AN ABSTRACT OF THE THESIS OF

Heidi V. Andersen for the degree of Master of Science in Fisheries Science presented on November 7, 2008.
Title: Transferability of Models to Predict Selection of Cover by Coastal Cutthroat Trout in Small Streams in Western Oregon, USA

Abstract approved:

Jason B. Dunham

We assessed use and selection of cover by coastal cutthroat trout (*Oncorhynchus clarkii clarkii)* in six headwater streams in three watersheds in western Oregon, USA during the summer low flow period from 1 August and September 30, 2007. We tagged 1037 coastal cutthroat trout (>100 mm) with passive integrated transponder (PIT) tags across all streams. Selection of cover was analyzed by comparing characteristics of locations used for concealment by relocated fish relative to characteristics of randomly available habitat that could be used for concealment. We measured habitat characteristics for 190 relocated individual fish using cover and 797 randomly points potentially available as cover. Of the latter points, only 235 of 797 were potential cover, based on characteristics of cover actually used by fish. In other words, 562 of the 797 randomly sampled points were unlikely to be used as cover by fish. Coastal cutthroat trout used substrate as cover (78%) more often than all other cover types combined (22%). Availability of different cover types was variable, but overall substrate made up 92% of available cover and the remaining 8% represented all other cover types combined. Habitat characteristics measured for both used and available cover included depth at fish location (cm), surface area of cover (m^2), proximity to depth of 20 cm for fish located in < 20 cm in depth, b-axis (mm) for substrate >2 mm, and distance under substrate. Each of these habitat characteristics was different for used and available cover (Wilcoxon rank-sum p-values all < 0.0001). Analysis of selection using logistic regression models indicated that cover use was more likely with increasing depth and surface area of cover. A negative interaction effect between the influences of depth and surface area suggested fish were more likely to use cover with smaller surface areas in deeper water. We found good transferability (i.e. predictive capabilities) of the logistic regression models across streams using three different methods: “leave-one-stream-out” cross validation, Cohen’s kappa statistic, and receiver operator characteristic curves. Our results suggested that characteristics of used cover were similar across six streams for coastal cutthroat trout in headwater streams. The strong and consistent influence of both depth and surface area of cover on selection of habitat by individual coastal cutthroat trout suggests these features of habitat may be critical to this species during summer low flows.

Transferability of Models to Predict Selection of Cover by Coastal Cutthroat Trout in Small Streams in Western Oregon, USA

by
Heidi V. Andersen

A THESIS

submitted to

Oregon State University

in partial fulfillment of
the requirements for the
degree of

Master of Science

Presented November 7, 2008
Commencement June 2009

Master of Science thesis of Heidi V. Andersen presented on November 7, 2008.

APPROVED:

Major Professor, representing Fisheries Science

Head of the Department of Fisheries and Wildlife

Dean of the Graduate School

I understand that my thesis will become part of the permanent collection of Oregon State University libraries. My signature below authorizes release of my thesis to any reader upon request.

Heidi V. Andersen, Author

ACKNOWLEDGEMENTS

First, I would like to thank my advisor, Jason Dunham, for being an excellent mentor and supporting me through all stages of my graduate program. Jason encouraged me to delve into the world of habitat selection, making my thesis research not only more challenging but more rewarding. I would like to thank my other committee members Kelly Burnett and Dan Rosenberg for helping me along the way with study design, answering questions, and general support. I would especially like to thank Kelly for teaching me that softball is more fun when played in a prom dress.

Many individuals and entities provided funding and support for this project which greatly enhanced my general well-being as a graduate student. The Oregon Department of Forestry, Weyerhaeuser Company, Roseburg Forest Products, and Plum Creek Timber Company provided support for my work in the Trask, Alsea, and Hinkle Creek watershed studies. Funding was provided through the OSU College of Forestry Fish and Wildlife Habitat in Managed Forests Research Program and the Watersheds Research Cooperative. I would like to thank Arne Skaugset for serving as the PI for this study. Additional funding was provided by USGS Forest Rangeland and Ecosystem Science Center (FRESC), The Washington County Fly Fishers, Oregon Chapter American Fisheries Society, Oregon Council of the Federation of Fly Fishers, and the Coombs-Simpson Memorial Scholarship. Thank you to the Department of Fisheries and Wildlife and the Biology Department for providing graduate teaching assistantships. In particular, I would like to thank Nancy Allen and Joe Beatty for helping me find teaching assistantships. Thanks to the Olympic National Forest for funding my SCEP position and to Bob Metzger for keeping up with the appropriate paperwork every time my plans changed (not an easy task).

Thanks to all the members of the Dunham lab. This project would not have been possible without Dave Leer and Steve Clark led who led the 2007 fish crew which spent many hours capturing and tagging fish. Mark Raggon, Hayden Howell, and Brooks Vandevelder helped with habitat measurements. Doug Bateman was always available to ponder why fish do what they do. Dave Hockman-Wert provided stellar database management and GIS maps. My fellow graduate students in the Dunham lab helped me with statistics, constructive reviews of presentations, SAS code, thesis editing, wedding planning, and other distractions that enhanced my time at OSU. Additional thanks go to all my fellow graduate students and friends, who are too numerous to mention here, for helping me stay relatively sane during my graduate program. Finally, I must acknowledge my family for always encouraging me to follow my dreams. The biggest thank you of all goes to my husband Eric for his love, support, and encouragement throughout the gradual school process.

CONTRIBUTION OF AUTHORS

Dr. Jason B. Dunham was involved in the study design, data analysis, and editing of all sections of this manuscript. Dave Hockman-Wert provided the map of stream locations in Chapter 2.

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CHAPTER 1

GENERAL INTRODUCTION

Coastal cutthroat trout is a widely distributed species, ranging from the Eel River in northern California to Prince William Sound in southern Alaska (Behnke 2002). Within river networks, coastal cutthroat trout occurs far upstream into small headwater streams (Hall et al. 1987). Within these streams cover is one of the least known aspects of habitat, yet potentially a critical feature for coastal cutthroat trout. Cover is often defined as a structure that provides the essential functions of predator avoidance, refuge from disturbances, and visual isolation from competitors (Allouche 2002). In small streams cover for fishes may be particularly limited during periods of low stream flow. When stream flows are reduced, predation may be a major factor in limiting survival of fishes (Power 1984, Power et al. 1985, Power 1987, Harvey 1991, Harvey and Stewart 1991, Matthews et al. 1994, Berger 2007). In the Pacific Northwest, availability of cover in small streams supporting coastal cutthroat trout may be impacted by land-uses such as urbanization, forestry practices, and road building (Trotter 1989, Reeves et al. 1997). In spite of the potential importance of instream cover to coastal cutthroat trout and relevance for management of stream habitats, little is known about the characteristics of cover that are important for this species.

In this study, we applied a resource selection approach to identify characteristics of instream cover used by coastal cutthroat trout, and to develop models to analyze selection of cover across multiple headwater streams in western Oregon. The specific objectives for this study were to 1) describe the characteristics of cover used by coastal cutthroat trout relative to available habitats, 2) develop models to predict selection of habitat based on these data, and 3) examine transferability of predictions from resource selection functions across streams. Chapter 2 of this thesis is a manuscript prepared for submission to a peer reviewed journal. Chapter 3 of this thesis provides some brief general conclusions.

CHAPTER 2

TRANSFERABILITY OF MODELS TO PREDICT SELECTION OF COVER BY COASTAL CUTTHROAT TROUT IN SMALL HEADWATER STREAMS IN WESTERN OREGON, USA

Introduction

Habitat is a central concept in ecology, yet one that has proven difficult to define (Hall et al. 1997). Most simply, habitat has been defined as the physical and environmental conditions required by a species for survival and reproduction (Block and Brennan 1993). Accordingly, organisms are expected to select habitats that maximize their individual fitness (Southwood 1977, Van Horne 1983, Railsback and Harvey 2002). In this view individuals are assumed to be more likely to occupy or use habitats that maximize their fitness, relative to available alternatives. The degree to which individuals selectively use habitats could be interpreted as a measure of “habitat quality” or “habitat requirements.” This idea has inspired a variety of new methods that define habitat or resource selection based on models which estimate the relationship among potential habitat variables and the individual’s probability of use. Such models are often referred to as resource selection functions (Boyce et al. 2002, Manly et al. 2002). Applications of resource selection functions have provided important insights, but many statistical and biological uncertainties remain (Strickland and McDonald 2006).

In practice one of the most obvious difficulties in using resource selection functions to define habitat requirements lies in identifying the roles of numerous biotic and abiotic factors that can influence habitat selection (Manly et al. 2002). Furthermore, temporal, spatial, or location-specific influences on availability of resources may be important (Wiens 1989, Arthur et al. 1996, Garshelis 2000, Boyce

2006). As a result, it has proven extremely difficult to develop models of habitat selection that can be applied outside of a single situation (Van Horne 2002). In other words, a model of habitat selection developed for one case may not transfer well to another. This poses significant problems for the applied relevance of habitat selection models (Araujo and Guisan 2006).

To be most relevant for applied purposes, predictions from models of habitat selection should be transferable, i.e. able to accurately predict independent events across many locations or over time periods (Angermeier et al. 2002, Araujo and Guisan 2006). For stream-living fishes, transferability of models may be limited by the variable influences of factors such as presence of predators (Gilliam and Fraser 1987, 2001), abundance of competitors (Hughes 1992), food and habitat availability (Rosenfeld et al. 2005), season, time of day and temperature (Hall et al. 1987, Hughes and Grand 2000). Part of the problem in developing models of habitat selection lies in understanding how organisms actually perceive and select habitat (Morris 1987). For example it is often possible to find associations between species responses and environmental variables, but such associations may lack biological relevance because the process of how or why individuals actually select habitat is unclear (Garshelis 2000). Such models may accurately predict patterns of habitat use in a particular location or during a particular time period, but may lack predictive ability in other cases (Van Horne 2002). Accordingly, more generalized or transferable predictive models should strive to include factors that reliably account for the underlying mechanisms of habitat selection (Schlosser 1998).

In this study, we developed models of habitat selection for coastal cutthroat trout (*Oncorhynchus clarkii clarkii*) in headwater streams in western Oregon and examined how well they performed across streams. Our focus was on selection of habitats during a specific time period (summer low-flow periods) when fish may be particularly vulnerable to predators (Heggenes and Borgstrom 1988, Power 1987, Harvey 1991). Whereas it is known that cover should be a critical component of habitat for stream fishes, characteristics of cover used to avoid predation are poorly understood (Allouche 2002). To better understand characteristics of cover used by coastal cutthroat trout, we quantified the use and selection of cover by individual fish. The specific objectives for this study were to 1) describe the characteristics of cover used by individual coastal cutthroat trout relative to available habitats, 2) develop models to predict selection of habitat based on these data, and 3) examine transferability of predictions from resource selection functions across streams.

Methods

Site Description

This study was conducted in the Oregon Coast Range in the Trask and Alsea River basins and in the foothills of the Cascade Mountains in the Umpqua River basin (Figure 2.1). There were four streams in the Trask River basin, one in the Alsea River basin, and one stream in the Hinkle Creek basin. Elevation in all three river basins ranged from 170 m to 1,251 m (Table 2.1). Geologic formations consisted mainly of marine sandstones and shale, with basaltic volcanic rock (Franklin and Dyrness 1988).

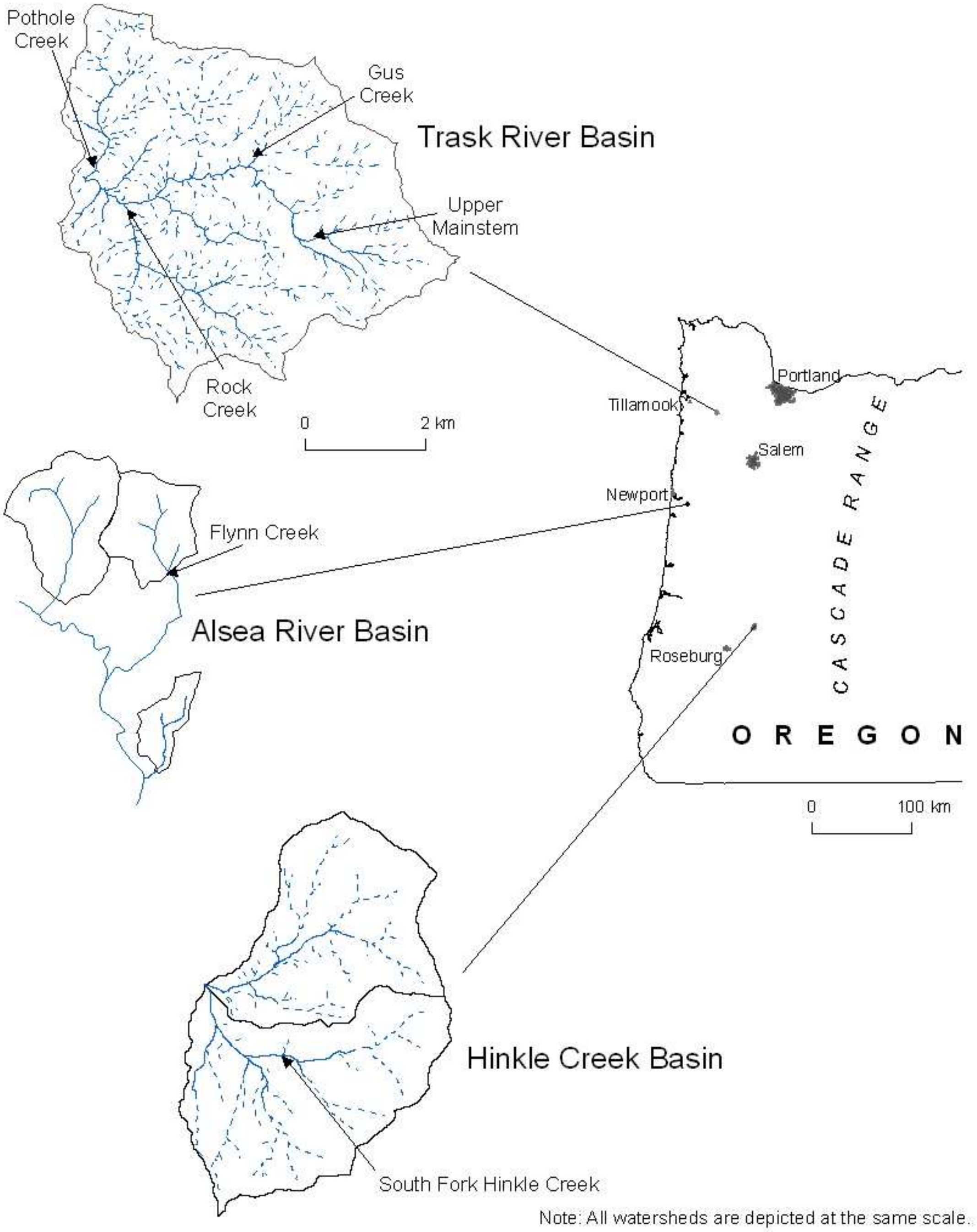

Figure 2.1. Names and locations of western Oregon streams sampled for this study. All watersheds depicted at the same scale.

The upland forest at these streams was dominated by Douglas fir (*Pseudotsuga menziesii*) with riparian vegetation consisting primarily of deciduous species including red alder (*Alnus rubra*), big leaf maple (*Acer macrophyllum*), vine maple (*Acer circinatum*), and salmonberry (*Rubus spectabilis*). All streams experience a maritime climate characterized by mild, wet winters (October –June) and cool, dry summers (July-September; Spies et al. 2002). Annual precipitation ranged from 150 to 500 cm, falling mainly in November, December, and January as rain, with snow at higher elevation (Nolin and Daly 2006). All streams were located in headwater areas near the upper extent of fish distribution. Headwater streams in these basins experienced a summer low-flow period for stream discharge from August to October, during this time habitat is greatly restricted for fishes. Coastal cutthroat trout, coho (*Oncorhynchus kisutch*), rainbow/steelhead trout (*Oncorhynchus mykiss*) and sculpin (*Cottus sp.*) were present in the study basins.

Table 2.1. Characteristics of six western Oregon streams (Figure 2.1) sampled over 1 August to 30 September, 2007.

Basin	Stream	Elevation (m)	Mean Wetted Width (m)	Species present
Trask	Gus Creek	463 – 1044	3.1	CT
Trask	Pothole Creek	324 – 807	2.7	CT, RB, CO, SC
Trask	Rock Creek	335 – 883	3.5	CT, RB, CO, SC
Trask	Upper Mainstem	608 – 966	3.0	CT, RB, SC
Alsea	Flynn Creek	170 – 435	1.8	CT, CO, SC
Hinkle	South Fork	428 – 1251	2.4	CT, SC

CT=coastal cutthroat trout, RB= rainbow trout, CO= coho salmon, SC = sculpin (*Cottus* sp.)

A variety of terrestrial mammalian, avian, and reptilian predators have been observed in western Oregon streams including raccoons (*Procyon lotor*), mink (*Mustela vison*), river otter (*Lutra canadensis***)**, blue heron (*Ardea herodias*), kingfisher (*Ceryle alcyon*), mergansers (*Mergus sp*.), and garter snakes (*Thamnophis sp*.), all of which could be important predators of coastal cutthroat trout (D. Bateman, Oregon State University, personal communication). Instream predators such as other fishes or amphibians may also be important (Schlosser 1987, Harvey and Stewart 1991). Thus, coastal cutthroat trout potentially face a broad range of threats from different predators. Pressure from these predators may be intensified during the summer low-flow period (Berger 2007), where loss of deeper water habitats and access to hiding cover may be substantial (Power 1987, Heggenes and Borgstrom 1988, Harvey 1991, Harvey and Stewart 1991).

Field Sampling

Sampling locations within the three river basins included six stream segments (hereafter referred to as streams), each approximately 200 – 560 m in length (Table 2.1) to represent a range of habitats and sufficient numbers of individual fish for measurement of used cover. Fish were captured by electrofishing in July 2007. At the time of initial capture, individual coastal cutthroat trout (≥ 100 mm) were implanted with 23 mm half duplex passive integrated transponder (PIT) tags. In Flynn Creek and Hinkle Creek fish were tagged as part of a concurrent study, so tagging occurred in longer stream segments than in the Trask watershed. Tagged fish were placed back into the stream. We waited a minimum of one week prior to collecting habitat characteristics for used and available habitat for this study to allow the fish to resume normal behavior after our initial capture. Sampling for used and available habitat occurred during the summer low-flow period from 1 August to 20 September 2007.

Used Cover

We were able to frighten fish by actively wading into streams and measuring characteristics of cover used by individual fish. We assumed this use of cover represented concealment or hiding behavior employed in response to actual predators (Caro 2005). To collect habitat characteristics of used cover we used two mobile PIT tag antennae to detect and precisely locate tagged individuals. For this study, cover was defined as any object that concealed a fish. One antenna was a portable half-duplex PIT tag antenna that detected tagged individuals within approximately 0.5 m of their location (Zydlewski et al. 2001). A portable stick antenna (RS320 Stick Reader Allflex USA, Inc., Texas)[1] was used to detect fish at a finer scale, within approximately 10 cm of their location in cover. Only fish remaining in cover (not visible from the surface and not moving) for a minimum of 20 seconds were recorded as using cover. Because tag detections could represent shed tags or mortalities, we attempted to touch fish when possible to ensure tag detections represented live

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[1] Use of firm or trade names is for reader information only and does not imply endorsement of any product or service by the United States Government.

animals. Streams were sampled a minimum of two times each for used cover (one pass in an upstream direction and another in a downstream direction), with the exception of each of the Trask River streams which were sampled three times. The order of sampling of streams was determined randomly to ensure temporal and spatial interspersion of sampling (See Appendix 4.0 –summer 2007 sampling schedule).

We considered a common set of characteristics for all study streams to describe cover used by individual tagged fish. These characteristics were, depth at fish location (cm), b-axis (mm; Kondolf 1997) of substrate and surface area of all used cover (m^2), proximity to depth of ≥ 20 cm (cm) was recorded for fish located in ≤ 20 cm in depth, whether substrate was embedded, and distance under substrate. Depth was measured because deeper water itself may serve as cover. Size (surface area) was measured to quantify cover in a way that is meaningful for a fish, rather than simply determining cover by “type” only. Proximity to depth was considered to account for the complementary influence of deep water on use of cover (Schlosser 1985, White and Rahel 2008). We hypothesized that fish should be more likely to use cover that is in or near depth (e.g., pools). We considered embeddedness because cover cannot be used by fish when the associated substrate becomes embedded, or surrounded by fine (<2 mm, b-axis) sediments (Platts et al. 1983). To further quantify the potential for fish to use substrate for cover, we also quantified the distance to which fish could potentially access underneath substrate. Even in cases where fines are abundant and substrate appears embedded, it is possible that small tunnels (e.g, excavated by other animals), fissures, or other points of access to cover are available.

A standard set of measurements was recorded for each cover characteristic used by a tagged fish. Depth (cm) was measured as close to the actual location of the fish as possible. For fish using depth ≤ 20 cm, the proximity to depth of 20 cm was recorded from the location of the fish to the nearest point, upstream and downstream, to a depth of ≥ 20 cm. The closer of the two distances (i.e. either upstream or downstream) was used for data analysis. We measured the b-axis diameter of substrate particles used by fish for cover (i.e. intermediate axis; Kondolf 1997). To quantify the degree to which the substrate was embedded, we recorded substrate as embedded when gravel, cobble, or boulder substrate had greater than 25% of surface covered by fine sediment (Platts et al. 1983) or if there was no access to interstitial space for fish to hide within. In addition, we quantified embeddedness by measuring the degree to which space underneath the substrate particle was available for concealment as indicated by the maximum distance to which a small diameter (5 mm) metal drain cable could be inserted underneath the substrate particle. For substrate particles, length corresponded to the a-axis (i.e. longest diameter of substrate particle) and the b-axis or median diameter of the substrate particle. For all other cover types, length was measured along the longest axis. In addition, three widths were measured for the portion of object providing cover for the fish. One measurement was taken at the longest width and two additional measurements at each end. Surface area was then calculated by multiplying the length by the average width.

In addition to measuring common characteristics of all used cover, we also classified cover type. Cover types were turbulence, large wood, woody material, undercut banks, substrate particle, vegetation, and detritus. Large wood included any piece of wood with a trunk longer than 3 m and at least 15 cm in diameter one-third of the way up from the base (Moore et al. 1999). The number of large wood pieces and whether the tree was live or dead was also noted. Turbulence was measured by lowering a 25 mm diameter Secchi disk (drawn on a hard piece of white plastic) from the surface of the water to the point at which the viewer lost sight of the black and white quadrants on the Secchi disk. Cover was recorded as turbulence when white water or bubbles obscured the overhead view of the Secchi disk. Substrate referred to sediments of any particle size used by a fish as cover, generally such particles were cobbles or boulders. Vegetation referred to instream vegetation and terrestrial vegetation overhanging within 40 cm of the stream surface (Inoue et al. 1997). Undercut banks were considered to be any portion of the stream that flowed under a bank, and were generally created by plants or tree roots. Detritus referred to benthic organic matter such as twigs and leaves that were a minimum of 2 cm in depth.

Available Habitat

Characteristics of random available habitat (potentially used as cover) were quantified by sampling random habitat points along transects perpendicular to the channel spaced every 2 m over the entire length of all streams. Measurements were the same as for characteristics of streams where fish were using cover. This design allowed for some randomness as well as interspersion of samples throughout each stream to provide a representative sample of available habitat. If characteristics of the available points were outside the range of those observed to be used by fish for cover in our study, the available point was not considered to represent potential cover and was recorded as “not cover.” Any randomly available points recorded as “not cover” with a surface area of cover smaller than $0.002m^2$ were removed from our analysis. Here after, these remaining points will be referred to as available cover.

