Curry County Watersheds Monitoring Program

OWEB #201-122
Final Report

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prepared for

Oregon Watershed Enhancement Board

prepared by

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Project Background

The South Coast and Lower Rogue Watershed Councils, in conjunction with the Curry Soil and Water Conservation District, have managed over 125 grants since the Councils' formation in 1994. Through these grants approximately 600 projects have been implemented. The need to monitor these projects was determined early on by both the funding entities, and the Councils themselves. Monitoring is an important step in the restoration process because it is the means of determining that the common goal of effective, efficient watershed restoration is indeed being met through the expenditure of these grant funds.

Since 1997 the Councils have maintained an active Watershed Monitoring Program. This Program has primarily operated on grants received from OWEB, of which this final report is concluding the Councils' 3rd two-year grant. The consistency of these OWEB monies has enabled the Councils to maintain qualified staff, and to develop a long-term monitoring program that addresses the need for both pre-project baseline data and project effectiveness data. Through this grant we continued to collect baseline road inventory data, and expanded the water quality component from 2 parameters (temperature and conductivity) to a suite of 10 parameters. Our project effectiveness monitoring also expanded in scope to include all of the Councils' fish passage, bio-engineering and riparian projects, in addition to maintaining a representative subset of road stormproofing/sediment abatement and large wood placement projects.

The continuation of the ***Road Inventory*** component was based on steady interest on the part of landowners, and the development of an active sediment abatement program geared toward implementing BMP's at high priority sites. During the last 3 years the road inventory data has been used to leverage over $378,580.00 in federal funds and approximately $270,380.00 in private match for road upgrades or decommissions. This has resulted in the treatment of approximately 80 miles of private road.

Expanding the ***Water Quality Monitoring*** component to include 8 new parameters was the result of an increase in the number of inquiries, reflecting concerns about water quality for swimming and drinking, as well as for the survival of aquatic species. In addition, the Local Advisory Committee for the SB1010 process was also seeking comprehensive water quality data that could help direct their development of an agricultural water quality management plan. At the time data was lacking, or extremely limited, for southern Oregon coastal streams, with the exception of water temperature and conductivity. The only data available for other parameters was through DEQ's ambient water quality monitoring network, which did not include Euchre and Hunter Creeks, and was only sampled once every two months (less frequently prior to mid-1998). By expanding the number of sites, and positioning them at forestry/agricultural/residential interfaces, the Councils' water quality monitoring could begin to isolate sources areas, and more accurately depict seasonal and diurnal variations. The ultimate objective of this additional data was to identify project opportunities, and/or additional sampling needs.

Since the Councils' Monitoring Program took shape in 1997, the ***Project Effectiveness*** component has been a challenge because of the quantity of projects implemented by the Councils, and the difficulty of isolating change in complex, natural systems such as stream channels, riparian forests, and salmon populations. To deal with the magnitude of on-the-ground projects, the Councils' earliest Program Manager decided to look at a representative sample by project type, instead of trying to monitor every project that was implemented. Although this is a sound approach, and one that we still employ for large wood placements and road stormproofing/sediment abatement projects, the need arose during this grant, albeit for different reasons, to visit all the fish passage, riparian restoration, and bio-engineered bank stabilizaiton projects.

- In general, **fish passage** projects are expensive, complex and directly affect salmonid populations. For this reason we've decided that each of these projects should be monitored because of the magnitude of the investment and the potential impact on the fishery.
- After six years of planting, and three years of monitoring, the number of questions related to riparian restoration was expanding at a rapid rate. In the fall of 2002 the Councils pulled together staff and local professionals involved in **riparian plantings** to discuss what we had learned, and in what direction we should be headed. Three "Riparian Summits" later, every individual involved had thrown out numerous explanations, suggestions, and inquiries, yet when the smoke cleared we were still far from understanding what techniques were most effective, and at what cost were we willing pay for each "free to grow" tree. The task of answering these questions fell onto the Monitoring Program, yet it was apparent that we did not have the resources to answer them. In order to build the needed capacity two grants were submitted, one to DEQ's 319 program, and a second one to the Siskiyou RAC. Through these grants $90,000.00 was leveraged to fund a comprehensive riparian monitoring program through December 2005. The objective of the program is to determine the status and needs of every planted site, to improve the efficiency of our limited maintenance dollars, and to generate statistical data that will help answer some of the questions raised through the "Riparian Summits".
- **Bio-engineered bank stabilization** projects constituted approximately $1/10^{th}$ of the Councils' on the ground activities in the late 1990's, following the November 1996 flood. Although most of these projects appear to be functioning well, a few have produced undesirable effects that required follow-up action. There has also been recent concern by local members of the restoration community that the number of existing structures, coupled with a continued request for new structures, was leading to a simplification of channel processes; particularly in the lower mainstem of Floras Creek. In response to these concerns, and to the risk of additional failures, both Council Coordinators requested that the Monitoring Program look at all of our bio-engineered bank stabilization projects in order to adequately address issues related to specific sites, and to the cumulative effects on the watershed scale.
- **Large wood placements** and **sediment abatement road projects** are still being monitored using a representative subset of each project type. Both types are

governed to some degree by standardized techniques and guidelines, and in general, neither project type requires continued maintenance, or additional treatments, in order to ensure project success. For these reasons we feel confident that an adequate depiction of the effectiveness of each project type is being developed through the monitoring of a representative sample.

