VOLUNTEERED HIGH LAKE SURVEYS
FIELD DATA COLLECTION GUIDELINES

by
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Data Form Purpose and History

The following detailed discussion of all elements in the standardized high lake fishery data collection form is intended to educate all users on the value and use of the data by the state fishery managers. In addition, good data are good data, and can be used by numerous other managers and scientists in their work or research. Examples will be provided below as appropriate. The purpose of this overview is to help assure that all data are gathered consistently, and most important, completely. Once an angler/hiker has gone to the trouble of climbing all the way to one of our mountain jewels, it is a shame if key information is not brought back. The cost of collecting it, once there, is generally $0. (Okay, I suppose the graphite worn off the end of a pencil and a paper field data form are worth something, albeit very small.)

I had the great pleasure of working with Walt and Brian Curtis on the initial design of the data form in the early 1980s. There have been one or two revisions along the way. The effort was guided by two key pre-requisites: the form had to be easy to understand, and the data collectible by non-professionals; and the data had to be useful to Washington Department of Fish and Wildlife (WDFW) fishery managers. Some club members had greater training and expertise, and were willing to take extra effort to gather more information than is found on the standard form. This was greatly appreciated and welcomed, but the fact remained that the form needed to be designed for ALL members, regardless of training and ability. We now have well over 20 years of data in the database, and its value and usefulness is starting to edge over that "invaluable" bar. I frankly know of no other state that has anything like it to support their high lake fishery program. The most spectacular and significant recent advance from the amazing Curtis family has been the development of website-based, on-line data entry.

Each data element of the form is discussed in turn, below. How to collect the basic information is presented first, followed by an explanation of its use by the professional fishery manager. This is followed by recommendations on how to augment the most basic data through use of the Comments fields. Under the heading "Extra Credit" I have also included comments on things people can do to go beyond the basic data form.

Critical Management Data

We have reached a point in Washington (as of 2006) where most of the high lakes have been surveyed, and we know a great deal about the majority of the fisheries in the lakes that support trout (Pfeifer et al. 2001). Therefore, gathering of "baseline" data is now

much less important, although certainly this is still a need in some lakes, particularly in Chelan County. For most of the lakes, we are primarily in a "monitoring" mode. That is, what is mainly needed by the WDFW fishery managers are these kinds of information:

- Access changes. In my opinion, the most important variable affecting the fishery.
- Changes in trout reproduction status – discovery of new natural reproduction.
- Evidence of overuse by visitors.
- Verification of survival of recent fry plants.
- Results from specific experiments.

All of these will be discussed below in connection with the relevant data elements.

General Advice on Use of the Data Form

The first and most obvious challenge is to get folks to TAKE THE FORM WITH THEM to the lake(s). Naturally this requires that people get in the habit; try to think of the data form as one of your 10 Essentials, or part of the gear that you just ALWAYS take on outings. As one gets in the habit of looking for the key information, one can just jot down notes on something, but it is always better to have that <u>form</u> in front of you so that you don't forget anything, and can make judgments on whether or not something is truly unchanged, or not significant to report.

If you are going to visit more than one lake, take as many forms as needed. I recommend the use of waterproof paper of some sort; perhaps we can get a supply printed up by a professional firm. I still use standard paper "club" forms that I have reproduced from a "master", and protect them in a Zip-Loc bag in the pack map pocket. (The use of non-waterproof paper club forms in the rain is of course problematic and a challenge. I also have a much more detailed form than the club form that I often use that is on waterproof paper.)

"Why take a form to the lake when the data entry form is on-line?" you ask? Because you WILL forget to gather some data, and/or gather it incorrectly if you don't take a form. (Of course, some people a lot smarter than me can remember everything. I could even name a couple of them.) The first rule DRILLED into scientists-in-training in college is the use of good data forms in all field work.

Never, **NEVER!!!** try to just fill out the on-line data form from memory when you get home. This is ***SIN NUMBER ONE***, and leads to **BAD DATA**. I am not going to name names. We database people would MUCH prefer that <u>no</u> information be logged into the database rather than incomplete or erroneous information. This cannot be over-emphasized. The only exception to this admonition would be if one logs just the most simple and obvious information, and nothing else (i.e. date of the trip, whether the lake was open or frozen, etc.). But we have had people even foul up the trip date when they logged their trip report days, or even weeks later. The on-line data entry form is now so easy to use, there really is no good excuse to not gather the basic info in the field on a

data sheet, then log it in when you get home. Note! If you have gathered the data on a form in the field, you can, in fact, log it into the database on-line months later since you have already memorialized it on a data form. But, why wait? I have told friends that I enjoy logging the information a lot, and will often do it with a drink while listening to music, etc. the night I get home. I find it very satisfying to make yet another incremental addition to the database, knowing that it is accurate and helpful.

For certain types of data, particularly time fished, number of fish caught, and the number of anglers in the reporting party and at the lake, a lot of confusion and errors can be eliminated by following a cardinal rule. "Sin Number One" was noted above; here is

RULE NUMBER ONE: For trip reports submitted on behalf of a group of 2 or more people (whether all fished or not), select ONE (1) person to coordinate the data collection at the lake(s) and prepare/submit the actual data on a paper report form, or (preferably) using the on-line data entry template. This is discussed further in the section below that begins with "Time At Lake". (If people insist on submitting their own reports for some reason, then each of them MUST indicate "1" angler in the party, and list all other co-reporters accurately. But even this approach can create certain dual-data problems.)

Data Form Elements

Name of the Lake

A "no-brainer", right? Hardly. Not only are there many "Trout" and "Lost Lakes" out there, there are many more "Unnamed" lakes. So it is essential that you be accurate in noting exactly which "unnamed" lake or pond you are taking data on.

