 55 | 83.64 | |
| Pearl Creek | 1998SBOIB033 | 4 | 2 | 3 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 40 | 55 | 72.73 | |
| Fisher Creek | 1998SBOIB034 | 4 | 4 | 4 | 4 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 43 | 55 | 78.18 | |
| Fisher Creek | 1998SBOIB035 | 4 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 4 | 46 | 55 | 83.64 | |
| Twentymile Creek | 1998SBOIB058 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 47 | 55 | 85.45 | |
| Twentymile Creek | 1998SBOIB059 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 47 | 55 | 85.45 | |
| Twentymile Creek | 1998SBOIB060 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 47 | 55 | 85.45 | |
| Twentymile Creek | 1999SBOIA019 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 5 | 4 | 5 | 4 | 47 | 55 | 85.45 | |
| Middle Brownlee Creek | 1999SBOIA051 2001SBOIA065 2001SBOIV006 2002SBOIV002 2002SBOIA036 2003SBOIA021 | 3 | 4 | 5 | 3 | 4 | 4 | 5 | 5 | 4 | 5 | 3 | 45 | 55 | 81.82 | |
| LEWISTON | | | | | | | | | | | | | | | | |
| Weir Creek | 1998SLEWA003 2002SLEWV002 2002SLEWA037 | 5 | 5 | 5 | 3 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 51 | 55 | 92.73 | |

| Water Body Name | Site ID | Reference Site Criteria Ratings (11 criteria) | | | | | | | | | | | Total Points | Total Points Possible | Percent | Comments |
|--|--|---|------------------------|-----------------------|-----------------------|------------|----------------------|-----------------------|------------------------------|------------------------|----------------------------------|---|--------------|-----------------------|---------|----------------------------------|
| | | 1. Roads | 2. Riparian Vegetation | 3. Riparian Structure | 4. Channel Morphology | 5. Channel | 6. Habitat Structure | 7. Chemical Stressors | 8. Channel/Flow Manipulation | 9. Substrate Materials | 10. Pipes, Drains, Ditches, Tile | 11. Evidence of Nonpoint Source Problems From Human Disturbance | | | | |
| Fish Creek | 1998SLEWA015 | 4 | 3 | 4 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 48 | 55 | 87.27 | |
| Robin Creek | 1998SLEWA031 2001SLEWA013 2001SLEWV001 2002SLEWV001 2002SLEWA036 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 55 | 55 | 100.00 | |
| Ballinger Creek | 1998SLEWA033 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 55 | 55 | 100.00 | |
| Meadow Creek | 1998SLEWA035 | 4 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 4 | 5 | 4 | 51 | 55 | 92.73 | |
| Cupboard Creek | 1998SLEWA036 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 54 | 55 | 98.18 | |
| Siwash Creek | 1999SLEWA001 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 53 | 55 | 96.36 | |
| Bargamin Creek | 1999SLEWA005 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 54 | 55 | 98.18 | |
| South Fork Skookumchuck Creek | 1999SLEWA023 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 5 | 5 | 53 | 55 | 96.36 | |
| North Fork Van Buren Creek | 1999SLEWA024 2001SLEWA016 2001SLEWV002 2002SLEWV003 2002SLEWA038 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 54 | 55 | 98.18 | |
| Simmons Creek | 1999SLEWA030 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 54 | 55 | 98.18 | |
| Sable Creek | 1999SLEWA031 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 54 | 55 | 98.18 | |
| Butte Creek | 1999SLEWA032 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 52 | 55 | 94.55 | |
| Burst Creek | 1999SLEWB006 | 5 | 5 | 5 | 5 | 5 | 3 | 5 | 5 | 3 | 5 | 5 | 51 | 55 | 92.73 | |
| Hemlock Creek | 1999SLEWB007 | 5 | 4 | 5 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 52 | 55 | 94.55 | |
| TWIN FALLS | | | | | | | | | | | | | | | | |
| Goose Creek | 1994STWFA013 2002STWV008 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 3 | 51 | 55 | 92.73 | Consider adding Lwr Shoshone Cr. |
| Jarbridge River | 1997STWFA032 2001STWFA067 2001STWV002 2002STWV007 2002STWFA055 | 3 | 5 | 5 | 5 | 5 | 5 | 3 | 5 | 4 | 5 | 3 | 48 | 55 | 87.27 | |
| Little Wood River (Upper) | 1996STWFA048 | 4 | 4 | 5 | 3 | 4 | 5 | 5 | 5 | 5 | 5 | 4 | 49 | 55 | 89.09 | |
| Trout Creek | 1997STWFA064 2002STWV009 2002STWFA060 | 4 | 5 | 2 | 2 | 3 | 4 | 3 | 5 | 2 | 5 | 1 | 36 | 55 | 65.45 | |
| Goose Creek (Upper) | 1997STWFA070 | 3 | 3 | 3 | 2 | 3 | 3 | 5 | 5 | 3 | 5 | 2 | 37 | 55 | 67.27 | |
| Jarbridge River (Bruneau River to Confl W/ East Frk Jarbridge) | 1997STWFB033 | 3 | 5 | 5 | 5 | 5 | 5 | 3 | 5 | 4 | 5 | 3 | 48 | 55 | 87.27 | |
| Norton Creek | 1998STWFA047 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 50 | 55 | 90.91 | |