- **Bio-engineered habitat structures** were implemented in the late 1990's as part of an effort to increase habitat complexity in straightened, agricultural channels, which were often incised. A subset of these projects is being monitored to determine if the use of rock vortex weirs and rock vanes can achieve pool formation and sinuosity, respectively, in a controlled manner.
- Other **miscellaneous projects**, such as wetland and estuarine restoration, have traditionally constituted a small percentage of the Councils' on the ground activities. These sites tend to have unique vegetative and hydraulic conditions which are best evaluated on a site by site basis.

In conjunction with the monitoring of 600 restoration projects, the inventorying of 215 miles of road, and the collection of 7 years of temperature data, there is the dilemma of storing, organizing, displaying and analyzing all of the information in some sort of useful, efficient manner. In the spring of 2002 it was becoming more apparent that the Monitoring Program's existing set of databases were insufficient for meeting the data needs, particularly as it related to displaying and spatially analyzing data. As part of the DEQ 319 and Siskiyou RAC grants mentioned above, $72,000 was secured to fund a *GIS Program* through December 2005. Through these funds the Monitoring Program's databases will be updated, new databases will be designed to handle the increased riparian and water quality monitoring data, all of our existing data sets will be digitized, and maps displaying project and monitoring data will be created.

This "Curry County Watersheds Monitoring Program" grant #201-122 was originally scheduled to close in June 2003, but because of delays in launching the new water quality components the grant was extended to April 2004. As a result of this extension, and OWEB's postponement to review Non-Capitol grants in the May 2003 grant cycle, funding for the Monitoring Program Manager was going to run 8 months short. To avoid this situation, approximately $4000.00 was transferred in the summer of 2003 from other budget categories within the grant, namely stream surveys and temperature technician, and a request was made to the Oregon Community Foundation (OCF) for $15,000 to span the short-term budget deficit. The OCF funds arrived in December 2003, and have been critical in maintaining the Program since the first of the year. These funds were also used to conduct baseline *Coho spawning surveys* on 24 small tributary reaches during the 2003/04 season. These surveys were undertaken to help foster support and protection for these streams on the local level, and in the long term they will be used to document the cumulative effects of restoration on a small watershed scale.

Volunteers

Road Inventory – 60 hours donated

Volunteers provided maps, directions, and historical information, highlighted problem areas, and in some cases, participated in the survey.

Steve Kalina	Bucky Wahl	Fred Messerlee	Donald Smith
Michael Knapp	Charlie Valentine	Knute Anderson	Rick McKenzie
Jane Dalleson	John Kirchgesler	Jim Kamph	

Spawning Surveys – 36 hours donated

Volunteers provided access, land ownership information, historical information, and insight into run timing and distribution, and in some cases assisted with the survey.

John Goodwin	Terry Wahl	Brice Wagner	Steve DiCicco
Stan Quigley	Clyde Quigley	Marsh Haven Farms	Betsy Harrison
Pete (Vermont)	Keavy Cook	Russ Walker	

Project Effectiveness Monitoring – 7 hours donated

Volunteers reported conditions they observed (i.e. fish spawning above a new culvert), and in some cases, assisted the Councils during the follow-up survey/assessment.

John Goodwin	Jeremiah Dane	George Fleming	Jim Kamph
George Fleming			

Water Quality Sampling - 419 hours donated

The Volunteers listed below assisted with regularly scheduled Phase I sampling, and with Phase II sampling including: Biscuit Fire Synoptic Storm Monitoring (two storms), Chetco Boat Basin Sampling, laboratory assistance, New River mainstem and tributary sampling, Lower Rogue cool pools during FLIR flight, and they served on the Water Quality Monitoring Advisory Committee.

Liesl Coleman	Lila Selin	Ann Petrie	Aaron Fitch
Tim Scullen	Kai Druzdel	Mike Becker	Helen Becker
Jack Churchill	Peter Aspinwall	Scott Thiemann	Allen Wilson
Anton Chaplin	Carl Hoogesteger	Steve Myers	Erin Minster
Terry Hoogesteger	Beth Pietrzak	Norm Leeling	Morgan Kocher
Andy Gross	Dick Laskey	Dick's friend	Willis Crouse
Taylor – Churchill	Jim Edwards	Abby Bradbury	David Riordan
Barbara Ricks	Walt Schroeder	Ray Adams	Ray's son
Lee Eisner			

Other Participants

Road Inventory

Kim Buckley (Lincoln Timber, LLC)
Nels Jensen (Lincoln Timber, LLC)
Fred Arnold (South Coast Lumber Co)
Pat ?? (South Coast Lumber Co)
Virgil ?? (South Coast Lumber Co)
Ron Ray (Menasha Log Co, LLC)
Jeff Miller (Moore Mill Co)
Paul Hammerberg (Moore Mill Co)
Gloria ?? (Siskiyou National Forest)
Milt Smith (Curry County Road Department)
Cecil Ashdown (Curry SWCD)
Pete Van Sickle (Roseburg Forest Products)
Carey Weatherly (Roseburg Forest Products)
Joseph Brown (Curry Farm Planner)
Dale Stewart (BLM Coos Bay)
Kathy Wiggins (ODF Coos Bay)
Tuck Koreiva (ODF Coos Bay)