At Home:

Using the "Lake Finder" feature of the Trail Blazers, Inc. web site can usually help to assure that the field data are logged to the correct water. Use a combination of that feature's topographic map, aerial photo, and lat/long coordinates to be SURE that the information is logged to the correct water (lake, pond, or tarn).

This is really only a problem for the small waters that are not on USGS topo maps (and there are many of them), or for waters you may encounter that are clustered in a group within a small area, say less than 40 acres. A good example would be the Bathtub Lakes on the shoulder of Mount Pilchuck. It is best if you can go into the field armed with the knowledge that there may be several unnamed waters that you will encounter (or purposefully survey), and you need to have a separate data form for each one to avoid confusion and (horrors!) bad data entered later, or logged to the wrong water. This can be challenging, so in those cases I went out with a sketch map to help assure that the data were gathered for the correct water. I often had to make changes to the field map when I

actually got out there since the USGS topos often have errors or omissions in these cases. Lake shapes on 7.5-Minute quads are also often incorrect for the very small waters.

Note that we are in a chicken-and-egg situation. In some cases you may know in advance that there will be a challenge for a small-lake cluster. In other cases you will not expect it, but find unmapped waters when you are actually out there. There will likely even be some waters that aren't yet in the Trail Blazer database; they are added as they are mapped. (We have logged just about everything down to about the 0.25 acre level. Ponds and tarns smaller than this rarely have any fishery or fishery potential.) In the case of waters that are not on USGS maps or in the Trail Blazer database (relatively rare), collection of a GPS waypoint at the water's outlet is invaluable.

If a GPS waypoint is collected at the outlet (if there is one) of a water, enter the information in the Comment field of the on-line data entry form unless you are SURE that the Lake Finder has brought up the correct water.

In the Field:

If you know in advance that you will encounter a cluster of small and/or unnamed waters, have a data sheet prepared with the presumed latitude and longitude noted on it in the margin, or under the Township / Range / Section fields. If there is no obvious outlet showing on the map or aerial photo, take a waypoint in the presume center of the water and bring that waypoint on the field form. If you have a reliable GPS instrument, standardize your GPS Datum to NAD 83 if at all possible; be sure to note the Datum on the field form if it is not NAD 83. If you use (say) NAD 27, you will find the discrepancy from NAD 83 will cause of lot of confusion in cases like the Bathtub Lakes where waters are clustered closely together.

Once at the water (lake, pond, or tarn), you can compare your field GPS reading with what you presumed it to be at home. If there is a substantial difference, note the field reading (and location error range, if it is large, say on the order of 250 feet or more) on the data form. This will help to sort things out later.

Again, this will only be an issue for very small waters that in most cases do not have any fishery history, or potential for one. For the vast majority of cases, the lake name is obvious, or pops up easily using the Lake Finder. For the unusual cases, confusion can be minimized or eliminated by collecting a solid GPS waypoint as noted above. Collection of some photos can also be invaluable – more on that below.

<u>Date of the Trip</u>

This may seem so self-evident that people pay little attention to it, and have been known to be lax about accuracy (being off a day or so from reality). This is an issue in at least a couple of ways:

1) Queries to the club database may be, and have been based on day of the week. Therefore, a trip logged as having occurred on a Monday, when in fact it was on a Sunday, can have real consequences in data analysis. For example, as most are aware, weekday use by hikers and anglers is far less than on weekend-days. So logging data saying there were 7 people at the lake on a Monday, when in fact it was on a Sunday introduces unwanted errors.
2) Two trips by separate parties may be logged as having occurred on the same day, when in fact they occurred on consecutive days. Again, this can skew analyses on usage, OR conflicting information can arise on things like fish abundance, or how many people were seen at the lake.

Solution: be sure about your date entry, AND note the day of the week alongside it (Sat, Sun, M, Tue, etc.).

Township – Range – Sub-section

The only thing that may confuse here is "Sub-section". One could narrow down the location using the "SE ¼ of the NW ¼ of the NE ¼ approach, but it easier to use the system Ernie Wolcott proposed in his Lakes of Washington books. He divided each square-mile Section into 16 equal sections, then gave each section a letter, like this:

D	C	B	A
E	F	G	H
M	L	K	J
N	P	Q	R

"I" and "O" were not used since they are so easily confused with the numbers zero and one. The letter "K" is equivalent to: the NW ¼ of the SE ¼.

For the vast majority of small lakes, a quarter of a quarter section is adequate to "capture" the lake. Unfortunately, there are always exceptions, and in some cases two or more waters will fall within this same 40-acre area (1 square mile = 640 acres; 640/16 = 40). In these cases you can still use the correct Sub-section, such as "K", but add a lat/long in the Comments field to assure that everyone knows for which water data are being reported. Latitude and Longitude should be reported to at least 5 decimal places, as seen in the Lake Finder.

There is no need to worry about these data fields at all if you correctly locate your lake or pond using the Lake Finder. That feature will assign the correct S/T/R information automatically.

Name of Reporter

Essential! Again, this is automated in the Trail Blazer lake survey template. But the reason it is important is we (and WDFW managers) often want to talk to the reporter(s) about what they saw. Don't be shy; the person who gathered the data should be the one who puts his/her name on the data submitted.

Fish: Number Caught, Lengths, and Weights

A book could be written on this data subject. There are three basic approaches:

1) Pool the number caught by each species and take no lengths or weights;
2) Pool the number caught and report an estimated range in their lengths; or
3) Take and report a total length (and maybe also a weight) on individual fish.

