Manual of Fisheries Survey Methods II: with periodic updates

Chapter 26: Stream Status and Trends Program Sampling Protocols

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Chapter 26: Stream Status and Trends Program Sampling Protocols

Todd C. Wills, Troy G. Zorn, and Andrew J. Nuhfer

Michigan's streams are a valuable, productive, and sustainable resource. For example, Michigan's "top quality" coldwater streams alone support wild populations of brook and brown trout estimated at over 10.7 million fish (based on 1967 Anonymous; Gowing and Alexander 1980). The number of naturally reproduced age-1 brook and brown trout in Michigan's streams (estimated at over 2.7 million fish) is about 3.4 times greater than the number produced annually by MDNR Fisheries Division hatcheries for stocking in streams (MDNR Fisheries Division 1995). In addition, many of these streams serve as important spawning and rearing grounds for other highly prized salmonids (e.g., steelhead [rainbow trout], Chinook salmon, and coho salmon) and numerous potamodromous fishes caught primarily in the Great Lakes. Abundant natural production of wild fishes provides forage for many species of wildlife (Alexander 1977) and humans. Each year, Michigan's lakes and streams provide recreation for over 277,000 trout and salmon anglers (average of 277,479 for 1991–95; Michigan License Control Commission). In addition, many warmwater streams have provided highly valued fisheries, primarily for smallmouth bass, within the last few decades (Lockwood et al. 1995).

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Successful management of these systems rests on Fisheries Division's ability to describe their status, detect adverse changes to them, and respond through the appropriate management action. However, with more than 36,000 miles of streams, this is a challenging task. Fisheries Division needs to be able to respond to a variety of questions regarding Michigan's stream resources. Seven common questions, posed by managers, researchers, and the public, are:

1. What types of fish live in this stream reach?
2. Why doesn't a certain species occur in this stream?
3. Why don't you stock trout in this stream?
4. How have fish populations changed through time in this stream?
5. What factors are responsible for the change?
6. Is the change specific to this stream, or is it common among other streams in the region or state?
7. Is the change outside of what would be considered normal for this type of stream?

A sampling design with the flexibility to address questions across various spatial and temporal scales is needed. Some questions (e.g., 1–3) are comparative, requiring biotic and abiotic data for evaluating different types of streams. Other questions (e.g., 4) require long-term, site-specific data, where variables changing through time exert the greatest influence on population trends. Other temporally extensive data are needed to answer questions (e.g., 5) regarding possible causes for change. Comparable data on fish communities are needed to answer questions (e.g., 6) on how widespread observed patterns are. Finally, data need to be collected for a sufficiently long period of time to determine the "normal" levels of variation for different types of streams (i.e., answer question 7).

The Division's sampling history shows that we have alternated between attempting to describe the spatial distribution of fishery resources and describing temporal trends in those resources. Early sampling was spatially extensive, followed by a shift to temporally extensive sampling, and then a shift back to spatially extensive sampling. Historically, stream surveys have not been coordinated between or within management units, or with the research section. Consequently, these surveys have been conducted using a variety of methods and sampling gear. Since databases were not shared or coordinated, little thought was given to using data from several management units to answer regional- or statewide-scale questions, and until recently, current differences in methods among management units prevented such uses of the survey data. Often, little information is available about the stream community other than fish population estimates or catch data. Such sampling approaches leave managers and researchers unequipped to answer pertinent questions and address issues faced by the state's stream resources, both through time and over multiple spatial scales. The Stream Status and Trends Program (SSTP) uses standardized sampling protocols and both a network of fixed sites and a stratified random sampling design to address questions at the most relevant spatial and temporal scales.

26.1 Overview of sampling plan

The general approach of the SSTP is to sample stream *communities* representative of streams across the state. However, data need to be collected over a sufficient period of time and an array of stream types to address common questions. Therefore, the design of the SSTP incorporates two different, yet complementary, types of sampling. A stratified random sampling design is used primarily for general resource inventory and to provide information to compare different valley segments and stream systems. Fixed sites are used for specifically looking at trends in important resources (i.e., coldwater and smallmouth bass streams) and testing hypotheses (Table 26.1). The following paragraphs discuss each type of sampling in more detail.

26.1.1 Random site sampling (stratified random sampling design)

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The SSTP uses a stratified random design for describing the status of our stream resources. The primary purpose of these data is to characterize different types of streams in the state, and to answer questions best answered by comparing different streams. These data also provide a low-resolution (yet statistically robust) means for evaluating temporal trends among different types (strata) of streams. However, differences among sites and streams within strata may add considerable variation to the "mean condition" for the year, making it difficult to detect subtle changes. Approximately 60% of Fisheries Division's SSTP sampling effort is allocated toward this design.

The primary sampling unit for the stratified random sampling design is the river valley segment, stratified according to management unit, stream size (defined by catchment area), and temperature class (as described by Seelbach et al. [1997] for Michigan's Lower Peninsula, and ongoing Study 662, Inventory and classification of Michigan rivers and river fish communities, for Michigan's Upper Peninsula). Size attributes are based upon the catchment area at the midpoint of the valley segment as follows:

- Small (<40 mi^2).–easily shocked;
- Medium (40–179 mi^2).–high to medium shocking efficiency;
- Large (180–620 mi^2).–medium to low shocking efficiency due to depth;
- Very large (>620 mi^2).–non-wadeable, boomshocking waters.

26.1.2 Fixed site sampling

The SSTP uses a network of fixed sites (rather than a stratified random sampling approach) for obtaining the high-resolution picture of temporal trends needed in stream types supporting valuable fisheries. The use of fixed sites allows managers and researchers to control for river- and site-level characteristics (e.g., river hydrology, local channel characteristics, and woody debris abundance) that exert consistent, and often considerable, influence on fish abundance. For example, by using fixed sites to control for differences among rivers, 50% changes in brown trout abundance in four Michigan streams (South Branch Paint River, and North and South branches and mainstem Au Sable River) could be detected with 3, 3, 4, and 9 years, respectively, of before and after data. More than 15 years of similar data would be needed to detect the same change if random sampling had occurred (Figure 26.1; Zorn, unpublished data).

Among Michigan streams with long-term data on trout abundance, 48% of the variation in brown trout levels and 22% of the variation in brook trout abundance were due to characteristics of the sites being sampled (Wiley et al. 1997). Brown trout trend data for several sites on the South Branch of the Au Sable River show that sites sampled within a stream segment show similar patterns in fish abundance through time. In addition, these data show that actual abundances vary considerably and fairly consistently among sites, i.e., some sites were always "better" for brown trout than others (Figure 26.2). So, if one randomly chose one of these four sites each year for trend monitoring, considerable site-level variation would be added to the data, making it difficult to discern a temporal trend that was actually common to all sites. The use of fixed sites in the SSTP helps to control for such differences and increase our ability to detect and describe temporal trends in fish abundance.

The SSTP uses a network of fixed sites, stratified by drainage area and connectivity to the Great Lakes, to provide additional resolution for describing temporal trends at regional and larger spatial scales in stream types supporting valuable fisheries (e.g., better quality, wadeable, wild trout and smallmouth bass streams). Fixed sampling sites are dispersed throughout the state with the sampling effort for each stratum being proportional to the geographic distribution of stream types. In other words, northern Michigan has proportionately more trout sites, while southern Michigan has more smallmouth bass sites. Population estimates are made for salmonids to maintain continuity and comparability of data over time. Catch-per-unit-effort data are used for smallmouth bass because others have shown it is not possible to generate valid population estimates for Michigan streams (Lockwood et al. 1995). Catch-per-unit-effort data are also periodically collected for all other non-game species. Locations having existing data collection programs, such as United States Geological Survey (USGS) gauges and long-term population estimate stations, are favored as fixed sites. Approximately 40% of Fisheries Division's SSTP sampling effort is put towards fixed site sampling. Fixed sites are sampled in a 3 years on, 3 years off rotation to provide broader geographic coverage, yet enable estimates of year to year survival at sites.

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Additional trend data may be desired for important events that happen at other times of the year. For example, the need to monitor trends in natural reproduction (or smolt production) of species such as lake sturgeon and Chinook salmon may arise. Such targeted sampling efforts will be addressed as special projects or on an as-needed basis.

26.2 Data collection and recording

26.2.1 General protocols

Standard SSTP data sheets are provided to accommodate any fisheries and habitat information that should be collected when sampling. Be thorough when filling these data sheets out, as they will later assist in data entry and error checking. Filling in some of the basic information on the data sheets in the office will assist in expediting the data recording process in the field. Copies of the standard SSTP data sheets are available at the end of this document (Appendix A), or electronically on the DNR Intranet.

Use the SURVEY INFORMATION form as a guide to note the following:

- <u>Stream survey details</u>.–Note the beginning and ending date of the complete survey (fish and habitat data collection), as well as the water body, valley segment identification number, station location (e.g., number of feet upstream or downstream from bridge, road, etc.), county, and township, range, and section (if available). Record the GPS (global positioning systems) coordinates of station boundaries in decimal degrees to five places past the decimal point. A line is available to briefly describe the location of the station, or you may map it on the back of the data sheet. Check appropriate boxes. Note the first initial and last name of all crew members.