Spawning Surveys

Gary Susac (ODFW Corvallis Research Lab)
Pat Burns (ODFW Coos Bay)
Steve Mazur (ODFW Gold Beach)
Nathaniel Davis (ODFW Gold Beach)
Fred Arnold (South Coast Lumber Co)

Project Effectiveness Monitoring

Ron Ray (Menasha Log Co, LLC)
Jeff Miller (Moore Mill Co)
Paul Hammerburg (Moore Mill Co)
Steve Mazur (ODFW Gold Beach)
Jeff Mace (Westbrook Land & Timber, LLC)
Paul Jacobsen (ODFW Corvallis Research Lab)
Jennifer Wright (ODF Coos Bay)
Bruce Follansbee (Consultant)
Todd Confer (ODFW Gold Beach)
Chris Massingal (Consultant)
Frank Burris (OSU Extension)

Water Quality Sampling

Matt Azhocar (Coos Bay District BLM)
Bill Blackwell (Siskiyou National Forest)

Rachel Burr (Department of Environmental Quality)
Frank Burris (Oregon State University Extension Service)
Todd Confer (Oregon Department of Fish and Wildlife)
Jennifer Godwin (Siskiyou National Forest)
Doug Hart (Oregon State University Extension Service)
Anthony Kirk (Americorps with OSU Extension)
Mike Meszaros (Curry County Public Health)
Erin Minster (Siskiyou National Forest)
Will Newdall (City of Gold Beach Public Works)
Connie Risley (Siskiyou National Forest)
James Simino (Siskiyou National Forest)
Nancy Toth (Watershed Council, DEQ 319 funds)
Pamela Wright (Department of Environmental Quality)
Tammy ?? (Port of Brookings)

Pre-Project Assessment

Nicki Moore (BLM Coos Bay)
Dale Stewart (BLM Coos Bay)

Materials and Methods

Road Inventory

The Councils' *Landowner Road Inventory* protocol was developed in 1998, by drawing from the OR Department of Forestry's Forest Road Hazard Inventory Protocol, the Pacific Watershed Associates' inventory protocol, and the needs of the Campbell Group. The Councils' protocol is a comprehensive assessment of the road prism's impact on water quality, which looks at the condition of the road drainage network, and its sediment delivery potential, the delivery potential of unstable road fills, and the risks associated with stream crossings. In addition, the protocol also assesses fish passage concerns at road/stream crossings. If fish passage is determined to be an issue based on the immediate channel features, the site is placed on a list of potential barriers. These sites will be further evaluated by assessing downstream access to the site, and the value of usable habitat upstream.

The protocol uses basic forestry/surveying equipment, including a clinometer, range finder, compass, and GPS unit. The protocol is most effective when used by a crew of two, although one person can collect the necessary data.

Water Quality Sampling

Materials and methods are summarized in the table below, and detailed information is available in documents included on a CD: Quality Assurance Project Plan and Standard Operating Procedures.

Sample Parameters, Equipment, and Protocols

Parameter, units	Equipment	Protocol
Specific Conductance, field (umhos/cm)	Yellow Springs Instruments (YSI) Model 30	Oregon Plan WQ Monitoring Guidebook, ch. 9, measured directly in water body
Water Temperature, degrees C	YSI Model 30 for grabs. Vemco or Optic Stowaway, and NIST traceable (audits) for continuous.	Measured directly in water body. Existing QAPP for continuous, uses OR Plan WQ Monitoring Guidebook
Dissolved Oxygen, mg/L, % saturation	Pipettes, buret titration, magnetic stirrer. YSI DO meter used for estuary profiles.	Azide Modification of Winkler Titration, 300 ml Oregon Plan WQ Monitoring Guidebook, ch 7. and DEQ Inorganic Section Reference
Biochemical Oxygen Demand –5 day	Same as above	Undiluted, Std Methods (EPA approved) and as above
pH	Meter w/ Auto Temp Comp, Orion Ross electrode model 81-02	Oregon Plan WQ Monitoring Guidebook, ch. 8
Turbidity, field, NTU	Hach 2100P Turbidimeter	Oregon Plan WQ Monitoring Guidebook, ch. 11
Total Solids, mg/L	Balance, oven, dessicator, ceramic evaporating dishes	Gravimetric 103-105 degrees C, Std Methods 2540 B
Nitrate+Nitrite, mg/L	Spectrophotometer	Cadmium Reduction, Std Methods 4500-NO3- E.
Total phosphorus, mg/L	Spectrophotometer	DEQ Modified Ascorbic Acid Method w/ Persulfate Digestion
E. coli, MPN cfu/100 ml	Quanti-Tray and Quanti-Tray 2000, Sealer, UV lamp	Oregon Plan WQ Monitoring Guidebook, ch. 15

Project Effectiveness Monitoring

The following is a description of the methods and materials used for each project type.