| Water Body Name | Site ID | Reference Site Criteria Ratings (11 criteria) | | | | | | | | | | | Total Points | Total Points Possible | Percent | Comments |
|--|--|---|------------------------|-----------------------|-----------------------|------------|----------------------|-----------------------|------------------------------|------------------------|----------------------------------|---|--------------|-----------------------|---------|---|
| | | 1. Roads | 2. Riparian Vegetation | 3. Riparian Structure | 4. Channel Morphology | 5. Channel | 6. Habitat Structure | 7. Chemical Stressors | 8. Channel/Flow Manipulation | 9. Substrate Materials | 10. Pipes, Drains, Ditches, Tile | 11. Evidence of Nonpoint Source Problems From Human Disturbance | | | | |
| Cunard Gulch Creek | 1999STWFA030 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 55 | 55 | 100.00 | |
| Badger Gulch Creek | 1999STWFA032 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 49 | 55 | 89.09 | |
| Grays Creek | NO BURP ID | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 54 | 55 | 98.18 | |
| Buckhorn Creek | NO BURP ID | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 54 | 55 | 98.18 | |
| Laidlaw Creek | NO BURP ID | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 55 | 55 | 100.00 | |
| East Fork Jarbridge River (Above Murphy's Hot Springs to Headwaters) | NO BURP ID | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 55 | 55 | 100.00 | |
| Kale Creek | NO BURP ID | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 55 | 55 | 100.00 | |
| Box Canyon Creek | NO BURP ID | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 54 | 55 | 98.18 | |
| Shoshone Creek | NO BURP ID | 3 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 51 | 55 | 92.73 | |
| IDAHO FALLS | | | | | | | | | | | | | | | | |
| Targhee Creek | 1994SIDFA006 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 4 | 4 | 50 | 55 | 90.91 | |
| Starhope Creek | 1994SIDFA023 1994SIDFA024 2001SIDFA095 2001SIDFV005 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 53 | 55 | 96.36 | |
| Carmen Creek | 1994SIDFA043 | 4 | 3 | 3 | 4 | 5 | 4 | 5 | 5 | 3 | 3 | 4 | 43 | 55 | 78.18 | |
| Bear Creek | 1996SIDFY015 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 3 | 3 | 5 | 49 | 55 | 89.09 | |
| Sellars Creek | 1996SIDFZ003 1995SIDFB023 1996SIDFZ002 1995SIDFB017 2001SIDFA033 2001SIDFV001 | 4 | 4 | 3 | 2 | 5 | 4 | 5 | 5 | 2 | 4 | 3 | 41 | 55 | 74.55 | |
| Pleasant Valley Creek | 1996SIDFZ059 1996SIDFZ069 | 4 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 4 | 4 | 49 | 55 | 89.09 | |
| Palisades Creek | 1996SIDFZ125 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 53 | 55 | 96.36 | |
| Bear Creek | 1997SIDFL108 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 54 | 55 | 98.18 | |
| Silver Creek | 1997SIDFM094 1997SIDFM095 1997SIDFM101 | 4 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 4 | 51 | 55 | 92.73 | |
| Hoodoo Creek | 1997SIDFM115 2002SIDFV003 2002SIDFA051 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 54 | 55 | 98.18 | Many less remote sites, make as good choice, but entail less effort to reach. |