- Effort details.–Note the beginning and ending date and time for the survey effort, as well as the sampling gear used (include gear inventory number as this will help in identifying suspect data due to faulty gear).
- Gear notes.–Record the number of probes used, as well as the voltage, duty cycle, and pulse if applicable. Note any problems or suspect gear as necessary.
- Sampling conditions.–Record the water temperature (and the time it was recorded), air temperature, and conductivity. Check the appropriate boxes regarding electrofishing efficiency, weather, water level, and water color.
- Site assessment data.–Rapidly assess site conditions using the check boxes provided on page 2 of the SURVEY INFORMATION form. Use the blank section at the bottom of this data sheet for notes, maps, or comments as necessary.
- Herps data.–Record any observations and incidental collections of herps (reptiles and amphibians) on the HERPS OBSERVATION data sheet. Include number and size data for each species.
- Habitat data.–Similar protocols are used for collecting habitat data at wadeable random and fixed sites. See "Habitat sampling protocols" below.

26.2.2 Random site protocols

26.2.2.1 Determining sampling locations for randomly selected river valley segments.– An ArcReader project is available that will allow you to view locations of river valley segments that are randomly selected for sampling under the SSTP. The project also shows road crossings and is useful for identifying specific locations for sampling. The ArcReader project for identifying locations of valley segments scheduled for random sampling, as well as an up-to-date random site list, can be found on the DNR Intranet.

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A copy of the data on compact disk was also distributed to each management unit in the spring of 2003. The zipped file is quite large (93 megabytes), so you may wish to locate your office copy rather than downloading. A separate file containing instructions is located at the same network address. A copy of the instructions is also attached to this document (Appendix B).

26.2.2.2 Fisheries data.– Once the random valley segments to be sampled are located, follow the instructions below for collecting fisheries data at random sites. Try to schedule fisheries surveys at random sites between June 15 and September 15, but preferably between July 15 and August 30. Also, try to sample during the same time period each year.

In addition to the information specified under "General protocols," use the SURVEY INFORMATION form as a guide to note the following:

- Stream survey details.–Check the box for "Random site one-pass" as the purpose.
- Effort details.–In general, use a stream shocker and record the number of probes used (see "Gear Notes" on the data sheet). If overhanging brush or woody debris prohibits the use of a stream shocker, two backpack electrofishing units operated in tandem are an acceptable alternative. A single backpack electrofishing unit is acceptable for very small streams. All electrofishing that is conducted at random sites with a stream shocker or backpack electrofishing unit should be completed in an upstream direction. Use a boomshocker for non-wadeable large rivers and very large rivers. Boomshock in a downstream direction on one bank only, and use dip nets with ½-in square mesh. Note the length and width of the sampling station, as station length varies with stream size. Random valley segments identified for sampling are classified by stream size on the random site list. Recommended lengths for random site survey stations are:

- Small streams <15 feet wide.–500 feet,
- Small streams ≥15 feet wide.–800 feet,
- Medium streams.–1200 feet,
- Large streams.–1500 feet (may require boomshocker),
- Very large streams.–1 mile (requires boomshocker).

Use the RANDOM SITE ONE-PASS RUN form to record information for all fish species encountered on the random site surveys. Conduct one-pass electrofishing for all fish species to obtain catch-per-unit-effort (CPUE) data. Fish less than 1 in long can be ignored. Measure and count all game fishes and all large-bodied (>8 in) non-game fishes (for example, suckers) to obtain length-frequency data and CPUE. For small, non-game fishes obtain a total count and length range (size of smallest and largest individual captured of each species measured to 0.1 in). Also collect length-frequency data for a representative sample of about 30 fish per species. If large numbers occur for a small, non-game fish species, then the weight of a 30-fish subsample and the bulk weight of the remaining individuals can be used to estimate the total number caught. For example: if 15 lb of creek chubs were collected and 30 fish weighed a total of 0.25 lb, then the total number of fish collected = 15 lb x (30 fish/ 0.25 lb) = 1800 fish.

Collect scale samples from 10 fish per in group for species of interest.

26.2.3 Fixed site protocols

26.2.3.1 Locating fixed sites.– An up-to-date fixed site list can be found on the DNR Intranet.

Fixed sites are sampled in a 3 years on, 3 years off rotation. The sites on the current rotation will always be highlighted in bold on the fixed site list.

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26.2.3.2 Fisheries data.– Once the fixed sites to be sampled are identified, follow the instructions below for collecting fisheries data at fixed sites. Try to schedule fisheries surveys at fixed sites between August 1 and October 15, but preferably between August 15 and September 15. Also, try to sample during the same time period each year. Use the “Survey information” form as a guide to note the following:

- Stream survey details.–Note the historic site name if applicable. In addition to recording the GPS coordinates of station boundaries, record the GPS coordinates of the half-way point (see “Effort details” below), in decimal degrees to five places past the decimal point. Check the box for “Fixed site marking and recapture run” as the purpose.
- Effort details.–Use a stream shocker and record the number of probes used (see “Gear Notes” on the data sheet). Block nets are optional, but should be used consistently. Identify, map (see Manual of Fisheries Survey Methods II, Figure 2.2), and place permanent stakes at boundaries, as well as the half-way point, of electrofishing stations. Use the lengths of pre-existing, long-term population estimate stations if they exist. Otherwise, station lengths at fixed sites are 1000 feet.

Use FIXED SITE MARKING RUN OR SMALLMOUTH BASS RUN and FIXED SITE RECAPTURE RUN forms to record information for all fish species encountered on the survey. Methods for target species are as follows (mark-recapture population estimates should be used for salmonid species at all fixed sites):

- Small streams.–Preferably complete the marking run at two fixed sites in day 1, and complete the recapture run in day 2. If this would cause excessive time and travel, then complete the marking and recapture run in the same day.

- Medium-size, coldwater (trout) streams.–Conduct traditional mark-recapture population estimates for all salmonid species (day 1 – marking run, day 2 – recapture run).
- Medium-size, smallmouth bass streams.–Use a stream shocker with 3 probes for all sites. Shock the entire left and right bank in an upstream direction to obtain CPUE. Multiple stream shocking units (one to cover each bank separately) are acceptable.

Record length-frequency data on all large-bodied (>8 in) non-game fishes in the first half of the station in year two of the 3-year shocking cycle only. For small-bodied, non-game fishes, simply count all fish. This will require that non-game species are collected in the first half of both the left and right banks at smallmouth bass sites. Note the occurrence of new species on the recapture run, but do not include them with quantitative data collected from the first pass. In years one and three of the 3-year shocking cycle, the sampling of non-game fishes is not required.

Collect scale samples from target species only. Record the length of scale-sampled fish to the nearest tenth of an inch. Obtain scale samples from 10 fish per inch group for fish 4 in or larger. Measure 10 fish to the tenth of an inch per inch group for fish 3 in and smaller and enter into the Fish Collection System as age-0. Avoid releasing scale-sampled fish in the upper one-half of the survey station to minimize numbers of fish migrating out of the station prior to the recapture run.

Note: Concerns regarding cases of low catch of resident trout at SSTP fixed sites in the Upper and northern Lower peninsulas were brought forward in the first 2 years after the SSTP was initiated. Low catches at fixed sites create a problem, as one of the primary objectives of the fixed site sampling design is to obtain a high resolution picture of temporal trends in stream types supporting valuable fisheries. If catches are too low, the confidence intervals surrounding population estimates may be too wide to make the estimates useful (depending upon capture efficiency). Accordingly, the information gained from sampling at such sites may not be worth expending the necessary time and effort needed for data collection. This raises the question of whether or not certain sites should be dropped from the fixed site rotation.

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If you feel that the catch at a particular fixed site is too low (or if it is repeatedly low), please contact a SSTP coordinator to discuss whether or not to keep the site in the fixed site rotation. Ideally, 100 fish should be marked to achieve the desired confidence; however, this may not be possible in all circumstances. If capture efficiency is good, and an even smaller number of fish (50) are marked, precise estimates can still be made. The following guidelines are given under the assumption that the capture efficiency is acceptable (50-75%):

1. If at least 50 resident trout (brook trout and brown trout combined) are marked, a minimum of 12 fish (~25%) should be >4.5 in in length (i.e., age 1 or older).
2. If less than 50 resident trout (brook trout and brown trout combined) are marked, a minimum of 12 fish should be >4.5 in in length (i.e., age 1 or older).
3. The suggestions in 1 and 2 apply to resident species only. There is no minimum for potamodromous species (rainbow trout, Chinook salmon, and coho salmon).

If a particular stream fails to provide an adequate catch, it can be considered for removal from the program only after consultation with the appropriate management biologist and a SSTP coordinator. If a fixed site is dropped from the rotation, all efforts should be made to find a suitable replacement as soon as possible. The following guidelines (in order of priority), are used to define sites that may be suitable for inclusion in the fixed site rotation:

1. High-quality fishery, amenable to sampling.
2. Presence of a USGS gauge.
3. Site helps provide a spatially-broad (even) geographic coverage of fixed sites.
4. Existence of long-term fish abundance data.
5. Simultaneous sampling of other parameters (water chemistry, invertebrates, etc.) by others.