Fish Passage

Projects were monitored using a combination of biological and physical surveys. The biological surveys were based on presence/absence of juveniles and/or spawning adults upstream of the structure. The ODFW *Coastal Salmonid Inventory Project* protocol was used for the spawning surveys, and the local ODFW habitat biologist assisted with juvenile surveys. The physical surveys measured parameters of the structure itself, including: flow measurements, documentation of resting opportunities, jump heights and pool dimensions, substrate depth, and channel dimensions. These surveys used a protocol

developed by the Councils, which incorporated jump height and velocity limitations by species, as defined in ODFW/ODF's *Guidelines and Criteria for Stream-Road Crossings.*

Equipment used included waders, wading boots, Marsh-McBirney electronic flow meter, mask and snorkel, electroshocker, digital camera, a GPS unit, and other misc. supplies listed above under spawning surveys. In general, both the biological and physical monitoring can be done by one person, although high flow measurements inside large culverts require two people for safety reasons, and juvenile monitoring relied on ODFW for increased accuracy.

Road Stormproofing/Sediment Abatement

Projects were monitored using photo points and narrative. New projects are visited following their first post-implementation winter. After the initial visit only a subset of the projects are added to our long-term monitoring list. These sites will be revisited 5-10 years following implementation.

Equipment used includes a GPS unit, digital camera, climometer, loggers tape, and misc. supplies. The monitoring usually takes place by one person, although a second person can improve the value of photos by adding scale to the pictures, and a second person can significantly increase the efficiency of finding old project sites along unmarked roads.

Riparian Restoration/Fencing

The Councils were one of the organizations who "test drove" the riparian monitoring protocols developed through the Coos Watershed Association's *Coastal Lowlands Riparian Silviculture Manual.* Given our need to address approximately 70 miles of existing plantings, as well as interplantings and new sites, the Councils decided to use a modified version of the *Manual's* extensive protocol. Our version dissects planted stream reaches into segments based on "free to grow" status, maintenance/interplanting needs, and excessive site limitations (i.e. extensive blackberry, droughty soils). By breaking the reach up in this manner we can more effectively apply our maintenance dollars, can begin to report miles of success (free to grow) by watershed, and can identify those sites that would require too much effort to restore (given our current budget). We adjusted how data on "damage" and "competition" was being collected so that it could be more easily analyzed statistically. In addition, we added a field for "fence condition" to the form.

Equipment used includes a GPS unit, digital cameral, clinometer, loggers tape, range finder, machete, and misc. supplies. The survey is usually done by one person, although two people significantly increase the rate of completion.

Largewood Placements

Projects were monitored using either ODFW's *Aquatic Habitat* Inventory, Longitudinal channel thalweg profiles, or Schematic drawings of individual placements. ODFW's *Inventory* breaks stream reaches into habitat units, which are analyzed cumulatively by habitat type to demonstrate changes from year to year in association with the wood placements. Longitudinal profiles are surveys of the thalweg location, which are tied to permanent control points. When pre and post implementation surveys are compared, plan

view maps can document changes in sinuosity associated with the placements, while profile grids of the thalweg can show increases/decreases in pool depth and frequency, and changes in stream length. Schematic drawings document conditions at individual sites through topographic surveys, longitudinal profiles, photo points, and pebble counts.

Equipment used includes a GPS unit, digital camera, Nikon Total Station transit (supplied through OSU Extension), climometer, waders and wading boots, loggers tape, and misc. supplies. All three survey types require a two person crew.

Bioengineered Bank Stabilization/Habitat Development Projects
The Councils' bio-engineered projects focused on either stabilizing eroding stream banks, or creating in-stream habitat through pool development and/or increased channel sinuosity. The monitoring of these projects differed depending on the objectives. We've used photo points, GPS points, and narratives to map and monitor bank stabilization projects. Longitudinal thalweg profiles were used for in-stream habitat sites.

Equipment used included a digital camera, GPS unit, Nikon Total Station transit, waders and wading boots, a canoe, and misc. supplies. Bank stabilization projects were monitored by one person, where as the Longitudinal profile surveys required a two person crew.

Wetlands/Estuaries
Projects were monitored through photo points and narrative, and one site was mapped topographically using the Nikon Total Station.

Equipment includes a digital camera, GPS unit, Nikon Total Station transit, rods and prisms, wading boots and waders, and misc. supplies. A two person crew is needed for the topographic surveys, but the rest can be done by one person.

Spawning Surveys

ODFW's *Coastal Salmonid Inventory Project* spawning survey protocol was used by the Councils to conduct their Coho spawning surveys. The protocol documents peak counts, as well as an estimation of the total run size. It also captures turbidity, flow conditions, and other interests such as beaver presence.

The equipment used included a GPS unit, waders and wading boots, machete, knives, tweezers, polarized sunglasses, and other misc. supplies. The surveys were conducted at least every 10 days over the course of the spawning season (Nov. – Feb.). One technician covered all the surveys.

Results

The following work took place through the Councils' Monitoring Program during the time period that this OWEB Grant #201-122 was active. Included is a discussion of the results/products of this work, and the funds used to accomplish each task.