Data Analysis

First, we compared used and available cover variables both within streams and for data pooled across streams using non-parametric Wilcoxon rank-sum tests (SAS version 9.1; SAS Institute Inc. 2004) for data that is not normally distributed. Explanatory variables were compared for used and available cover data; including depth (cm), surface area of cover (m^2), b-axis of boulders (mm), proximity to depth of 20 cm, and distance under substrate (cm). A significance level of 0.05 was used for all statistical tests (Moran 2003).

Selection of habitat presumably used for cover by coastal cutthroat trout was based on estimating the relative probability of use. Selection is the process by which the animal chooses the resource and use of a resource is said to be selective when that resource is used disproportionately to what is available (Johnson 1980, Manly et al. 2002). To estimate selection of cover by coastal cutthroat trout, we determined use of cover by individual fish and modeled relative probability of use relative to randomly available cover within each of the six streams (Manly et al. 2002). Our study followed the Manly et al. (2002) study design II which measures use for known individuals and availability for all individuals within a spatial frame of reference. The spatial frame we studied (200-560m) approximates the limited extent to which salmonids move during low-flow periods (Gowan and Fausch 2002, Gresswell and Hendricks 2007).

Use-availability studies can be applied to estimate a resource selection function that predicts the relative probability of use of a resource (Manly et al. 2002). An inherent assumption of use-availability studies is that available habitat is never used (i.e. used and available habitat are distinct categories), but this assumption is not always true. Habitat that is categorized as available may actually be used outside of the study period or if the study area is monitored more intensively (Johnson et al. 2006). The resulting overlap, referred to as “contamination”, precludes estimating the absolute proportion of used vs. available habitat for a given study area (Keating and Cherry 2004, Johnson et al. 2006). Since the absolute proportion of used vs. available habitat is not known for certain, the absolute probability of use can not be determined (Johnson et al. 2006). In spite of not predicting absolute probability of use, use-availability studies are still a robust tool for examining relative probabilities of habitat selection even when it is infeasible to sample all used and unused habitat for an individual animal.

We used logistic regression to analyze selection of cover by coastal cutthroat trout in our six study streams using use-availability data. The use of logistic regression to analyze use-selection data has been a source of recent discussion (Keating and Cherry 2004, Johnson et al. 2006). Keating and Cherry (2004) suggested that logistic regression can be used to develop a logistic discriminant function to evaluate and rank differences between habitat characteristics of used and available habitat, but cannot be used to develop a reliable resource selection function to predict the relative probability of use of a given habitat. This concern about logistic regression for use-availability data was further evaluated by Johnson and others (2006) who suggested that not only are use-availability studies valid, they are often the most appropriate method for exploring ecological interactions between species and their associated habitat.

With the preceding cautionary considerations in mind, we used logistic regression to model the relative probability of use of cover (= “selection”) for coastal cutthroat trout across three watersheds by comparing used and available cover across streams (Allison 1999, Manly et al. 2002). The model related selection of cover by coastal cutthroat trout to environmental variables, including characteristics of potentially used cover. Model fit for logistic regression models was assessed using the Hosmer-Lemeshow goodness-of-fit test (Hosmer and Lemeshow 2000) and the Pearson dispersion statistic (Allison 1999). We used Spearman rank correlation to examine collinearity between the environmental predictors. We omitted one predictor from each highly correlated pair ($r \geq 0.60$) to avoid multicolinearity. For pairs of predictors showing such high correlations, we retained those with the simplest and most direct biological interpretation related to our hypotheses about cover use.

The performance of the model (transferability) was examined across streams to evaluate how well the model predicted used vs. available cover in different streams. We used a “leave-one-stream-out” approach to examine transferability in which we removed one stream from the model and used the five remaining streams to predict use and availability for the removed stream. This process was repeated six times, such that each stream was removed from the model. We evaluated transferability using three methods: model cross validation, Cohen’s Kappa statistic, and receiver operator characteristic curves (ROC).

The first method we used to examine transferability of model predictions was a leave-one stream-out cross-validation among each of the six streams. With this procedure we systematically excluded one stream in fitting a model of habitat selection and then used the model to predict use of cover in the excluded stream. Model predictions of 0.50 or greater were considered “events” or predictions of “use” for comparison to actual observations (e.g., 0 = not used, 1 = used). This procedure was repeated six times, dropping one stream each time from the model and then evaluating the predictions for the dropped stream. The frequencies of correct predictions of used, available, and overall classification rates were summarized to evaluate model performance.

The second method for examining transferability was Cohen’s kappa which is a statistic used to measure the proportion of two possible outcomes that are correctly predicted by a model (Manel et al. 2001). We used Cohen’s kappa to determine how well our logistic regression model distinguished between used and available cover and thus how well our model transferred across the six streams. Cohen’s Kappa statistics require that a threshold is set (generally 0.5) to determine whether the resource is used or available, thus if the threshold is changed, the kappa statistic also changes. We determined the optimal threshold for predicting the use of cover with a classification table from our logistic regression models. The probability with the highest overall percent correct was used to determine which threshold to use for the Kappa statistic, this number is based on the number of correctly predicted events. Fielding and Bell (1997), suggested the following ranges of agreement for the Kappa statistic: poor $K < 0.4$; good $K= 0.4$ to 0.75, and excellent $K > 0.75$.

Receiver operator characteristic curves (ROC) evaluate model performance independent of the need to set a threshold value for distinguishing between used and available habitat (Fielding and Bell 1997, Manel et al. 2001, Gönan 2007). ROC curves are obtained by plotting sensitivity on the y-axis against the corresponding (1-specificity) for all possible threshold values (Fielding and Bell 1997, Manel et al. 2001). Sensitivity refers to the probability of a positive outcome (i.e. used cover) and specificity is the probability of a negative outcome (i.e. available habitat) (Agresti 2007). From the ROC plot, the area under the cover (AUC) is derived to assess model performance (Manel et al. 2001). We used PROC LOGISTIC in SAS to calculate the AUC values and the associated confidence intervals (Gönan 2007). AUC provides a single threshold-independent measure of overall model accuracy between 0.5 and 1.0 (Fielding and Bell 1997). Models with AUC values $\geq$ 0.8 are considered to have good agreement.

Results

We implanted 1037 coastal cutthroat trout ranging in fork length from 100 to 204 mm with PIT tags in all six streams (Table 2.2). The number of fish tagged in each stream was variable and ranged from a high of 388 fish in the South Fork of Hinkle Creek to a low of 63 fish in Pothole Creek. At the time of tagging the mean and standard deviation for fork length of fish at all streams was 121 mm ± 20. Between streams, the shortest mean fork length was observed in Rock Creek (114 mm) and the longest observed in Gus Creek (124 mm).

Table 2.2. Number of tagged fish, mean fork length, stream length, and number of used and available habitat samples for streams in six western Oregon streams. Used cover is provided as number of detections (number of uniquely identified fish).

Stream	# Fish Tagged	Fork Length	Stream Length Sampled (m)	Used Cover (*n*)	Available Points (*n*)
Gus Creek	251	124 ± 23	316	91 (59)	128
Pothole Creek	63	116 ± 13	224	19 (13)	102
Rock Creek	98	114 ± 14	286	47 (33)	107
Upper Mainstem	97	123 ± 20	200	74 (45)	82
Flynn Creek	139	118 ± 19	560	18 (15)	240
South Fork	388	123 ± 21	276	36 (25)	138
All Streams	1036	121 ± 20	1862	285 (190)	797

Used and Available Cover

From August 1 to September 15, 2007, we detected 285 fish using cover. These detections represented 190 individual fish. Coastal cutthroat trout used substrate as cover 220 times (78% of total detections) (Figure 2.2). Of these 220 detections of substrate, boulders made up 63% and cobble/gravel 15%. In contrast, all other cover types combined were used as cover for 22% of the total detections.

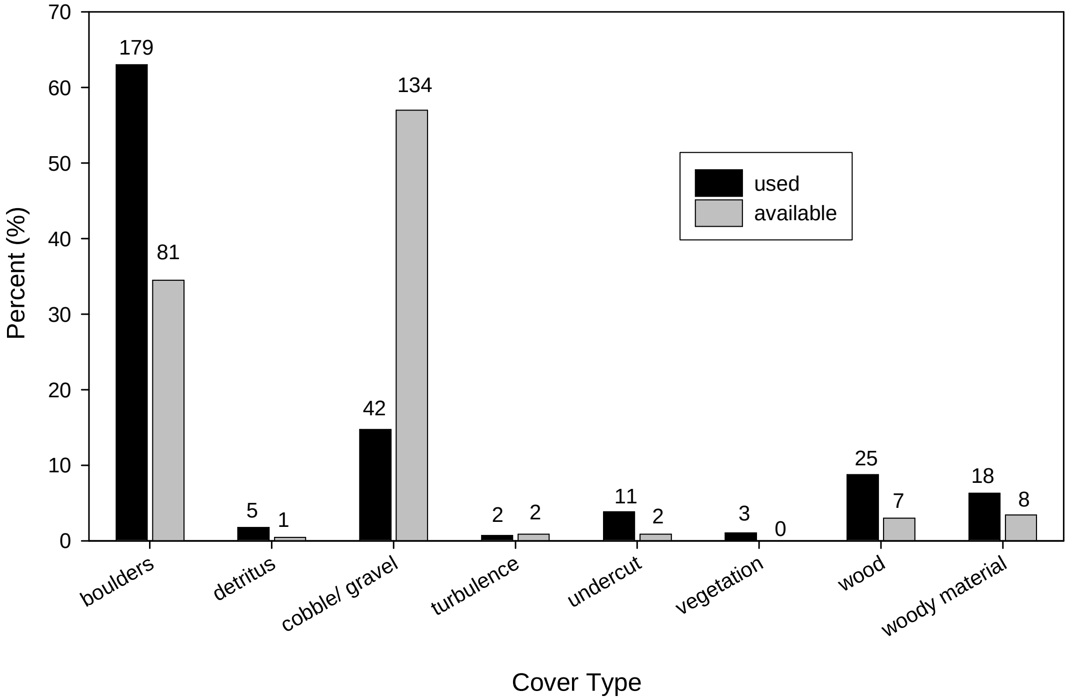

Figure 2.2. Coastal cutthroat trout used a wide variety of cover types, the cover type used most often was boulders in the six streams in Western Oregon during the study period of August to 30 September 2007. Numbers above the bars denote sample size.

Habitat characteristics and cover type were collected for 797 randomly available points. Of these points, 70% (562) were removed from data analysis because they did not represent available cover (hereafter not used). The smallest surface area of cover used by fish was 0.002m^2, thus to better represent what was available to fish for use as cover we removed all randomly available points with surface areas smaller than 0.002m^2 (Table 2.3). This reduced the number of available points to 235. For the remaining 235 available points (hereafter available cover), substrate represented the largest percent of available habitat at 92%. Of the available cover categorized as substrate, boulders accounted for 34% and cobble/ gravel represented 57%. All other cover types combined represented the remaining 8% of the available cover.

Characteristics of cover used by fish differed from the available cover across all streams (Figure2.3). All Wilcoxon rank sum p-values for used vs. available habitat were <0.0001, indicating a difference between means for depth, proximity to depth, surface area, b-axis of substrate, and distance under substrate (Table 2.3). Fish used deeper water than the randomly available cover (Table 2.5; Figure 2.4). Not only did fish use cover in deeper water, used cover was more proximate to areas of deep water than available cover (Figure 2.5). The furthest distance from deep water for used cover was 808 cm in contrast to available cover which was 3540 cm. Fish used cover with larger surface areas than the available cover (Figure 2.6). For fish using substrate as cover, the b-axis diameter was larger than available substrate. Not only was the substrate larger, the distance under the boulder (i.e. space available for hiding) was larger for used cover than available cover (Figure 2.7).

Table 2.3. Wilcoxon rank-sum test *z*-statistic and *P-values* for the comparison of used cover characteristics vs. available cover characteristics for six streams in Western Oregon during the study period of August to September 2007.

Variable	*z*	*P-value*
Depth (cm)	-6.54	0<0.0001
Proximity to depth 20cm (cm)	10.60	0<0.0001
Surface area of cover (m^2)	-10.44	0<0.0001
B-axis of substrate (mm)	-9.06	0<0.0001
Distance under substrate (cm)	-15.32	0<0.0001

Table 2.4. Summary of habitat characteristics for used cover, available and “not used” habitat (*n* = number of samples) for six streams in western, Oregon over the period of 1 August to 30 September 2007. Used refers to detections of fish using cover, available refers to randomly selected habitat points, and not used refers to randomly available habitat points removed from data analysis because the surface area of cover was less than 0.002m^2. The variables b-axis and distance under boulder refer only to cover categorized as substrate.

Variable	*n*	Mean	SD	Range
USED				
Depth (cm)	284	19.44	10.09	3-80
Proximity to depth 20cm (cm)	285	69.44	111.23	0-808
Surface area of cover (m^2)	282	0.76	1.39	0.002-7.2
B-axis of substrate (mm)	219	411.5	194.2	54-1310
Distance under substrate (cm)	219	29.4	14.5	4-109
AVAILABLE				
Depth (cm)	233	9.03	6.41	1-40
Proximity to depth 20cm (cm)	233	226.28	313.72	0-3540
Surface area of cover (m^2)	233	0.22	0.48	.003-4.15
B-axis of substrate (mm)	214	259.3	201.6	12-1200
Distance under substrate (cm)	215	7.1	13	0-90
NOT USED (removed points)				
Depth (cm)	564	9.04	8.06	0-57
Proximity to depth 20cm (cm)	564	266.09	350.44	0-2290
Surface area of cover (m^2)	562	0	0	0
B-axis of substrate (mm)	2	101.5	16.3	90-113
Distance under substrate (cm)	2	0	0	0

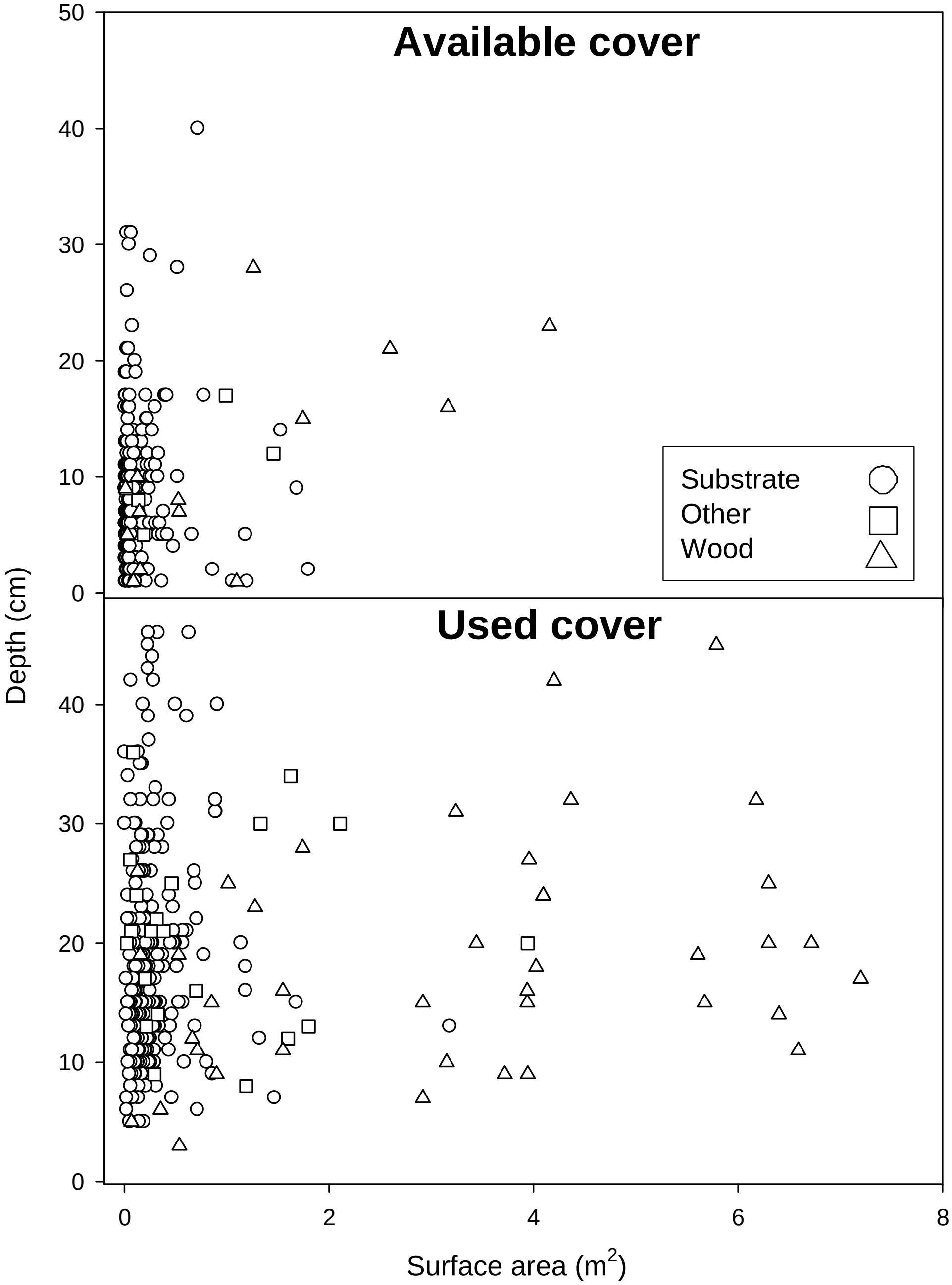

Figure 2.3. Relationship between surface area of cover and depth of used and available cover by cover type for six streams in western, Oregon over the period of 1 August to 30 September 2007. The top portion of the figure represents available cover and the bottom portion used cover. Note that wood refers to the cover types of both large wood and woody material. Other refers to turbulence, vegetation, undercut banks, and detritus.

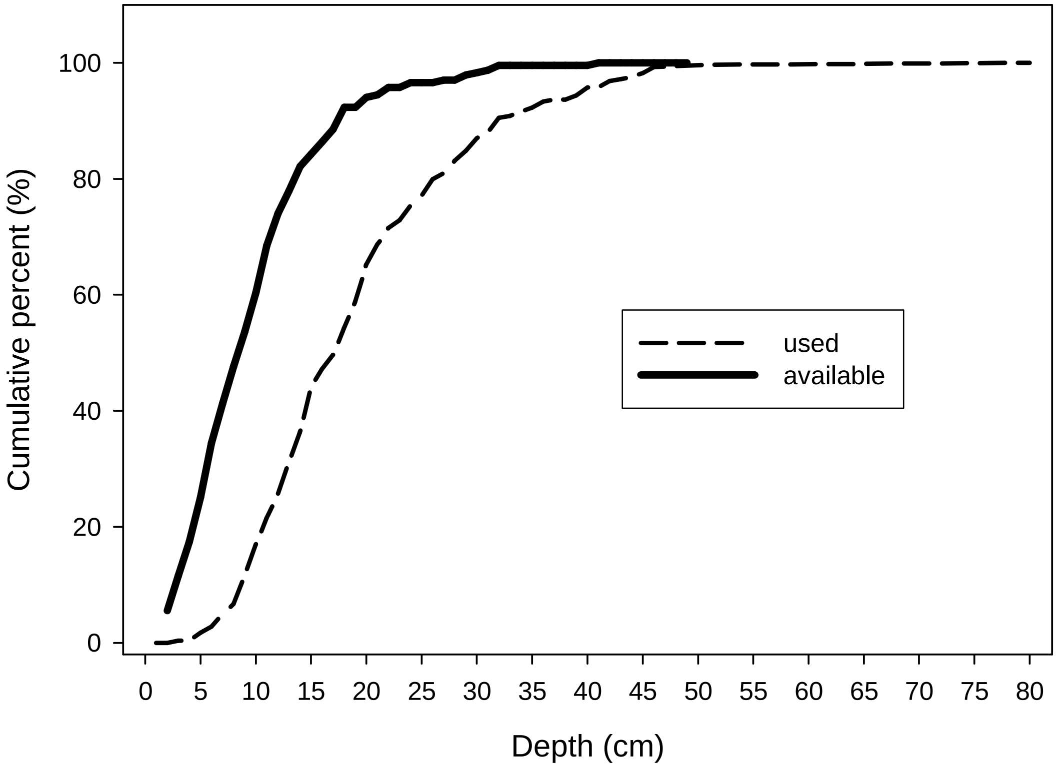

Figure 2.4. Cumulative percent of used and available cover by depth for coastal cutthroat trout in six streams in western, Oregon over the period of 1 August to 30 September 2007. Approximately 90% of available cover was located in water < 17 cm deep, in contrast to only 49% of used cover.

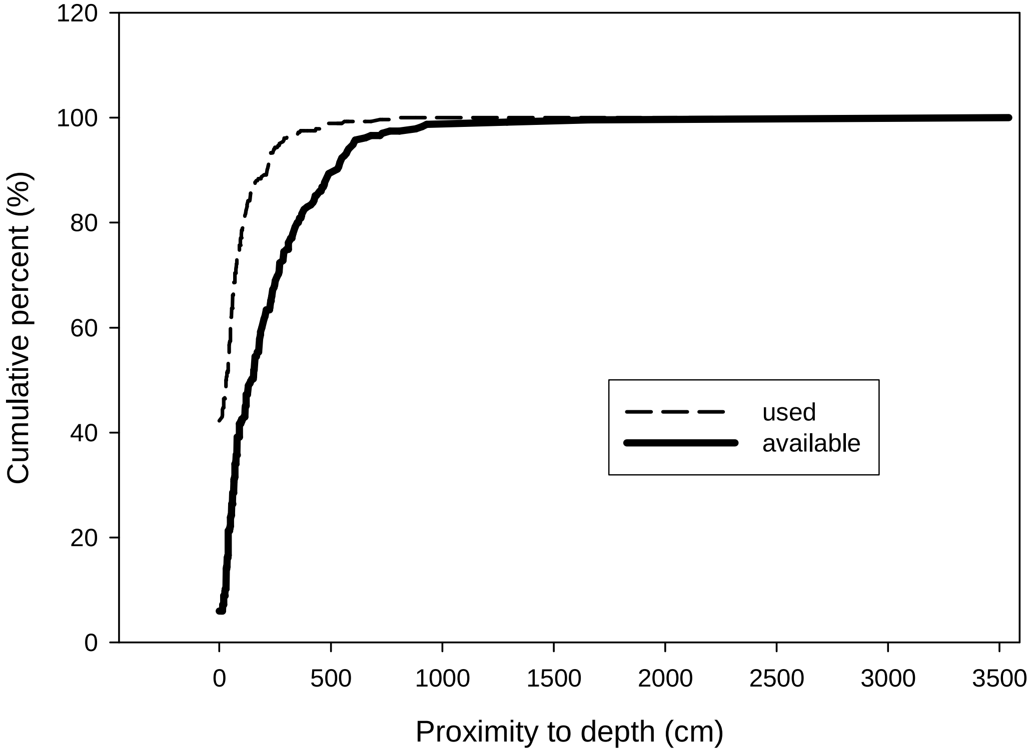

Figure 2.5. Cumulative percent of used and available cover by proximity to depth > 20 cm for coastal cutthroat trout in six streams in western, Oregon over the period of 1 August to 30 September 2007. Note that 40% of used cover was located in water 20cm deep and most used cover (90%) was located within 200 cm of deep water.