26.2.4 Habitat sampling protocols

26.2.4.1 General information.–Habitat sampling occurs in year 1 of each 3-year shocking cycle for the fixed sites, and on each survey for the random sites. Try to collect habitat data as close to the time of the fish survey as possible. Habitat sampling methods are described below, and in detail on the habitat data sheets.

26.2.4.2 Gear.–Besides waders and raingear, the standard gear required for habitat sampling consists of, (2) 100 or 250-foot measuring tapes, (2) 3–4 foot pieces of rebar, (2) clamps to hold the tape taught across the transect, (2) sticks 6-feet long with marks at 6, 12 18, and 24 in (for measuring large woody debris), a GPS unit, a clipboard, data sheets, pencils, a current meter, a graduated rule for measuring depth, and station marking equipment (paint, flagging, stakes, and a hammer).

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26.2.4.3 Locating transects and sampling points.–Habitat data are recorded from evenly-spaced transects and include width, depth, and substrate measurements at points across the transect (Table 26.2). Point sampling on a transect always occurs from left to right when facing upstream. For point sampling at random sites, note that the thalweg is defined as the deepest part of the channel (which usually carries the bulk of the river's current). Transects are always numbered from downstream to upstream (i.e., transect 1 is furthest downstream). Transect spacing and point sampling protocol for random sites follow the methods of the Wisconsin Department of Natural Resources (Simonson et al. 1994), which have known levels of precision and accuracy (Wang et al. 1996).

26.2.4.4 Riparian zone conditions.–Use the RIPARIAN and BANK CONDITION data sheet to document riparian habitat at each transect, including riparian vegetation and bank condition (refer to the appropriate vegetation and bank stability classes on the data sheet). Note the dominant vegetation (>50%) within 30 feet from the water's edge and 30 feet upstream and 30 feet downstream of the transect (don't count islands). Complete riparian measurements as if the stream was at bankfull stage, but note the presence of exposed substrate when the water level is low.

26.2.4.5 Width, depth, and substrate.–Two forms (RANDOM SITE TRANSECT HABITAT data sheet and FIXED SITE TRANSECT HABITAT data sheet) are available for width, depth, and substrate measurements at the transects. Measure stream width (to the nearest foot) as the wetted width of the channel; for braided channels measure the width of each island and record both the wetted and total width of the channel (include the island when calculating total channel width, but not the wetted width). Note the predominant mesohabitat type as pool, riffle, or run. The following definitions may be helpful in identifying the appropriate mesohabitat type:

- <u>Pools</u>.–Have deeper than average maximum depths, with no obvious surface turbulence or broken water. Water velocities are always slow.
- <u>Riffles</u>.–Have shallower than average maximum depths and obvious surface turbulence. Water velocity is faster than average.

- Runs.–Have average maximum depths and little or no surface turbulence. Water velocities may be fast or slow, but water surface is generally smooth.

Take depth and substrate data at the properly spaced sampling points along the entire transect and record island as a substrate type when islands occur (refer to the data sheet for the entire list of substrate classes). Measure stream depth to the nearest tenth of a foot and record the dominant substrate, the percent of wood, and the percent of rooted plants in a 1-foot diameter circle at the sampling point. Wood is defined as any woody material that is dense enough to provide fish cover, such as root wads and woody debris. When gravel substrate is encountered, record the appropriate embeddedness code (refer to the data sheet for a definition of each embeddedness code). Note that only gravel receives a measurable embeddedness code. All other substrates receive an unmeasurable embeddedness code. Don't leave any blanks on the transect habitat data sheets. If a value equals zero, then enter "0" in the appropriate column.

26.2.4.6 Large woody material.–Data for lineal and areal counts of large woody material (>6 in in diameter and >6 feet long) in the channel are recorded on the LARGE WOODY DEBRIS COUNT DATA form. Measure the number of full, 6-foot stick lengths, by diameter, for individual logs at least 6 feet long and in contact with water at least 6 in deep. Logs that are less than 6 feet in length, or logs that are not in contact with water at least 6 in deep, do not count as large woody debris. Only measure the portion of the log in water >6 in deep. Lengths of logs that are >12 in in diameter are measured from the base to the point on the log where the diameter becomes <6 in. Each individual 6-foot stick length equals one length class on the LARGE WOODY DEBRIS COUNT DATA form. For example, a 12-in diameter log that is 18 feet long and in 6 in of water would count as three 12-in length classes. A 30-foot long log in 6 in of water that is 18 in in diameter at the base, tapers to 12 in in diameter after 12 feet, 6 in in diameter after 18 feet, and 4 in in diameter after 24 feet would count as two 18-in length classes, one 12-in length class, and one 6-in class. The portion of the log less than 6 in in diameter is not counted.

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Record areal dimensions of natural log jams, beaver dams, brush deposits, and artificial structures to the nearest foot (record lineal feet for wing deflectors). Only record the area of natural or artificial structure that is in water >6 in deep. Refer to the data sheet for the proper natural and artificial structure codes. The following definitions may be helpful for identifying the proper structure types:

- Artificial log jam.–Same definition as log jam, except structure was built by humans.
- Brush deposits.–Piles of brush in streams, such as beaver lodges or food caches.
- Individual log.–Individual logs placed in channel as cover.
- Log jam.–three or more large diameter (>6 in) intermingled logs in water at least 6 in deep.
- Lunker structure.–Overhanging structure built into stream bank.
- Raft.–Sunken rafts that look like something built by Tom Sawyer.
- Riprap.–Rocks placed along the stream edge to stabilize a bank and deflect the current.
- Wing deflector.–Lineal walls placed in the channel to deflect the current.

26.2.4.7 Discharge.–Three different data sheets are available for recording discharge measurements (DISCHARGE DATA SHEET FOR RIVERS GENERALLY <30' WIDE, DISCHARGE DATA SHEET FOR RIVERS GENERALLY 30-60' WIDE, and DISCHARGE DATA SHEET FOR RIVERS GENERALLY >60' WIDE). Choose the appropriate discharge data sheet based upon the width of the stream to be sampled. Collect one discharge measurement at one location at the time of habitat sampling (for wadeable streams only). Measure stream depth (to the nearest tenth of a foot) and velocities where the channel is straight, canal-like, and has laminar flow (not at bridges). Measure water velocities at 0.6 times the depth (for example, if the depth is equal to 1 foot, measure the velocity at 0.6 feet below the water surface). Set the flow meter to average values over 10 seconds.

***26.2.4.8 Temperature.*–**Use the TEMPERATURE LOGGER DEPLOYMENT form to track the deployment and recovery of temperature loggers for stream temperature measurements. Collect hourly temperature measurements year-round for all 3 years of the shocking cycle on fixed sites. For random sites, temperature loggers should be deployed at a minimum from June 1 to August 31, but where possible should be deployed for a full year. Be sure to note the logger model and serial number as well as any information pertaining to the delayed start option. Also note the date and time of deployment and recovery, as well as the surface water temperature (this will help to identify any erroneous temperature data recorded by the logger after it is removed from the water). Space is provided to note and map the location of the temperature logger to assist in recovery.

Note: Temperature is probably *the* most critical habitat feature for stream fishes. Thus, measuring temperature is a priority.

***26.2.4.9 Water quality.*–**The Department of Environmental Quality (DEQ) will be sampling some of our fixed and random sites and providing water quality data, but there is presently no comprehensive DEQ plan for water quality sampling at all fixed or random sites. Water chemistry data will be used when available, but not collected as part of this program.

26.3 Data management in the Fish Collection System

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Once field work is completed, all fisheries and habitat data collected for the SSTP must be entered into the Fish Collection System (FCS). Do not combine multiple surveys in the same river from different sites, valley segments, or years into one survey folder. Each survey conducted at an individual sampling site in a given year should have its own survey folder in the FCS. Note that all standardized data sheets for the SSTP have space available to identify the water body, valley segment, and date sampled. Group all data sheets for completed surveys by water body and date so that all data are available in one location. This will expedite data entry, as well as error checking.

Be thorough and complete (yet succinct) in comments and descriptions and fill out as many screens as possible for each survey within the FCS. The intent of the standardized data sheets is to assist you in collecting all of the pertinent information associated with a survey, and to ensure that this information is stored in the FCS. Such detail can help in future data analysis or in identifying suspect data. Double-check your data entry in the FCS. Hurried data entry often leads to inaccurate survey results and data analysis problems in the future. Review the available summary reports and population estimates. Do they seem reasonable for the data that you collected? Are there any apparent problems? If so, correct them immediately, while the data are fresh in your mind, rather than waiting.

Refer to the Fish Collection System User's Guide for general instructions on entering fish and habitat survey data. For Stream Status and Trends Program surveys, remember the following notes in particular when completing the survey folder "Details" and "Efforts" tabs in the FCS. Doing so will greatly assist in querying and summarizing data in the future.

26.3.1 Survey folder "Details" tab

1. All SSTP surveys must be identified with a "Primary purpose of collection" of "Status and Trends." Purposes such as "Population estimate," "General survey," or "Research project" are inappropriate.
2. Use the "Fixed or random" drop-down menu to distinguish fixed and random site surveys.

3. Enter a brief, specific description under "Purpose note." If the survey is for a fixed site specify the site name, year of the rotation (e.g., year 1 of 3), and "fixed;" for random sites specify the valley segment identification number, road crossing, and "random."
4. Enter the valley segment identification number in the "Valley Seg. I.D." field.