Road Inventory

The original budget had scheduled 16 weeks of road inventory (8 weeks per spring using a two person crew), but only 11 weeks were completed. The 5 week difference was the product of three factors. The first was a need to increase funding for the Water Quality Analyst position and the mileage category. Under funding of the Analyst position resulted from our inability to project all the time it would take to start the new Water Quality Monitoring component, while the mileage was due to an under projection of miles driven and the use of the old mileage rate when we established the budget. The second reason for the 5 week difference is that we were accumulating inventory data faster than we could address the issues raised by the data. The Councils have had a sediment abatement component in the road program for the past 7 years, which has been actively implementing BMP's at sites identified through the inventory. Although this program has upgraded or decommissioned approximately 100 miles of road, there are still over 115 miles of inventory data that need to be addressed. Although some of these miles may not qualify for projects because they're low priority status, or lack participation on the part of the landowner, most are suitable for the program. The reduction of inventory in 2002 and 2003, coupled with a very minor inventory effort in 2004, will enable the program to catch up with the existing data, and support new inventory in 2005. The third reason for the 5 week difference stems from the Monitoring Program Manager's inability to commit 8 weeks in the spring of 2003. During this time period the Manager was consumed with duties related to the monitoring program, and with project development. Since the Program Manager is one of the two person crew, the season was cut short by 2 weeks so that he could address more immediate needs.

Although only 11 weeks were undertaken, 43.4 miles were inventoried in 2002, and 34.6 miles in 2003. The following is a breakdown of those miles by watershed and landowner:

Spring 2002
- Brush Creek (Coastal Trib.), industrial timber – 9.3 miles
- Pistol River Trib., industrial timber – 9.2 miles
- Floras Lake, cranberry farm – 20.4 miles
- Lower Rogue Trib., rancher – 4.5 miles

Spring 2003
- East Fork Floras, rancher – 4.5 miles
- Lower Rogue, industrial timber – 4.7 miles
- Elk River Trib., industrial timber – 6.4 miles]
- Upper Euchre Creek, industrial timber – 16 miles
- New River Tribs., 2 ranchers – 3 miles

Of these miles, 43.5 have been analyzed; 16.9 of which were either upgraded or decommissioned in 2003. An additional 6.5 of these miles will be addressed in 2004. The 34.5 miles that have not been analyzed belong to one industrial timber company. During the Biscuit Fire this company had to reallocate their road building equipment to fight fire, and have subsequently been behind in their road maintenance schedule. As a result, they had to drop our sediment abatement project, which would have addressed 20.5 miles in the Euchre Creek Watershed. If the company chooses to resume the project, we will analyze the 34.5 miles of remaining inventory, and develop a project plan for those miles.

All of the funding for the road inventory came through this OWEB Monitoring Grant.

Water Quality Sampling

Results for the water quality program are given in the detailed reports to be available at www.currywatersheds.org, and in a water quality power point presentation *(see Appendix for power point printout, and refer to CD for a digital copy)*. During Phase I, 16 sites were regularly sampled every week during the summer, and every two weeks during the other months. The ten parameters sampled are listed above in materials and methods. Parameter values were summarized by Fall-Winter-Spring and Summer months, and mean values were converted to DEQ Water Quality Sub-indices. The sub-indices are be interpreted in categories of Excellent-Good-Fair-Poor-Very Poor. Generally, we determined that water quality is excellent in most of Curry County's watersheds. Water quality is degraded from above to below rural-residential/agricultural influences, but remains in the excellent to good category at the lower end of most rivers.

Exceptions to these results were the focus of most Phase II sampling activities. The Water Quality Monitoring Advisory Committee (WQMAC) reviewed the results and recommended priorities for Phase II. In Hunter Creek and Pistol River estuaries, and along Floras Creek, state dissolved oxygen (DO) standards were periodically violated, particularly in the morning samples. Results for each site and each parameter were plotted over time, to display seasonal changes, and DO and pH values were labeled with the time of day to look at the effects of algae on diurnal cycles. Phase II diurnal sampling tracked the duration and magnitude of low DO and high pH at several sites within Hunter (3x), Pistol (2x) and Floras Creek (2x).

In the Port of Brookings-Harbor Boat Basins along the Chetco River estuary, concerns about nutrient input and diurnal oxygen levels led to a Phase II study (see Chetco Boat Basin presentation). Tributary nutrient inputs were measured in the Commercial and Sport Boat Basins. Flow was also measured to determine that nutrient loads entering the Commercial Boat Basin were the highest. Algal activity was attributed to periods of high biochemical oxygen demand, and tributary loads appear to be supplemented by ocean nutrients during periods of upwelling.

Some rivers had higher levels of nitrate+nitrite or violations of the E.coli standards during the summer and fall/winter runoff. In Phase II, a "nutrient source search" included sampling along more reaches and tributaries to Floras Creek, Sixes River, Euchre Creek,

Hunter Creek, and Pistol River. Elevated levels of phosphorus, turbidity, and total solids during runoff samples in Phase I, scored relatively low sub-index values on some streams (table 2). Recommendations from the WQMAC led to the development of a synoptic sampling design, to be implemented under the next OWEB monitoring grant using volunteer "storm-chasers."

Public interest in the effects of the Biscuit Fire led the Councils to mobilize volunteers for Phase II synoptic sampling on burned and unburned tributaries to the Illinois, Rogue, and Chetco Rivers. Baseline summer flow sampling was begun in partnership with the Siskiyou National Forest. During the early storms, total phosphorus and biochemical oxygen demand were elevated above low flow levels at all sites, but the burned tributaries were especially high. The total phosphorus results are likely to be graded as less than data quality levels A, and possibly less than B, but the relationships among sites are still expected to be valid.