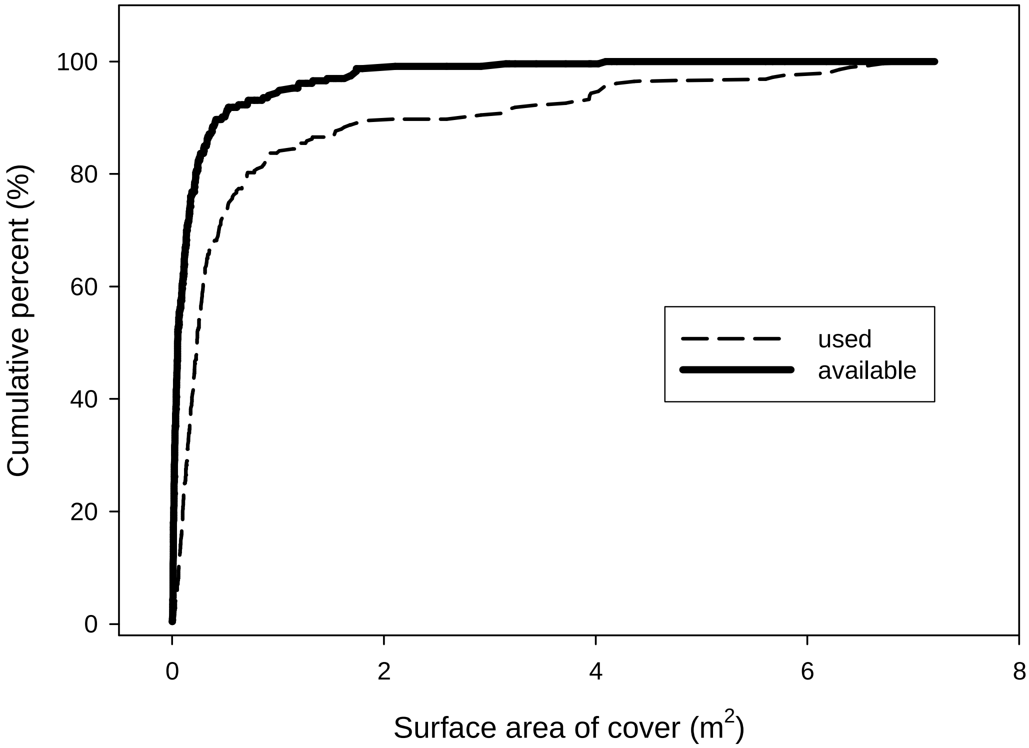

Figure 2.6. Cumulative percent of used and available cover by surface area of cover (m^2) for coastal cutthroat trout in six streams in western, Oregon over the period of 1 August to 30 September 2007. Approximately 90% of available cover was smaller than 0.5 m^2 whereas 70% of used cover was smaller than 0.5 m^2. Note that 0.5 m^2 is approximately equal to an object 28 cm (length) by 18 cm (width).

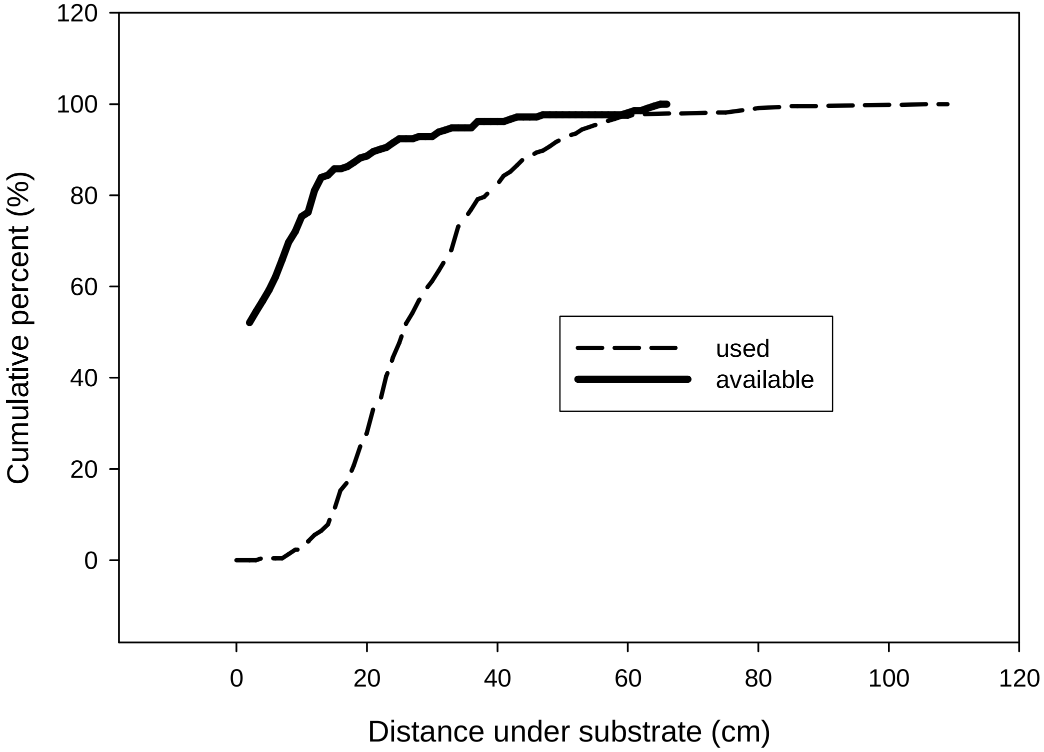

Figure 2.7. Cumulative percent of used and available cover by distance under substrate particle for coastal cutthroat trout using boulders and cobbles as cover in six streams in western, Oregon over the period of 1 August to 30 September 2007. Approximately 50% of available cover was embedded (i.e. zero distance) and over 75% had a distance under substrate <10cm.

Logistic Regression Model – Selection of cover

From the initial set of five variables (Table 2.4), we selected a subset representing statistically independent predictors to model and predict the relative probability of use of cover by individual coastal cutthroat trout. From this initial set of variables, we selected a final subset representing statistically independent predictors. Results of the Spearman's rank correlation indicated depth and proximity to depth of 20 cm were negatively associated ($r = -0.77$; $df = 515$; $p < 0.0001$). Surface area and depth were not highly correlated ($r = 0.37$; $df = 514$; $p < 0.0001$). Based on these results, we dropped proximity to depth from the model. The variables distance under boulder and b-axis were not included in the model because they were only collected when substrate was the cover type.

Selection of cover was analyzed using a logistic regression model. The variables used in the model included surface area of cover, water depth, and the interaction of these two terms (depth * surface area). Our first attempt at fitting the logistic regression model resulted in complete separation of the used and available data. When data is perfectly predicted, a logistic model can not be fit to the data (Allison 1999). We removed all available habitat points with surface area of cover less than 0.002m^2 because this was the smallest surface area of cover used by fish. Removal of these data points resulted in a better fit of the model and a more biologically relevant model because the removed points were likely not available for use as cover. Hosmer-Lemeshow goodness of fit ($X^2 = 11.38$; $df = 8$; $P = 0.18$) and

Pearson dispersion statistics ($X^2 = 497.22$; $df = 505$; $P = 0.59$) indicated a good fit for the model.

During the summer low flow period, selection of cover was positively associated with surface area of cover and depth, and negatively associated with the interaction between depth and surface area for all models (Table 2.5).

Table 2.5. Parameter estimates of logistic regression model for predicting cover selection by coastal cutthroat trout in six headwater streams, western Oregon, USA from August to September 2007. Note that all variables were transformed using log (Base 10).

Variable	Estimated Coefficient (β)	SE	*P* -value	Compared to available cover used cover…
Intercept	-7.79	0.84	<0.0001	No interpretation
Surface area	6.41	1.79	0.0003	had larger surface areas
Depth	2.97	0.32	<0.0001	was in deeper water
Depth * surface area	-1.82	0.64	0.004	had smaller surface areas when located in deeper water

Model Transferability

The overall percentage of correctly predicted values across all streams using the "leave-one-stream-out" cross validation was 83% for used cover and 74.2% for available cover (Table 2.6). Predicted values ≥ 0.5 were classified as used and values ≤ 0.49 were classified as available. Overall accuracy rates for distinguishing between used and available cover varied little when predictions were estimated for the stream excluded from the model, these values ranged from 77% to 80% for all models. Predictions of used cover were more accurate (81 to 86%) than the predictions of available cover (68 to 78%) for all streams. The optimal thresholds for distinguishing between used and available cover ranged from 0.44 to 0.62 (Table 2.7). Kappa statistics based on these optimal thresholds ranged from 0.55 to 0.66. The lowest AUC value (0.84) was for Flynn Creek and the highest for South Fork Hinkle Creek (0.90) (Table 2.7; Figure 2.8). Overall, predictive performance of the model was high across the six streams ranging from 0.84 to 0.86.

Table 2.6. Results of model cross validations using data from all streams to predict used and available cover (avail.). Cross validations between streams were conducted by using a model developed from all streams, removing one stream from the data, and then predicting the observations from the removed stream. The threshold value used to determine whether model predictions were categorized as used or available was 0.50.

Excluded Stream	Overall correct	Correct (used)	Incorrect (used)	% Correct (used)	Correct (avail.)	Incorrect (avail.)	% Correct (avail.)
None	0.79	235	47	83.3	173	63	74.2
Gus	0.78	220	62	78.0	184	49	78.9
Pothole	0.77	239	43	84.7	160	73	68.7
Rock	0.79	233	49	82.6	175	58	75.1
Upper Main	0.80	230	52	81.5	183	50	78.5
Flynn	0.79	241	41	85.4	166	67	71.2
South Fork	0.78	244	38	86.5	160	73	68.6

Table 2.7. Cohen's Kappa (optimal threshold) and AUC for used and available predictions, each stream was excluded from the model then this model was used to predict used cover and available cover.

Excluded Stream	Cohen's Kappa (optimal threshold)	AUC	AUC Confidence Intervals
None	0.59 (0.53)	0.86	0.83-0.89
Gus Creek	0.58 (0.45)	0.86	0.83-0.89
Pothole Creek	0.57 (0.56)	0.85	0.823-0.89
Rock Creek	0.59 (0.52)	0.86	0.823-0.89
Upper Mainstem	0.57 (0.50)	0.85	0.83-0.89
Flynn Creek	0.55 (0.55)	0.84	0.83-0.89
South Fork	0.66 (0.63)	0.90	0.82-0.90

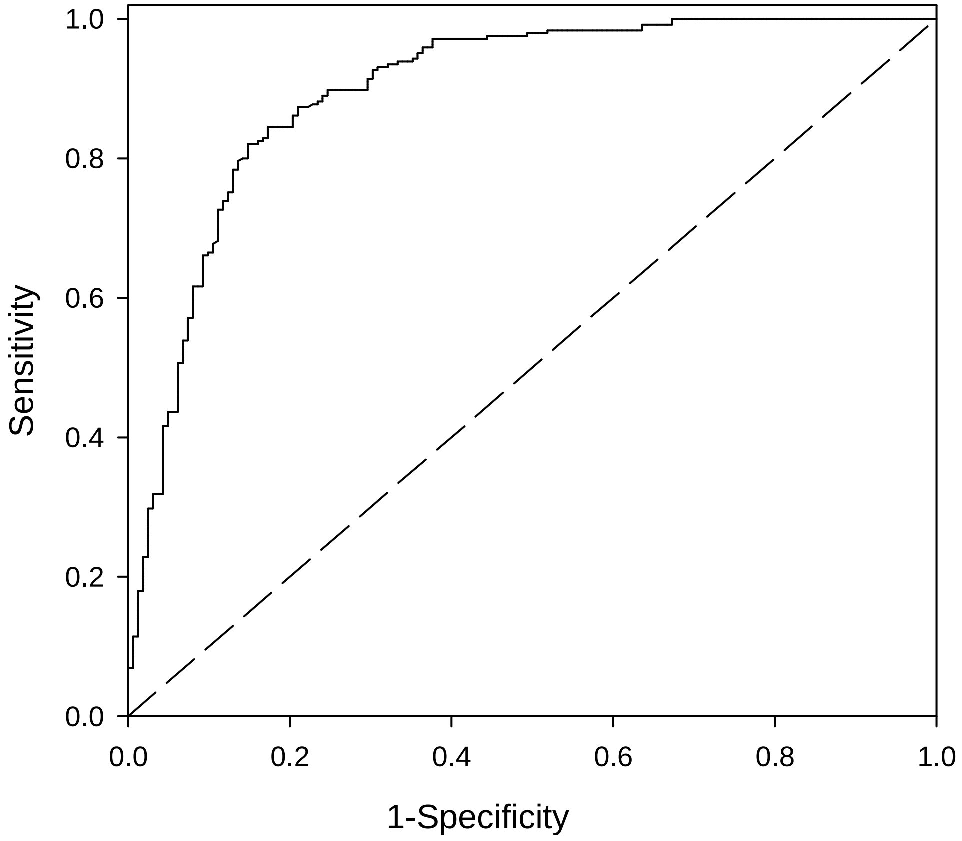

Figure 2.8. Example of a receiver operator characteristic (ROC) curve for the model which excludes the South Fork stream to test for model transferability between streams. The dashed line is the 45-degree line which represents a visual lower bound for the ROC curve.

Discussion

We found that coastal cutthroat trout used a wide range of cover types, but that substrate (cobbles and boulders) was by far the most dominant type used. General characteristics of cover used by coastal cutthroat trout differed from the characteristics of available cover. Depth, surface area of cover, and the interaction term (depth*surface area) were all significant predictors of cover used by coastal cutthroat trout. Despite both biotic and physical differences among streams, model predictions transferred well among them, suggesting common characteristics of cover that are important for coastal cutthroat trout in the streams we studied.

Among the six streams we studied, substrate was the most common type of cover used and more widely available. It is generally believed that salmonids use the interstitial spaces of substrate for concealment in streams (Bjornn and Reiser 1991). In this study, boulders were used more often than smaller substrate particles. Harvey et al. (1999) similarly found that boulders were commonly used by adult coastal cutthroat trout in fall and winter even when availability of such boulders was low. The importance of larger substrate such as boulders may explain why numbers of coastal cutthroat trout appear to be greater where instream boulders are more numerous (Novick 2005).

Larger substrates were clearly important for coastal cutthroat trout in this work. We found that the characteristics of boulders (and used substrate of other sizes) differed from characteristics of available cover. Boulders used by fish were larger in diameter and less embedded than available cover. Unembedded boulders seem to be more suitable for concealment than embedded substrate because fine sediments fill in the interstitial spaces leaving less space available for concealment, further reducing availability of cover during critical periods. Gries and Juaenes (1998) found that Atlantic salmon used only unembedded cobbles and boulders for cover during the day in summer. Previous studies have also described the importance of unembedded substrate for cover use by salmonids during winter months (Bustard and Narver 1975, Hillman et al. 1987). In addition to interstitial spaces for concealment, boulders help create pools and the turbulence created when water flows over the surface of boulders may provide a secondary form of cover (Allouche 2002). The presence of unembedded boulders during these ecological crunch times of summer low-flow and winter may be critical in streams that are limited by the availability of alternative cover types.

Whereas substrate was the most common type of cover used, fish in our study used other cover types such as detritus, turbulence, undercut banks, vegetation, woody material and large wood. The lack of availability of large wood in particular was marked. Where available, large wood is believed to provide many important benefits to fish habitat (Gregory et al. 2003), including pieces that provide instream cover directly, or indirectly through influencing channel morphology (Lewis 1969, Fausch and Northcote 1992, Montgomery et al. 2003). Coastal cutthroat trout are often associated with pools formed by large wood (Harvey et al. 1999, Rosenfeld et al. 2000). Similarly, where large wood was present in our study, fish also used it for cover. Inputs of large wood into streams depend on several factors, including land-use practices, natural disturbance regimes, and the age and species of available trees (Dolloff and Warren 2003, Czarnomski et al. 2008). With the exception of Flynn Creek, which has not been logged, each of our streams was affected by previous timber harvest practices, the legacy of which may account for the lack of large wood (Swanson and Lienkaemper 1978, Bilby and Bisson 2001). Improvements to contemporary forest practices (Northcote and Hartman 2004, Andrus 2008), and efforts to restore structural features of stream habitats created through natural recruitment of large wood (Roni et al. 2008a) may increase availability of cover to coastal cutthroat trout in the future.

Regardless of cover type, we found that coastal cutthroat trout selected cover with larger surface areas. Cover with larger surface area may provide better protection in the presence of an overhead predation threat from avian and terrestrial predators (Steinmetz et al. 2003). Werner et al. (1983) determined the presence of predators can influence cover use by fish. However, larger cover may also provide ambush spots for in-stream predators, keeping smaller fish from using cover and forcing them into shallower habitats (Power et al. 1985, Schlosser 1987, 1988, Angermeier 1992). In our streams, however, most instream predators (e.g., Pacific giant salamanders, other fish) were probably not large enough to consume fish of the size we studied (>100 mm, FL). Accordingly, we hypothesize that terrestrial predators are most important for larger coastal cutthroat trout in small streams during summer low-flows.

In addition to surface area, depth was also a significant predictor of cover selection. Previous studies of larger coastal cutthroat trout have also found higher abundance in deeper areas such as pool habitat (Bisson et al. 1988, Heggenes et al. 1991a, Lonzarich and Quinn 1995, Young 1996). The use of deeper pools by fish is likely attributed to the fact that larger fish are more susceptible to predation in shallow water (Power 1987, Harvey 1991). Terrestrial predators such as herons and raccoons catch fish more efficiently in shallower water and tend to feed on larger fish when possible in streams (Power 1987). Power (1984) found that depths of 20 cm or less are the most effective depth for feeding by birds, thus fish may avoid shallower water when possible. Although not focused on salmonids, an experimental study on Panamanian catfish in open pens found that the fish in water depths of 10-20 cm had much lower survival rates than those held in deeper water pens (Power et al. 1989). Larger trout may similarly be more susceptible to predation in shallow water (Heggenes and Borgstrom 1988, Northcote 1992, Connolly and Hall 1999) during the summer low-flow period when low streamflow can greatly reduce the availability of cover and deep water areas (Heggenes et al. 1991b, Lonzarich and Quinn 1995).

Refuge from predation is likely not the only explanation for use of deeper areas by larger fish in our study. Coastal cutthroat trout go through an ontogenetic shift from residing primarily in riffles as juveniles to pools as adults (Rosenfeld and Boss 2001), mechanisms for this shift may be related to feeding and growth rather than predation alone. The presence of lower velocity focal points next to faster currents in pools may provide greater feeding opportunities for fish by reducing energy expenditure (Fausch 1993). Furthermore, pools may increase prey availability for cutthroat in the form of smaller juvenile fish (Rosenfeld and Boss 2001).

Both depth and surface area were significant predictors of cover selection in our study, however, depth and surface area alone did not predict the selection of cover. This was because the interaction term of depth*surface area was also significant in our model. The negative sign of the interaction term (depth*surface area) suggested that fish were more likely to use larger (greater surface area) cover in shallow water. This may reflect the increased importance of instream cover as available space (e.g., depth) within streams decreases. Other studies have also found that depth and surface area jointly influence coastal cutthroat trout. Heggenes et al. (1991) quantified habitat selection and found a composite measure of depth and cover was the most important predictor of habitat selection for coastal cutthroat trout. Similarly, Lonzarich and Quinn (1995) found that a combination of depth and structure (i.e. cover) resulted in the highest overall fish densities and species richness in their study sites.

The relationships between instream cover, depth and relative probability of use were consistent with transferable model predictions across the six streams we studied. For a model to be transferable, it must be able to accurately predict independent events across locations or over different time periods (Angermeier et al. 2002, Araujo and Guisan 2006). In general, previous studies of the transferability of habitat selection models in fisheries have had mixed results; some models did not transfer well across locations (Bowlby and Roff 1986, Layher and Maughan 1987, Leftwich et al. 1997, Hubert and Rahel 1989,) while others were transferable across locations (Belaud et al. 1989, Guay et al. 2003).

For a model to transfer well, there must be a balance between being specific to the site of interest, yet general enough to transfer across locations. Often habitat selection models that transfer well across spatial scales are too general to accurately predict outcomes for the location in which the models were developed (Leftwich et al. 1997, Van Horne 2002). Reasons for the poor transferability of habitat selection models include studies conducted at the wrong scale for the desired outcome, not including multiple scales (Morris 1987, Boyce 2006), or simply measuring variables that are not significant for the species across scales (Garshelis 2000). Models of habitat selection developed in this work may have transferred well for several reasons, including 1) they addressed specific requirements for instream cover during a specific season (summer low-flow), and 2) measured use of cover at a fine scale of resolution (e.g., locations of fish determined within a 10 cm radius). Furthermore, our ability to detect habitat use without directly observing concealed fish via PIT tag detections avoided biases associated with methods such as underwater observation or electrofishing (Baltz et al. 1991).

While our models transferred well, there are still several assumptions inherent in our study design based on use-availability data that make determining absolute selection of cover by coastal cutthroat trout challenging. We likely underestimated use because we only had a single relocation for most individual fish. By only re-locating fish once, we were unable to determine whether fish used multiple areas for concealment. Additionally, we did not tag every coastal cutthroat trout $\geq$ 100 mm in the streams so we did not measure use of cover for every fish. Therefore we likely underestimated use because availability infers that available cover is not used by a fish during the study period (Johnson 1980, Manly et al. 2002). We can not eliminate the possibility of fish using the available habitat for other purposes during the study period. The overall effect on our model predictions is underestimation of the relative probability of use or selection of habitat (Boyce et al. 2002, Keating and Cherry 2004). However, our models did provide a measure of the relative degree to which habitats were selected (Manly et al. 2002) and were relevant for better understanding habitat requirements of coastal cutthroat trout. Estimates of absolute probabilities of selection are probably impossible to attain under most field conditions, but we were able to employ a resource selection approach in this study to develop a sensible and useful model of habitat selection.

This study helped elucidate the characteristics of cover used and selected by coastal cutthroat trout, but many questions still remain. Instream cover is believed to provide three main functions: protection against predators, visual isolation from competitors, and shelter from high water velocity, but distinguishing among these alternatives is a challenge (Fausch 1993, Allouche 2002). In the context of this work, we suggest predation is the most likely mechanism for cover use during the study period. We conducted our study during the summer low-flow period when cover is potentially the most limiting and the threat of predation is high. In summer, velocity refuges are of minor importance, especially in small headwater streams where stream flows are drastically reduced. Fausch (1993) provided evidence that predation is the mechanism driving cover use during the summer when he found that rainbow trout used habitat structures with overhead cover more often than structures with visual isolation alone or velocity refuge alone. If visual isolation was a factor of overriding importance, we would have expected to observe more fish using shallow water, where smaller obstructions and turbulence can create more visual barriers. We observed the opposite, with fish more likely to occur in deeper water or in proximity to deep water. Finally, during low-flows we would expect survival to be of paramount importance, as opposed to growth, as a factor contributing to the fitness of individual fish (Railsback and Harvey 2002). We cannot rule out visual isolation, but it is difficult to argue for its precedence over the importance of cover for predator avoidance during summer low-flows.

In this work, we have emphasized the importance of instream cover, but individuals may also use evasion to avoid predators. Though we did not quantify the number of fish using concealment vs. evasion in this study, evasion may be an important behavior. Evasion refers to a fish attempting to swim away from a predator rather than finding concealment in cover. During the summer low-flow period, opportunities for evasion may be limited for large fish because there is less available space in the small streams we studied. Thus concealing in cover may be a more efficient tactic to avoid predation during this period. Furthermore, evasion may be more important overall in streams larger than those studied herein. Future work to examine factors influencing the prevalence of these tactics and their consequences for survival of individuals would be instructive.