| | | Reference Site Criteria Ratings (11 criteria) | | | | | | | | | | | | | | |
|----------------------------|--|---|------------------------|-----------------------|-----------------------|------------|----------------------|-----------------------|------------------------------|------------------------|----------------------------------|---|--------------|-----------------------|---------|--|
| Water Body Name | Site ID | 1. Roads | 2. Riparian Vegetation | 3. Riparian Structure | 4. Channel Morphology | 5. Channel | 6. Habitat Structure | 7. Chemical Stressors | 8. Channel/Flow Manipulation | 9. Substrate Materials | 10. Pipes, Drains, Ditches, Tile | 11. Evidence of Nonpoint Source Problems From Human Disturbance | Total Points | Total Points Possible | Percent | Comments |
| McKay Creek | 1998SIDFA080 1998SIDFA081 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 55 | 55 | 100.00 | |
| East Fork Pahsimeroi River | 1998SIDFB124 2001SIDFA118 2001SIDFV004 2002SIDFV002 2002SIDFA050 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 54 | 55 | 98.18 | Not sure what site is rep of as it sits at an ecotone btwn high desert and forested mountains. |
| Webber Creek | 1998SIDFB033 1998SIDFA041 1997SIDFM134 2001SIDFA101 2001SIDFV003 2002SIDFV001 2002SIDFA005 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 51 | 55 | 92.73 | |
| COUER D' ALENE | | | | | | | | | | | | | | | | |
| Trestle Creek | 1994SCDAA007 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 52 | 55 | 94.55 | |
| Upper Priest River R1 | 1994SCDAA021 | 4 | 5 | 5 | 5 | 5 | 4 | 4 | 3 | 4 | 5 | 4 | 48 | 55 | 87.27 | |
| Upper Priest River R2 | 1994SCDAA022 | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 4 | 4 | 5 | 4 | 48 | 55 | 87.27 | |
| Long Canyon Creek | 1994SCDAA029 | 5 | 3 | 4 | 4 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 49 | 55 | 89.09 | |
| Parker Creek | 1994SCDAA030 | 5 | 4 | 3 | 5 | 4 | 5 | 5 | 5 | 4 | 5 | 5 | 50 | 55 | 90.91 | |
| St. Joe River | 1994SCDAA050 | 3 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 5 | 5 | 4 | 43 | 55 | 78.18 | |
| St. Joe River, Upper | 1994SCDAA051 | 3 | 4 | 4 | 3 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 43 | 55 | 78.18 | |
| Fly Creek, Lower | 1994SCDAA044 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 54 | 55 | 98.18 | |
| Fly Creek, Upper | 1994SCDAA045 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 55 | 55 | 100.00 | |
| Mosquito Creek, Lower | 1994SCDAA046 | 4 | 4 | 5 | 5 | 5 | 4 | 4 | 4 | 5 | 5 | 5 | 50 | 55 | 90.91 | |
| Mosquito Creek, Upper | 1994SCDAA047 | 4 | 4 | 4 | 4 | 4 | 4 | 5 | 4 | 5 | 5 | 5 | 48 | 55 | 87.27 | |
| Copper Creek, Lower | 1994SCDAA054 | 4 | 4 | 5 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 51 | 55 | 92.73 | |
| Copper Creek, Upper | 1994SCDAA055 | 4 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 52 | 55 | 94.55 | |
| Bruin Creek | 1996SCDAA010 2001SCDAA029 2001SCDAV002 2002SCDAV004 2002SCDAA039 | 3 | 3 | 3 | 3 | 4 | 5 | 5 | 3 | 5 | 5 | 4 | 43 | 55 | 78.18 | For 2002 varib study, sites were randomly selected out of potential ref sites. |