26.3.2 Survey folder "Efforts" tab

1. Under "Details," enter the "Total effort quantity" in feet for all surveys. For fixed sites, use acres as the "Alternative total effort quantity;" for random sites use seconds.
2. Enter the marking run first and the recapture run second for fixed sites, all other efforts should follow. For smallmouth bass fixed sites, enter separate efforts for the left and right bank.
3. Create a separate effort (effort quantity should be half of the total station length in feet) for the non-game species collection at fixed sites in year 2 of the 3-year rotation. For smallmouth bass fixed sites, enter separate efforts for the left and right bank.
4. Create a separate effort (with "Other" as the gear used) for scale envelopes. Enter scale data for all inch groups captured. Don't forget to enter age-0 fish.
5. Use a brief, specific "Location" description in the "Site Characteristics" tab. Specify whether the effort is for the marking or recapture run for salmonid fixed sites, or the left or right bank for smallmouth bass fixed sites.
6. Enter the site length and width in feet in the "Site Characteristics" tab (this calculates the acreage in the population estimate spreadsheet).
7. Fill out as much information as possible in other spaces (weather, water, stream conditions, etc.).
8. Enter GPS coordinates for the site by using the "Electro. Stations" button in the limnology effort.

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26.3.3 Fish Collection System improvements

After the initiation of the SSTP, the FCS was upgraded to accommodate the wide range of fisheries and habitat variables (including temperature from electronic temperature loggers) collected by management units during SSTP sampling. In addition to storing fisheries data, the FCS is capable of limited data analysis, such as summary reports and population estimates, although these analyses are limited to single systems. Conducting data analyses within the FCS to compare fisheries data across multiple systems is currently not possible. Yet, many of the questions that the SSTP will address require this ability. For example, a manager may wish to know if changes in fish populations are unique to one stream of interest, or if they are common among other streams in the region or state. Such questions require the ability to conduct data analysis and comparisons across multiple stream systems and types at different regional scales.

Upgrading the FCS to conduct data analysis across systems and regions is important to providing the information Fisheries Division personnel need for effective management of Michigan's stream resources. Ideally, this information should be provided in a manner that is easily accessible and simple to utilize. Stream Status and Trends Program coordinators will continue to collaborate with Fisheries Division database personnel in charge of the operation and maintenance of the FCS to provide an easily accessible, user-friendly, web-based interface to the database. The ability of the FCS to query, analyze, and provide output from data of interest within and across systems will be of great utility to managers and researchers, as well as the public concerned with the quality of stream resources. In addition to addressing complex questions requiring comparisons among systems, such an interface will allow managers to easily address questions received from the public regarding a single stream of interest.

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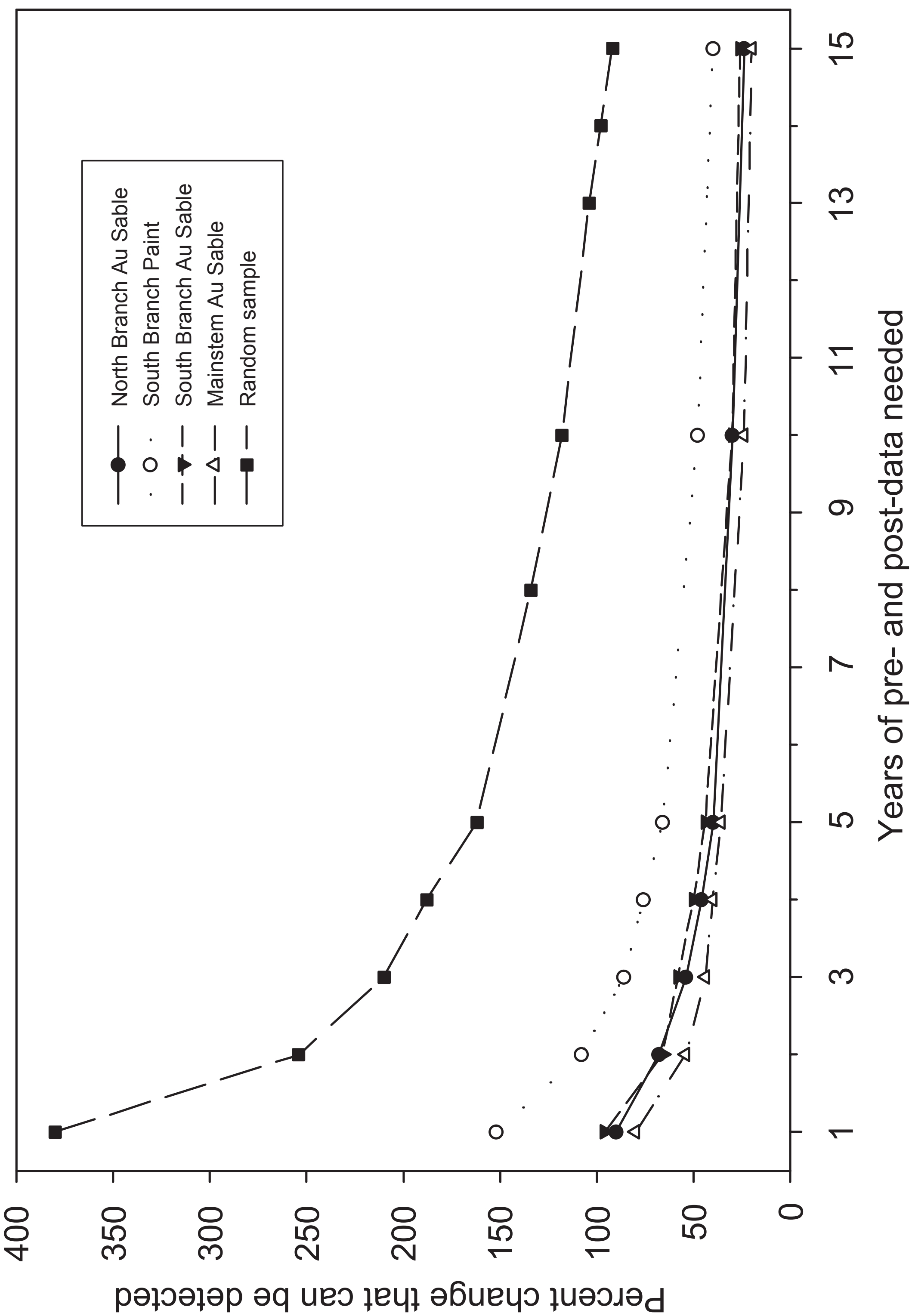

Figure 26.1.–Brown trout trend detection ability at fixed vs. random sites.

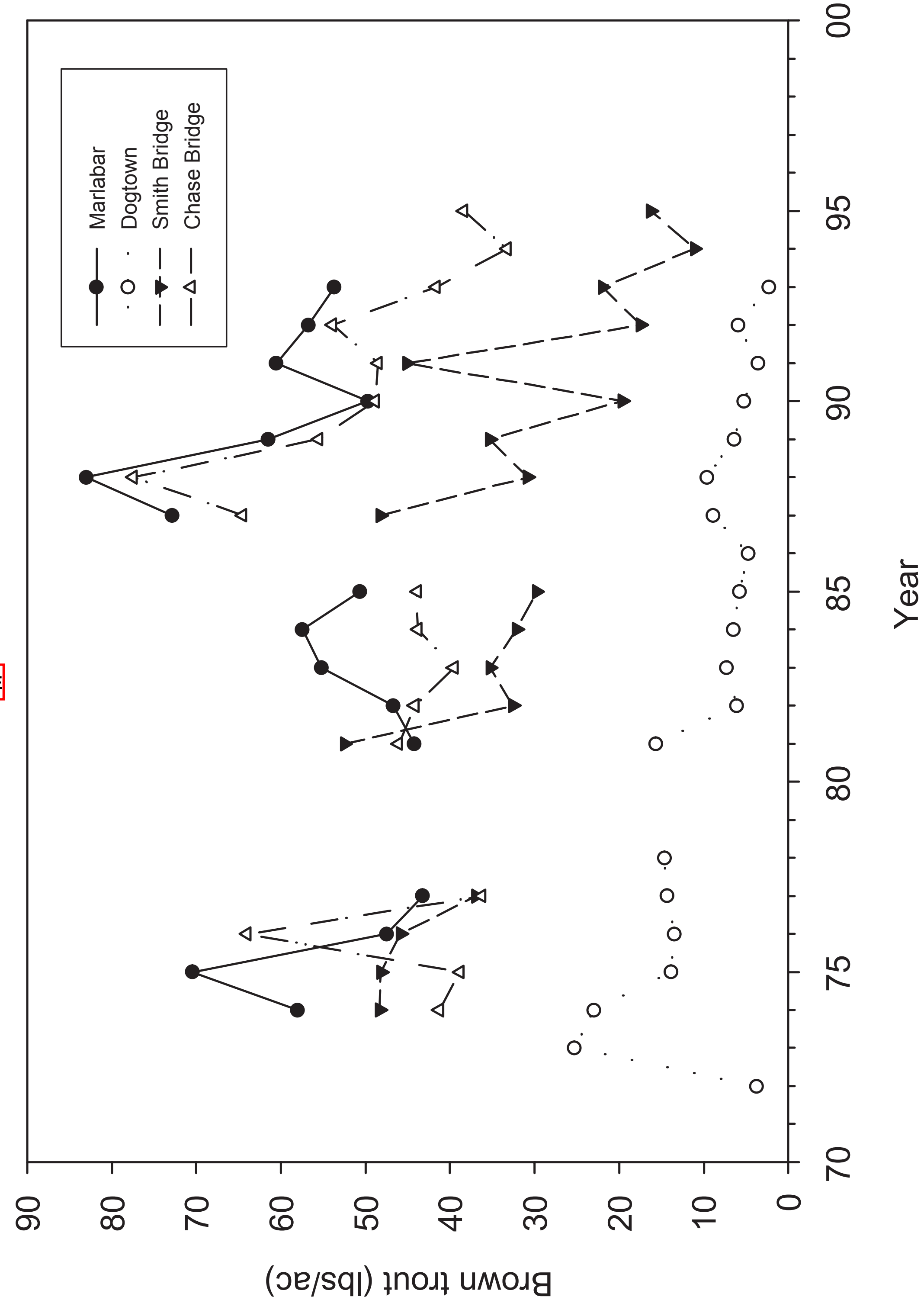

Figure 26.2.–Consistent differences and similar trends among sites in the South Branch Au Sable River.