Further research is also needed to quantify selection of instream cover during other seasons or times of day. Our study was conducted during the summer low-flow period when cover is thought to be most limiting for coastal cutthroat trout; however, cover may also be crucial during other times of the year since habitat selection by coastal cutthroat trout can vary over days, seasons, and years. In winter, decisions on habitat selection may be based on minimizing energy expenditure (Cunjak 1996) rather than predation threat or metabolic requirements. However, other authors have found that stream-living salmonids may use substrate as cover more often in winter months to avoid predation or as a velocity shelter during high flows (Bustard and Narver 1975, Hillman et al. 1987, Griffith and Smith 1993). Heggenes et al. (1991) found that coastal cutthroat trout moved out of pools into shallower water during winter months.

In addition to seasonal variation, cover selection by coastal cutthroat trout may shift diurnally. Diurnal shifts in selection of cover are likely influenced by differences in feeding and predator activity (Railsback et al. 2005). Furthermore, selection of cover is likely different for small fish, which were not considered in this work. Since smaller fish are vulnerable to a wider range of predators (including larger fish) and are competitively inferior in contests for profitable positions within streams (Fausch et al. 1984), small fish are more likely to be forced into shallower habitats and stream margins (Moore and Gregory 1988) to avoid the threat of in-stream predators.

In conclusion we found that habitats presumably used for cover by coastal cutthroat trout during summer low-flows can be highly predictable across streams in western Oregon. Our model was based on a measure of cover that was developed on direct inferences from the use of cover measured at a fine scale. Patterns of selection for instream cover we observed likely represent the importance of concealment from predators, as survival of larger coastal cutthroat trout is lowest during summer low-flows in small headwater streams (Berger 2007). Instream cover can be restored or maintained by addition of larger substrate or wood and compliance with land use practices designed to minimize unnatural delivery of fine sediment to streams and allow natural recruitment of wood and larger sediment that can provide cover (Montgomery and Buffington 2001). The measures of cover we found, (i.e. surface area of cover, depth) can be used to evaluate stream conditions for fish and to monitor the effectiveness of restoration and land use treatments. Furthermore, by adapting a resource selection approach changes in availability and selection of instream cover by fish can be tracked over time or among locations as a response to these influences.

CHAPTER 3

GENERAL CONCLUSIONS

We developed a logistic regression model that predicted the relative probability of use of cover for coastal cutthroat trout in headwater streams based on easily measured habitat characteristics. Depth, surface area, and the interaction (depth*surface area) were used to predict relative probability of use of cover for coastal cutthroat trout in our study. We found that the logistic regression model with these habitat characteristics not only predicted use of cover well, it transferred strongly across streams. Strong model transferability suggests that we measured habitat characteristics for coastal cutthroat trout which are important across spatial scales.

Our results and those of previous studies suggest commonalities that should be considered when managing habitat for coastal cutthroat trout in small headwater streams. First, for fish >100 mm, depth is an important habitat characteristic (Bisson et al. 1988, Heggenes et al. 1991, Young 1996, Rosenfeld et al. 2000). Thus, it is essential to maintain pool habitat and water flow in small streams during critical periods such as the summer low-flow when cover is likely the most limited. Management practices such as removal of large wood can result in loss of obstructions in streams which help to create pools (Montgomery et al. 2003). In addition, chronic fine sediment input from roads and other sources can cause pools to fill in (Reeves et al. 1997), reducing habitat complexity in small streams (Fausch and Northcote 1992).

We also found that surface area or size of cover is an important predictor of cover use by coastal cutthroat in headwater streams. We found that fish select cover with larger surface areas as compared to what was available. Since many streams in western Oregon have been previously impacted by timber harvest and removal of large wood and boulders, the availability of cover with larger surface areas is likely to be limited while upland forests have time to regenerate and larger trees begin to find their way into streams. Accordingly, habitat restoration has considered shorter-term opportunities for large boulders to provide instream cover until natural recruitment of large wood is restored over decades (Roni et al. 2008b).

Our study does not tell the whole story of cover in streams. During the summer low flow period, use of cover by costal cutthroat trout was positively associated with surface area of cover and water depth. We predicted that predation is important for habitat selection during the summer low-flow period, but cover may play other important roles. For example, cover may be important to survival during other seasons, such as winter, when the mechanisms of cover use may change from predation to using cover as a velocity barrier from high flow events (Allouche 2002) characteristic of flow regimes in western Oregon. The role of cover during the winter months has been demonstrated in several studies that often invoke the importance of predators when stream flows are reduced (Cunjak and Power 1986, Hillman et al. 1987, Griffith and Smith 1993). Thus with the flashy flows common to western Oregon streams in winter, instream cover may provide protection from predators one day, and the next serve as an important velocity refuge or vice-versa.

In addition to exploring seasonal variation in the role and selection of cover by fish, further exploration of differences between size of fish and species would be illustrative for both further understanding of the ecology of fishes and management. Finally, testing a similar model on streams of various sizes could reveal the changing importance of instream cover to fish as other options for avoiding predators, such as evasion or schooling behaviors, may come into play.

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APPENDICES

Figure 4.0. Summer sampling schedule for six streams in western, Oregon over the period of 1 August to September 30 2007.

AUGUST

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
			Trask 1 Upper Main	Trask 2 Gus	Trask 3 Rock	4
5	Trask 6 Pothole	7	8	9	Trask 10 Rock	11
Trask 12 Gus	Trask 13 Upper Main	Trask 14 Pothole	15	16	17	18
Trask 19 Gus	Trask 20 UM and PH	Trask 21 Rock	22	23 Alsea	24 Hinkle	25
26	27	28 Hinkle	Trask 29 Gus - AV	Trask 30 Gus - AV	31 Alsea	

SEPTEMBER

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday
						1
2	3	Trask 4 UM - AV	Trask 5 UM/PH - AV	Trask 6 PH/Rock - AV	Trask 7 Rock - AV	8
9	10	11	12 Alsea -AV	13 Alsea - AV	14 Hinkle - AV	15
16	17	18	19	20	21	22
23	24	25	26	27	28	29
30						

Table 4.1. Summary of habitat characteristics for used cover (number of samples, mean, standard deviation, and range) for all streams. The variables b-axis and distance under boulder refer only to cover categorized as substrate.

Stream	Variable	*n*	Mean	SD	Range
Gus Creek	Depth (cm)	90	20.8	11.78	5-80
	Proximity to depth 20 cm (cm)	91	92.85	153.74	0-808
	Surface area of cover (m^2)	90	0.67	1.33	0.02-7.2
	B-axis of substrate (mm)	77	463.3	234.3	90-1310
	Distance under substrate (cm)	77	30.5	16.2	9-109
Pothole Creek	Depth (cm)	19	16.36	5.48	8-30
	Proximity to depth 20 cm (cm)	19	88.78	109.62	0-460
	Surface area of cover (m^2)	19	1.71	2.55	0.04-6.71
	B-axis of substrate (mm)	11	338.6	93.2	190-460
	Distance under substrate (cm)	11	24.2	13.5	4-48
Rock Creek	Depth (cm)	47	20.08	9.07	7-46
	Proximity to depth 20 cm (cm)	47	33.44	48.35	0-231
	Surface area of cover (m^2)	47	0.26	0.16	0.06-0.63
	B-axis of substrate (mm)	45	429.1	131.6	160-710
	Distance under substrate (cm)	45	35.2	17.2	12-86
Upper Mainstem	Depth (cm)	74	17.95	7.58	3-36
	Proximity to depth 20 cm (cm)	74	66.31	97.35	0-455
	Surface area of cover (m^2)	73	0.92	1.43	0.002-5.67
	B-axis of substrate (mm)	44	345.2	164.2	54-880
	Distance under substrate (cm)	45	23.2	8.9	8-51
Flynn Creek	Depth (cm)	18	22.11	11.48	9-42
	Proximity to depth 20 cm (cm)	18	34.83	42.20	0-110
	Surface area of cover (m^2)	17	1.99	1.82	0.08-6.17
	B-axis of substrate (mm)	6	550	171.8	260-700
	Distance under substrate (cm)	7	32.3	9.5	21-49
South Fork	Depth (cm)	36	18.52	11.96	5-46
	Proximity to depth 20 cm (cm)	36	70.77	75.62	0-270
	Surface area of cover (m^2)	36	0.22	0.22	0.01-1.32
	B-axis of substrate (mm)	36	359.2	192.5	90-1130
	Distance under substrate (cm)	36	28.6	12.2	8-61
All Streams	Depth (cm)	284	19.44	10.09	3-80
	Proximity to depth 20 cm (cm)	285	69.44	111.23	0-808
	Surface area of cover (m^2)	282	0.76	1.39	0.002-7.2
	B-axis of substrate (mm)	219	411.5	195.2	54-1310
	Distance under substrate (cm)	221	29.4	14.7	4-109

Table 4.2. Summary of habitat characteristics for all available cover measurements (number of samples, mean, standard deviation, and range) for all streams. This table includes available habitat points including those with surface areas < 0.002 (m^2).

Stream	Variable	*n*	Mean	SD	Range
Gus Creek	Depth (cm)	128	8.57	9.86	1-57
	Proximity to depth 20 cm (cm)	128	173.88	177.27	0-840
	Surface area of cover (m^2)	128	0.12	0.50	0-4.15
	B-axis of substrate (mm)	49	211.57	192.75	4-1200
	Distance under substrate (cm)	128	4.17	14.38	0-90
Pothole Creek	Depth (cm)	102	9.09	6.82	1-37
	Proximity to depth 20 cm (cm)	102	268.28	233.28	0-1054
	Surface area of cover (m^2)	102	0.01	0.05	0-0.53
	B-axis of substrate (mm)	67	71.27	74.95	5-520
	Distance under substrate (cm)	102	0.63	2.21	0-12
Rock Creek	Depth (cm)	107	12.17	8.00	1-43
	Proximity to depth 20 cm (cm)	107	90.54	82.01	0-340
	Surface area of cover (m^2)	106	0.03	0.07	0-0.32
	B-axis of substrate (mm)	54	140.96	131.28	9-502
	Distance under substrate (cm)	107	1.35	4.49	0-30
Upper Mainstem	Depth (cm)	82	9.03	6.78	1-38
	Proximity to depth 20 cm (cm)	82	240.08	199.75	0-765
	Surface area of cover (m^2)	82	0.06	0.29	0-2.59
	B-axis of substrate (mm)	62	104.02	107.48	5-510
	Distance under substrate (cm)	82	1.30	3.30	0-18
Flynn Creek	Depth (cm)	240	7.06	6.21	1-34
	Proximity to depth 20 cm (cm)	240	445.05	509.66	0-3540
	Surface area of cover (m^2)	240	0.05	0.22	0-1.74
	B-axis of substrate (mm)	152	79.43	101.85	4-800
	Distance under substrate (cm)	240	1.28	5.24	0-42
South Fork	Depth (cm)	138	10.44	11.96	1-37
	Proximity to depth 20 cm (cm)	138	123.12	75.62	0-680
	Surface area of cover (m^2)	137	0.10	0.22	0-1.68
	B-axis of substrate (mm)	125	183.25	192.51	4-1140
	Distance under substrate (cm	138	2.65	12.18	0-36
All Streams	Depth (cm)	797	9.04	7.61	1-57
	Proximity to depth 20 cm (cm)	797	254.45	340.4	0-3540
	Surface area of cover (m^2)	795	0.06	0.28	0-4.15
	B-axis of substrate (mm)	509	126.15	152.58	4-1200
	Distance under substrate (cm)	797	1.91	7.42	0-90

Table 4.3. Summary of habitat characteristics for used cover, available and “not used” habitat with repeat detections of individual fish removed (*n* = number of samples) for six streams in western, Oregon over the period of 1 August to 30 September 2007. Used refers to detections of fish using cover, available refers to randomly selected habitat points, and not used refers to randomly available habitat points removed from data analysis because the surface area of cover was less than $0.002m^2$. The variables b-axis and distance under boulder refer only to cover categorized as substrate.

Variable	*n*	Mean	SD	Range
USED COVER				
Depth (cm)	189	19.87	10.99	3-80
Proximity to depth 20 cm (cm)	190	71.04	108.92	0-720
Surface area of cover (m^2)	187	0.71	1.35	0.002-7.2
B-axis of substrate (mm)	146	400	190.9	54-1310
Distance under substrate (cm)	146	29.4	14.7	4-109
AVAILABLE				
Depth (cm)	233	9.03	6.41	1-40
Proximity to depth 20cm (cm)	233	226.28	313.72	0-3540
Surface area of cover (m^2)	233	0.22	0.48	.003-4.15
B-axis of substrate (mm)	214	259.3	201.6	12-1200
Distance under substrate (cm)	215	7.1	13	0-90
NOT USED (removed points)				
Depth (cm)	564	9.04	8.06	0-57
Proximity to depth 20cm (cm)	564	266.09	350.44	0-2290
Surface area of cover (m^2)	562	0	0	0
B-axis of substrate (mm)	2	101.5	16.3	90-113
Distance under substrate (cm)	2	0	0	0

Table 4.4. Parameter estimates of logistic regression model for predicting cover selection by coastal cutthroat trout in six headwater streams, western Oregon, USA from August to 30 September 2007 with repeat detections of individual fish removed. Note that all variables were log transformed.

Variable	Estimated Coefficient (β)	SE	p-value	Compared to available cover used cover…
Intercept	-7.74	0.86	<0.0001	No interpretation
Surface area	65.95	1.71	0.0005	had larger surface areas
Depth	2.82	0.32	<0.0001	was deeper
Depth * surface area	-1.72	0.60	0.0045	had smaller surface areas when located in deeper water

Table 4.5. Results of model cross validations using data from all streams to predict used and available cover (avail.) with all repeat detections of individual fish removed. Cross validations between streams were conducted by using a model developed from all streams, removing one stream from the data, and then predicting the observations from the removed stream. The threshold value used to determine whether model predictions were categorized as used or available was 0.50.

Excluded Stream	Overall correct	Correct (used)	Incorrect (used)	% Correct (used)	Correct (avail.)	Incorrect (avail.)	% Correct (avail.)
None	0.78	138	49	73.7	190	43	81.5
Gus Creek	0.77	126	61	67.3	197	36	84.5
Pothole Creek	0.78	139	48	74.3	189	44	81.0
Rock Creek	0.77	133	54	71.1	191	42	81.9
Upper Mainstem	0.75	125	62	66.8	193	40	82.8
Flynn Creek	0.73	122	65	65.2	186	47	79.8
South Fork	0.77	151	36	80.7	174	59	74.6

Table 4.6. Cohen's Kappa (optimal threshold) and AUC for used and available predictions, each stream was excluded from the model then this model was used to predict used and available cover, in addition all repeat detections of individual fish were removed for this analysis.

Excluded Stream	Cohen's Kappa (optimal threshold)	AUC	AUC Confidence Intervals
None	0.59 (0.53)	0.855	0.819-0.890
Gus Creek	0.58 (0.44)	0.851	0.819-0.890
Pothole Creek	0.57 (0.55)	0.849	0.820-0.890
Rock Creek	0.59 (0.52)	0.857	0.820-0.890
Upper Mainstem	0.57 (0.50)	0.852	0.821-0.891
Flynn Creek	0.55 (0.55)	0.835	0.820-0.890
South Fork	0.57 (0.51)	0.893	0.817-0.889

Table 4.7. Raw data from 1 August to 30 September, 2007 for all six streams in western, Oregon.

observation#	date	watershed	site	tagnumber	species	forklength	response	type	sa
1	8/29/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.10800000
2	8/30/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.12000000
3	8/30/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.16240000
4	8/29/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.16340000
5	8/29/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.17630000
6	8/30/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.24200000
7	8/29/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.33600000
8	8/29/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.34770000
9	8/30/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.37500000
10	8/30/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.42000000
11	8/30/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.65800000
12	8/29/2007	Trask	Bob and Sherri	na	na	na	0	boulder	0.72000000
13	8/30/2007	Trask	Bob and Sherri	na	na	na	0	boulder	1.05760000
14	8/30/2007	Trask	Bob and Sherri	na	na	na	0	boulder	1.80000000
15	8/12/2007	Trask	Bob and Sherri	93430	CT	123	1	boulder	0.08100000
16	8/2/2007	Trask	Bob and Sherri	94762	CT	125	1	boulder	0.08580000
17	8/12/2007	Trask	Bob and Sherri	94720	CT	143	1	boulder	0.09000000
18	8/12/2007	Trask	Bob and Sherri	94762	CT	125	1	boulder	0.09360000
19	8/2/2007	Trask	Bob and Sherri	93430	CT	123	1	boulder	0.09450000
20	8/2/2007	Trask	Bob and Sherri	94758	CT	134	1	boulder	0.10125000
21	8/2/2007	Trask	Bob and Sherri	94761	CT	129	1	boulder	0.10560000
22	8/12/2007	Trask	Bob and Sherri	93334	CT	131	1	boulder	0.11070000
23	8/12/2007	Trask	Bob and Sherri	94769	CT	119	1	boulder	0.11115000
24	8/12/2007	Trask	Bob and Sherri	94762	CT	125	1	boulder	0.11880000
25	8/2/2007	Trask	Bob and Sherri	94779	CT	143	1	boulder	0.12925000
26	8/12/2007	Trask	Bob and Sherri	94743	CT	112	1	boulder	0.13200000
27	8/2/2007	Trask	Bob and Sherri	94766	CT	169	1	boulder	0.13530000
28	8/12/2007	Trask	Bob and Sherri	93387	CT	104	1	boulder	0.14100000

29	8/12/2007	Trask	Bob and Sherri	94755	CT	107	1	boulder	0.14280000
30	8/12/2007	Trask	Bob and Sherri	94762	CT	125	1	boulder	0.14500000
31	8/12/2007	Trask	Bob and Sherri	93384	CT	102	1	boulder	0.16500000
32	8/12/2007	Trask	Bob and Sherri	93393	CT	102	1	boulder	0.16740000
33	8/19/2007	Trask	Bob and Sherri	93510	CT	100	1	boulder	0.17200000
34	8/2/2007	Trask	Bob and Sherri	93319	CT	101	1	boulder	0.17640000
35	8/2/2007	Trask	Bob and Sherri	93371	CT	117	1	boulder	0.17860000
36	8/19/2007	Trask	Bob and Sherri	93323	CT	117	1	boulder	0.18150000
37	8/12/2007	Trask	Bob and Sherri	93353	CT	121	1	boulder	0.18620000
38	8/12/2007	Trask	Bob and Sherri	94748	CT	110	1	boulder	0.18870000
39	8/2/2007	Trask	Bob and Sherri	94753	CT	103	1	boulder	0.20060000
40	8/12/2007	Trask	Bob and Sherri	94746	CT	114	1	boulder	0.20160000
41	8/12/2007	Trask	Bob and Sherri	93510	CT	100	1	boulder	0.20210000
42	8/12/2007	Trask	Bob and Sherri	94758	CT	134	1	boulder	0.21000000
43	8/2/2007	Trask	Bob and Sherri	94770	CT	102	1	boulder	0.21840000
44	8/2/2007	Trask	Bob and Sherri	93410	CT	148	1	boulder	0.23460000
45	8/19/2007	Trask	Bob and Sherri	94762	CT	125	1	boulder	0.23460000
46	8/12/2007	Trask	Bob and Sherri	93321	CT	114	1	boulder	0.23560000
47	8/2/2007	Trask	Bob and Sherri	93403	CT	115	1	boulder	0.23560000
48	8/19/2007	Trask	Bob and Sherri	93366	CT	114	1	boulder	0.23760000
49	8/12/2007	Trask	Bob and Sherri	94703	CT	204	1	boulder	0.24180000
50	8/2/2007	Trask	Bob and Sherri	93401	CT	178	1	boulder	0.25550000
51	8/12/2007	Trask	Bob and Sherri	94724	CT	100	1	boulder	0.25600000
52	8/2/2007	Trask	Bob and Sherri	94714	CT	126	1	boulder	0.25740000
53	8/12/2007	Trask	Bob and Sherri	93435	CT	138	1	boulder	0.26600000
54	8/12/2007	Trask	Bob and Sherri	93396	CT	127	1	boulder	0.27500000
55	8/2/2007	Trask	Bob and Sherri	93374	CT	106	1	boulder	0.28500000
56	8/2/2007	Trask	Bob and Sherri	94750	CT	119	1	boulder	0.28710000
57	8/19/2007	Trask	Bob and Sherri	94740	CT	112	1	boulder	0.30150000
58	8/2/2007	Trask	Bob and Sherri	94735	CT	105	1	boulder	0.33150000
59	8/12/2007	Trask	Bob and Sherri	93403	CT	115	1	boulder	0.33800000
60	8/19/2007	Trask	Bob and Sherri	93395	CT	104	1	boulder	0.37720000

61	8/12/2007	Trask	Bob and Sherri	93316	CT	113	1	boulder	0.42630000
62	8/12/2007	Trask	Bob and Sherri	94735	CT	105	1	boulder	0.44100000
63	8/2/2007	Trask	Bob and Sherri	94716	CT	116	1	boulder	0.44240000
64	8/2/2007	Trask	Bob and Sherri	93345	CT	103	1	boulder	0.46360000
65	8/2/2007	Trask	Bob and Sherri	93360	CT	103	1	boulder	0.49840000
66	8/2/2007	Trask	Bob and Sherri	93363	CT	120	1	boulder	0.53200000
67	8/12/2007	Trask	Bob and Sherri	94714	CT	126	1	boulder	0.58480000
68	8/2/2007	Trask	Bob and Sherri	94771	CT	120	1	boulder	0.68340000
69	8/12/2007	Trask	Bob and Sherri	94716	CT	116	1	boulder	0.69010000
70	8/19/2007	Trask	Bob and Sherri	94771	CT	120	1	boulder	0.69345000
71	8/12/2007	Trask	Bob and Sherri	94751	CT	103	1	boulder	0.70810000
72	8/2/2007	Trask	Bob and Sherri	94772	CT	104	1	boulder	0.71440000
73	8/2/2007	Trask	Bob and Sherri	94772	CT	104	1	boulder	0.77700000
74	8/12/2007	Trask	Bob and Sherri	94740	CT	112	1	boulder	0.80500000
75	8/2/2007	Trask	Bob and Sherri	94732	CT	116	1	boulder	0.89280000
76	8/2/2007	Trask	Bob and Sherri	94742	CT	124	1	boulder	0.89280000
77	8/19/2007	Trask	Bob and Sherri	94742	CT	123	1	boulder	0.89680000
78	8/12/2007	Trask	Bob and Sherri	93363	CT	120	1	boulder	1.14000000
79	8/2/2007	Trask	Bob and Sherri	94721	CT	132	1	boulder	1.18490000
80	8/12/2007	Trask	Bob and Sherri	93387	CT	104	1	boulder	1.18500000
81	8/2/2007	Trask	Bob and Sherri	94702	CT	132	1	boulder	1.46730000
82	8/12/2007	Trask	Bob and Sherri	94763	CT	110	1	boulder	1.68000000
83	8/2/2007	Trask	Bob and Sherri	93349	CT	152	1	boulder	3.18330000
84	8/30/2007	Trask	Bob and Sherri	na	na	na	0	detritus	0.00000520
85	8/2/2007	Trask	Bob and Sherri	94769	CT	119	1	detritus	0.05180000
86	8/2/2007	Trask	Bob and Sherri	94734	CT	204	1	detritus	0.32400000
87	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
88	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
89	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
90	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
91	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
92	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000