| Water Body Name | Site ID | Reference Site Criteria Ratings (11 criteria) | | | | | | | | | | | Total Points | Total Points Possible | Percent | Comments |
|---------------------------|--|---|------------------------|-----------------------|-----------------------|------------|----------------------|-----------------------|------------------------------|------------------------|----------------------------------|---|--------------|-----------------------|---------|---|
| | | 1. Roads | 2. Riparian Vegetation | 3. Riparian Structure | 4. Channel Morphology | 5. Channel | 6. Habitat Structure | 7. Chemical Stressors | 8. Channel/Flow Manipulation | 9. Substrate Materials | 10. Pipes, Drains, Ditches, Tile | 11. Evidence of Nonpoint Source Problems From Human Disturbance | | | | |
| Trestle Creek | 1997SCDAA034 | 4 | 5 | 5 | 4 | 4 | 4 | 5 | 4 | 4 | 5 | 5 | 49 | 55 | 89.09 | |
| Olsen Creek | 1997SCDAA040 | 4 | 5 | 5 | 5 | 5 | 5 | 4 | 4 | 4 | 5 | 5 | 51 | 55 | 92.73 | Not in candidate area |
| Eagle Creek, W.F., Upper | 1998SCDAB005 | 3 | 3 | 4 | 3 | 4 | 5 | 4 | 4 | 5 | 5 | 4 | 44 | 55 | 80.00 | |
| Long Canyon Creek | 1998SCDAA015 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 55 | 55 | 100.00 | |
| Graham Creek | 1998SCDAB011 | 4 | 3 | 3 | 5 | 3 | 5 | 5 | 5 | 5 | 5 | 5 | 48 | 55 | 87.27 | Not in candidate area |
| Gold Creek | 1998SCDAA023 | 3 | 4 | 5 | 4 | 4 | 5 | 4 | 3 | 4 | 5 | 4 | 45 | 55 | 81.82 | |
| Graham Creek | 1998SCDAB011 | 5 | 4 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 53 | 55 | 96.36 | |
| Gold Creek | 1998SCDAB034 | 3 | 4 | 4 | 4 | 4 | 5 | 4 | 3 | 4 | 5 | 4 | 44 | 55 | 80.00 | |
| Granite Creek, South Fork | 1998SCDAB040 | 4 | 5 | 5 | 4 | 4 | 5 | 5 | 4 | 4 | 5 | 5 | 50 | 55 | 90.91 | |
| Blacktail Creek | 1998SCDAB045 | 5 | 4 | 4 | 5 | 4 | 4 | 5 | 5 | 4 | 5 | 5 | 50 | 55 | 90.91 | |
| Whitetail Creek | 1998SCDAB046 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 4 | 5 | 5 | 52 | 55 | 94.55 | |
| Jordan Creek | 1999SCDAA005 | 5 | 4 | 4 | 3 | 4 | 3 | 5 | 3 | 3 | 5 | 4 | 43 | 55 | 78.18 | |
| Deer Creek | 1999SCDAA006 2001SCDAA031 2001SCDAV001 2002SCDAV002 2002SCDAA037 | 5 | 5 | 5 | 5 | 4 | 4 | 5 | 5 | 5 | 5 | 5 | 53 | 55 | 96.36 | Limited reconn, due to late arrival of site |
| Emerson Creek | 1999SCDAA007 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 54 | 55 | 98.18 | |
| Savage Creek | 1999SCDAA008 | 4 | 5 | 5 | 5 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 52 | 55 | 94.55 | |
| Lightning Creek, Upper | 1999SCDAA009 | 4 | 4 | 4 | 5 | 4 | 5 | 5 | 5 | 5 | 5 | 4 | 50 | 55 | 90.91 | |
| Hobo Creek | 1999SCDAA018 | 4 | 5 | 5 | 4 | 5 | 5 | 4 | 4 | 5 | 5 | 4 | 50 | 55 | 90.91 | |
| Mosquito Creek | 1999SCDAA019 2001SCDAA030 2001SCDAV003 2002SCDAV003 2002SCDAA038 | 4 | 3 | 4 | 3 | 4 | 4 | 5 | 4 | 4 | 5 | 5 | 45 | 55 | 81.82 | Not in candidate area |
| Timber Creek | 1999SCDAA020 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 53 | 55 | 96.36 | |
| Lime Creek | 2002SCDAV001 2002SCDAA036 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 5 | 4 | 54 | 55 | 98.18 | No BURP ID, hand selected by CDA RO |
| POCATELLO | | | | | | | | | | | | | | | | |
| Bell Marsh Creek | 1995SPOCA003 2001SPOCA053 2001SPOCV001 2002SPOCV012 2002SPOCA014 | 4 | 5 | 5 | 4 | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 51 | 55 | 92.73 | |

| | | Reference Site Criteria Ratings (11 criteria) | | | | | | | | | | | | | | |
|----------------------|--|---|------------------------|-----------------------|-----------------------|------------|----------------------|-----------------------|------------------------------|------------------------|----------------------------------|---|--------------|-----------------------|---------|----------|
| Water Body Name | Site ID | 1. Roads | 2. Riparian Vegetation | 3. Riparian Structure | 4. Channel Morphology | 5. Channel | 6. Habitat Structure | 7. Chemical Stressors | 8. Channel/Flow Manipulation | 9. Substrate Materials | 10. Pipes, Drains, Ditches, Tile | 11. Evidence of Nonpoint Source Problems From Human Disturbance | Total Points | Total Points Possible | Percent | Comments |
| West Fork Mink Creek | 1997SPOCA004 2001SPOCA054 2001SPOCV003 2002SPOCV011 2002SPOCA015 | 4 | 4 | 5 | 4 | 4 | 4 | 4 | 5 | 5 | 5 | 4 | 48 | 55 | 87.27 | |
| Webb Creek | 1997SPOCA067 2001SPOCA019 2001SPOCV002 2002SPOCV010 2002SPOCA016 | 4 | 5 | 5 | 5 | 5 | 5 | 4 | 5 | 5 | 5 | 4 | 52 | 55 | 94.55 | |