In the first case an angler simply tallies the number of (rainbow or whatever) caught and reports the sum. Example: 6 rainbow, 2 cutthroat, 4 hybrids. (In this case the 4 "cuttbow" hybrids would be noted in the far right blank column on the paper data form; virtually every possible fish you might catch in our high lakes is found in the list in "Step 2" of the Trail Blazer data entry template. Also, if this information is from a single angler, and not a group or party check, presumably some or all of the fish were released since 12 fish is greater than the legal harvest limit.) This first case applies especially well to folks who are practicing catch and release and don't want to stress the fish unduly. They bring the fish to hand, and at least get an accurate species identification before turning it loose.

(**DON'T** report fish as being "caught" if you don't at least get them to hand for a positive species ID. If you insist on getting some "credit" for the near-misses, note them in a comment field about the trip. You could say something like "I also had three fish on but didn't land them", or the like. It is essential that the data be clean in this regard since the database may be used to calculate catch statistics of various sorts. Therefore, the way in which "catches" are reported must be consistent. Please don't be embarrassed about low catches. I freely admit that I am a Class C angler, and nowhere near in the skill level of people I could name in the clubs. In fact, for quite a few years I used a group of crack anglers as "gill nets" to get fish samples while I did other tasks on the surveys.)

The second case (pooling number caught, estimating length range) would apply where at least an attempt was made to estimate lengths of individual fish by eye, or briefly holding them against a ruler of some sort before releasing them. Personally, as a trained scientist, I loathe reporting or seeing length data like this. It is subject to way too much error for my liking. I would rather see a squishy comment in the "Comments" section for the trip such as "the fish ranged in length from about 8 to 12 inches" rather than putting actual "hard" numbers in the boxes for length range. This is a plea for discipline; I suggest that you do not log a length range into the database for fish that you did not actually lay flat and measure with a tape or such.

(One of the great advantages of a major database is it can be queried, or data retrieved from it for various research questions. One obvious and quick analysis using these catch data would be to calculate the average number of fish caught [and kept] by anglers at Lake Y over some time span [usually a number of years]. It should be clear that such a calculated statistic would be compromised if people routinely added in fish that they really did not have under their complete control. Managers are rarely trying to determine whether fish are present or not in such an analysis, but rather are usually looking for trends in catch rates that may be related to things like increasing or failing natural reproduction, etc. So crisp and accurate data on actual fish caught and brought in under control are preferred. The manager can "get at" fish presence or absence in other ways; these data fields should be honest and accurate, and reported consistently.)

The third case (actual lengths and weights obtained) is by far the preferred approach. Naturally some folks prefer to release their fish; they should not report lengths or weights, but just the number caught of each species. Remember that all of the trout in these lakes are not native to them, and were put there strictly for recreation. Of course it is appropriate and laudable to release some fish to spread the fishery in small lakes that have very limited numbers of fish, but the fishery manager gets the most value out of knowing exactly what the lengths and weights were for the fish caught. (The data are even more valuable if the fish can be aged; see "Extra Credit" below.)

My personal opinion is that getting a live fish quiet enough to get an accurate length and weight causes so much stress it might as well be sacrificed for the pan or taken home. The fish must be removed from the water, and long enough so that it quits flopping around. Apart from compromised blood chemistry from that stress, handling the fish usually removes mucus sufficiently to make the fish highly susceptible to *Saprolegnia* (fungus) infection. My strong recommendation is: DON'T try to accurately measure or weigh fish that you intend to release. (References can be provided.) See Case #1 above; just report visual estimates of lengths in the Trip Comments field.

With the fish completely quiet, measure total lengths (only). Don't take fork length, or other odd length measurements. Total length is from the tip of the nose to the extreme end of the tail, or caudal fin, ideally with the caudal fin squeezed slightly (this adds several millimeters, at least). Metric measurement in millimeters is certainly preferred (more accurate); if English is used, measure to at least the nearest 1/8 inch. Specify "centimeters" or "inches" when using the on-line database entry form. A 208 mm fish would be 20.8 centimeters, or about 8 1/8 inches.

With the fish completely quiet, weigh it with a high quality spring scale or the like, and report the results to the nearest gram, if possible. Prior to weighing, wipe off all litter and debris clinging to the fish's skin, and/or allow excess water to drain off. For the weight to be standardized, the fish should be whole, i.e. not cut, bled, or eviscerated in any way.

Length and weight data are fundamentally important in the management of high lake fisheries. Length at age information (e.g. 12.4" at the end of the 3rd year of life) gives critical feedback to the manager regarding the propriety of fry planting rates and

frequencies. In some cases some species do much better in a lake than another, such as atlantic salmon versus rainbow. In simple situations where only one year class of fish is swimming around in the lake, accurate length information over a few years gives solid feedback on how those fish grew from one year to the next.

Weight data from individual fish is not critical information, but when coupled with length gives an extremely useful measure for the "condition" of the fish. I have elsewhere prepared a separate complete discussion of the value of this information. However, analysis of these metrics (such as Relative Weight) is tricky, and their limitations must be taken into account. For example, Relative Weight varies significantly with season and sexual maturation state. Nevertheless, if gathered correctly and analyzed properly, a solid and standardized measure of fish condition is extremely valuable.

So ideally, from a data collection and fishery monitoring standpoint, all fish that are caught are sacrificed for the table or camp meals, and are carefully measured and weighed – preferably in metric units. Each fish's length and weight are logged to the database individually, not as ranges. (I recognize that many anglers prefer to not sacrifice their fish. And obviously if a small lake received numerous trips from surveying Hi-Lakers or Trail Blazers within a few years, we would normally not want to kill dozens of fish within that short time frame. The text above is general guidelines.)