93	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
94	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
95	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
96	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
97	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
98	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
99	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
100	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
101	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
102	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
103	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
104	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
105	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
106	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
107	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
108	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
109	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
110	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
111	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
112	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
113	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
114	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
115	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
116	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
117	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
118	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
119	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
120	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
121	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
122	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
123	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
124	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000

125	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
126	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
127	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
128	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
129	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
130	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
131	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
132	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
133	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
134	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
135	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
136	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
137	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
138	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
139	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
140	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
141	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
142	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
143	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
144	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
145	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
146	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
147	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
148	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
149	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
150	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
151	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
152	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
153	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
154	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
155	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
156	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000

157	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
158	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
159	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
160	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
161	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
162	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
163	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
164	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
165	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
166	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
167	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
168	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
169	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
170	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
171	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
172	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
173	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
174	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
175	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
176	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
177	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
178	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
179	8/30/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
180	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
181	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
182	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
183	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
184	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
185	8/29/2007	Trask	Bob and Sherri	na	na	na	0	not cover	0.00000000
186	8/30/2007	Trask	Bob and Sherri	na	na	na	0	substrate	0.01820000
187	8/30/2007	Trask	Bob and Sherri	na	na	na	0	substrate	0.01950000
188	8/29/2007	Trask	Bob and Sherri	na	na	na	0	substrate	0.02400000

189	8/30/2007	Trask	Bob and Sherri	na	na	na	0	substrate	0.02550000
190	8/30/2007	Trask	Bob and Sherri	na	na	na	0	substrate	0.02700000
191	8/29/2007	Trask	Bob and Sherri	na	na	na	0	substrate	0.03600000
192	8/30/2007	Trask	Bob and Sherri	na	na	na	0	substrate	0.04320000
193	8/30/2007	Trask	Bob and Sherri	na	na	na	0	substrate	0.04750000
194	8/30/2007	Trask	Bob and Sherri	na	na	na	0	substrate	0.05760000
195	8/19/2007	Trask	Bob and Sherri	94748	CT	110	1	substrate	0.02160000
196	8/12/2007	Trask	Bob and Sherri	93344	CT	149	1	substrate	0.03200000
197	8/2/2007	Trask	Bob and Sherri	94720	CT	104	1	substrate	0.05040000
198	8/2/2007	Trask	Bob and Sherri	94746	CT	114	1	substrate	0.05040000
199	8/12/2007	Trask	Bob and Sherri	94751	CT	103	1	substrate	0.05850000
200	8/19/2007	Trask	Bob and Sherri	94748	CT	110	1	substrate	0.06200000
201	8/2/2007	Trask	Bob and Sherri	94772	CT	104	1	substrate	0.08800000
202	8/2/2007	Trask	Bob and Sherri	94724	CT	100	1	substrate	0.11220000
203	8/30/2007	Trask	Bob and Sherri	na	na	na	0	turbulence	0.01440000
204	8/29/2007	Trask	Bob and Sherri	na	na	na	0	turbulence	0.13416667
205	8/2/2007	Trask	Bob and Sherri	94707	CT	106	1	turbulence	0.08400000
206	8/2/2007	Trask	Bob and Sherri	93366	CT	114	1	turbulence	0.11440000
207	8/29/2007	Trask	Bob and Sherri	na	na	na	0	undercut bank	0.99000000
208	8/12/2007	Trask	Bob and Sherri	93319	CT	101	1	undercut bank	0.20000000
209	8/30/2007	Trask	Bob and Sherri	na	na	na	0	wood	3.16333333
210	8/29/2007	Trask	Bob and Sherri	na	na	na	0	wood	4.15400000
211	8/2/2007	Trask	Bob and Sherri	94778	CT	101	1	wood	5.78766667
212	8/2/2007	Trask	Bob and Sherri	94760	CT	112	1	wood	.
213	8/19/2007	Trask	Bob and Sherri	94775	CT	111	1	woody material	0.15300000
214	8/12/2007	Trask	Bob and Sherri	93359	CT	100	1	woody material	0.90000000
215	8/19/2007	Trask	Bob and Sherri	94751	CT	103	1	woody material	1.01333333
216	8/2/2007	Trask	Bob and Sherri	94748	CT	110	1	woody material	1.74080000
217	8/19/2007	Trask	Bob and Sherri	93316	CT	113	1	woody material	6.30000000
218	8/19/2007	Trask	Bob and Sherri	94762	CT	125	1	woody material	6.30000000
219	8/2/2007	Trask	Bob and Sherri	94775	CT	111	1	woody material	7.20000000
220	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.09720000

221	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.11340000
222	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.11480000
223	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.12760000
224	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.12760000
225	9/12/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.13640000
226	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.16450000
227	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.17160000
228	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.23460000
229	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.30530000
230	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.48000000
231	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.52080000
232	9/13/2007	Alsea	Flynn Creek	na	na	na	0	boulder	0.86400000
233	8/31/2007	Alsea	Flynn Creek	91557	CT	151	1	boulder	0.34040000
234	8/23/2007	Alsea	Flynn Creek	67407	CT	111	1	boulder	0.43990000
235	8/23/2007	Alsea	Flynn Creek	91557	CT	151	1	boulder	0.44850000
236	8/23/2007	Alsea	Flynn Creek	67427	CT	100	1	boulder	0.91000000
237	8/23/2007	Alsea	Flynn Creek	67451	CT	104	1	boulder	0.91000000
238	8/23/2007	Alsea	Flynn Creek	37871	CT	132	1	boulder	.
239	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
240	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
241	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
242	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
243	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
244	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
245	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
246	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
247	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
248	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
249	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
250	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
251	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
252	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000

253	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
254	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
255	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
256	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
257	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
258	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
259	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
260	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
261	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
262	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
263	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
264	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
265	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
266	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
267	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
268	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
269	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
270	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
271	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
272	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
273	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
274	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
275	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
276	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
277	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
278	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
279	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
280	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
281	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
282	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
283	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
284	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000

285	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
286	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
287	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
288	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
289	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
290	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
291	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
292	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
293	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
294	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
295	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
296	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
297	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
298	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
299	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
300	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
301	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
302	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
303	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
304	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
305	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
306	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
307	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
308	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
309	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
310	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
311	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
312	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
313	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
314	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
315	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
316	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000

317	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
318	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
319	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
320	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
321	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
322	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
323	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
324	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
325	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
326	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
327	9/13/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
328	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
329	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
330	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
331	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
332	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
333	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
334	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
335	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
336	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
337	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
338	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
339	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
340	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
341	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
342	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
343	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
344	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
345	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
346	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
347	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
348	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000

349	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
350	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
351	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
352	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
353	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
354	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
355	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
356	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
357	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
358	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
359	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
360	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
361	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
362	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
363	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
364	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
365	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
366	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
367	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
368	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
369	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
370	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
371	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
372	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
373	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
374	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
375	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
376	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
377	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
378	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
379	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
380	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000

381	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
382	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
383	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
384	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
385	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
386	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
387	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
388	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
389	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
390	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
391	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
392	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
393	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
394	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
395	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
396	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
397	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
398	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
399	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
400	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
401	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
402	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
403	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
404	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
405	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
406	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
407	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
408	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
409	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
410	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
411	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
412	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000

413	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
414	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
415	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
416	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
417	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
418	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
419	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
420	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
421	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
422	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
423	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
424	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
425	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
426	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
427	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
428	9/12/2007	Alsea	Flynn Creek	na	na	na	0	not cover	0.00000000
429	9/12/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.00765000
430	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.00825000
431	9/12/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.00840000
432	9/12/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.00840000
433	9/12/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.00855000
434	9/12/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.00880000
435	9/12/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.00945000
436	9/12/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.01050000
437	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.01170000
438	9/12/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.01224000
439	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.01275000
440	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.01890000
441	9/12/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.01976000
442	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.02030000
443	9/12/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.02340000
444	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.02940000

445	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.03420000
446	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.03640000
447	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.04180000
448	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.04760000
449	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.04760000
450	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.05040000
451	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.05280000
452	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.05300000
453	9/12/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.06440000
454	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.09360000
455	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.09430000
456	9/13/2007	Alsea	Flynn Creek	na	na	na	0	substrate	0.10660000
457	8/23/2007	Alsea	Flynn Creek	67434	CT	134	1	substrate	0.08840000
458	9/12/2007	Alsea	Flynn Creek	na	na	na	0	undercut bank	1.45600000
459	8/23/2007	Alsea	Flynn Creek	67447	CT	103	1	vegetation	0.21200000
460	8/23/2007	Alsea	Flynn Creek	67467	CT	100	1	vegetation	1.62500000
461	8/23/2007	Alsea	Flynn Creek	67465	CT	128	1	vegetation	3.94400000
462	9/13/2007	Alsea	Flynn Creek	na	na	na	0	wood	1.09666667
463	9/12/2007	Alsea	Flynn Creek	na	na	na	0	wood	1.74213333
464	9/12/2007	Alsea	Flynn Creek	na	na	na	0	wood	1.74213333
465	8/23/2007	Alsea	Flynn Creek	17114	CT	120	1	wood	1.54800000
466	8/23/2007	Alsea	Flynn Creek	37875	CT	103	1	wood	1.54800000
467	8/23/2007	Alsea	Flynn Creek	67442	CT	110	1	wood	3.24000000
468	8/4/2007	Alsea	Flynn Creek	17114	CT	120	1	wood	3.71733333
469	8/4/2007	Alsea	Flynn Creek	37875	CT	103	1	wood	3.94400000
470	8/23/2007	Alsea	Flynn Creek	67420	CT	119	1	wood	4.20000000
471	8/23/2007	Alsea	Flynn Creek	67422	CT	106	1	wood	6.17933333
472	9/13/2007	Alsea	Flynn Creek	na	na	na	0	woody material	0.02600000
473	9/13/2007	Alsea	Flynn Creek	na	na	na	0	woody material	0.08400000
474	9/12/2007	Alsea	Flynn Creek	na	na	na	0	woody material	0.14350000
475	9/13/2007	Alsea	Flynn Creek	na	na	na	0	woody material	0.15033333
476	9/12/2007	Alsea	Flynn Creek	na	na	na	0	woody material	1.26000000

477	8/23/2007	Alsea	Flynn Creek	67436	CT	107	1	woody material	0.65960000
478	9/6/2007	Trask	Pothole Creek	na	na	na	0	boulder	0.00343200
479	8/6/2007	Trask	Pothole Creek	94461	CT	112	1	boulder	0.07700000
480	8/6/2007	Trask	Pothole Creek	94439	CT	104	1	boulder	0.11250000
481	8/14/2007	Trask	Pothole Creek	94461	CT	112	1	boulder	0.20090000
482	8/20/2007	Trask	Pothole Creek	94422	CT	106	1	boulder	0.20800000
483	8/14/2007	Trask	Pothole Creek	94447	CT	131	1	boulder	0.21600000
484	8/20/2007	Trask	Pothole Creek	94447	CT	131	1	boulder	0.21600000
485	8/14/2007	Trask	Pothole Creek	94683	CT	104	1	boulder	0.28980000
486	8/6/2007	Trask	Pothole Creek	94683	CT	104	1	boulder	0.31280000
487	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
488	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
489	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
490	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
491	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
492	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
493	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
494	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
495	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
496	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
497	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
498	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
499	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
500	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
501	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
502	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
503	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
504	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
505	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
506	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
507	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
508	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000

509	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
510	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
511	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
512	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
513	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
514	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
515	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
516	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
517	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
518	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
519	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
520	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
521	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
522	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
523	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
524	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
525	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
526	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
527	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
528	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
529	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
530	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
531	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
532	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
533	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
534	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
535	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
536	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
537	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
538	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
539	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
540	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000

541	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
542	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
543	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
544	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
545	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
546	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
547	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
548	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
549	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
550	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
551	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
552	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
553	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
554	9/6/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
555	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
556	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
557	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
558	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
559	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
560	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
561	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
562	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
563	9/5/2007	Trask	Pothole Creek	na	na	na	0	not cover	0.00000000
564	9/5/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.00000000
565	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.00770000
566	9/5/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.00880000
567	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.00992000
568	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.01080000
569	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.01200000
570	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.01200000
571	9/5/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.01200000
572	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.01400000

573	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.01430000
574	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.01755000
575	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.01755000
576	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.01988000
577	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.02420000
578	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.02450000
579	9/5/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.03080000
580	9/5/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.03960000
581	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.04335000
582	9/5/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.05200000
583	9/5/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.05400000
584	9/5/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.05520000
585	9/5/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.06600000
586	9/6/2007	Trask	Pothole Creek	na	na	na	0	substrate	0.06615000
587	8/6/2007	Trask	Pothole Creek	94646	CT	126	1	substrate	0.04560000
588	8/20/2007	Trask	Pothole Creek	94646	CT	126	1	substrate	0.06480000
589	8/6/2007	Trask	Pothole Creek	94686	CT	102	1	substrate	0.10810000
590	8/6/2007	Trask	Pothole Creek	94688	CT	105	1	undercut bank	0.31360000
591	8/14/2007	Trask	Pothole Creek	94443	CT	113	1	undercut bank	1.33000000
592	9/5/2007	Trask	Pothole Creek	na	na	na	0	wood	0.53266667
593	8/14/2007	Trask	Pothole Creek	94440	CT	116	1	wood	5.60666667
594	8/6/2007	Trask	Pothole Creek	94467	CT	107	1	wood	6.40000000
595	8/6/2007	Trask	Pothole Creek	94466	CT	128	1	wood	6.58833333
596	8/20/2007	Trask	Pothole Creek	94440	CT	116	1	wood	6.71833333
597	8/14/2007	Trask	Pothole Creek	94472	CT	171	1	woody material	0.71070000
598	8/20/2007	Trask	Pothole Creek	94688	CT	105	1	woody material	3.15000000
599	9/7/2007	Trask	Rock Creek	na	na	na	0	boulder	0.08432000
600	9/6/2007	Trask	Rock Creek	na	na	na	0	boulder	0.09424800
601	9/6/2007	Trask	Rock Creek	na	na	na	0	boulder	0.11340000
602	9/6/2007	Trask	Rock Creek	na	na	na	0	boulder	0.13313200
603	9/7/2007	Trask	Rock Creek	na	na	na	0	boulder	0.13716000
604	9/7/2007	Trask	Rock Creek	na	na	na	0	boulder	0.16800000

605	9/6/2007	Trask	Rock Creek	na	na	na	0	boulder	0.17500000
606	9/7/2007	Trask	Rock Creek	na	na	na	0	boulder	0.17630000
607	9/6/2007	Trask	Rock Creek	na	na	na	0	boulder	0.21560000
608	9/7/2007	Trask	Rock Creek	na	na	na	0	boulder	0.24924000
609	9/7/2007	Trask	Rock Creek	na	na	na	0	boulder	0.25380000
610	9/7/2007	Trask	Rock Creek	na	na	na	0	boulder	0.27300000
611	9/6/2007	Trask	Rock Creek	na	na	na	0	boulder	0.30120000
612	9/7/2007	Trask	Rock Creek	na	na	na	0	boulder	0.32680000
613	8/10/2007	Trask	Rock Creek	94678	CT	108	1	boulder	0.10230000
614	8/21/2007	Trask	Rock Creek	94387	CT	109	1	boulder	0.11520000
615	8/3/2007	Trask	Rock Creek	94402	CT	105	1	boulder	0.12060000
616	8/10/2007	Trask	Rock Creek	94430	CT	102	1	boulder	0.12923800
617	8/10/2007	Trask	Rock Creek	94382	CT	100	1	boulder	0.14850000
618	8/3/2007	Trask	Rock Creek	94692	CT	123	1	boulder	0.14960000
619	8/3/2007	Trask	Rock Creek	94475	CT	105	1	boulder	0.15120000
620	8/3/2007	Trask	Rock Creek	94692	CT	123	1	boulder	0.15840000
621	8/21/2007	Trask	Rock Creek	94471	CT	120	1	boulder	0.15990000
622	8/10/2007	Trask	Rock Creek	94387	CT	109	1	boulder	0.17220000
623	8/3/2007	Trask	Rock Creek	94408	CT	112	1	boulder	0.17400000
624	8/3/2007	Trask	Rock Creek	94401	CT	101	1	boulder	0.17500000
625	8/3/2007	Trask	Rock Creek	94405	CT	108	1	boulder	0.17600000
626	8/21/2007	Trask	Rock Creek	94436	CT	110	1	boulder	0.18700000
627	8/3/2007	Trask	Rock Creek	94400	CT	115	1	boulder	0.19680000
628	8/3/2007	Trask	Rock Creek	94393	CT	100	1	boulder	0.19890000
629	8/3/2007	Trask	Rock Creek	94416	CT	100	1	boulder	0.20000000
630	8/3/2007	Trask	Rock Creek	94455	CT	156	1	boulder	0.20880000
631	8/10/2007	Trask	Rock Creek	94380	CT	103	1	boulder	0.21150000
632	8/3/2007	Trask	Rock Creek	94436	CT	110	1	boulder	0.22960000
633	8/3/2007	Trask	Rock Creek	94385	CT	112	1	boulder	0.23100000
634	8/3/2007	Trask	Rock Creek	94668	CT	129	1	boulder	0.23100000
635	8/10/2007	Trask	Rock Creek	94401	CT	178	1	boulder	0.23970000
636	8/3/2007	Trask	Rock Creek	94414	CT	106	1	boulder	0.24380000

637	8/21/2007	Trask	Rock Creek	94401	CT	101	1	boulder	0.25500000
638	8/3/2007	Trask	Rock Creek	94432	CT	148	1	boulder	0.26320000
639	8/3/2007	Trask	Rock Creek	94658	CT	130	1	boulder	0.26680000
640	8/3/2007	Trask	Rock Creek	94399	CT	107	1	boulder	0.27840000
641	8/3/2007	Trask	Rock Creek	94768	CT	107	1	boulder	0.28400000
642	8/3/2007	Trask	Rock Creek	94692	CT	123	1	boulder	0.31200000
643	8/21/2007	Trask	Rock Creek	94402	CT	105	1	boulder	0.33000000
644	8/21/2007	Trask	Rock Creek	94386	CT	106	1	boulder	0.37400000
645	8/3/2007	Trask	Rock Creek	94663	CT	109	1	boulder	0.46560000
646	8/21/2007	Trask	Rock Creek	94393	CT	100	1	boulder	0.48190000
647	8/21/2007	Trask	Rock Creek	94432	CT	148	1	boulder	0.48190000
648	8/3/2007	Trask	Rock Creek	94463	CT	102	1	boulder	0.49560000
649	8/3/2007	Trask	Rock Creek	94400	CT	115	1	boulder	0.57120000
650	8/3/2007	Trask	Rock Creek	94478	CT	107	1	boulder	0.57200000
651	8/3/2007	Trask	Rock Creek	94644	CT	105	1	boulder	0.60970000
652	8/3/2007	Trask	Rock Creek	94403	CT	113	1	boulder	0.61060000
653	8/21/2007	Trask	Rock Creek	94668	CT	129	1	boulder	0.63000000
654	8/3/2007	Trask	Rock Creek	94665	CT	102	1	detritus	0.06400000
655	8/3/2007	Trask	Rock Creek	94658	CT	130	1	detritus	0.45966667
656	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
657	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
658	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
659	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
660	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
661	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
662	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
663	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
664	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
665	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
666	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
667	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
668	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000

669	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
670	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
671	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
672	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
673	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
674	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
675	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
676	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
677	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
678	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
679	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
680	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
681	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
682	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
683	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
684	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
685	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
686	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
687	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
688	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
689	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
690	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
691	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
692	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
693	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
694	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
695	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
696	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
697	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
698	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
699	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
700	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000

701	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
702	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
703	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
704	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
705	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
706	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
707	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
708	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
709	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
710	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
711	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
712	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
713	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
714	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
715	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
716	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
717	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
718	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
719	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
720	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
721	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
722	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
723	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
724	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
725	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
726	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
727	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
728	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
729	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
730	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
731	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
732	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000

733	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
734	9/7/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
735	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
736	9/6/2007	Trask	Rock Creek	na	na	na	0	not cover	0.00000000
737	9/7/2007	Trask	Rock Creek	na	na	na	0	substrate	0.00768000
738	9/6/2007	Trask	Rock Creek	na	na	na	0	substrate	0.01020000
739	9/7/2007	Trask	Rock Creek	na	na	na	0	substrate	0.01856000
740	9/6/2007	Trask	Rock Creek	na	na	na	0	substrate	0.03300000
741	9/6/2007	Trask	Rock Creek	na	na	na	0	substrate	0.04370000
742	9/7/2007	Trask	Rock Creek	na	na	na	0	substrate	0.04560000
743	9/6/2007	Trask	Rock Creek	na	na	na	0	substrate	0.04600000
744	9/7/2007	Trask	Rock Creek	na	na	na	0	substrate	0.04872000
745	9/6/2007	Trask	Rock Creek	na	na	na	0	substrate	0.06281600
746	9/7/2007	Trask	Rock Creek	na	na	na	0	substrate	0.07613000
747	9/6/2007	Trask	Rock Creek	na	na	na	0	substrate	0.09360000
748	9/7/2007	Trask	Rock Creek	na	na	na	0	substrate	.
749	8/10/2007	Trask	Rock Creek	94665	CT	102	1	substrate	0.06240000
750	8/21/2007	Trask	Rock Creek	94768	CT	107	1	substrate	0.06820000
751	8/3/2007	Trask	Rock Creek	94359	CT	104	1	substrate	0.07200000
752	8/3/2007	Trask	Rock Creek	94412	CT	108	1	substrate	0.08000000
753	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.09805000
754	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.10230000
755	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.11880000
756	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.13160000
757	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.13760000
758	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.13800000
759	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.14400000
760	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.16660000
761	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.17500000
762	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.21115000
763	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.21150000
764	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.22260000

765 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.22260000
766 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.22560000
767 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.22620000
768 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.24480000
769 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.26000000
770 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.27000000
771 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.30240000
772 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.33600000
773 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.38500000
774 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.39420000
775 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.41000000
776 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.41400000
777 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.52080000
778 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	0.77760000
779 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	1.18320000
780 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	1.20000000
781 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	1.53000000
782 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	1.68720000
783 9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	boulder	.
784 8/28/2007	Hinkle	South Fork Hinkle	65263	CT	119	1	boulder	0.10730000
785 8/28/2007	Hinkle	South Fork Hinkle	65188	CT	102	1	boulder	0.12784000
786 8/15/2007	Hinkle	South Fork Hinkle	63151	CT	112	1	boulder	0.13500000
787 8/24/2007	Hinkle	South Fork Hinkle	65193	CT	114	1	boulder	0.16430000
788 8/28/2007	Hinkle	South Fork Hinkle	65208	CT	111	1	boulder	0.16830000
789 8/15/2007	Hinkle	South Fork Hinkle	39002	CT	113	1	boulder	0.17760000
790 8/28/2007	Hinkle	South Fork Hinkle	65231	CT	103	1	boulder	0.18850000
791 8/28/2007	Hinkle	South Fork Hinkle	65243	CT	100	1	boulder	0.19000000
792 8/28/2007	Hinkle	South Fork Hinkle	65243	CT	100	1	boulder	0.22880000
793 8/28/2007	Hinkle	South Fork Hinkle	65188	CT	102	1	boulder	0.24050000
794 8/28/2007	Hinkle	South Fork Hinkle	65183	CT	141	1	boulder	0.25960000
795 8/28/2007	Hinkle	South Fork Hinkle	65270	CT	108	1	boulder	0.27470000
796 8/24/2007	Hinkle	South Fork Hinkle	65182	CT	101	1	boulder	0.27900000