Phase II also included two areas where no baseline data were available for the DEQ WQI parameters. The New River mainstem between Storm Ranch and south of Bono ditch was sampled twice, and the tributaries were sampled three times along Highway 101. Although the New River mainstem was not sampled during the diurnal extremes, the results indicate that DO and pH standards would be exceeded in the sampled area. Samples in the vicinity of the breach site where the water was deeper had better water quality. Lower Rogue (private) tributaries were sampled two-three times during the summer. The results indicate a need for followup E.coli and nitrate testing.

Project Effectiveness Monitoring

The following are the accomplishments by monitoring type:

Fish Passage
In May 2003 an updated *Fish Passage Project Effectiveness Report* was completed. The report summarized data collected between 2001 and 2003, and added this data to the 2000/01 Report. Of the 41 projects on the ground at the time, 25 had been monitored. Efforts to monitor the other 16 projects, and projects implemented in the summer of 2003, are underway.

Large Wood Placements
At the beginning of this OWEB Monitoring Grant the Councils had nine large wood projects that were being monitored on a long-term basis, using Aquatic Habitat Inventory, Longitudinal Thalwegs, and/or Schematic Drawings. These long-term sites are on a schedule to be resurveyed in their 5th and 10th year on the ground. During the 2002 and 2003 field seasons only one of these projects entered its 5th year, and we resurveyed that site using the Aquatic Habitat Inventory. The *Aquatic Habitat Inventory for Large Wood Placement Effectiveness Monitoring* report produced in December 2001 has not yet been updated. The other 8 long-term sites will enter their 5th year in either 2004 or 2005, at which time we will undertake the resurveys, and the updating of the report. As we entered into the 2002 field season we made a conscious decision not to add any more

projects to our long-term monitoring list because of concerns about the complexity of isolating change associated with large wood, and because we felt there is already a significant body of published knowledge that has documented the benefits of large wood.

Our stream survey efforts focused instead on mapping the channel thalweg on 3 streams where we expected to see a change in conjunction with a restoration project. The first of these streams is a denuded pasture channel that was replanted with native hardwoods and conifers. The survey included a thalweg profile, channel cross-sections, and a "Green Line" vegetation log. The intent is to register potential channel changes associated with re-vegetating riparian areas, such as channel narrowing and deepening, point bar development, and increases in sinuosity. The site won't be resurveyed for at least another 4 years, and possibly longer depending on the plantings' growth rate. The second stream is a channelized tributary to New River. The landowner would like to relocate the stream to a longer, more sinuous, shaded ditch that may represent the old channel location, as well as construct 300 yds or more of new channel. The survey included a thalweg profile, channel cross sections on both the existing and proposed ditches, and topographic mapping of the 100 or so acres that constitute the project site *(see Appendix for Bethel Creek Plan View Map)*. In addition, the existing channel was surveyed using the Aquatic Habitat Inventory to capture the quantity and quality of instream habitat, so that a comparison can be made to the "new" channel location after the project is completed. The Total Station survey (thalweg, cross sections, topography) was used to initiate a design and begin the permitting process. Unfortunately the project did not come together, and the landowner is currently tied up with the regulatory branch of the Corps, so it is unclear if these surveys will ever come to bear any value. The third stream is a small pasture tributary that is confined hydraulically by a driveway culvert, pasture berm, and Highway 101. The project entailed the removal of small quantities of earth adjacent to outside channel bends with the intent of increasing sinuosity and pool development. We surveyed the channel thalweg in 2003, and will resurvey the site in 5 or so years.

In the original grant budget 6 weeks of stream surveys was scheduled, but only 3.8 weeks were completed. The 2.2 week difference is a reflection of a decrease in the projected workload that resulted from our decision not to add new sites to the long-term list. These funds were transferred to the Program Manager category. All of the survey work was funded through this OWEB Monitoring Grant, while the cost of contracting the CAD mapping of Bethel Creek came through an OWEB Technical Assistance Grant.

Riparian Planting and Fencing

In spring 2002 the Councils were involved with the Coos Watershed Association's development of riparian monitoring protocols, as part of their *Coastal Lowlands Riparian Silviculture Manual.* We "test drove" both the intensive and extensive methods, as well as their planting summary guidelines, and accompanied the author, Chris Massingal, in the field at a handful of sites. We decided to adopt a modified version of the extensive protocol for the monitoring of our existing sites, and future interplantings (see materials and methods). Using the modified extensive protocol marks an increase in the quantity and quality of data that we are gathering on these plantings.

While efforts to develop a more thorough and effective monitoring protocol were being initiated by our peers in the Coos, a growing interest in the effectiveness of our planting program was occurring internally. This interest ultimately evolved into the "Riparian Summits" mentioned in question 1, which in turn emphasized the importance of the Coos efforts, and our need to increase the magnitude of the Councils' riparian monitoring. Since these events, most of the Program Manager's time working on riparian monitoring has been spent writing the Siskiyou RAC and DEQ grants, hiring and training a person to fill the new "Riparian Specialist" position, and working with a consultant to develop a database that can store the data, and facilitate the analysis. As a result, the *Riparian Improvement Project Effectiveness* report completed in February 2002 has not been updated.