Extra Credit: I mentioned that length and weight data are of maximum utility when they can be linked to known age. Calculation of length at age, or total length at the time of annulus formation in scales or other hard parts gives the most valuable information on growth rates in a given lake and fish population.

Over the years I trained interested anglers and scientists to collect scales and otoliths (fish ear bones) that I could later analyze. This analysis is tedious and time-consuming, however, so my counsel at this point is to not collect these hard parts from fish for analysis by WDFW unless they are specifically requested by WDFW staff. That will tend to assure that they have the time to do the analysis. I have prepared a general summary of growth characteristics based on years of collection of this kind of information (Pfeifer 2005). That report is found in the Science section of the Trail Blazers web site. The raw data from many hundreds of fish is logged into the Trail Blazer database. There are not many lakes where new, baseline information is needed on specific growth rates.

If scales or otoliths are sought by WDFW, a knife blade is used to scrape a half-centimeter square patch of scales from each side of the fish, and the scraping is inserted into a suitable storage container – usually a coin envelope or the like. Key data from the fish (total length and weight most important) are written on that storage container to assure the information is logged to the correct fish, lake, and date. Scales are collected from the second row above the fish's lateral line, and at a point directly below the posterior insertion of the dorsal fin. Since making a scrape like this can definitely expose the fish to infections of various sorts, it should never be done on fish that are to be released back into the lake.

Otoliths (sagittae) are removed from beneath the brain by a necropsy procedure of two perpendicular cuts at the base of the skull; this requires in-hand, on-site training. The two sagittae are placed into a coin envelope along with the scale scrapes. Scales are always collected; adding otoliths often helps in the analyses. Otoliths alone should not be colleted. The sample envelopes must be protected from crushing or folding as the otoliths are easily broken.

Quality of Fishing

This opens up a large box owned by a Ms. Pandora. The basic problem is this is an extremely subjective kind of thing. Catching one or two skinny little naturally-produced cutthroat may thrill a child, but would be aggravating to an experienced fly angler. I am joined by some who have "Excellent" fishing if we catch one or two decent trout, but have a great time in other respects. This measure is also for the FISHING, not the overall trip experience. Granted, it is hard to fully separate the two. There is a ton of literature on this subject. So our counsel is: just go ahead and rate your FISHING experience on this trip using whatever qualifier seems or feels "right" to you. Analysis of the data by an experienced fishery manager takes the subjective nature of it into account. Large sample sizes are critical; if 200 users of Snoqualmie Lake indicated that fishing was "Good" for 36% of them, things aren't too awry up there. Maybe 9% even had "Excellent" fishing. The manager needs to take a hard look at a fishery when a preponderance of the users are ranking their fishing as "Poor", or "Zilch".

There has been confusion about the "Zilch" ranking; perhaps we should do away with it. The intent was to check that box if no fish were caught, or even hooked. (Note! Seeing fish is covered separately as "Fish Activity". Also note that for some people just seeing fish in a lake gives positive feedback and enjoyment.) There may some confusion since in some ways "Poor" is synonymous with "Zilch". I feel the two are separate since "Zilch" or perhaps "No Action" is not the same as "Poor" since presumably some fish were caught during the "Poor" experience, but none were caught in the "Zilch" case. Perhaps "No Action" is a less-confusing category title than "Zilch". (I can't remember now who came up with this term, Walt or Brian or I, but I feel sorry for it, and would like to see it kept.)

There is NO shame attached to a "Zilch" (or No Action) assessment of fishing quality. The best anglers in the state are often "zilched". That's fishing! Especially high lake fishing. The data are still very useful when coupled with observations of fish that indicate the fish are/were there, but were just hard to catch. I can think of several lakes were long term high "Zilch" percentages led to a species switch or addition that rectified the problem. NOTE that unless people turn in those "Zilch" ratings, the manager doesn't know about the problem.

Fish Activity

These rankings are again fairly subjective. Few high lake anglers have the time or wherewithal to pack acoustic (echo sounder) gear into the lakes to count and estimate fish abundance. The ratings for number of fish seen rising or cruising are deliberately loose and relatively easy to choose. Based on my experience, I would choose "Few" if the rises were 5 or less per hour on the whole lake or within sight, and "Lots" if multiple rises are seen at any one time, or occur at 10-15/hour or more, lake-wide.

In case it isn't obvious, the number of fish seen is hugely dependant upon whether the fish are active or not, and where they are lying. **BY FAR** the most common mistake made by unsophisticated high lake anglers who saw no fish or fish sign even after being at a lake for hours is to assume that the lake is fishless. I made this mistake myself early in my career until solid data proved that it was a common mistake. My firm rule now is to NOT assume a lake is barren until at least three (3) trip reports spaced apart by a few weeks all report no sign of fish after serious fishing and observation effort. Much of the probability of error depends on the species of trout involved. Golden trout are especially likely to fool people into believing they are absent. Given this extremely common and ironically, extremely important source of error, it is very important that serious attention be paid to this data notation. (Multiple conflicting trip reports from specific lakes could be quoted to prove this point, but I will spare certain individuals the embarrassment.)

The number of fish seen cruising is also affected by whether or not one goes onto the lake in a raft, and particularly by how much attention is paid to the shallow nearshore zone. Again, my rough guideline would be "Few" if 5 or fewer are seen in an hour of reasonably diligent observation, and "Lots" if a cruising fish is seen every 10-15 minutes or less.

The typical use of this information by the manager is verification of fry survival, presence or absence of fish in lakes where little information is on file, and warnings about excessive reproduction where "Lots" crops up and it has generally not been seen before.