797	8/28/2007	Hinkle	South Fork Hinkle	65266	CT	100	1	boulder	0.28400000
798	8/28/2007	Hinkle	South Fork Hinkle	65227	CT	103	1	boulder	0.29400000
799	8/24/2007	Hinkle	South Fork Hinkle	65227	CT	103	1	boulder	0.29520000
800	8/24/2007	Hinkle	South Fork Hinkle	65231	CT	103	1	boulder	0.29930000
801	8/28/2007	Hinkle	South Fork Hinkle	65268	CT	137	1	boulder	0.30800000
802	8/28/2007	Hinkle	South Fork Hinkle	39002	CT	113	1	boulder	0.32660000
803	8/15/2007	Hinkle	South Fork Hinkle	63131	CT	107	1	boulder	0.33150000
804	8/15/2007	Hinkle	South Fork Hinkle	63131	CT	107	1	boulder	0.38500000
805	8/24/2007	Hinkle	South Fork Hinkle	65201	CT	112	1	boulder	0.43550000
806	8/24/2007	Hinkle	South Fork Hinkle	39002	CT	113	1	boulder	0.47570000
807	8/24/2007	Hinkle	South Fork Hinkle	63151	CT	112	1	boulder	1.32210000
808	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
809	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
810	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
811	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
812	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
813	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
814	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
815	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
816	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
817	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
818	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
819	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
820	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
821	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
822	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
823	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
824	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
825	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
826	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
827	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
828	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000

829	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
830	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
831	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
832	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
833	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
834	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
835	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
836	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
837	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
838	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
839	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
840	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
841	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
842	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
843	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
844	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
845	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
846	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
847	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
848	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
849	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
850	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
851	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
852	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
853	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
854	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
855	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
856	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
857	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
858	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
859	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
860	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000

861	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
862	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
863	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
864	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
865	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
866	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
867	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
868	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
869	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
870	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
871	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
872	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	not cover	0.00000000
873	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.00000000
874	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.00660000
875	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.00700000
876	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.00700000
877	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.00845000
878	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.00880000
879	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.01080000
880	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.01100000
881	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.01330000
882	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.01440000
883	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.01540000
884	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.01540000
885	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.01620000
886	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.01760000
887	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.01800000
888	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.02040000
889	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.02090000
890	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.02119000
891	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.02200000
892	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.02420000

893	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.02450000
894	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.02860000
895	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.03135000
896	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.03400000
897	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.03500000
898	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.03680000
899	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.03920000
900	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.04060000
901	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.04200000
902	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.04620000
903	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.05250000
904	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.05270000
905	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.05460000
906	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.05520000
907	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.05550000
908	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.06090000
909	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.06720000
910	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.06875000
911	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.07800000
912	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.10320000
913	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	substrate	0.11250000
914	8/15/2007	Hinkle	South Fork Hinkle	39040	CT	107	1	substrate	0.01890000
915	8/28/2007	Hinkle	South Fork Hinkle	32887	CT	115	1	substrate	0.02210000
916	8/24/2007	Hinkle	South Fork Hinkle	65191	CT	106	1	substrate	0.03600000
917	8/28/2007	Hinkle	South Fork Hinkle	65260	CT	104	1	substrate	0.05250000
918	8/28/2007	Hinkle	South Fork Hinkle	94204	CT	106	1	substrate	0.05460000
919	8/28/2007	Hinkle	South Fork Hinkle	65242	CT	118	1	substrate	0.06120000
920	8/28/2007	Hinkle	South Fork Hinkle	65201	CT	112	1	substrate	0.06270000
921	8/28/2007	Hinkle	South Fork Hinkle	65191	CT	106	1	substrate	0.06380000
922	8/24/2007	Hinkle	South Fork Hinkle	65257	CT	107	1	substrate	0.06720000
923	8/28/2007	Hinkle	South Fork Hinkle	65180	CT	106	1	substrate	0.10080000
924	8/24/2007	Hinkle	South Fork Hinkle	65213	CT	110	1	substrate	0.10140000

925	8/28/2007	Hinkle	South Fork Hinkle	65213	CT	110	1	substrate	0.10250000
926	9/14/2007	Hinkle	South Fork Hinkle	na	na	na	0	woody material	0.12400000
927	9/4/2007	Trask	Upper Main	na	na	na	0	boulder	0.08370000
928	9/5/2007	Trask	Upper Main	na	na	na	0	boulder	0.08991000
929	9/4/2007	Trask	Upper Main	na	na	na	0	boulder	0.11560000
930	9/5/2007	Trask	Upper Main	na	na	na	0	boulder	0.11890000
931	9/5/2007	Trask	Upper Main	na	na	na	0	boulder	0.15360000
932	9/5/2007	Trask	Upper Main	na	na	na	0	boulder	0.19600000
933	9/5/2007	Trask	Upper Main	na	na	na	0	boulder	0.21450000
934	9/5/2007	Trask	Upper Main	na	na	na	0	boulder	0.36720000
935	8/13/2007	Trask	Upper Main	93314	CT	125	1	boulder	0.02600000
936	8/20/2007	Trask	Upper Main	93408	CT	100	1	boulder	0.05600000
937	8/13/2007	Trask	Upper Main	93408	CT	100	1	boulder	0.08680000
938	8/1/2007	Trask	Upper Main	93425	CT	123	1	boulder	0.09860000
939	8/20/2007	Trask	Upper Main	93398	CT	100	1	boulder	0.09920000
940	8/13/2007	Trask	Upper Main	93355	CT	105	1	boulder	0.10725000
941	8/13/2007	Trask	Upper Main	93343	CT	103	1	boulder	0.11060000
942	8/1/2007	Trask	Upper Main	93361	CT	138	1	boulder	0.13230000
943	8/13/2007	Trask	Upper Main	93369	CT	108	1	boulder	0.13300000
944	8/1/2007	Trask	Upper Main	93315	CT	134	1	boulder	0.13940000
945	8/1/2007	Trask	Upper Main	93381	CT	127	1	boulder	0.13950000
946	8/20/2007	Trask	Upper Main	93379	CT	111	1	boulder	0.14430000
947	8/1/2007	Trask	Upper Main	93399	CT	107	1	boulder	0.14760000
948	8/20/2007	Trask	Upper Main	93449	CT	130	1	boulder	0.15480000
949	8/20/2007	Trask	Upper Main	93361	CT	138	1	boulder	0.15540000
950	8/13/2007	Trask	Upper Main	93425	CT	123	1	boulder	0.15840000
951	8/13/2007	Trask	Upper Main	93335	CT	123	1	boulder	0.19200000
952	8/20/2007	Trask	Upper Main	93335	CT	123	1	boulder	0.21600000
953	8/1/2007	Trask	Upper Main	93398	CT	100	1	boulder	0.22420000
954	8/20/2007	Trask	Upper Main	93407	CT	128	1	boulder	0.23000000
955	8/13/2007	Trask	Upper Main	93379	CT	111	1	boulder	0.24010000
956	8/20/2007	Trask	Upper Main	93404	CT	113	1	boulder	0.24960000

957	8/13/2007	Trask	Upper Main	93404	CT	113	1	boulder	0.29400000
958	8/20/2007	Trask	Upper Main	93386	CT	101	1	boulder	0.30500000
959	8/1/2007	Trask	Upper Main	93363	CT	120	1	boulder	0.31500000
960	8/13/2007	Trask	Upper Main	93340	CT	139	1	boulder	0.35190000
961	8/1/2007	Trask	Upper Main	93404	CT	113	1	boulder	0.40320000
962	8/20/2007	Trask	Upper Main	93340	CT	139	1	boulder	0.45000000
963	8/13/2007	Trask	Upper Main	93465	CT	131	1	boulder	0.51350000
964	8/13/2007	Trask	Upper Main	93509	CT	149	1	boulder	0.57120000
965	8/13/2007	Trask	Upper Main	93346	CT	118	1	boulder	0.86240000
966	9/4/2007	Trask	Upper Main	na	na	na	0	detritus	0.18633333
967	8/1/2007	Trask	Upper Main	93342	CT	129	1	detritus	0.02040000
968	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
969	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
970	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
971	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
972	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
973	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
974	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
975	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
976	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
977	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
978	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
979	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
980	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
981	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
982	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
983	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
984	9/5/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
985	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
986	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
987	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
988	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000

989	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
990	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
991	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
992	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
993	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
994	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
995	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
996	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
997	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
998	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
999	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1000	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1001	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1002	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1003	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1004	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1005	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1006	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1007	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1008	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1009	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1010	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1011	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1012	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1013	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1014	9/4/2007	Trask	Upper Main	na	na	na	0	not cover	0.00000000
1015	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.01170000
1016	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.01215000
1017	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.01350000
1018	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.01350000
1019	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.01380000
1020	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.01470000

1021	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.01560000
1022	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.01610000
1023	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.01650000
1024	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.01800000
1025	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.02210000
1026	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.02288000
1027	9/5/2007	Trask	Upper Main	na	na	na	0	substrate	0.02640000
1028	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.02730000
1029	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.02835000
1030	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.02970000
1031	9/5/2007	Trask	Upper Main	na	na	na	0	substrate	0.03075000
1032	9/5/2007	Trask	Upper Main	na	na	na	0	substrate	0.03906000
1033	9/5/2007	Trask	Upper Main	na	na	na	0	substrate	0.03910000
1034	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.04287500
1035	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.05040000
1036	9/5/2007	Trask	Upper Main	na	na	na	0	substrate	0.05336000
1037	9/4/2007	Trask	Upper Main	na	na	na	0	substrate	0.05440000
1038	8/1/2007	Trask	Upper Main	93362	CT	146	1	substrate	0.00204600
1039	8/1/2007	Trask	Upper Main	93379	CT	111	1	substrate	0.00326160
1040	8/13/2007	Trask	Upper Main	93314	CT	125	1	substrate	0.01900000
1041	8/1/2007	Trask	Upper Main	93431	CT	130	1	substrate	0.03190000
1042	8/13/2007	Trask	Upper Main	93373	CT	144	1	substrate	0.03240000
1043	8/20/2007	Trask	Upper Main	93381	CT	127	1	substrate	0.03300000
1044	8/13/2007	Trask	Upper Main	93314	CT	125	1	substrate	0.03770000
1045	8/13/2007	Trask	Upper Main	93358	CT	107	1	substrate	0.04140000
1046	8/1/2007	Trask	Upper Main	93335	CT	123	1	substrate	0.07416000
1047	8/13/2007	Trask	Upper Main	93322	CT	100	1	substrate	0.07800000
1048	8/13/2007	Trask	Upper Main	93418	CT	131	1	substrate	0.08190000
1049	8/20/2007	Trask	Upper Main	93373	CT	144	1	substrate	0.09430000
1050	8/1/2007	Trask	Upper Main	93376	CT	155	1	substrate	0.09430000
1051	8/20/2007	Trask	Upper Main	93343	CT	102	1	substrate	0.09620000
1052	8/1/2007	Trask	Upper Main	92756	CT	132	1	undercut bank	0.25900000

1053	8/1/2007	Trask	Upper Main	93381	CT	127	1	undercut bank	0.29160000
1054	8/1/2007	Trask	Upper Main	93399	CT	107	1	undercut bank	0.38000000
1055	8/20/2007	Trask	Upper Main	93337	CT	130	1	undercut bank	0.70000000
1056	8/20/2007	Trask	Upper Main	93351	CT	116	1	undercut bank	1.19000000
1057	8/20/2007	Trask	Upper Main	93342	CT	129	1	undercut bank	1.60000000
1058	8/20/2007	Trask	Upper Main	93431	CT	130	1	undercut bank	1.80000000
1059	8/1/2007	Trask	Upper Main	93373	CT	144	1	undercut bank	2.10700000
1060	9/4/2007	Trask	Upper Main	na	na	na	0	wood	2.59533333
1061	8/1/2007	Trask	Upper Main	93356	CT	118	1	wood	0.12483333
1062	8/13/2007	Trask	Upper Main	93325	CT	147	1	wood	2.91666667
1063	8/13/2007	Trask	Upper Main	93356	CT	118	1	wood	2.91666667
1064	8/1/2007	Trask	Upper Main	93313	CT	101	1	wood	3.93880000
1065	8/1/2007	Trask	Upper Main	93343	CT	103	1	wood	3.93880000
1066	8/1/2007	Trask	Upper Main	93405	CT	116	1	wood	3.95600000
1067	8/13/2007	Trask	Upper Main	93399	CT	105	1	wood	4.02620000
1068	8/20/2007	Trask	Upper Main	93362	CT	146	1	wood	4.09500000
1069	8/20/2007	Trask	Upper Main	93405	CT	116	1	wood	4.09500000
1070	8/20/2007	Trask	Upper Main	93418	CT	131	1	wood	4.09500000
1071	8/13/2007	Trask	Upper Main	93324	CT	171	1	wood	4.36500000
1072	8/20/2007	Trask	Upper Main	93364	CT	106	1	wood	5.67333333
1073	9/4/2007	Trask	Upper Main	na	na	na	0	woody material	0.00910000
1074	9/4/2007	Trask	Upper Main	na	na	na	0	woody material	0.52500000
1075	8/13/2007	Trask	Upper Main	93393	CT	102	1	woody material	0.06673333
1076	8/13/2007	Trask	Upper Main	93399	CT	105	1	woody material	0.35200000
1077	8/13/2007	Trask	Upper Main	93364	CT	106	1	woody material	0.52973333
1078	8/13/2007	Trask	Upper Main	93318	CT	150	1	woody material	0.53600000
1079	8/13/2007	Trask	Upper Main	93367	CT	119	1	woody material	0.85020000
1080	8/13/2007	Trask	Upper Main	93383	CT	120	1	woody material	1.27500000
1081	8/13/2007	Trask	Upper Main	93313	CT	101	1	woody material	3.44000000
1082	8/1/2007	Trask	Upper Main	93402	CT	106	1	woody material	.

observation#	depth	depthdist	d50	xsection	probe	embedded	surveydir
1	4	32	270	0.1575	17	Y	upstream
2	3	200	300	0.268375	5	Y	upstream
3	2	375	280	0.084	16	N	upstream
4	8	35	380	0.228	24	Y	upstream
5	6	310	410	0.424	0	Y	upstream
6	9	30	440	0.2925	0	Y	upstream
7	12	155	480	0.11775	61	Y	upstream
8	6	268	570	0.20025	36	Y	upstream
9	5	70	500	0.084	46	Y	upstream
10	5	160	600	0.069	0	Y	upstream
11	5	205	700	0.2255	80	Y	upstream
12	40	0	800	0.979	36	Y	upstream
13	1	210	800	0.1456	12	Y	upstream
14	2	270	1200	0.104	60	Y	upstream
15	20	0	270	0.52275	15	N	Upstream
16	26	0	260	0.3705	11	N	Upstream
17	15	325	300	0.209	11	Y	Upstream
18	18	17	240	0.117	26	Y	Upstream
19	21	0	270	0.5343	23	N	Upstream
20	9	434	270	0.2055	18	N	Upstream
21	12	77.5	320	0.11275	37	N	Upstream
22	10	60	270	0.231625	36	N	Upstream
23	30	0	285	0.342	18	Y	Upstream
24	28	0	330	0.35	9	Y	Upstream
25	51	0	275	1.7172	20	N	Upstream
26	12	220	330	0.27045	31	Y	Upstream
27	11	231	330	0.055125	24	N	Upstream
28	8	80	300	0.25415	23	N	Upstream
29	5	156	340	0.37125	26	Y	Upstream

30	11	40	290	0.288	28	Y	Upstream
31	13	115	300	0.1984	30.5	N	Upstream
32	9	138	360	0.196	31	Y	Upstream
33	15	230	400	0.39	21	Y	Upstream
34	11	467	360	0.134	43	N	Upstream
35	21	0	380	0.2925	16	N	Upstream
36	40	0	330	0.67375	32	Y	Upstream
37	28	0	380	0.297	20	Y	Upstream
38	14	28	370	0.3045	21	Y	Upstream
39	26	0	340	1.03005	16	N	Upstream
40	21	0	420	0.35805	23	Y	Upstream
41	11	720	430	0.225	21	Y	Upstream
42	11	808	420	0.2275	24	Y	Upstream
43	22	0	390	0.451	21	N	Upstream
44	46	0	460	1.62975	12	N	Upstream
45	12	85	460	0.219	29	Y	Upstream
46	39	0	380	1.72125	36	N	Upstream
47	29	0	380	0.2465	18	N	Upstream
48	20	0	440	0.2576	27	Y	Upstream
49	37	0	390	0.348	19	Y	Upstream
50	12	45	350	0.41	41	N	Upstream
51	14	130	400	0.084	20	Y	Upstream
52	10	118	390	0.275	52	N	Upstream
53	80	0	380	2.139125	16	Y	Upstream
54	23	0	500	0.1995	19	Y	Upstream
55	13	161	380	0.205875	43	N	Upstream
56	32	0	435	1.53035	36	N	Upstream
57	28	0	450	0.8424	27	Y	Upstream
58	29	0	510	0.2337	37	N	Upstream
59	14	150	520	0.10725	30	N	Upstream
60	28	0	410	1.0815	34	Y	Upstream

61	30	0	490	0.95	34	Y	Upstream
62	32	0	630	2.385	35	Y	Upstream
63	.	560	560	0	32	N	Upstream
64	14	231	610	0.132	18	N	Upstream
65	40	0	560	0.55125	39	N	Upstream
66	15	85	560	0.263375	34	N	Upstream
67	10	100	680	0.168	32	Y	Upstream
68	26	0	670	0.666125	53	N	Upstream
69	13	354	670	0.0875	23	Y	Upstream
70	25	265	690	0.558	44	Y	Upstream
71	22	0	730	0.098175	39	Y	Upstream
72	6	140	760	0.196875	57	N	Upstream
73	19	76	700	0.08925	31	N	Upstream
74	10	66	700	0.1947	43	Y	Upstream
75	31	0	930	0.6595125	33	N	Upstream
76	32	0	930	0.6595125	33	N	Upstream
77	31	0	760	0.64125	46	Y	Upstream
78	20	0	950	0.348	59	Y	Upstream
79	16	14	820	0.966	75	N	Upstream
80	18	50	790	0.1935	29	N	Upstream
81	7	38	730	0.157275	45	N	Upstream
82	15	50	1200	0.4255	54	Y	Upstream
83	13	114	1310	0.27	109	N	Upstream
84	11	100	20	0.133	.	Y	upstream
85	27	0	.	0.264375	.	Y	Upstream
86	14	114	.	1.2482	.	N	Upstream
87	1	640	.	0.0249	.	N	upstream
88	3	610	.	0.21	.	Y	upstream
89	5	59	16	0.178875	.	N	upstream
90	10	65	.	0.29	.	Y	upstream
91	2	140	.	0.03375	.	N	upstream

92	7	80	.	0.3072	.	N	upstream
93	1	219	.	0.0426	.	N	upstream
94	3	385	.	0.00795	.	N	upstream
95	9	198	.	0.05625	.	N	upstream
96	1	35	.	0.105125	.	N	upstream
97	57	0	.	0.9805	.	N	upstream
98	4	385	20	0.061625	.	Y	upstream
99	1	135	8	0.066	.	Y	upstream
100	26	0	32	1.0235	.	Y	upstream
101	1	105	25	0.09	.	Y	upstream
102	1	100	14	0.25	.	Y	upstream
103	17	125	4	0.17825	.	Y	upstream
104	1	225	.	0.02325	.	N	upstream
105	9	13	.	0.054	.	N	upstream
106	3	60	.	0.106875	.	N	upstream
107	1	40	.	0.015	.	N	upstream
108	1	145	.	0.018125	.	N	upstream
109	4	462	.	0.0225	.	N	upstream
110	4	280	.	0.02925	.	N	upstream
111	5	450	.	0.06825	.	N	upstream
112	2	290	.	0.0225	.	N	upstream
113	1	140	.	0.02175	.	N	upstream
114	28	0	.	0.315	.	N	upstream
115	19	25	.	0.192375	.	N	upstream
116	7	40	.	0.365625	.	N	upstream
117	8	40	.	0.483	.	N	upstream
118	8	105	17	0.15925	.	Y	upstream
119	9	350	14	0.075	.	Y	upstream
120	5	175	.	0.072	.	N	upstream
121	22	0	.	0.26125	.	N	upstream
122	9	140	.	0.11	.	N	upstream

123	2	60	.	0.02125	.	N	upstream
124	2	180	.	0.0225	.	N	upstream
125	28	0	.	0.204	.	Y	upstream
126	24	0	.	0.292	.	N	upstream
127	1	160	.	0.04675	.	N	upstream
128	5	110	.	0.03025	.	N	upstream
129	25	0	13	0.3944	.	Y	upstream
130	16	200	38	0.04375	.	Y	upstream
131	5	64	.	0.16675	.	N	upstream
132	11	65	11	0.198	.	Y	upstream
133	4	170	.	0.0504	.	N	upstream
134	4	178	.	0.0255	.	N	upstream
135	5	96	.	0.1015	.	N	upstream
136	1	350	.	0.09345	.	N	upstream
137	3	200	.	0.029	.	N	upstream
138	2	90	.	0.0988	.	N	upstream
139	2	190	.	0.025	.	N	upstream
140	1	144	.	0.21065	.	N	upstream
141	1	580	.	0.0612	.	N	upstream
142	3	650	.	0.132	.	N	upstream
143	3	338	.	0.01995	.	N	upstream
144	3	54	.	0.15925	.	N	upstream
145	7	115	.	0.0385	.	N	upstream
146	19	20	.	0.224775	.	Y	upstream
147	4	65	.	0.033	.	N	upstream
148	9	90	.	0.1925	.	N	upstream
149	9	230	.	0.1495	.	N	upstream
150	7	65	.	0.02	.	N	upstream
151	4	40	.	0.059625	.	N	upstream
152	20	0	9	0.26875	.	N	upstream
153	1	325	.	0.037	.	N	upstream

154	4	365	.	0.0975	.	N	upstream
155	10	195	.	0.089	.	N	upstream
156	4	94	.	0.06075	.	N	upstream
157	11	95	9	0.1155	.	Y	upstream
158	2	430	.	0.039	.	N	upstream
159	1	840	.	0.02625	.	N	upstream
160	4	730	.	0.07035	.	N	upstream
161	1	380	.	0.0475	.	N	upstream
162	1	88	4	0.1207	.	Y	upstream
163	21	0	.	0.56055	.	Y	upstream
164	6	60	.	0.7373	.	N	upstream
165	52	0	15	0.81755	.	N	upstream
166	11	90	60	0.216	.	Y	upstream
167	10	225	.	0.1976	.	Y	upstream
168	22	0	220	0.21525	.	Y	upstream
169	20	0	20	0.5425	.	Y	upstream
170	2	110	.	0.1957	.	Y	upstream
171	8	116	.	0.3374	.	Y	upstream
172	2	350	230	0.274375	.	Y	upstream
173	10	150	.	0.13125	.	N	upstream
174	5	610	.	0.115	.	N	upstream
175	1	215	.	0.01	.	N	upstream
176	16	65	.	0.091	.	N	upstream
177	3	285	.	0.13175	.	N	upstream
178	33	0	.	1.38225	.	N	upstream
179	3	0	.	0.12375	.	N	upstream
180	18	15	.	0.18	.	N	upstream
181	19	3	.	0.0875	.	N	upstream
182	11	160	30	0.0775	.	Y	upstream
183	4	60	.	0.243	.	N	upstream
184	1	155	.	0.0165	.	N	upstream