The grant monies for the Riparian Specialist position came on line in May of 2003. We intended to survey 30 miles of our existing plantings that summer using the extensive monitoring protocol, but the person hired to fill the position did not work out. We rehired in August, but because of the delay caused by the change in personnel, only 10 miles were completed. As part of these surveys, segment specific maintenance needs were generated, and the information for the priority sites was passed directly to the maintenance crew. Establishing this direct link between the Riparian Specialist and the folks doing maintenance will significantly increase our efficiency. Since October 2003 the Riparian Specialist has assumed control of both the planting program, and the riparian monitoring duties. Compared to the previous structure, which had different entities responsible for the planning, planting, maintenance, and monitoring phases of a project, this new arrangement will reduce a number of bottlenecks to the flow of information. Planting plans and planting records will feed directly into the monitoring phase, and planted sites will be familiar to the person surveying them. The Riparian Specialist will also assume the responsibility of producing an annual monitoring report, summarizing both the extensive monitoring and any trial plots that are developed. The first report will be completed in early June 2004.

Funding for the Program Manager to write the grants, hire the Riparian Specialist, and develop the protocol and database came through this OWEB Monitoring Grant. All of the funds for the Riparian Specialist's time are coming through the RAC and DEQ grants.

Road Stormproofing/Sediment Abatement

A *Road Stormproofing Project Effectiveness* report was completed in July 2001. Most of the long-term sites monitored in this report occur within the Lobster Creek Watershed, which is owned by a private industrial timber company. This land was sold in the spring of 2003, which temporarily limited our access to those sites. Relations with the new owner were develop as part of a 319 grant proposal, submitted by the Lower Rogue Watershed Council, to reconvene the Lobster Creek Partnership. The original Partnership, which included the Siskiyou Forest Service, the previous industrial timber company, the local ODFW office, the Lower Rogue Council, and a private restoration consultant, formed in the mid 1990's to develop a strategic restoration and conservation plan for the watershed. Part of this plan included a prioritization of the road network (both private and public) based on potential sediment sources. Through this new 319

grant the sediment sources will be reassessed using the Council's existing road inventory and project effectiveness monitoring data. As a result, all of the Councils' road projects in Lobster Creek, including the long-term sites, will be visited in May of 2004 using funds from this 319 grant, which will facilitate an update of the July 2001 report.

In addition to the Lobster Creek sites, sediment abatement road projects in other watersheds have been added to the long-term monitoring list, so that variations in land management, geology, and climate can be taken into account. Our objective is to visit these sites in their 5th and 10th years, or following a major storm event. During the life of this grant, monitoring of road projects primarily focused on post implementation visits in the spring of the first year because none of the sites outside the Lobster Creek Watershed had reached their 5th year. These follow-up visits often captured immediate changes that could be difficult to identify after 5 years, such as headcuts and small fill slope failures. In a few cases, these follow-up visits also highlighted the need for additional work, such as adding more surface rock, adding a crossdrain, or pulling back unstable fill at a decommissioned crossing.

Funding for pre-winter "as-built" monitoring was covered by the project grants (in the last three years these were primarily 319 funds), while the post-implementation spring visits were funded through this OWEB Monitoring Grant. As mentioned above, monitoring of the Lobster Creek sites will be funded through the Lobster Creek Partnership 319 grant.

Bio-engineered Structures

In March 2004, the survey work for the first phase of the Councils' effort to monitor all of their bio-engineered bank stabilization structures was completed on the mainstem Floras Creek, from the canyon mouth downstream to Highway 101. This 2.5 mile stretch has the highest concentration of the Councils' bank stabilization projects, and has recently been the focus of concerns about channel simplification. Instead of visiting just the Councils' projects, we decided to survey all of the existing bank stabilization work within this reach, as well as new erosion sites. This data has not yet been mapped and summarized, but an initial review indicates that the Councils' rock structures are performing well, particularly where low terraces were created in conjunction with the structures, and where the original bank erosion was occurring in a non-sinuous stream reach. When compared to the older, non-Council rip rap revetment sites, the Councils' projects tend to re-vegetate more quickly, and with a greater diversity of species. In regard to concerns about channel simplification raised by members of the local restoration community, there is strong evidence that the rock veins, rock weirs, and log structures implemented by the Councils are less constrictive, and create more habitat complexity, than rip rap revetments. Although all indicators suggest that the Councils' bio-engineered structures are less detrimental to watershed health, the bottom line is that they are adding to the loss of lateral channel movement. When this loss is considered in addition to the confinement produced by the existing rip rap revetments, approximately 60% of the channel is being controlled to some degree. Not surprisingly, in most areas where lateral movement is still possible, there is fresh erosion resulting from a large flow event in December 2003. A more conclusive assessment of this data will take place in the

summer/fall of 2004, when we map and analyze these projects. An update to the *2002 Bioengineering Project Effectiveness* report will follow, as will a "Bank Stabilization Summit" directed at addressing the concerns raised about channel simplification.

In addition to the bank stabilization structures, three bio-engineered in-stream habitat development projects are also being monitored. Longitudinal thalweg profiles of these sites were surveyed in 2000, using the Nikon Total Station transit. Unfortunately an error in the gun setup rendered these surveys useless. In 2001 these sites were resurveyed, and one survey was continued upstream in 2002, to include a reach that was going to be treated with large wood placements that year. In 2003 the Councils contracted with a CAD operator to plot some of the Total Station surveys, of which two of these in-stream habitat bio-engineering projects were included (*see Appendix for Brown's Willow Creek and Lang's Willow Creek surveys*). Only Brown's project had two survey years that could be compared because of the loss of the 2000 surveys. Since neither of these years were pre-implementation surveys, it is difficult to determine the magnitude of change associated with the structures. The maps of Brown's survey are a good example, though, of the technique we are trying to employ. We anticipate re-surveying these sites in 3-5 years.