Fish Condition

Again, this is a fairly subjective assessment. A "normal" fish may be "fat" to another angler. Completely objective measures of fish condition were referred to earlier where length and weight can be analyzed in various ways, such as the Relative Condition metric. Our decision was to keep the form simple so that non-professionals could provide useful feedback.

A "Fat" fish would not be sleek, but would have a more rounded profile when viewed from the side. It would also have stored internal body fat if cleaned. This is usually seen as yellow or slightly reddish material laid down along the pyloric caecae ("fingers") attached to the stomach, as well as along the intestine. When fat reserves are heavy, the caecae can actually be engulfed in the fat.

A “Normal” fish would not appear fat or thin. Good luck!

A “Thin” fish may have a slightly sunken belly when viewed from the side. It will appear narrower than “normal” when viewed from above. As condition worsens, the top and bottom (dorsal and ventral) body line, when viewed from the side, will actually be narrower than the profile of the head. Thus the “Big head” category is provided. In other words, the fish appears to have a “big head” relative to its overall body appearance. Fish in this condition are often termed “stunted” since their growth has been halted by a lack of food.

Fish in “Spawning” condition are either spilling eggs or milt when squeezed (or even just held), or they show gonads that are spent when cleaned. The ovary is rough, ragged, and carrying no eggs; the sperm duct is collapsed. Fish that have just finished spawning (or attempting to do so) are often in relatively poor condition, and usually lack all internal fat and appear thin, but they may recover as they feed and the season progresses.

“Dead fish seen” and “Fry seen’ were placed under this heading for reasons that escape me. They are really a form of fish “activity”. Maybe we just didn’t want to create a new category. If dead fish are seen, check the box. In the Comments indicate the obvious or likely source of mortality. But, don’t check the “Dead fish” box if someone has just left cleaned or discarded whole fish on the lake bottom where they can be seen. Likely sources of natural mortality include winterkill (anoxia due to lengthy ice and snow cover); summerkill (rare; due to too warm water and inadequate flushing or oxygenation); or disease (also rare). Fish that die from natural causes are usually seen soon after ice-out since when the lake warms bacterial decomposition is fairly rapid. This is mainly a flag to the manager that the situation at the lake bears watching. Natural mortality may indicate the lake is unsuitable for planting.

Fry (fish 1-2” in total length) are usually seen in spawning areas (inlets or outlets, usually), or in the lake shallows near cover of some sort. Fry seen may be fry that were recently planted (legally or otherwise), but what is key here is where fry are seen when they “shouldn’t” be. The purpose of this data note is primarily to alert the manager to the presence of natural reproduction (often a very bad thing, since these lakes are best managed with plants of known numbers of fish).

Other/Comments: this is where key information can be provided beyond that provided by a check mark alone. Personal impressions and details add greatly to the basic information provided by a “Fat” or “Dead fish” check. An example would be: “There were surprising numbers of rainbow spawning in the main inlet”, or Fish condition has steadily worsened in this lake over the past 5 years. Reproduction is unfortunately now out of control.”

<u>Successful Lures</u>

This is fairly self-explanatory. Check all boxes that apply, i.e. gear that was used that caught fish. (I suppose in this case we could say that any fish hooked, even if it was not landed or fully controlled, would "count" since what we are interested in here is what gear elicited a strike.) Give as much information in the "Comments" box as you feel willing to disclose (grin). This information is not really critical to the fishery manager since the best, and **standardized gear** for sampling these lakes is a sinking gill net, or slight variations thereon. However, it is useful to any angler, especially one like a manager who needs to get his/her hands on the fish, to know what works in a particular lake. Remember, these fish are put there to be caught for recreation.

Stomach Contents

The most important information to the manager is if the fish are finding something to eat ("Empty" check marks, or notes on fullness – see below), particularly when this is linked to condition indices such as internal fat and weight. Knowing exactly what is in the stomach isn't as important, but is still very useful information. Diet varies not only seasonally, but even between fish in the same lake at the same time. Flesh color (below) is closely linked to their most recent diet. Fish on an insect diet usually have white or very pale flesh color.

If the fish are filtering copepods out of the water, they are usually relatively large as far as copepods go, and are also usually red from a store of oils in their bodies. If the fish have eaten a large number of these zooplankton (usually *Hesperodiaptomus kenai* in our lakes) they will usually appear like tomato paste in the stomach. If a small part of the mass is diluted in some water in the hand or a container, the individual copepods will become more identifiable.

Zooplankton that consists of mainly *Daphnia* or other cladocerans will usually look like a nondescript grey mass which, when diluted and spread, will reveal the very small organisms, if undigested.

"Shrimp", or *Gammarus sp.*, don't really look like anything else, but their size and color can vary quite a bit. Color ranges from pale yellow to gray or green. They can be 3 mm in length to about a centimeter. They prefer lakes with a neutral to slightly alkaline pH, and that have organic substrates. Trout can grow like mad on "shrimp" in these lakes. This is probably the best food item to have in a high lake. They can also be over-cropped if the fish are too numerous. The animal is crescent-shaped when lying on its side, and one side has a feathery appearance due to numerous legs.

"Larvae" is basically a catch-all category for a variety of insect larvae. The most common, by far, are midge larvae or pupae. Running a close second are caddisfly larvae ("periwinkles") that may or may not still be in their various cases made from substrate materials. A "joker" in the deck that sometimes is seen in some lakes is the highly unusual "phantom midge" larva, or *Chaoborus* sp. When available, trout may feed on these exclusively. The larvae are virtually transparent except for a couple of eye spots, so

a mass of them in the stomach appears much like a ball of nearly-clear jelly. Dilution and teasing of the food mass will reveal hundreds or thousands of the cylindrical larvae.