185	31	0	230	0.5904	.	Y	upstream
186	1	255	130	0.13275	0	Y	upstream
187	3	50	150	0.055	9	Y	upstream
188	4	55	.	0.09	11	N	upstream
189	5	50	150	0.2068	13	Y	upstream
190	12	40	150	0.08	18	N	upstream
191	4	340	180	0.0825	90	Y	upstream
192	1	600	180	0.1225	0	Y	upstream
193	1	450	190	0.07625	0	Y	upstream
194	2	540	240	0.119	0	Y	upstream
195	6	285	90	0.1302	16	Y	Upstream
196	22	0	160	0.1998	14	Y	Upstream
197	14	114	210	0	nd	N	Upstream
198	9	78	200	0.13975	nd	N	Upstream
199	20	0	150	0.12675	19	Y	Upstream
200	10	0	200	0.15675	23	Y	Upstream
201	14	55	220	0.209625	16	N	Upstream
202	18	290	220	0.07695	34	N	Upstream
203	9	30	25	0.139175	.	Y	upstream
204	8	152	165	0.0735	.	Y	upstream
205	36	0	40	0.2676	.	N	Upstream
206	24	0	32	0.22275	.		Upstream
207	17	64	9	0.2125	.	N	upstream
208	17	65	105	0.19895	.	Y	Upstream
209	16	235	9	0.1	.	Y	upstream
210	23	0	.	0.4914	.	Y	upstream
211	45	0	.	0.8526	.	N	Upstream
212	13	0	.	0.741	.	N	Upstream
213	19	130	.	0.33075	.	Y	Upstream
214	9	200	9	0.357	.	N	Upstream
215	25	0	8	0.41925	.	Y	Upstream

216	28	0	.	0.4655	.	Y	Upstream
217	20	0	.	0.9675	.	Y	Upstream
218	25	0	12	0.52725	.	Y	Upstream
219	17	140	.	0.313125	.	N	Upstream
220	9	460	270	0.1007	0	Y	upstream
221	2	910	270	0.02625	0	Y	upstream
222	10	90	280	0.152	8	Y	upstream
223	8	490	290	0.066	0	Y	upstream
224	1	290	220	0.003225	0	Y	upstream
225	11	230	310	0.209	6	Y	upstream
226	10	130	350	0.088	0	Y	upstream
227	3	470	330	0.03575	0	Y	upstream
228	2	90	12	0.056	42	Y	upstream
229	6	360	430	0.0525	12	Y	upstream
230	4	90	480	0.0405	8	Y	upstream
231	28	0	620	0.325	30	Y	upstream
232	2	330	800	0.1	41	Y	upstream
233	13	50	460	0.187	28	Y	Downstream
234	24	0	530	0.735	21	Y	Upstream
235	13	15	650	0.172	49	Y	Upstream
236	40	0	700	0.6084	34	Y	Upstream
237	40	0	700	0.6084	34	Y	Upstream
238	22	0	.	0.4392	37	Y	Upstream
239	17	45	5	0.14025	.	Y	upstream
240	10	85	.	0.26	.	N	upstream
241	10	200	10	0.042	.	Y	upstream
242	1	420	31	0.0094	.	N	upstream
243	5	230	.	0.07975	.	N	upstream
244	18	10	.	0.19475	.	N	upstream
245	4	0	32	0.1505	.	Y	upstream
246	15	55	50	0.1392	.	Y	upstream

247	13	35	29	0.22575	.	Y	upstream
248	5	190	11	0.12825	.	Y	upstream
249	3	185	10	0.028	.	Y	upstream
250	9	58	.	0.63	.	N	upstream
251	7	60	.	0.373625	.	N	upstream
252	5	380	15	0.0657	.	Y	upstream
253	2	340	15	0.06175	.	Y	upstream
254	16	90	15	0.06175	.	Y	upstream
255	4	104	4	0.097	.	Y	upstream
256	3	350	6	0.0315	.	Y	upstream
257	2	560	6	0.02475	.	Y	upstream
258	10	780	.	0.0605	.	N	upstream
259	3	350	30	0.0605	.	Y	upstream
260	9	760	.	0.0774	.	N	upstream
261	3	70	30	0.01435	.	N	upstream
262	9	110	.	0.09775	.	N	upstream
263	15	110	.	0.343	.	N	upstream
264	1	180	5	0.0125	.	Y	upstream
265	4	360	.	0.022	.	N	upstream
266	4	530	.	0.10075	.	N	upstream
267	7	330	6	0.0525	.	Y	upstream
268	11	30	5	0.07425	.	Y	upstream
269	3	660	5	0.1365	.	Y	upstream
270	2	680	5	0.073125	.	Y	upstream
271	6	200	.	0.0715	.	N	upstream
272	7	170	5	0.07475	.	Y	upstream
273	1	240	20	0.027	.	Y	upstream
274	5	130	460	0.054	.	Y	upstream
275	1	860	23	0.1485	.	Y	upstream
276	6	1060	30	0.099025	.	Y	upstream
277	4	1260	12	0.0392	.	Y	upstream

278	6	1460	.	0.028	.	N	upstream
279	7	1860	45	0.03445	.	Y	upstream
280	1	1840	18	0.06	.	Y	upstream
281	3	1640	31	0.0385	.	Y	upstream
282	1	1440	15	0.035	.	N	upstream
283	6	1240	10	0.0493	.	Y	upstream
284	6	1030	20	0.076	.	Y	upstream
285	1	750	60	0.014	.	N	upstream
286	15	510	.	0.15725	.	N	upstream
287	3	350	55	0.02925	.	N	upstream
288	10	130	40	0.081	.	Y	upstream
289	13	55	.	0.152	.	N	upstream
290	3	180	.	0.0288	.	N	upstream
291	5	380	48	0.021	.	Y	upstream
292	2	310	28	0.0135	.	Y	upstream
293	13	60	9	0.179375	.	Y	upstream
294	1	270	30	0.012	.	Y	upstream
295	10	500	.	0.14875	.	N	upstream
296	9	710	.	0.128125	.	N	upstream
297	4	1080	.	0.02375	.	N	upstream
298	5	880	.	0.0435	.	N	upstream
299	3	680	.	0.039	.	N	upstream
300	4	480	34	0.054	.	Y	upstream
301	6	200	4	0.051	.	Y	upstream
302	23	0	25	0.288	.	N	upstream
303	23	0	.	0.2889	.	N	upstream
304	12	115	.	0.11475	.	N	upstream
305	1	290	35	0.044	.	Y	upstream
306	1	130	.	0.108	.	N	upstream
307	7	95	.	0.055	.	N	upstream
308	1	330	41	0.0336	.	Y	upstream

309	3	480	45	0.023375	.	N	upstream
310	3	1080	14	0.036	.	N	upstream
311	10	980	.	0.04225	.	N	upstream
312	4	390	29	0.0575	.	Y	upstream
313	10	150	90	0.063	.	N	upstream
314	6	58	11	0.2808	.	Y	upstream
315	2	144	.	0.048	.	N	upstream
316	7	335	.	0.0381	.	N	upstream
317	1	800	25	0.00875	.	N	upstream
318	3	700	.	0.005	.	N	upstream
319	8	540	.	0.090625	.	N	upstream
320	2	348	.	0.0076	.	N	upstream
321	2	94	25	0.0045	.	N	upstream
322	1	200	.	0.018	.	N	upstream
323	21	0	.	0.351	.	N	upstream
324	13	60	.	0.5475	.	N	upstream
325	6	280	.	0.0408	.	N	upstream
326	12	690	.	0.0896	.	N	upstream
327	2	1490	.	0.0644	.	N	upstream
328	1	1690	.	0.2522	.	N	upstream
329	9	1890	.	0.02975	.	N	upstream
330	3	2090	.	0.020425	.	N	upstream
331	8	2290	12	0.08075	.	Y	upstream
332	3	2140	.	0.027125	.	N	upstream
333	3	1940	9	0.03125	.	Y	upstream
334	1	1740	.	0.0212	.	N	upstream
335	3	1540	18	0.02	.	Y	upstream
336	2	1340	.	0.01925	.	N	upstream
337	2	1140	.	0.0174	.	N	upstream
338	3	940	.	0.036	.	N	upstream
339	3	740	.	0.036	.	N	upstream

340	1	540	.	0.01875	.	N	upstream
341	1	540	.	0.0165	.	N	upstream
342	6	120	.	0.2133	.	N	upstream
343	23	0	.	0.715	.	N	upstream
344	6	170	.	0.588	.	N	upstream
345	5	460	51	0.03225	.	N	upstream
346	4	700	.	0.09	.	N	upstream
347	7	1200	.	0.0855	.	N	upstream
348	10	1340	45	0.1066	.	Y	upstream
349	13	1140	10	0.1	.	Y	upstream
350	10	300	.	0.06	.	N	upstream
351	17	50	.	0.18	.	N	upstream
352	4	100	.	0.0975	.	N	upstream
353	1	340	30	0.065625	.	Y	upstream
354	2	560	20	0.035	.	N	upstream
355	6	480	56	0.030375	.	N	upstream
356	17	30	.	0.162	.	N	upstream
357	3	80	.	0.228	.	N	upstream
358	2	210	100	0.039	.	N	upstream
359	12	30	60	0.2331	.	Y	upstream
360	8	160	.	0.183	.	N	upstream
361	10	60	7	0.145425	.	Y	upstream
362	7	280	.	0.11875	.	N	upstream
363	2	620	38	0.051	.	Y	upstream
364	3	360	30	0.03555	.	N	upstream
365	1	118	45	0.05445	.	N	upstream
366	18	10	55	0.282	.	Y	upstream
367	8	110	.	0.208	.	N	upstream
368	3	270	41	0.05775	.	N	upstream
369	3	450	11	0.05625	.	N	upstream
370	1	235	9	0.015	.	N	upstream

371	13	43	.	0.192	.	N	upstream
372	15	25	.	0.21	.	N	upstream
373	15	20	.	0.1188	.	N	upstream
374	3	230	20	0.031	.	N	upstream
375	5	450	68	0.0245	.	N	upstream
376	3	460	40	0.034875	.	N	upstream
377	4	290	25	0.02205	.	N	upstream
378	13	94	10	0.0828	.	Y	upstream
379	29	0	.	0.3348	.	N	upstream
380	9	150	.	0.08325	.	N	upstream
381	23	0	.	0.2295	.	N	upstream
382	4	110	.	0.1025	.	N	upstream
383	2	250	19	0.01925	.	N	upstream
384	2	295	27	0.0595	.	N	upstream
385	5	80	32	0.04375	.	N	upstream
386	23	0	.	0.234	.	N	upstream
387	25	0	.	0.282	.	N	upstream
388	1	181	38	0.0356	.	N	upstream
389	6	70	29	0.124875	.	Y	upstream
390	2	260	.	0.042625	.	N	upstream
391	1	510	45	0.0315	.	N	upstream
392	3	580	52	0.044	.	Y	upstream
393	3	340	29	0.028	.	Y	upstream
394	5	90	55	0.16625	.	N	upstream
395	22	0	.	0.27225	.	N	upstream
396	15	70	.	0.25935	.	N	upstream
397	34	0	.	0.783	.	N	upstream
398	4	170	22	0.05175	.	Y	upstream
399	4	430	50	0.018	.	N	upstream
400	1	648	.	0.01575	.	N	upstream
401	1	930	.	0.0961	.	N	upstream

402	15	750	.	0.1904	.	N	upstream
403	16	550	.	0.1419	.	N	upstream
404	9	348	37	0.0276	.	N	upstream
405	9	100	.	0.0871	.	N	upstream
406	9	76	23	0.07755	.	Y	upstream
407	9	95	18	0.066	.	Y	upstream
408	2	280	38	0.042	.	Y	upstream
409	13	15	.	0.48	.	N	upstream
410	5	51	11	0.2375	.	Y	upstream
411	10	60	.	0.203	.	N	upstream
412	2	405	10	0.073125	.	Y	upstream
413	2	638	15	0.03955	.	Y	upstream
414	2	880	49	0.04	.	Y	upstream
415	4	702	.	0.07125	.	N	upstream
416	4	405	39	0.065625	.	Y	upstream
417	3	182	53	0.05175	.	Y	upstream
418	25	0	.	0.36975	.	N	upstream
419	4	202	31	0.01	.	Y	upstream
420	5	152	9	0.02025	.	Y	upstream
421	11	95	.	0.1221	.	N	upstream
422	5	345	19	0.05075	.	Y	upstream
423	7	540	29	0.07905	.	Y	upstream
424	5	458	21	0.078	.	Y	upstream
425	2	305	5	0.050225	.	Y	upstream
426	16	50	25	0.2052	.	Y	upstream
427	19	10	22	0.319	.	Y	upstream
428	9	60	.	0.26325	.	N	upstream
429	3	730	85	0.077	3	Y	upstream
430	3	570	75	0.0147	2	Y	upstream
431	4	110	70	0.025	0	N	upstream
432	6	250	80	1.0324	0	Y	upstream

433	6	530	90	0.02975	0	Y	upstream
434	6	248	80	0.04675	2	N	upstream
435	3	180	70	0.0272	4	N	upstream
436	5	395	100	0.05325	11	N	upstream
437	3	300	90	0.10325	0	Y	upstream
438	6	160	102	0.100875	5	Y	upstream
439	7	235	85	0.0731	4	Y	upstream
440	2	1660	135	0.037375	9	Y	upstream
441	3	490	130	0.03125	14	N	upstream
442	4	3540	140	0.0495	6	Y	upstream
443	10	170	130	0.054	6	Y	upstream
444	10	430	140	0.12	0	Y	upstream
445	14	40	180	0.2375	7	Y	upstream
446	15	25	140	0.1	0	Y	upstream
447	3	270	190	0.02275	0	Y	upstream
448	8	180	170	0.06	0	Y	upstream
449	3	350	170	0.0408	0	Y	upstream
450	3	560	120	0.036	12	Y	upstream
451	8	490	165	0.0369	23	Y	upstream
452	4	1290	200	0.12065	20	Y	upstream
453	10	930	230	0.104	24	N	upstream
454	9	75	260	0.051	0	Y	upstream
455	2	530	230	0.01925	0	Y	upstream
456	1	70	260	0.012825	9	N	upstream
457	17	40	260	0.424	23	Y	Upstream
458	12	26	.	0.08085	.	N	upstream
459	13	110	.	0.795375	.	N	Upstream
460	34	0	.	0.616	.	N	Upstream
461	20	0	.	0.3406	.	Y	Upstream
462	1	880	15	0.0158	.	N	upstream
463	15	15	60	0.11005	.	N	upstream

464	15	75	42	0.09425	.	Y	upstream
465	11	80	.	0.1885	.	N	Upstream
466	16	80	.	0.1885	.	N	Upstream
467	31	0	.	0.4875	.	Y	Upstream
468	9	101	.	0.233475	.	N	Upstream
469	9	101	.	0.233475	.	N	Upstream
470	42	0	.	0.2835	.	Y	Upstream
471	32	0	.	0.544	.	Y	Upstream
472	5	580	13	0.021	.	N	upstream
473	1	680	28	0.016625	.	N	upstream
474	7	55	12	0.096	.	Y	upstream
475	2	600	.	0.0385	.	N	upstream
476	28	0	.	0.418	.	N	upstream
477	12	50	20	0.3666	.	Y	Upstream
478	9	155	520	0.234375	0	Y	upstream
479	10	103	275	0.1392	14	N	Upstream
480	25	0	300	0.756	27	N	Upstream
481	17	64	410	0.27125	47	Y	Upstream
482	18	40	400	0.335	48	Y	Downstream
483	18	70	400	0.304	26	Y	Upstream
484	18	65	400	0.31265	17	Y	Downstream
485	15	70	420	0.09425	26	Y	Upstream
486	8	50	460	0.14025	4	N	Upstream
487	4	850	.	0.05985	.	N	upstream
488	6	563	.	0.0567	.	N	upstream
489	9	362	.	0.0868	.	N	upstream
490	12	130	.	0.1131	.	N	upstream
491	12	80	.	0.170625	.	N	upstream
492	6	120	.	0.2695	.	N	upstream
493	5	590	24	0.1308	.	Y	upstream
494	4	300	68	0.091	.	Y	upstream

495	25	0	.	0.36285	.	N	upstream
496	4	70	33	0.3885	.	Y	upstream
497	2	160	54	0.0455	.	Y	upstream
498	6	430	55	0.2262	.	Y	upstream
499	21	0	.	0.357675	.	N	upstream
500	1	107	.	0.364	.	N	upstream
501	8	204	39	0.145	.	Y	upstream
502	8	375	50	0.0786	.	Y	upstream
503	9	170	28	0.12075	.	Y	upstream
504	3	258	29	0.102	.	Y	upstream
505	9	470	30	0.104	.	Y	upstream
506	9	350	19	0.077	.	Y	upstream
507	4	470	5	0.1575	.	Y	upstream
508	4	640	20	0.0165	.	Y	upstream
509	4	430	.	0.05425	.	N	upstream
510	11	174	.	0.27745	.	N	upstream
511	19	20	.	0.55915	.	N	upstream
512	10	238	.	0.162	.	N	upstream
513	4	898	32	0.0465	.	Y	upstream
514	7	1054	17	0.06	.	Y	upstream
515	18	32	.	0.392	.	N	upstream
516	10	90	11	0.052	.	Y	upstream
517	3	460	8	0.12375	.	Y	upstream
518	4	72	9	0.10625	.	Y	upstream
519	10	490	55	0.14375	.	Y	upstream
520	3	760	30	0.096	.	Y	upstream
521	8	770	35	0.0855	.	Y	upstream
522	4	520	.	0.171	.	N	upstream
523	8	86	20	0.253125	.	Y	upstream
524	1	250	20	0.121	.	Y	upstream
525	8	145	.	0.2465	.	N	upstream

526	26	0	.	0.742	.	N	upstream
527	2	360	36	0.0525	.	Y	upstream
528	10	320	.	0.096	.	N	upstream
529	5	140	10	0.162	.	Y	upstream
530	7	102	11	0.18975	.	Y	upstream
531	20	0	.	0.34425	.	N	upstream
532	33	0	.	0.65975	.	N	upstream
533	2	110	28	0.1	.	Y	upstream
534	6	500	29	0.04675	.	Y	upstream
535	9	350	30	0.104	.	Y	upstream
536	7	75	.	0.37675	.	N	upstream
537	10	58	.	0.204	.	N	upstream
538	10	190	.	0.096	.	N	upstream
539	2	730	50	0.1995	.	Y	upstream
540	2	450	30	0.209	.	Y	upstream
541	2	254	11	0.132	.	Y	upstream
542	10	90	.	0.153125	.	N	upstream
543	10	104	.	0.221	.	N	upstream
544	1	54	12	0.16675	.	Y	upstream
545	1	160	28	0.16065	.	Y	upstream
546	4	264	29	0.096	.	Y	upstream
547	12	40	.	0.2405	.	N	upstream
548	2	170	.	0.374	.	N	upstream
549	18	10	30	0.117	.	Y	upstream
550	28	0	.	0.363	.	N	upstream
551	37	0	.	0.9	.	N	upstream
552	8	258	14	0.1415	.	Y	upstream
553	10	138	15	0.185625	.	Y	upstream
554	2	380	54	0.1463	.	Y	upstream
555	10	110	.	0.143	.	N	upstream
556	10	260	.	0.1875	.	N	upstream

557	9	610	21	0.05875	.	Y	upstream
558	9	580	6	0.1015	.	Y	upstream
559	5	360	.	0.1305	.	N	upstream
560	5	180	.	0.1275	.	N	upstream
561	19	20	.	0.40115	.	N	upstream
562	22	0	.	0.18975	.	N	upstream
563	9	150	19	0.08015	.	Y	upstream
564	11	110	113	0.121	0	Y	upstream
565	11	310	70	0.0945	0	Y	upstream
566	9	610	21	0.145	0	Y	upstream
567	13	184	80	0.1595	0	Y	upstream
568	5	327	90	0.1177	3	Y	upstream
569	9	535	100	0.06175	4	Y	upstream
570	10	68	80	0.1824	12	Y	upstream
571	7	340	80	0.17325	0	Y	upstream
572	5	472	100	0.1806	0	Y	upstream
573	4	270	110	0.095	6	Y	upstream
574	9	360	130	0.156	0	Y	upstream
575	4	240	130	0.141	0	Y	upstream
576	19	20	140	0.128	3	Y	upstream
577	7	60	110	0.322	6	Y	upstream
578	9	135	140	0.10925	0	Y	upstream
579	11	184	140	0.207	0	Y	upstream
580	21	0	180	0.31415	0	Y	upstream
581	6	160	170	0.1265	10	Y	upstream
582	17	38	200	0.168	8	Y	upstream
583	4	180	180	0.104	0	Y	upstream
584	8	540	230	0.162	2	Y	upstream
585	6	656	220	0.14	11	Y	upstream
586	10	96	245	0.2028	0	Y	upstream
587	15	45	190	0.1632	12	N	Upstream

588	15	20	240	0.2	25	Y	Downstream
589	15	215	230	0.08325	21	N	Upstream
590	22	0	.	0.3585	.	N	Upstream
591	30	0	.	0.3564	.	N	Upstream
592	7	550	42	0.0425	.	Y	upstream
593	19	190	.	0.516	.	N	Upstream
594	14	90	.	0.348725	.	N	Upstream
595	11	165	95	0.186775	.	Y	Upstream
596	20	0	.	0.7125	.	N	Downstream
597	11	460	55	0.1444	.	Y	Upstream
598	10	40	.	0.3036	.	Y	Downstream
599	3	120	272	0.13175	0	Y	upstream
600	4	48	306	0.4845	11	Y	upstream
601	6	160	280	0.20425	0	Y	upstream
602	13	30	332	0.399	12	Y	upstream
603	8	80	360	0.25575	0	Y	upstream
604	8	60	280	0.3485	0	Y	upstream
605	14	80	350	0.32625	20	Y	upstream
606	11	15	410	0.10925	9	Y	upstream
607	15	30	440	0.86625	14	Y	upstream
608	10	140	402	0.494	30	Y	upstream
609	29	0	470	0.391	0	Y	upstream
610	14	55	420	0.18975	3	Y	upstream
611	16	66	502	0.153	0	N	upstream
612	10	315	430	0.195	0	Y	upstream
613	13	50	310	0.195	35	N	Upstream
614	15	90	320	0.253125	22	Y	Upstream
615	14	25	335	0.642025	26	N	Upstream
616	16	12	358	0.32215	24	N	Upstream
617	28	0	275	0.369	42	N	Upstream
618	13	45	340	0.4368	31	Y	Upstream

619	22	0	360	0.35	34	N	Upstream
620	10	140	330	0.197	19	N	Upstream
621	19	30	390	0.374	19	Y	Upstream
622	26	0	350	0.35955	28	N	Upstream
623	35	0	300	0.5192	33	N	Upstream
624	12	26	350	0.5115	33	N	Upstream
625	15	119	320	0.21	25	N	Upstream
626	19	35	340	0.333	51	Y	Upstream
627	19	47	410	0.38	32	N	Upstream
628	18	63	390	0.42275	25	N	Upstream
629	22	0	400	0.2646	33	N	Upstream
630	8	231	360	0.273	35	N	Upstream
631	20	0	450	0.351	40	N	Upstream
632	21	0	410	0.361725	55	N	Upstream
633	43	0	440	1.43	15		Upstream
634	45	0	440	1.488375	15	N	Upstream
635	18	60	470	0.615	28	N	Upstream
636	15	70	460	0.3686	34	N	Upstream
637	17	50	500	0.394875	51	Y	Upstream
638	26	0	470	0.3255	26	N	Upstream
639	20	0	460	0.3363	16	N	Upstream
640	20	0	480	0.5362	41	N	Upstream
641	9	151	400	0.28275	58	N	Upstream
642	15	33	520	0.35475	36	N	Upstream
643	19	60	550	0.69	43	Y	Upstream
644	19	45	550	0.7665	24	Y	Upstream
645	7	64	480	0.4465	56	N	Upstream
646	21	0	610	0.2912	80	Y	Upstream
647	20	0	610	0.2912	80	Y	Upstream
648	20	0	590	0.2639	39	N	Upstream
649	20	0	680	0.441	46	N	Upstream