Table H-1 Reference Trend Sites Selected in 2002.

| REG_OFF | STREAM | STR_ORDR | HUC4_CODE | HUC4NAME | COUNTY | QUAD24K | BIO_REG | PLS |
|---------|----------------------------|----------|-----------|--------------------------|------------|----------------------|---------|----------|
| BOI | Boulder Creek | 2 | 17060210 | Little Salmon | Adams | Pollock Mountain | CSM | 21N01W26 |
| BOI | Lime Creek | 5 | 17050113 | South Fork Boise | Elmore | Pine | BASIN | 01N10E16 |
| BOI | Little Jack Creek | 4 | 17050102 | Bruneau | Owyhee | Big Horse Basin Corp | BASIN | 08S03E16 |
| BOI | Middle Brownlee Creek | 2 | 17050201 | Brownlee Reservoir | Washington | Neil Gulch | BASIN | 16N05W26 |
| BOI | Middle Fork Pine Creek | 2 | 17050120 | South Fork Payette | Boise | Grimes Pass | CSM | 09N06E21 |
| BOI | Second Fork Squaw Creek | 3 | 17050122 | Payette | Gem | Sage Hen Reservoir | BASIN | 12N02E29 |
| CDA | Bruin Creek | 2 | 17010304 | St. Joe | Shoshone | Conrad Peak | NM | 44N08E11 |
| CDA | Deer Creek | 3 | 17010301 | Upper Couer d'Alene | Shoshone | Jordan Creek | NM | 53N03E05 |
| CDA | Lime Creek | 2 | 17010215 | Priest | Boundary | Continental Mountain | NM | 64N05W15 |
| CDA | Mosquito Creek | 2 | 17010304 | St. Joe | Shoshone | Conrad Peak | NM | 44N08E14 |
| IDF | East Fork Pahsimeroi River | 2 | 17060202 | Pahsimeroi | Custer | Burnt Creek | CSM | 09N23E11 |
| IDF | Hoodoo Creek | 2 | 17060206 | Lower Middle Fork Salmon | Lemhi | Yellow Jacket | CSM | 19N16E27 |
| IDF | Webber Creek | 3 | 17040215 | Medicine Lodge | Clark | Heart Mountain | CSM | 12N33E19 |
| LEW | North Fork Van Buren Creek | 2 | 17060209 | Lower Salmon | Idaho | Florence | CSM | 26N03E29 |
| LEW | Robin Creek | 2 | 17060303 | Lochsa | Idaho | Cayuse Junction | NM | 37N13E36 |
| LEW | Weir Creek | 2 | 17060303 | Lochsa | Idaho | Greystone Butte | NM | 36N11E13 |
| POC | Bell Marsh Creek | 2 | 17040208 | Portneuf | Bannock | Scout Mountain | BASIN | 08S36E31 |
| POC | Webb Creek | 2 | 17040208 | Portneuf | Bannock | Bonneville Peak | BASIN | 06S36E36 |
| POC | West Fork Mink Creek | 2 | 17040208 | Portneuf | Bannock | Clifton Creek | BASIN | 08S34E13 |
| TWF | Goose Creek | 3 | 17040211 | Goose | Cassia | Timber Butte | BASIN | 15S19E32 |
| TWF | Jarbridge River | 4 | 17050102 | Bruneau | Owyhee | Dishpan | BASIN | 16S09E10 |
| TWF | Trout Creek | 2 | 17040211 | Goose | Cassia | Mohogany Butte | BASIN | 16S19E12 |

Lime Creek (Bonners Ferry)

Starting Point: Latitude: 48° 53' 46::68 N **Longitude:** 116° 57' 47::81W

Forest Service: Kanisku National Forest

USGS Quadrangles: BONNERS FERRY, IDAHO-MONTANA 1:100K

Public Land Survey: Twnshp: 64N **Range:** 05W **Section:** 15 NW ¼ of the NE ¼ of the SW ¼

Directions to Starting Point: Take Highway 57 North. It turns into FR 302. Continue on FR 1013 to the Bridge that crosses Lime Creek. Site approximately 15 to 20 meters upstream of bridge.

Downstream



Upstream

Figure H-1 Example site information sheet.

IDEQ-60, 82039, 4/2004, Cost Per Unit: \$4.98



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