"Surface Insects" is fairly self-explanatory, and is most commonly flies of various sorts, or bees. However, usually once or twice a summer there may be huge winged ant hatches on our local high lakes. There are brown and black-bodied forms. When these hatches occur, the fish will be stuffed with them, and you'd better have a decent imitation in your fly box.

"Debris" is another catch-all box for fir needles and small cones, gravel, coarse sand, wood chips, etc.

"Other" can include very unusual items like mice that can be found in the guts of huge trout. Be sure to note the circumstances around these oddities in the Comments box. Salamander adults (almost always Northwest salamander) or larvae will also be seen in larger (> 12") trout. Note these in the "Other" category as well. Another occasional item is *Pisidium*, or the small "fingernail clam". It looks just like what it is – a very small, whitish freshwater clam.

Extra Credit: One of the most valuable pieces of information to the fishery manager is whether the fish are getting enough to eat. The presence of internal body fat is concrete evidence that they are, so that is extremely valuable information. Next best is documentation of Stomach Fullness. This is somewhat subjective, but comments like "Stuffed", "Distended", "Full", "Half Full", "Near Empty", or "Empty" are fairly self-explanatory, and convey a lot of information. The only tricky part is differentiating between "Full" and "Half Full". This comes with experience in looking at numerous fish stomachs. Put this information in the Comments space in the web site data entry form.

It is useful to know whether the fish are focusing on crustaceans such as copepods and/or amphipods, or freshwater shrimp (*Gammarus*). A crustacean diet will lead to a pink or even red flesh color as the carotenoid pigment astaxanthin from the crustaceans is deposited in the fish flesh. Rainbow and kokanee are better able to filter copepods and other zooplankton out of the water column due to having more and/or finer gill raker "filters". Notes on flesh color in the Comments box are good data ("the rainbow all had pink meat").

<u>Time At the Lake</u>

This information can be a source of confusion, yet it is also very important. The key source of the confusion is usually whether counts of anglers or their at-lake (and fishing) time is doubly reported by separate members of the same party. This problem can be avoided quite simply by paying close attention to the instructions in the on-line data entry form. In the field, it can also be avoided by the party agreeing on whether one person will prepare the trip report for the overall group, or whether each party member will prepare a report for him/herself. (See "Rule Number One" near the beginning of this

manual.) We (Brian Curtis and I) strongly recommend the "single lead reporter" approach. If for some reason some party members are not at the lake for the same time as others, separate reports should be made, with caution paid to avoid errors in reported total fishing time.

For "Days" and "Hours", do not make an entry in "Days" if the stay is for less than 1 full day. Use the "Hours" space for partial days (most common). If one is at the lake for over 2 days, the entries could be something like "2" days and "6" additional hours. Note this is very different from the time spent fishing, but gives the fishery manager a sense of how long the angler(s) may have been observing the lake and the number of people coming and going. The "Time At (the) Lake" data are for the reporting party or group as a whole. So if 1 person was at the lake for 5 hours, and a party of 3 was at the lake for 5 hours, a "5" would be entered in the Hours box in both cases.

Time Fishing

This is one of the most important field on the data form. If entered into the database properly, a very large amount of information on angler catch per unit effort (fish/hour) can be generated by various database queries. However, in order to log one's fishing time accurately, one must get into the habit of noting when they start and stop fishing. This is not always easy to do when one is in the habit of reveling in the extreme scenery of our high lakes once one gets to the lake. The other key consideration is to keep track of time actually spent fishing, as much as possible, and not add in time spent paddling down a lake in a raft, for example. If I am breaking my fishing up a lot due to rafting without trolling, or walking from Point A to Point B around the shoreline, I tend to jot down fishing times on my data form or scratch paper, then add it up at the end of the day, or when I have completed fishing. If one person is making the collective trip report, then he/she also has to get that information from the others, and the others need to note their fishing time conscientiously also.

Keep track of "on" time and "off" time when fishing as accurately as possible. I note watch times to the minute and jot the times down, then I round the collective time I have fished off to the nearest ¼-hour, as noted on the field form, and the on-line data entry template. Most people won't be this detail-oriented, but should at least look at their watches to note time fished, rather than just guessing. So if Jack fished from 0814 to 0940, AND from 1222 to 1510, he has fished a total of 4 hours and 14 minutes, reported as 4.25 hours. If Jill fished from about 0830 to 1425, her total time is 5.75 hours. NOTE however that if only one person is reporting for the 2-person group (or any group larger than 1), the total fishing time reported (logged to the database) is not the simple sum of 10.0 hours, but rather that sum divided by the number of anglers that contributed to it. We need to do it this way because the database is typically queried for cpue in ways that require multiplying the total fishing time by the number of anglers that contributed to that fishing time.

I just mentioned that the most common use of these data is calculation of catch per unit effort (cpue). For this party at this lake, 2 anglers fished for 10.0 hours. If they had

caught (brought to hand) 17 fish, their cpue is 17/10, or 1.7 fish per hour. I used to use 1.0 fish/hour as a floor value for trip satisfaction, but as noted earlier many people have a satisfactory trip even if they only see some fish and the weather and scenery are good. But, it is possible and desirable to have some objective and quantifiable measure of angler catch success, and cpue is the standard metric in fisheries management. The better the data are on fishing time and number of fish caught, the better our management will be.

KEY GUIDELINE: Enter time fished as the mean (average) of all time fished by all anglers when reporting for a group ("Number of Anglers in Party") of 2 or more.

Angler Counts

On past field data forms, this information was found under Time At Lake and Time Fishing. Angler counts are in their own "box" on the on-line data entry form. The latter is more appropriate. And, this information is hugely important.