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Table 26.1.–Overview of random and fixed site sampling design for the SSTP.

	Random sites (60% of effort)	Fixed sites (40% of effort)
Objectives	• Describe stream resource • Characterize valley segment strata • Used for answering comparative questions (i.e., Why is this stream marginal for trout?) • Describe temporal trends by strata; low resolution due to site level differences within strata, but high confidence if there is a change	• Ecosystem study (increase understanding of ecological mechanisms that influence valuable fisheries) • Describe long term trends • Describe baseline variation in population levels and fish growth, survival, and reproductive success • Quantify rates of change in stream habitat characteristics • Provide high resolution data for “early” detection of temporal trends, with broad geographic coverage • Contrast land-locked and Great Lakes connected streams
Types of streams	• All stream types	• Higher quality representatives of valuable fishery types • Wadeable reaches • Study streams: Landlocked small and medium wild trout Potamodromous small and medium wild trout Medium smallmouth bass
Statewide sampling design	• Late summer samples • Stratified random sampling using valley segment strata	• Late summer, biennial (3 year on-off) samples at fixed sites • Sites distributed across the state with effort proportional to distribution of the resource (more trout sites in the north and more bass sites in the south) • Try to cover major valley segment types • Preference for sites having USGS gages and existing long-term fish data
Type and frequency of data		
Fish:	• CPUE for all species	• Population estimates for trout to maintain continuity and comparability of data over time, CPUE for all other species
Temperature:	• Continuous data from temperature loggers	• Continuous temperature data from temperature loggers
Discharge:	• Periodic discharge measurements	• Discharge data in cooperation with the USGS
Habitat:	• Detailed measurements of riparian and in-stream features	• Periodic detailed measurements of riparian and in-stream features

Table 26.2.–Spacing of transects and sample points for SSTP habitat sampling.

Size strata	Station length (feet)	Transect spacing (feet)	Space between sampling points on transect
Random sites			
Small (<15’ wide)	500	40	1/5, 2/5, 3/5, 4/5 across channel, at thalweg
Small (≥15’ wide)	800	60	1/5, 2/5, 3/5, 4/5 across channel, at thalweg
Medium	1200	90	1/5, 2/5, 3/5, 4/5 across channel, at thalweg
Large	1500	110	1/5, 2/5, 3/5, 4/5 across channel, at thalweg
Very large	1 mile	400	1/5, 2/5, 3/5, 4/5 across channel, at thalweg
Fixed sites			
Small	1000*	75	2’
Medium	1000*	75	3’

*Or length of historic index station.

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26.4 Literature cited

Alexander, G. R. 1977. Food of vertebrate predators on trout waters in north central lower Michigan. Michigan Academician 10(2): 181-195.

Anonymous. 1967. Michigan stream classification: 1967 system. Chapter 20 in Schneider, James C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

Gowing, H., and G. R. Alexander. 1980. Population dynamics of trout in some streams of the northern Lower Peninsula of Michigan. Michigan Department of Natural Resources, Fisheries Research Report 1877, Ann Arbor.

Lockwood, R. N., R. D. Clark, Jr., and J. W. Merna. 1995. Evaluation of catch-and-release smallmouth bass fishing regulations on the Huron River, Michigan. Michigan Department of Natural Resources, Fisheries Research Report 2016, Ann Arbor.

MDNR Fisheries Division. 1995. Michigan fish stocking record 1995. Michigan Department of Natural Resources Fisheries Division, Lansing.

Schneider, J. C. (ed.) 2000. Manual of fisheries survey methods II: with periodic updates. Michigan Department of Natural Resources, Fisheries Special Report 25, Ann Arbor.

Seelbach, P. W., M. J. Wiley, J. C. Kotanchik, and M. E. Baker. 1997. A landscape-based ecological classification system for river valley segments in lower Michigan (MI-VSEC version 1.0). Michigan Department of Natural Resources, Fisheries Research Report 2036, Ann Arbor.

Simonson, T. D., J. Lyons, and P. D. Kanehl. 1994. Quantifying fish habitat in streams: transect spacing, sample size, and a proposed framework. North American Journal of Fisheries Management 14:607–615.

Wang, L., T. D. Simonson, and J. Lyons. 1996. Accuracy and precision of selected stream habitat estimates. North American Journal of Fisheries Management 16:340–347.

Wiley, M.J., S.L. Kohler, and P.W. Seelbach. 1997. Reconciling landscape and local views of aquatic communities: lessons from Michigan trout streams. Freshwater Biology 37: 133-148.

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Written in 2006 by T. C. Wills, T. G. Zorn, and A. J. Nuhfer

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Appendix A

Copies of the standard SSTP data sheets (also available electronically on the DNR Intranet).

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FISH COLLECTION: SURVEY INFORMATION (reduced to fit on this page).

DNR

Stream Status and Trends Program
Fish collection

Survey information
Page 1
Revised 3/22/04

Stream survey details:

Begin date: ____________ End date: ____________ GPS[1]: Upstream Middle Downstream

Water body: ______________________________ Lat: ________ ________ ________

Station: ______________________________ Long: ________ ________ ________

VSEC I.D. ____________ County: ______________ T. ________ R. ________ Sec. ________

Station description[2] (describe or map on back of sheet): ______________________________

Purpose: Fixed site marking and recapture run ☐ Random site one pass ☐ Other (explain): ____________

Check if station is inaccessible: ☐ Check if station is intermittent/dry: ☐ Check if station has Great Lakes access: ☐

Has station been stocked w/in last 5 years? Yes ☐ No ☐ If yes, indicate species: ____________

Crew (first initial, last name): ______________________________

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Effort details:

Effort number: ______ Beginning date: ________ Time: ________ Ending date: ________ Time: ________

Effort number: ______ Beginning date: ________ Time: ________ Ending date: ________ Time: ________

Gear: Boomshocker ☐ Backpack ☐ Barge ☐ EF Unit I.D. no. ____________

Station length[3] (ft): ________ Station width (ft): ________ Acres: ________ Check if block nets were used[4]: ☐

Gear notes:

No. of anodes: ________ Volts: ________ Duty cycle: ________ Pulse: ________

Notes: ______________________________

Sampling conditions:

Water temp (°F): ________ Air temp (°F): ________ Time of temperature recording: ________ AM ☐ PM ☐

Conductivity (µs/cm): ________ Notes: ______________________________

Electrofishing efficiency: Low ☐ Med. ☐ High ☐ Water level: Very high ☐ High ☐ Avg.☐ Low ☐ Very Low ☐

Weather: Clear ☐ P. Cloudy ☐ Overcast ☐ Rain ☐ Water color: Clear ☐ Gry ☐ Brn ☐ Blk ☐ Green ☐

[1]Record GPS coordinates in decimal degrees to 5 decimal places.
[2]Include access point with reference to nearest road or highway.
[3]**Fixed sites**: Use lengths of pre-existing long-term pop'n estimate stations if they exist. Otherwise, station lengths are 1000'.
Random sites: Sm. stream <15' wide=500', >15' wide=800'; med. stream=1200'; lg. stream=1500', very lg. stream=boomshock for 1 mile.
[4]Fixed sites: Block nets are optional, but should be used consistently.

FISH COLLECTION: SURVEY INFORMATION, page 2 (reduced to fit on this page).

DNR

Stream Status and Trends Program
Fish collection

Survey information
Page 2
Revised 3/22/04

Water body and station: ______________________ Begin date: __________ End date: __________

Site assessment data: *The purpose of this section is to provide a **rapid** assessment of on-site conditions…devote time accordingly.*

Physical appearance:	Upstream of section midpoint (Check all that apply)				Downstream of section midpoint (Check all that apply)			
Invertebrates[5]	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Floating algae	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Filamentous algae	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Turbidity	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Oil sheen	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Foam	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Trash	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Comments (presence of crayfish, minnows):								

Instream cover:	Upstream of section midpoint (Check all that apply)				Downstream of section midpoint (Check all that apply)			
Undercut banks	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Overhanging vegetation	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Deep pools	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Boulders	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Aquatic plants	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Logs/woody debris	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐	Abundant ☐	Moderate ☐	Sparse ☐	Absent ☐
Comments:								

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Notes, maps, or additional comments:

[5]Note invertebrate abundance on hard surface (such as rock or wood).