650	21	0	550	0.5198	44	N	Upstream
651	39	0	670	0.649	34	N	Upstream
652	21	0	710	0.8925	86	N	Upstream
653	46	0	700	1.321625	27	Y	Upstream
654	21	0	38	0.3115	.	N	Upstream
655	25	0	.	0.562275	.	Y	Upstream
656	1	119	.	0.18125	.	N	upstream
657	11	55	.	0.22275	.	N	upstream
658	6	29	.	0.187	.	N	upstream
659	17	40	.	0.27	.	N	upstream
660	10	180	9	0.24025	.	Y	upstream
661	11	55	.	0.3675	.	N	upstream
662	11	33	.	0.2365	.	N	upstream
663	6	40	.	0.143	.	N	upstream
664	10	110	11	0.5	.	Y	upstream
665	9	124	.	0.3045	.	N	upstream
666	19	10	9	0.481	.	Y	upstream
667	43	0	.	1.00825	.	N	upstream
668	17	25	.	0.344	.	N	upstream
669	27	0	9	0.592	.	Y	upstream
670	33	0	.	0.3465	.	N	upstream
671	21	0	.	0.3895	.	N	upstream
672	4	50	.	0.1785	.	N	upstream
673	13	14	12	0.42875	.	Y	upstream
674	3	80	37	0.252	.	Y	upstream
675	18	44	.	0.297	.	N	upstream
676	7	60	.	0.168	.	N	upstream
677	4	308	.	0.2975	.	N	upstream
678	14	45	.	0.33825	.	N	upstream
679	28	0	.	0.25875	.	N	upstream
680	30	0	.	0.28175	.	N	upstream

681	7	20	9	0.076	.	N	upstream
682	18	12	.	0.08575	.	N	upstream
683	8	85	.	0.03675	.	N	upstream
684	6	50	20	0.37925	.	Y	upstream
685	1	50	.	0.232	.	N	upstream
686	20	0	17	0.258	.	Y	upstream
687	2	75	.	0.33325	.	N	upstream
688	7	180	21	0.169	.	Y	upstream
689	24	0	.	0.342	.	N	upstream
690	37	0	.	1.118	.	N	upstream
691	23	0	.	1.1	.	N	upstream
692	11	96	.	0.055	.	N	upstream
693	5	43	.	0.1445	.	N	upstream
694	13	140	20	0.32375	.	Y	upstream
695	13	50	16	0.14	.	Y	upstream
696	11	120	51	0.076	.	Y	upstream
697	2	30	.	0.14725	.	N	upstream
698	24	0	12	0.456	.	Y	upstream
699	11	115	.	0.192	.	N	upstream
700	8	160	38	0.246	.	Y	upstream
701	9	120	.	0.441	.	N	upstream
702	9	150	.	0.1785	.	N	upstream
703	15	93	12	0.374	.	Y	upstream
704	11	48	.	0.3875	.	N	upstream
705	8	164	.	0.343	.	N	upstream
706	4	110	11	0.231	.	Y	upstream
707	12	180	38	0.17	.	Y	upstream
708	3	225	.	0.3675	.	N	upstream
709	17	328	10	0.25725	.	Y	upstream
710	4	328	.	0.385	.	N	upstream
711	10	90	24	0.18	.	Y	upstream

712	9	210	.	0.35875	.	N	upstream
713	9	120	.	0.19575	.	N	upstream
714	10	50	41	0.105	.	Y	upstream
715	16	36	.	0.399	.	N	upstream
716	11	120	9	0.2975	.	Y	upstream
717	21	0	67	0.42525	.	Y	upstream
718	7	110	.	0.10075	.	N	upstream
719	16	30	.	0.2695	.	N	upstream
720	4	180	.	0.39975	.	N	upstream
721	10	130	50	0.34075	.	Y	upstream
722	4	87	.	0.52	.	N	upstream
723	4	340	10	0.423	.	Y	upstream
724	14	30	39	0.1815	.	Y	upstream
725	16	50	.	0.033	.	N	upstream
726	24	0	.	0.2025	.	N	upstream
727	6	95	12	0.21875	.	Y	upstream
728	25	0	.	0.549	.	N	upstream
729	27	0	.	0.61	.	N	upstream
730	16	50	12	0.539	.	Y	upstream
731	7	145	.	0.16575	.	N	upstream
732	9	21	.	0.19975	.	N	upstream
733	15	70	.	0.168	.	N	upstream
734	9	120	38	0.172	.	Y	upstream
735	2	107	.	0.08	.	N	upstream
736	17	100	80	0.39775	.	Y	upstream
737	10	270	60	0.22525	0	Y	upstream
738	13	240	85	0.145	2	Y	upstream
739	5	190	80	0.195	10	Y	upstream
740	16	115	150	0.30225	12	Y	upstream
741	6	185	190	0.3255	0	Y	upstream
742	9	210	190	0.198	0	Y	upstream

743	4	75	200	0.192	0	Y	upstream
744	2	160	203	0.328	11	Y	upstream
745	5	170	208	0.24	11	Y	upstream
746	13	30	230	0.177	0	Y	upstream
747	12	120	180	0.2925	0	Y	upstream
748	13	40	120	0.217	0	Y	upstream
749	22	0	240	0.3675	16	N	Upstream
750	14	55	220	0.506	21	Y	Upstream
751	9	20	160	0.4698	16	N	Upstream
752	7	51	250	0.517125	12	N	Upstream
753	2	145	265	0.08085	11	N	upstream
754	3	80	310	0.264	0	Y	upstream
755	11	30	330	0.279	7	Y	upstream
756	12	120	280	0.0737	0	Y	upstream
757	7	74	320	0.2678	7	Y	upstream
758	7	100	300	0.0714	0	Y	upstream
759	10	50	360	0.319725	6	Y	upstream
760	13	25	340	0.165025	0	Y	upstream
761	2	155	350	0.230175	0	Y	upstream
762	17	65	410	0.14725	0	Y	upstream
763	8	70	450	0.0872	9	Y	upstream
764	11	230	420	0.066	0	Y	upstream
765	15	250	430	0.12825	4	Y	upstream
766	12	40	470	0.0756	11	Y	upstream
767	5	70	390	0.042	0	Y	upstream
768	6	115	480	0.19285	0	Y	upstream
769	11	40	500	0.4247	14	Y	upstream
770	10	30	450	0.11715	32	Y	upstream
771	11	420	480	0.1106	0	Y	upstream
772	5	190	560	0.072	0	Y	upstream
773	7	80	550	0.2075	17	Y	upstream

774	17	40	540	0.24725	36	Y	upstream
775	17	80	500	0.0564	8	Y	upstream
776	17	30	600	0.6494	31	Y	upstream
777	10	130	620	0.0588	0	Y	upstream
778	17	70	720	0.3536	27	Y	upstream
779	5	45	1020	0.135375	22	Y	upstream
780	1	20	800	0.1955	23	N	upstream
781	14	20	900	0.0438	0	Y	upstream
782	9	60	1140	0.2635	19	Y	upstream
783	2	490	560	0.0978	0	Y	upstream
784	15	20	290	0.4165	26	Y	Upstream
785	19	50	272	0.091	37	Y	Upstream
786	7	142	270	0.096875	19	Y	Downstream
787	29	0	310	0.6853	29	Y	Downstream
788	23	0	330	0.377	23	Y	Upstream
789	29	0	370	0.127	25	Y	Downstream
790	5	112	290	0.07225	21	Y	Upstream
791	10	125	380	0.1308	21	Y	Upstream
792	12	60	440	0.7497	15	Y	Upstream
793	10	30	370	0.42705	21	Y	Upstream
794	9	215	440	0.111	34	Y	Upstream
795	44	0	410	0.651	49	Y	Upstream
796	9	230	450	0.1288	41	Y	Downstream
797	42	0	400	0.69865	48	Y	Upstream
798	10	60	420	0.34815	34	Y	Upstream
799	11	50	410	0.39975	30	Y	Downstream
800	17	75	410	0.2975	53	Y	Downstream
801	33	0	440	0.3045	29	Y	Upstream
802	46	0	460	0.82225	41	Y	Upstream
803	18	42	510	0.2553	40	Y	Downstream
804	18	75	550	0.231	29	Y	Downstream

805	11	60	650	0.4536	44	Y	Downstream
806	23	0	670	0.48425	32	Y	Downstream
807	12	95	1130	0.299	61	Y	Downstream
808	27	0	20	0.243	.	N	upstream
809	2	250	35	0.05775	.	Y	upstream
810	13	50	.	0.5536	.	N	upstream
811	13	40	.	0.34625	.	N	upstream
812	6	30	11	0.24415	.	Y	upstream
813	10	130	5	0.291225	.	Y	upstream
814	12	100	.	0.282975	.	N	upstream
815	12	150	25	0.103275	.	Y	upstream
816	2	130	25	0.17325	.	Y	upstream
817	10	40	4	0.2475	.	Y	upstream
818	16	70	.	0.165075	.	N	upstream
819	10	50	10	0.2268	.	Y	upstream
820	5	400	40	0.11115	.	Y	upstream
821	4	200	20	0.09625	.	Y	upstream
822	10	170	9	0.071875	.	Y	upstream
823	11	50	30	0.1343	.	Y	upstream
824	17	45	20	0.21735	.	Y	upstream
825	15	30	5	0.3712	.	Y	upstream
826	15	90	24	0.13365	.	Y	upstream
827	2	90	45	0.1206	.	Y	upstream
828	3	300	45	0.0657	.	Y	upstream
829	8	130	22	0.085025	.	N	upstream
830	37	100	55	0.465	.	N	upstream
831	14	30	42	0.4199	.	Y	upstream
832	5	60	20	0.153	.	N	upstream
833	18	30	.	0.1976	.	N	upstream
834	4	200	4	0.187	.	N	upstream
835	14	280	40	0.1315	.	N	upstream

836	10	680	.	0.15345	.	N	upstream
837	3	560	.	0.04615	.	N	upstream
838	9	360	.	0.088	.	N	upstream
839	10	160	55	0.1034	.	Y	upstream
840	2	55	15	0.218225	.	Y	upstream
841	10	60	.	0.1554	.	N	upstream
842	17	105	17	0.119625	.	Y	upstream
843	5	180	12	0.1098	.	Y	upstream
844	5	140	6	0.063	.	Y	upstream
845	5	160	6	0.0504	.	Y	upstream
846	16	35	30	0.1425	.	Y	upstream
847	7	220	20	0.056225	.	Y	upstream
848	12	110	31	0.098	.	Y	upstream
849	8	310	5	0.084	.	Y	upstream
850	2	140	60	0.039375	.	Y	upstream
851	8	50	15	0.24475	.	Y	upstream
852	10	110	35	0.0222	.	Y	upstream
853	6	108	.	0.10575	.	N	upstream
854	1	155	11	0.10575	.	Y	upstream
855	35	0	.	0.6554	.	N	upstream
856	1	85	31	0.0513	.	Y	upstream
857	4	60	22	0.176175	.	Y	upstream
858	7	40	30	0.8268	.	Y	upstream
859	10	25	11	0.324625	.	Y	upstream
860	13	100	56	0.14	.	Y	upstream
861	19	45	.	0.1944	.	N	upstream
862	21	0	.	0.382	.	N	upstream
863	2	195	26	0.0468	.	N	upstream
864	1	45	8	0.12495	.	Y	upstream
865	1	70	22	0.10725	.	Y	upstream
866	16	30	25	0.230175	.	N	upstream

867	15	79	12	0.168	.	Y	upstream
868	11	310	70	0.16875	.	N	upstream
869	5	165	48	0.1155	.	Y	upstream
870	1	360	35	0.039375	.	Y	upstream
871	16	210	11	0.266	.	Y	upstream
872	10	220	30	0.05775	.	Y	upstream
873	11	110	90	0.089	0	Y	upstream
874	16	40	55	0.175	0	Y	upstream
875	17	52	70	0.1152	0	Y	upstream
876	1	230	72	0.07575	0	Y	upstream
877	9	265	65	0.0868	0	Y	upstream
878	19	40	80	0.2862	0	Y	upstream
879	6	15	90	0.1071	0	Y	upstream
880	10	180	100	0.103	0	Y	upstream
881	5	65	95	0.13225	0	Y	upstream
882	17	35	90	0.1785	0	Y	upstream
883	5	290	110	0.07065	7	N	upstream
884	4	120	110	0.0867	0	Y	upstream
885	5	65	120	0.1551	4	N	upstream
886	8	380	110	0.078625	0	Y	upstream
887	5	120	75	0.16875	0	Y	upstream
888	3	285	120	0.0699	11	N	upstream
889	9	65	110	0.179375	6	Y	upstream
890	7	260	130	0.074025	0	Y	upstream
891	19	40	110	0.256425	0	Y	upstream
892	31	0	110	0.278	0	Y	upstream
893	21	0	140	0.15695	0	Y	upstream
894	26	0	130	0.2183	0	Y	upstream
895	4	118	165	0.05225	0	Y	upstream
896	10	80	170	0.057375	0	Y	upstream
897	11	115	140	0.042	0	Y	upstream

898	5	60	160	0.0989	0	Y	upstream
899	8	310	160	0.1275	0	Y	upstream
900	10	130	140	0.0506	0	Y	upstream
901	7	70	200	0.175275	0	Y	upstream
902	30	0	210	0.2806	0	Y	upstream
903	9	55	31	0.0728	16	Y	upstream
904	5	130	170	0.0782	6	Y	upstream
905	1	55	210	0.401625	5	Y	upstream
906	12	40	230	0.2592	0	Y	upstream
907	12	180	150	0.08835	7	N	upstream
908	11	200	210	0.05085	0	Y	upstream
909	31	0	210	0.24225	0	Y	upstream
910	7	200	250	0.18225	0	Y	upstream
911	23	0	260	0.4148	0	Y	upstream
912	20	0	240	0.32555	21	Y	upstream
913	19	35	250	0.0692	0	Y	upstream
914	14	20	90	0.217375	8	Y	Downstream
915	7	120	130	0.2352	17	Y	Upstream
916	34	0	120	0.3636	20	Y	Downstream
917	5	245	210	0.110925	11	Y	Upstream
918	19	30	210	0.2288	25	Y	Upstream
919	8	270	180	0.0676	15	Y	Upstream
920	32	0	190	0.175	21	Y	Upstream
921	42	0	220	0.4998	19	Y	Upstream
922	13	90	160	0.7917	25	Y	Downstream
923	12	126	240	0.2775	23	Y	Upstream
924	10	110	260	0.1573	19	Y	Downstream
925	9	96	250	0.15125	25	Y	Upstream
926	10	210	13	0.112875	.	Y	upstream
927	8	115	270	0.16275	18	Y	upstream
928	14	40	243	0.5625	0	Y	upstream

929	9	90	340	0.26075	0	Y	upstream
930	4	180	290	0.07345	11	Y	upstream
931	13	574	320	0.1056	5	Y	upstream
932	10	350	400	0.0946	0	Y	upstream
933	1	227	390	0.108	0	Y	upstream
934	1	604	510	0.1278	0	Y	upstream
935	14	50	130	0.20125	17	N	Downstream
936	11	95	280	0.2059	19	Y	Upstream
937	10	125	280	0.138	18	Y	Downstream
938	30	0	290	0.2444	24	N	Upstream
939	16	40	310	0.324	16	Y	Upstream
940	9	365	275	0.2096	17	Y	Downstream
941	16	55	280	0.207	24	Y	Downstream
942	36	0	315	0.7385	8	Y	Upstream
943	10	100	350	0.13225	13	Y	Downstream
944	18	0	340	0.21845	26	N	Upstream
945	19	0	310	0.205425	24	N	Upstream
946	26	0	370	0.366	23	Y	Upstream
947	14	60	360	0.210105	20	N	Upstream
948	14	50	360	0.32775	40	Y	Upstream
949	35	0	370	0.732	18	Y	Upstream
950	32	0	330	0.2115	24	N	Downstream
951	26	0	320	6.4	35	N	Downstream
952	15	20	400	0.94405	28	Y	Upstream
953	24	0	380	0.204	28	N	Upstream
954	11	95	460	0.14935	42	Y	Upstream
955	29	0	490	0.408	37	Y	Downstream
956	16	40	480	0.55	22	Y	Upstream
957	15	50	490	0.39775	23	Y	Downstream
958	13	45	500	0.429	15	Y	Upstream
959	14	40	500	0.381225	30	N	Upstream

960	15	25	510	0.4384	21	Y	Downstream
961	12	80	560	0.1165	51	N	Upstream
962	20	0	500	0.7161	23	Y	Upstream
963	18	250	650	0.23025	38	Y	Downstream
964	15	55	680	0.18655	23	Y	Downstream
965	9	40	880	0.7625	15	Y	Downstream
966	5	450	.	0.06205	.	N	upstream
967	20	0	.	0.20125	.	N	Upstream
968	8	68	20	0.1775	.	Y	upstream
969	10	170	.	0.13635	.	N	upstream
970	9	485	8	0.133975	.	Y	upstream
971	3	360	.	0.45	.	N	upstream
972	9	222	.	0.143	.	N	upstream
973	1	470	10	0.10075	.	Y	upstream
974	4	654	23	0.04725	.	Y	upstream
975	1	465	5	0.072675	.	Y	upstream
976	2	160	29	0.1169	.	Y	upstream
977	5	94	24	0.1615	.	Y	upstream
978	2	284	10	0.08415	.	Y	upstream
979	3	328	61	0.09075	.	Y	upstream
980	11	50	7	0.2346	.	Y	upstream
981	15	152	.	0.1284	.	N	upstream
982	4	393	90	0.11125	.	Y	upstream
983	19	30	.	0.295	.	N	upstream
984	5	83	52	0.087875	.	Y	upstream
985	11	60	62	0.144	.	Y	upstream
986	12	38	.	0.561	.	N	upstream
987	9	95	21	0.1805	.	Y	upstream
988	18	20	.	0.561	.	N	upstream
989	17	130	.	0.18275	.	N	upstream
990	11	320	19	0.13775	.	Y	upstream

991	2	200	15	0.14	.	Y	upstream
992	6	645	8	0.102	.	Y	upstream
993	1	655	40	0.1544	.	Y	upstream
994	6	40	.	0.287	.	N	upstream
995	8	100	12	0.27195	.	Y	upstream
996	16	70	.	0.1445	.	N	upstream
997	19	15	40	0.20085	.	Y	upstream
998	10	85	.	0.22	.	N	upstream
999	8	130	17	0.1827	.	Y	upstream
1000	9	305	.	0.03825	.	N	upstream
1001	7	410	.	0.13175	.	N	upstream
1002	6	455	19	0.07425	.	Y	upstream
1003	4	180	13	0.1134	.	Y	upstream
1004	4	140	9	0.1386	.	Y	upstream
1005	6	170	28	0.10725	.	Y	upstream
1006	38	0	.	0.4608	.	N	upstream
1007	33	0	.	0.873	.	N	upstream
1008	31	0	.	0.442	.	N	upstream
1009	6	500	19	0.055	.	Y	upstream
1010	6	250	8	0.0525	.	Y	upstream
1011	16	30	9	0.17745	.	Y	upstream
1012	5	65	36	0.17765	.	Y	upstream
1013	10	340	20	0.13195	.	Y	upstream
1014	4	750	.	0.1235	.	Y	upstream
1015	5	60	90	0.2835	7	Y	upstream
1016	6	80	90	0.21	7	Y	upstream
1017	7	90	90	0.0825	3	Y	upstream
1018	4	545	75	0.1775	9	Y	upstream
1019	11	320	115	0.12325	0	Y	upstream
1020	13	35	105	0.609	0	Y	upstream
1021	6	340	120	0.165375	5	Y	upstream

1022	13	80	115	0.216	0	Y	upstream
1023	11	30	110	0.51035	0	Y	upstream
1024	4	410	100	0.0665	7	Y	upstream
1025	5	200	130	0.1125	8	Y	upstream
1026	7	290	104	0.1834	0	Y	upstream
1027	12	240	110	0.2552	2	Y	upstream
1028	7	368	130	0.13965	0	Y	upstream
1029	2	370	135	0.0864	0	Y	upstream
1030	13	50	110	0.2034	0	Y	upstream
1031	6	459	123	0.1035	0	Y	upstream
1032	4	765	155	0.0328	0	Y	upstream
1033	10	90	170	0.1518	0	Y	upstream
1034	11	160	175	0.2052	0	Y	upstream
1035	16	20	189	0.42075	5	Y	upstream
1036	7	424	230	0.052	11	Y	upstream
1037	8	430	170	0.2064	9	Y	upstream
1038	36	0	.	0.4312	21	N	Upstream
1039	30	0	54	0.3696	30	N	Upstream
1040	17	215	95	0.252625	13	N	Downstream
1041	20	0	220	0.18755	9	N	Upstream
1042	24	0	180	0.62	18	Y	Downstream
1043	15	15	150	0.6408	20	Y	Upstream
1044	10	455	130	0.1599	22	Y	Downstream
1045	13	245	180	0.126225	18	Y	Downstream
1046	16	32	240	0.739375	24	N	Upstream
1047	11	120	260	0.1425	11	Y	Downstream
1048	27	0	210	0.546	14	Y	Downstream
1049	12	30	230	0.71675	30	Y	Upstream
1050	20	0	230	0.774	27	N	Upstream
1051	19	55	260	0.23625	26	Y	Upstream
1052	21	0	100	0.22695	.	N	Upstream

1053	9	12	.	0.86955	.	N	Upstream
1054	21	0	.	0.276925	.	N	Upstream
1055	16	70	.	0.506	.	Y	Upstream
1056	8	90	.	0.2115	.	Y	Upstream
1057	12	15	.	0.7275	.	N	Upstream
1058	13	30	.	0.79825	.	N	Upstream
1059	30	0	.	0.7375	.	N	Upstream
1060	21	0	.	0.708	.	N	upstream
1061	26	0	.	0.7	.	N	Upstream
1062	7	25	.	0.75115	.	N	Downstream
1063	15	65	.	0.7783	.	N	Downstream
1064	15	224	.	0.14245	.	N	Upstream
1065	16	224	.	0.14245	.	N	Upstream
1066	27	0	.	0.4719	.	N	Upstream
1067	18	309	.	0.2261	.	N	Downstream
1068	24	0	.	0.6825	.	N	Upstream
1069	24	0	.	0.6825	.	N	Upstream
1070	24	0	.	0.6825	.	N	Upstream
1071	32	0	.	0.49025	.	N	Downstream
1072	15	35	.	0.16625	.	Y	Upstream
1073	9	290	11	0.23625	.	Y	upstream
1074	8	245	.	0.259	.	N	Upstream
1075	5	291	.	0.2325	.	Y	Downstream
1076	6	218	9	0.15	.	Y	Downstream
1077	19	176	.	0.14875	.	N	Downstream
1078	3	70	.	0.38	.	N	Downstream
1079	15	160	.	0.264	.	N	Downstream
1080	23	0	.	0.7625	.	Y	Downstream
1081	20	0	.	0.2205	.	N	Downstream
1082	13	46	.	0.714375	.	N	Upstream