One of, if not the most common data need and frustration in managing Washington's high lake fishery is not having good, solid measures of angler and non-angler use of the lakes. Ideally, we would have this information not only for large areas, such as WDFW administrative Regions, but for individual wilderness areas, or even individual lakes. A small book could be written on this subject. Historically, WDFW has obtained indirect estimates of high lake use on a broad scale within the state by use of surveys of license buyers. The precision of the estimates are little better than Westside versus Eastside. Direct counts of users at lakes are preferable, and this approach is being used in at least one Canadian Province that I am aware of.

This field data form is one way where exact counts can be obtained on a lake by lake basis. The only limitations are how long the reporter is at the lake, and whether he/she takes the trouble to get accurate counts of other people there. On small lakes, getting a complete count is usually as easy as looking around the whole lake from a vantage point. On larger lakes, some effort may be required to walk around and see if people are camped or present at other parts of the lake. Another error source is a count made when the reporter is only at the lake for a part of the day (such as is typical on a day trip). But, for most of the small, off-trail lakes that we "day trip" to, users are usually only there during the middle of the day anyway. Note that it is not important to know how long those other anglers fished, or were at the lake since fishery managers usually use the statistic of "Trips" rather than hours. That is, if four other anglers were at the lake, they constituted 4 "trips" or 4 "angler-days" at the lake, even if they only fished for 5 minutes.

I won't take a lot of time and space discussing the minutia of potential error analysis. The point is that you can gather extremely valuable information on usage by simply taking some time and effort to get an accurate count of the number of people who are at the lake, and separating them into two groups based on whether they fished or not. It is

often necessary to ASK some people, such as overnight campers, whether they fished or not. (Again, don't worry about how long they fished.)

It is asking a lot for anyone to canvass all of the people at Snow Lake on a Saturday. This guidance is intended for the more typical, low-effort lakes. Don't worry about monsters like Snow Lake, or Copper Lake near Skykomish, or others where there are dozens of people present every weekend day. Nevertheless, it is still useful to take a shot at a count at those lakes if you want to, and the counts you report are fairly accurate. (Please don't report counts that are little better than guesses. Remember the mantra: Good Data!)

There has been some confusion about angler counts, depending on who is reporting for a group of 2 or more. Again, pay close attention to the instructions for the on-line data entry form. It states: "If there are multiple people on your trip only one person needs to fill out a trip report and lake survey if they are reporting the fish caught by everyone in the party. Be sure to list all the participants." In general, it is best if just one (1) person reports for all of the people in the party. (See "Rule Number One" near the beginning of this manual.) The key point is that any query of the clubs' database would internally do the math, and it would multiply the number of anglers noted by the amount of fishing time noted. Therefore, the single reporter needs to sum the fishing time for all of the party members and calculate an average for them all so that when the a query is made of total time fished, the product is the correct figure. Here is an example:

Jack fished 2.55 hours on Day 1 and 1.8 hours on Day 2.
Jill fished 3.4 hours on Day 1 and 5.3 hours on Day 2.
Bill fished 0.7 hours on Day 1, only.
Bob fished 2.2 hours on Day 2, only.

Bob has agreed to do the Trip Report for the party of four people. At home after the trip he calculates that 4 anglers fished a total of 15.95 hours (rounded to the nearest 0.25 hour, or 16.0 hours). Therefore the MEAN number of hours fished for each angler is 16/4, or 4.0 hours. (Note that the data entry form allows decimal values, so go ahead and be accurate to at least one decimal place in all calculations.) For Time Fishing he enters 4.0 hours and 0.0 minutes. For Anglers In Party he enters '4".

It is certainly feasible for each member of a party to log a separate report for themselves. The great danger in this, however, is the strong potential for confusion when statistics are calculated by database queries. There is a large number of permutations in the list of potential errors. Here are just a few where everyone submits their own report of the same trip:

1) Bob correctly logs a "1" for the number of anglers in the party since he is just reporting for himself, but Bill screws up and forgets, and puts a "4" in that space;
2) Bob inadvertently includes some of Jack's fish in his catch total because they were mixed up in the raft they shared and he forgot who caught what (he's gettin' old);

3) Bill accurately reports the number of people fishing and not fishing at the lake, but Jill does not.

To minimize, if not eliminate the potential for errors, let's just make the RULE be that for party reports, one person submits the trip report, and summarizes the data accurately before logging it into the database. The confusion problem is then solved. He/she adds up everyone's fishing time and calculates an average to enter as hours and minutes fished. He/she enters the total number of anglers who fished in the party and enters that number. He/she enters the best possible accurate count of all anglers and non-anglers present at the lake. (If the counts aren't accurate, don't enter them!) He/she distinguishes the number of anglers in the reporting party from the OTHER anglers at the lake, as noted on the data entry form.

Lake Condition

Although lake color and transparency (two different characteristics, by the way) can vary quite a bit, we have chosen to lump all lakes into just three basic groups: clear water, glacial (colored from rock flour), and "dark", where stained from organic material in the basin – usually tannins from leaves and needles, etc. The "dark" classification is probably the most problematic. If the water has a brownish color, call it "dark" even if the amount of color is relatively light. A guideline might be if it looks like weak tea or darker, call it "dark". A source of error could be some brownish coloration during or after a storm if the water happens to have an inlet that is carrying a lot of soil sediment due to bank or bed erosion. This coloration would soon pass as the sediment settled to the lake bottom, whereas color from tannins and the like will remain in the water column and not settle out.