FISH COLLECTION: FIXED SITE MARKING RUN OR SMB RUN (reduced to fit on this page).

DNR

Stream Status and Trends Program
Fish collection

Fixed site
Marking run or
Smallmouth bass run
Revised 3/14/06

Water body: ______________________ Date: ____________ Page ______ of ______

Station: ____

Target species[1,2]: ____________ Start time: ________ AM ☐ PM ☐ End time: ________ AM ☐ PM ☐

Crew[3] (first initial, last name): ______________________________

Inch group	Species	Species	Species	Species	Species	Species	Species	Species
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

[1]In one year of the 3-year shocking cycle collect length-frequency data on all large-bodied non-game fishes in the first half of the station. For small-bodied non-game fishes, count all fish. In the other two years, sampling of non-game fishes is not required.
[2]Scale sample target species only. Sample 10 fish per inch group for fish > 4 inches. For fish < 4 inches measure 10 fish per inch group to a tenth of an inch and enter into Fish Collection System as age-0.
[3]Note additional comments as necessary on back of data sheet.

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FISH COLLECTION: FIXED SITE RECAPTURE RUN (reduced to fit on this page).

DNR

Stream Status and Trends Program
Fish collection

Fixed site
Recapture run
Revised 3/22/04

Water body: ______________________ Date: ____________ Page ______ of ______

Station: ____

Target species[1]: ____________ Start time: ________ AM ☐ PM ☐ End time: ________ AM ☐ PM ☐

Crew[2] (first initial, last name): ______________________________

Inch group	Species		Species		Species		Species	
	Unmarked	Marked	Unmarked	Marked	Unmarked	Marked	Unmarked	Marked
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								

[1]Note occurrences of new species on the recapture run, but do not include them with quantitative data from the first pass.
[2]Note any additional comments as necessary on back of data sheet.

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FISH COLLECTION: RANDOM SITE ONE-PASS RUN (reduced to fit on this page).

DNR

Stream Status and Trends Program
Fish collection

Random site
One-pass run
Revised 3/22/04

Water body: ____________________ Date: ______________ Page ________ of ________

Station: ____

Crew[1] (first initial, last name): ________________________________

VSEC I.D. ____________ Start time: ____________ AM ☐ PM ☐ End time: ____________ AM ☐ PM ☐

Inch Group[2]	Species	Species	Species	Species	Species	Species
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						
22						
23						
24						
25						
26						
27						
28						
29						
30						

Subsamples (small, non-game species only)	Species										
A. Weight of 30 fish:											
B. Total wt. of all fish:											
Total number of fish: (30 / **A**) X **B**											

[1]Note any additional comments as necessary on back of data sheet.
[2]Scale sample 10 fish per inch group for species of interest.

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HERPS OBSERVATION (reduced to fit on this page).

DNR

Stream Status and Trends Program
Herps observation

Revised 3/22/04

Water body: ______________________ Date: ____________ Page ________ of ________

Station: ____

Crew[1] (first initial, last name): ____

Species	Number	Size[2]	Species	Number	Size[2]
Turtles:			Eastern Gray Tree Frog		
Snapping			Northern Spring Peeper		
Softshell			Western Chorus Frog		
Spotted*			Bullfrog		
Wood***			Green Frog		
Eastern Box***			Pickerel Frog		
Blandings***			Northern Leopard Frog		
Map			Mink Frog		
Painted			Wood Frog		
Red-eared Slider			Copes Gray Tree Frog		
Musk			Boreal Chorus Frog***		
Lizards:			**Snakes:**		
5-lined Skink			Kirtlands**		
6-lined Race Runner***			Copperbelly Water**		
Salamanders:			Northern Water		
Eastern Tiger			Queen		
Spotted			Brown		
Blue Spotted			Northern Red-bellied		
Marbled*			Eastern Garter		
Small-mouthed**			Butler's Garter		
Four-toed			Northern Ribbon		
Mudpuppy			Northern Ringneck		
Central Newt			Eastern Hognose		
Red-spotted Newt			Blue Racer		
Red-backed			Black Rat***		
Western Lesser Siren			Eastern Fox*		
Frogs and Toads:			Eastern Milk		
Eastern American Toad			Smooth Green		
Fowler's Toad			Eastern Massasauga***		
Blanchard's Cricket Frog***			Western Fox		

[1]Note any additional comments as necessary on back of sheet.
[2]Turtles: measure straight-line length of shell (end-to-end without measuring curve). All other herps: measure total length. Enter data under "Actual" column in the "Herps Observation" section of the Fish Collection System.

***Threatened** ****Endangered** *****Special concern**

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NOTES AND EQUIPMENT, page 2 (reduced to fit on this page).

Stream Status and Trends Program

Notes and equipment list

Revised 3/22/04

Try to collect habitat data as close to the time of fish survey as possible.

Water body: ______________________________

Station: ______________________________

Date: ____________________

Equipment needed for measuring habitat:

	Check:
(1) GPS unit (set to record data in decimal degrees)	☐
(2) 100’ or 250’ tapes, rerod and clamps (to hold tape taut across transect)	☐
(1) Clipboard, data sheets, pencils	☐
(1) Current meter (set to average over 10 seconds)	☐
(1) Graduated stick for measuring stream depth	☐
(2) LWD sticks (6’ long w/marks at 6”, 12”, 18”, and 24”)	☐
(1) Station marking supplies (paint, flagging, stakes, hammer)	☐
Raingear	☐
Waders	☐

Spacing of transects and sample points:

Size category	Electrofishing station length (ft)	Transect spacing (ft)	Space between sampling points on transect (ft)
Random sites			
Small (<15’ wide)	500	40	1/5, 2/5, 3/5, 4/5 across transect and at the thalweg
Small (>15’ wide)	800	60	1/5, 2/5, 3/5, 4/5 across transect and at the thalweg
Medium	1200	90	1/5, 2/5, 3/5, 4/5 across transect and at the thalweg
Large	1500	110	1/5, 2/5, 3/5, 4/5 across transect and at the thalweg
Very large	1 mile	400	1/5, 2/5, 3/5, 4/5 across transect and at the thalweg
Fixed sites			
Small	1000’ or length of historic station	75	2
Medium	1000’ or length of historic station	75	3

Miscellaneous definitions:

Riffles: Have shallower than average maximum depths and obvious surface turbulence. Water velocity is faster than average.

Runs: Have average maximum depths and little or no surface turbulence. Water velocities may be fast or slow, but water surface is generally smooth.

Pools: Have deeper than average maximum depths, with no obvious surface turbulence or broken water. Water velocities are always slow.

Thalweg: The deepest part of the channel (usually carries the bulk of the river’s current).

Artificial log jam: Same definition as log jam, except structure was built by humans.

Brush deposits: Piles of brush in streams, such as beaver lodges of food caches.

Individual log: Individual logs placed in channel as cover.

Log jam: 3 or more large diameter (>6”) intermingled logs in water at least 6” deep.

Lunker structure: Overhanging structure built into stream bank.

Raft: Sunken rafts that look like something built by Tom Sawyer.

Riprap: Rocks placed along the stream edge to stabilize a bank and deflect the current.

Wing deflector: Lineal walls placed in the channel to deflect the current.

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RIPARIAN AND BANK CONDITION DATA SHEET (reduced to fit on this page).

DNR

Stream Status and Trends Program
Riparian and bank condition data sheet

Revised 3/22/04

Water body: ______________________________

Station: ______________________________

Date: ____________________

Crew: ______________________________

Riparian zone measurements:
Record dominant vegetation (>50%) within 30' from waters edge and 30' upstream and 30' downstream from transect. Don't count islands. Complete riparian measurements as if stream is at bankfull stage. Note presence of exposed substrate when water level is low.

Riparian vegetation classes:
YD – Yard/lawn
AP - Agriculture, pasture
AR – Agriculture, row crops
GF – Grassland, forb
TA – Tag alder types
SC – Small coniferous trees (up to 6" dbh)
LC – Large coniferous trees (>6" dbh)
SD – Small deciduous trees (up to 6" dbh)
LD – Large deciduous trees (>6" dbh)

Streambank vegetative stability:
Assuming the channel was full of water, look at where the river would touch the streambank.

Stability classes:
1 – **Good <25%** of streambank is bare soil
2 – **Fair 25-50%** of streambank is bare soil
3 – **Poor 50-75%** of streambank is bare soil
4 – **Very poor >75%** of streambank is bare soil

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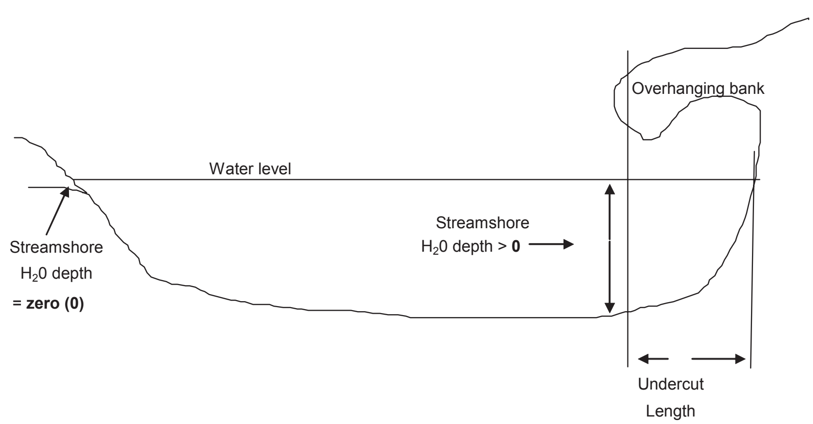
	Left bank (facing upstream)					**Right bank** (facing upstream)				
Transect number	Riparian class	Bank stability	Undercut length (x.x ft)	Streamshore H_20 depth (x.x ft)	Comments	Riparian class	Bank stability	Undercut length (x.x ft)	Streamshore H_20 depth (x.x ft)	Comments
1										
2										
3										
4										
5										
6										
7										
8										
9										
10										
11										
12										
13										
14										
15										



RANDOM SITE TRANSECT HABITAT DATA SHEET (reduced to fit on this page).

DNR

Stream Status and Trends Program

Random site transect habitat data sheet

Page 1
Revised 3/22/04

Water body: ______________________________

Station: ______________________________

Date: ______________ VSEC I.D. ______________

Crew: ______________________________

Comments: ______________________________

GPS coordinates of electrofishing station

Record in decimal degrees to 5 places past decimal.

	Latitude	Longitude
Upstream end:		
Downstream end:		

Transects are numbered from downstream to upstream (i.e. transect 1 is furthest downstream).
Don't forget *to characterize bank and riparian condition on both banks of each transect!*
Note on islands: *Put a "Y" under "Island" when transect crosses an island. Include island when calculating total channel width, but not wetted width. On transects, take data along the whole transect and record island as a substrate type when island occurs.*
Distance from left bank is facing upstream, and depths are measured to a tenth of a foot.
Record dominant substrate, % wood, and % rooted plants in a 1' diameter circle at sample point.
Substrates – C – clay, **D** – detritus/silt, **S** – sand, **G** – gravel (<2.5"), **SC** – small cobble (2.5-5"), **LC** – large cobble (5-10"), **B** – boulder (>10"), **W** – wood, **BE** – bedrock, **ISL** – island
Wood = brush that is dense enough to provide fish cover (root wads, woody debris, etc.).
Embeddedness classes for gravel – **0** = <50% (<50% of vertical profile of gravel buried in fines), **1** = >50%, **9** = unmeasurable or N/A.
Leave no blanks! *If a value equals zero then enter "0".*

	Width for braided channels (record to nearest ft)					Channel width (ft)		Predominant habitat type (check one)	Island? ("Y" if yes)
Transect #	Channel	Island	Channel	Island	Channel	Wetted	Total		
1								Pool ☐ Riffle ☐ Run ☐	
2								Pool ☐ Riffle ☐ Run ☐	
3								Pool ☐ Riffle ☐ Run ☐	
4								Pool ☐ Riffle ☐ Run ☐	
5								Pool ☐ Riffle ☐ Run ☐	
6								Pool ☐ Riffle ☐ Run ☐	
7								Pool ☐ Riffle ☐ Run ☐	
8								Pool ☐ Riffle ☐ Run ☐	
9								Pool ☐ Riffle ☐ Run ☐	
10								Pool ☐ Riffle ☐ Run ☐	
11								Pool ☐ Riffle ☐ Run ☐	
12								Pool ☐ Riffle ☐ Run ☐	
13								Pool ☐ Riffle ☐ Run ☐	
14								Pool ☐ Riffle ☐ Run ☐	
15								Pool ☐ Riffle ☐ Run ☐	
16								Pool ☐ Riffle ☐ Run ☐	

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Trans. #	Portion of width from left bank	Depth (ft)	Sub-strate	Embed. class (0, 1, 9)	Wood (%)	Plants (%)
1	0.2					
1	0.4					
1	0.6					
1	0.8					
1	Thalweg					
2	0.2					
2	0.4					
2	0.6					
2	0.8					
2	Thalweg					
3	0.2					
3	0.4					
3	0.6					
3	0.8					
3	Thalweg					

Trans. #	Portion of width from left bank	Depth (ft)	Sub-strate	Embed. class (0, 1, 9)	Wood (%)	Plants (%)
4	0.2					
4	0.4					
4	0.6					
4	0.8					
4	Thalweg					
5	0.2					
5	0.4					
5	0.6					
5	0.8					
5	Thalweg					
6	0.2					
6	0.4					
6	0.6					
6	0.8					
6	Thalweg					

RANDOM SITE TRANSECT HABITAT DATA SHEET, page 2 (reduced to fit on this page).

Stream Status and Trends Program

Random site transect habitat data sheet

Page 2
Revised 3/22/04

Water body and station: ______________________ Date: __________

Trans. #	Portion of width from left bank	Depth (ft)	Sub-strate	Embed. class (0, 1, 9)	Wood (%)	Plants (%)
7	0.2					
7	0.4					
7	0.6					
7	0.8					
7	Thalweg					
8	0.2					
8	0.4					
8	0.6					
8	0.8					
8	Thalweg					
9	0.2					
9	0.4					
9	0.6					
9	0.8					
9	Thalweg					
10	0.2					
10	0.4					
10	0.6					
10	0.8					
10	Thalweg					
11	0.2					
11	0.4					
11	0.6					
11	0.8					
11	Thalweg					

Trans. #	Portion of width from left bank	Depth (ft)	Sub-strate	Embed. class (0, 1, 9)	Wood (%)	Plants (%)
12	0.2					
12	0.4					
12	0.6					
12	0.8					
12	Thalweg					
13	0.2					
13	0.4					
13	0.6					
13	0.8					
13	Thalweg					
14	0.2					
14	0.4					
14	0.6					
14	0.8					
14	Thalweg					
15	0.2					
15	0.4					
15	0.6					
15	0.8					
15	Thalweg					
16	0.2					
16	0.4					
16	0.6					
16	0.8					
16	Thalweg					

Notes or comments:

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FIXED SITE TRANSECT HABITAT DATA SHEET (reduced to fit on this page).

Stream Status and Trends Program

Fixed site transect habitat data sheet

Page 1
Revised 3/22/04

Water body: ______________________________

Station: ______________________________

Date: ______________

Crew: ______________________________

Comments: ______________________________

GPS coordinates of electrofishing station

Record in decimal degrees to 5 places past decimal.

	Latitude	Longitude
Upstream end:		
Downstream end:		

Transects are numbered from downstream to upstream (i.e. transect 1 is furthest downstream).
Don't forget *to characterize bank and riparian condition on both banks of each transect!*
Note on islands: *Put a "Y" under "Island" when transect crosses an island. Include island when calculating total channel width, but not wetted width. On transects, take data along the whole transect and record island as a substrate type when island occurs.*
Distance from left bank is facing upstream, and depths are measured to a tenth of a foot.
Record dominant substrate, % wood, and % rooted plants in a 1 ft. diameter circle at sample point.
Substrates – C – clay, **D** – detritus/silt, **S** – sand, **G** – gravel (<2.5"), **SC** – sm cobble (2.5-5"), **LC** – lg cobble (5-10"), **B** – boulder (>10"), **W** – wood, **BE** – bedrock, **ISL** – island
Wood = brush that is dense enough to provide fish cover (root wads, woody debris, etc.).
Embeddedness classes for gravel – **0** = <50% (<50% of vertical profile of gravel buried in fines), **1** = >50%, **9** = unmeasurable or N/A.
Leave no blanks! *If a value equals zero then enter "0".*

	Width for braided channels (record to nearest ft)					Channel width (ft)		Predominant habitat type (check one)	Island? ("Y" if yes)
Transect #	Channel	Island	Channel	Island	Channel	Wetted	Total		
1								Pool ☐ Riffle ☐ Run ☐	
2								Pool ☐ Riffle ☐ Run ☐	
3								Pool ☐ Riffle ☐ Run ☐	
4								Pool ☐ Riffle ☐ Run ☐	
5								Pool ☐ Riffle ☐ Run ☐	
6								Pool ☐ Riffle ☐ Run ☐	
7								Pool ☐ Riffle ☐ Run ☐	
8								Pool ☐ Riffle ☐ Run ☐	
9								Pool ☐ Riffle ☐ Run ☐	
10								Pool ☐ Riffle ☐ Run ☐	
11								Pool ☐ Riffle ☐ Run ☐	
12								Pool ☐ Riffle ☐ Run ☐	
13								Pool ☐ Riffle ☐ Run ☐	
14								Pool ☐ Riffle ☐ Run ☐	
15								Pool ☐ Riffle ☐ Run ☐	
16								Pool ☐ Riffle ☐ Run ☐	

Trans. #	Distance from left bank	Depth (ft)	Sub-strate	Embed. class (0, 1, 9)	Wood (%)	Plants (%)

Trans. #	Distance from left bank	Depth (ft)	Sub-strate	Embed. class (0, 1, 9)	Wood (%)	Plants (%)

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FIXED SITE TRANSECT HABITAT DATA SHEET, page 2 (reduced to fit on this page).