The basic use of this information is to classify the waters very broadly. Most lakes are "clear", but their perceived color can vary considerably. Optical qualities are affected by sky condition, true water transparency, etc. Extremely clear lakes will look deep blue much of the time simply due to their physical optical qualities – i.e., the nature of the light transmission. They are not blue because they are polluted with copper ions. A perfect example of this is Copper Lake in the Sultan Basin. It looks very much like Crater Lake in Oregon. It is a gorgeous high lake. The "Comments" field is the perfect place to say something like "Iceberg Lake's color varies seasonally, and is often "glacial" early on, but then clears up by the fall." This is a fact for this spectacular lake in the upper Middle Fork Snoqualmie River drainage, and is not a made-up example.

"% Frozen" and the "Comments" fields are the place where, again, very valuable information on snow conditions can be memorialized. In the % space, simply make a visual estimate of how much of the actual lake surface is still covered by snow or ice. Don't worry about the fact that the stuff on the surface may be slush, snow, ice, or some combination. Simply differentiate between open water and the white stuff. The details can be noted in the Comments box, and you are encouraged to do so. Here is also where needed information on how much snow in the trees or on the route is logged. I also try to

make a visual estimate of where the generally continuous snow line is. This could lie below the lake's elevation , or above it. Example: "Banks remained in the forest near the lake and were about 4 feet deep on average. The continuous snow line appeared to be at about the 3300 foot level about the lake. The historic "permanent" snow field at the west end of the lake is now gone!" Digital photos of these conditions are also very, very valuable, and can be added to the database.

Camp Usage

The three usage categories are necessarily general and subjective. The USFS has techniques of measuring trampling and vegetation impacts, for example, but we are not asking for this level of detail on this form. Here are some suggested guidelines to help you choose the best rating; any one of the listed guidelines would qualify selection of the associated rating:

"Heavy": More than one camp site for every 100 feet of shoreline, for any lake. More than six sites readily visible to anyone walking past or around the lake. One or more sites that collectively have at least 1000 square feet of mineral soil exposed due to native plant removal and/or trampling. One or more sites that collectively support a season-long average of 10 users/weekend-day, or more. (NOTE that "users" definitely includes non-anglers. For the last guideline, an example would be a lake that receives 400 users/year, and the typical season has 35 weekend-days, so 400/35 = 11.4.)

"Moderate": One camp site for every 300-500 feet of shoreline. Between 2 and 5 sites readily visible to anyone walking past or around the lake. One or more sites that collectively have between 100 and 1000 square feet of mineral soil exposed due to native plant removal and/or trampling. One or more sites that collectively support a season-long average of between 2 and 9 users/weekend-day.

"Light": Less than one camp site for every 500 feet of shoreline. Less than 2 sites readily visible to anyone walking past or around the lake. One or fewer sites that have 100 square feet or more of mineral soil exposed due to native plant removal and/or trampling. One or more sites that collectively support a season-long average of less than 2 users/weekend-day. Any lake that has no observable camp sites is automatically classed as having "Light" camp use.

# of Camp Sites

This begs the definition of a "camp site". For the current data forms, this is a spot where it is obvious that someone has cleared brush or grasses and rocks to create a flat spot for a tent, rain fly, or bivvy sack. There may or may not be a fire ring. Camp sites usually have a fire ring, however lakes commonly have fire rings where no "camp" has been created. Someone simply built a warming fire or cooked some food and did not clear vegetation for a tent, etc. For the current form, log the number of camp sites (largely ignoring the presence of fire rings). (Don't forget that creating new camp sites or fire

rings in designated wilderness is a mortal sin. We are gathering data, not creating it by creating new scars on the landscape.)

Extra Credit: Fire rings are themselves a use indicator, so tallying them is a useful thing to do. Go ahead and count them; their number is usually equal to, or slightly higher than the number of camps. However, be sure to not add them to the number of camps when reporting the number of camp sites. Note their number separately in one of the Comments fields.

Weather

The principal value of this information to the fishery manager is to help put into perspective things like "Zilch" fishing success, or "0" fish seen rising. The weather choices are pretty self-explanatory; check all that apply, and discuss changing weather during the trip in the Comments field. The Comments box is a great place to brag about what awful weather you endured. I have some personal favorites from years past, such as the "20-foot water spout in the middle of the lake, and gale force winds" at Edds Lake, reported by a very reliable person. Not especially relevant lake surface (wave) conditions in the Comments.

"Other" can include freak earthquakes; ash falls from volcanic activity (I know of some people who were out when St. Helens popped); rock, soil, debris, or snow avalanches; and hailstorms. If you get dumped on by snow, indicate the depth of the fresh slop before it melts.

The biggest deficiency of this list is it should probably include a "cool" category, rather than just "cold" or "warm". Handle fuzzy conditions in the Comments, or choose "warm". Obviously this is subjective; some hard cases would call 30-50^{o} F "warm".

Comments

One of, if not the most important data entry box on the forms. This is where you can synthesize all of the information, and expand on data that are not adequately explained by a simple check or number. Do NOT be shy; note everything you think is significant. Others will edit any egregious misspellings, etc.

Confidentiality

Here is where you can limit who sees your data. But, at this point I am going to express my plea, as a former fishery manager, to PLEASE let the managers know everything about the lakes. I, and many others, have worked very hard to build up a strong level of trust between the agency and the volunteer groups. WDFW Area Bios know better than to divulge to the public the lakes that grow big fish. To do so is extremely counter-productive to the agency's objective to manage the lakes for quality, since quality fishing

definitely means low numbers of people to most people (solitude), as well as unsullied surroundings. On the other hand, the managers need to know where things work well, where fish grow fast and well, and what the conditions are (local site conditions, correlated with planting rates and frequency) that lead to success on a lake by lake basis. Please don't keep this information a secret from the people who are dedicated to doing as good a job as humanly possible in maximizing the quality of our fantastic high lake fishery.

Bob Pfeifer
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