Stream Status and Trends Program

Fixed site transect habitat data sheet

Page ____of____

Revised 3/22/04

Water body and station: ____ Date: ____________

Trans. #	Distance from left bank	Depth (ft)	Sub-strate	Embed. class (0, 1, 9)	Wood (%)	Plants (%)	Trans. #	Distance from left bank	Depth (ft)	Sub-strate	Embed. class (0, 1, 9)	Wood (%)	Plants (%)

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DISCHARGE DATA SHEET FOR RIVERS GENERALLY <30' WIDE (reduced to fit on this page).

DNR

Stream Status and Trends Program

Discharge data sheet for rivers generally <30' wide

Revised 3/22/04

Water body: ______________________________

Station: ______________________________

Date: ________________

Crew: ______________________________

Description of discharge measurement transect location: ______________________________

GPS coordinates of discharge transect location[1]: Latitude ________________ Longitude ________________

Measure depths and velocities where the channel is straight, canal-like, and has laminar flow (not at bridges).
Distance from left bank is facing upstream, and depths are measured to a tenth of a foot.
Measure velocities at 0.6 times the depth. Example – If depth = 1.0 ft, the measure velocity at 0.6 ft below the water surface.
Set flow meter to average over 10 seconds.

Distance from left bank (ft)	Depth (ft)	Velocity (ft/s)
0		
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		

Distance from left bank (ft)	Depth (ft)	Velocity (ft/s)
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

[1]Record GPS coordinates of discharge transect location in decimal degrees to 5 places past the decimal.

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DISCHARGE DATA SHEET FOR RIVERS GENERALLY 30–60' WIDE (reduced to fit on this page).

DNR

Stream Status and Trends Program

Discharge data sheet for rivers generally 30-60' wide

Revised 3/22/04

Water body: ______________________________

Station: ______________________________

Date: ______________

Crew: ______________________________

Description of discharge measurement transect location: ______________________________

GPS coordinates of discharge transect location[1]: Latitude ______________ Longitude ______________

Measure depths and velocities where the channel is straight, canal-like, and has laminar flow (not at bridges).
Distance from left bank is facing upstream, and depths are measured to a tenth of a foot.
Measure velocities at 0.6 times the depth. Example – If depth = 1.0 ft, the measure velocity at 0.6 ft below the water surface.
Set flow meter to average over 10 seconds.

Distance from left bank (ft)	Depth (ft)	Velocity (ft/s)
0		
2		
4		
6		
8		
10		
12		
14		
16		
18		
20		
22		
24		
26		
28		
30		
32		
34		
36		
38		
40		

Distance from left bank (ft)	Depth (ft)	Velocity (ft/s)
42		
44		
46		
48		
50		
52		
54		
56		
58		
60		

[1]Record GPS coordinates of discharge transect location in decimal degrees to 5 places past the decimal.

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DISCHARGE DATA SHEET FOR RIVERS GENERALLY >60' WIDE (reduced to fit on this page).

DNR

Revised 3/22/04

Stream Status and Trends Program

Discharge data sheet for rivers generally >60' wide

Water body: ______________________

Station: ______________________

Date: ______________________

Crew: ______________________

Description of discharge measurement transect location: ______________________

GPS coordinates of discharge transect location[1]: Latitude ______________ Longitude ______________

Measure depths and velocities where the channel is straight, canal-like, and has laminar flow (not at bridges).
Distance from left bank is facing upstream, and depths are measured to a tenth of a foot.
Measure velocities at 0.6 times the depth. Example – If depth = 1.0 ft, the measure velocity at 0.6 ft below the water surface.
Set flow meter to average over 10 seconds.

Distance from left bank (ft)	Depth (ft)	Velocity (ft/s)
0		
3		
6		
9		
12		
15		
18		
21		
24		
27		
30		
33		
36		
39		
42		
45		
48		
51		
54		
57		
60		
63		
66		
69		
72		
75		
78		
81		
84		
87		
90		
93		
96		
99		
102		
105		
108		

Distance from left bank (ft)	Depth (ft)	Velocity (ft/s)
111		
114		
117		
120		
123		
126		
129		
132		
135		
138		
141		
144		
147		
150		
153		
156		
159		
162		
165		
168		
171		
174		
177		
180		
183		
186		
189		
192		
195		
198		
201		
204		
207		
210		
213		
216		
219		

[1]Record GPS coordinates of discharge transect location in decimal degrees to 5 places past the decimal.

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LARGE WOODY DEBRIS COUNT DATA SHEET (reduced to fit on this page).

DNR

Stream Status and Trends Program

Large woody debris count data sheet

Revised 3/22/04

Water body: ______________________________

Station: ______________________________

Date: ______________________________

Crew: ______________________________

Large woody debris - *Record individual logs at least 6' long in contact with water at least 6" deep. Measure portion of log in water 6+" deep.*
Note: Lengths of logs that are >12" dbh are measured from the base to the point on the log where diameter becomes <6".

Length classes (# of full 6' stick lengths – one mark per observation)

Dbh class	1	2	3	4	5	6	7	8+
>6"								
>6"								
>6"								
>6"								
>6"								
>12"								
>12"								
>12"								
>12"								
>12"								
>18"								
>18"								
>18"								
>24"								
>24"								

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Natural log jams, beaver dams, and brush deposits – *Record areal dimensions of each jam to the nearest 3'.*
Type codes: **LJN** – natural log jam, **BD** – beaver dam, **BrD** – brush deposit
Log jam definition: 3 or more large diameter (>6") intermingled logs in water at least 6" deep.

Individual log jam dimensions (length x width in ft)

Type	Length (ft)	Width (ft)	Type	Length (ft)	Width (ft)	Type	Length (ft)	Width (ft)

Artificial structures – *Record areal dimensions of each structure (lineal feet for wing deflectors).*
Type codes: **LJ** – log jam, **LS** – lunker structure, **R** – raft, **RR** – riprap, **S** – stump clumps, **W** – wing deflectors, **Log** – individual log
Only record area of structure in water >6" deep.

Type	Length (ft)	Width (ft)	Type	Length (ft)	Width (ft)	Type	Length (ft)	Width (ft)

TEMPERATURE LOGGER DEPLOYMENT (reduced to fit on this page).

DNR

Revised 3/22/04

Stream Status and Trends Program
Temperature Logger Deployment

Water body: ____________________ GPS[1]: Lat ______________ Long ______________

County: ______________________ T. ______ R. _______ Sec. ______ VSEC I.D. ______

Location description[2] (describe or map below):

Logger model: ________________ Logger number: ___________ Interval: 1 hour

Delayed start: Yes ☐ No ☐ If yes: Start date: ______ Start time: ______ AM ☐ PM ☐

Date deployed: _________ Time deployed: _______ AM ☐ PM ☐ Surface temp. (°F) ______

Date recovered: ________ Time recovered: _______ AM ☐ PM ☐ Surface temp. (°F) ______

Notes, maps, or additional comments:

[1]Record GPS coordinates of logger location in decimal degrees to 5 decimal places
[2]Note location of logger in relation to landmarks for future reference. Be specific.

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Appendix B

Instructions for using the ArcReader project to locate randomly selected river valley segments.

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Instructions for using the ArcReader project to locate randomly selected river valley segments.

1. Install ArcReader 8.3 from http://www.esri.com/software/arcgis/arcreader/download.html. You'll need administrative rights to complete the installation. Alternatively, you can have a microcomputer technician complete the installation for you.

2. Copy the "Random_Segment_Locator" folder from your office cd or the DNR Intranet to your hard drive.

3. Start ArcReader.

4. Open the file "Random Segment Locator.pmf" in the "Random_Segment_Locator" subdirectory on your hard drive.

5. Click on the "MI Streams Dissolved by FMUs" data layer in the left pane to highlight it (do not uncheck the box).

6. Click on the binocular icon or click on "Edit" and then on "Find".

7. From the "Find" screen, select "MI Streams Dissolved by FMUs" from the "In layers" pull-down menu. Under "Search" select "In fields" and "SEGMENT_ID".

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8. Enter the valley segment identification number from the random site list on the "Find" line and hit the "Find" button.

9. In the bottom window of the "Find" screen, click on the line showing the segment that was found. It will also flash and be highlighted on the map.

10. You can zoom in on the segment to see road crossings with the magnifying glass icon with the plus sign in it by drawing a square over the area of interest. Road names will appear if you zoom in far enough.

    Note: Since the intent of the random sampling portion of the Streams Status and Trends Program is to describe all the different river habitats in the state (rather than changes at a site over time), it is recommended that surveys occur at new access sites rather than previously-surveyed sites. If the entire valley segment is not publicly accessible, make a note and notify a SSTP coordinator (Wills or Zorn) so that the valley segment can be removed from the random site list. Do not conduct the survey.

11. You can zoom back to the previous selection by clicking on the icon that looks like a big, dark blue arrow pointing to the left.

12. Repeat steps 7 to 11 until all random segments have been located. If you find, over time, that you are falling behind on the list of random valley segments to be surveyed, don't panic. Simply continue where you left off on the list the previous year. The number of sites scheduled for completion will be adjusted through time as the SSTP progresses and personnel become more familiar with the sampling protocols.