Funding for the 2002 longitudinal thalweg survey of Brown's Willow Creek, and the CAD time to work up both Brown's and Lang's surveys, came through this OWEB Monitoring Grant. The bank stabilization survey of Floras Creek is being funded through the OCF grant.

Miscellaneous Projects

One wetland construction and one estuarine restoration project are part of the Councils' long-term monitoring set. A topographic survey and vegetative survey of the wetland project were completed in 1998, following construction, and resurvey of the topography was done in 1999. Neither of these surveys have been plotted, and no additional survey work has been done. We will likely resurvey the topography and vegetation in 2005, and at that time, plot all three topographic surveys for comparison. In 2001 a project on the Winchuck Estuary removed fill that was placed into the estuarine area during the Highway 101 construction. Photo monitoring has taken place by the South Coast Council Coordinator, but no reports have been drafted.

Spawning Surveys

In the winter of 2003/04 the Councils undertook 24 Coho spawning surveys in 16 small tributaries of the County. Most of these tributaries include one or more of the Councils' restoration projects. The intent of the surveys is to establish long term data sets that can depict the cumulative effects of the restoration efforts taking place in the watershed. These surveys are also intended to increase local support and protection for these small streams, which are often thought to be of little importance. In addition, 13 of the surveys are also being used to evaluate the effectiveness of fish passage structures installed by the Councils.

On the streams where we have existing data, the spawning surveys documented poor distribution and lower densities in the winter of 2003/04 then were observed over the past three years. In part, this may be due to low flows in the winter of 2000/01 (Coho return as three year olds), and, according to the local ODFW District Biologist, it could also be the product of less fish straying from the Umpqua, Columbia, and other systems, which accounted for some of the fish observed in 2001 and 2002. These surveys will be posted on the Councils' webpage, www.currywatersheds.org, as soon as the data is summarized by ODFW's Corvallis Research Lab.

All funding for these spawning surveys came through the OCF grant, and the data analysis and summarization is through ODFW.

Other Program Accomplishments

Education and Outreach

- Presentation was given to the Association of Oregon Loggers on sediment abatement issues.
- Three classes on road inventory and sediment abatement projects were held as part of a Forest and Stream Education Program
- Three classes on water quality sampling were also held as part of the Forest and Stream Education Program.
- Project Effectiveness Monitoring results were presented to the South Coast and Lower Rogue Watershed Councils, the Oregon Watershed Enhancement Board, and the South Coast Fisherman.
- Water Quality results were presented to 6 of the individual South Coast Councils, and the Lower Rogue Council, as well as the SB1010 LAC, the Curry SWCD, and the Forage and Nutrition Group.
- Articles on water quality and project effectiveness were included in the Councils' newsletter, Curry Currents.
- Coordinated volunteer events on both the Chetco and the Lower Rogue to collect water quality sampling.
- Attended quarterly ODFW coordination meetings.
- Attended monthly SWCD Board meetings.

OSU Extension Wetland Restoration Surveys

In exchange for the use of the Nikon Total Station Transit, the Program Manager surveyed two wetland restoration projects for OSU Extension agents. One project is located in Marion County, the other is located in Curry County.

Webpage Development

The Councils' webpage www.currywatersheds.org was upgraded using funds through a USFWS grant. All of the Councils' project effectiveness reports were upgraded to electronic form, converted to Adobe Acrobat format, and upload to the webpage, as were the South Coast watershed assessments. The water quality reports and spawning survey summaries will also be loaded onto the page in the near future.

GIS Development
As was mentioned under earlier, the Councils' received $72,000.00 through RAC and DEQ 319 grants to develop a GIS system to house our project and monitoring data. Thus far the following work has occurred:

- Seventeen maps for the Lower Rogue Watershed Assessment.
- Digitized shade Assessment maps for the Chetco, Pistol, Euchre, Sixes, Elk and Floras Watersheds.
- Digitized wetland assessments for all 9 of the South Coast Watersheds.
- Biscuit Fire Water Quality Monitoring site map.
- Curry County Water Quality Monitoring site map.
- Mapping of the Lower Rogue road crossing density.
- Mapping of the wetlands of the Rogue River Estuary.

Program Expenditures and Match Documentation

Curry County Watersheds Monitoring Program #201-122

$43,993.01	Monitoring Program Manager
$42,014.38	Water Quality Analyst
$14,157.46	Road Inventory Crew
$4905.75	Stream Survey Crew
$4634.51	Temperature Technician
$5429.69	Water Quality Reagents
$1969.08	Monitoring/Water Quality Equip & Supplies
$282.89	Survey Materials & Equip
$265.97	Production, Film, etc.
$7202.27	Mileage
$1518.99	Training
$12,640.00	Administration
$139,014.00	Total

Match

$2400.00	City of Gold Beach Lab for Water Quality
$750.00	Chetco Watershed Council donation to Boat Basin sampling
$750.00	Cal-Ore Enhancement donation to Boat Basin sampling
$750.00	EPA Rural Sustainability donation to Boat Basin sampling
$480.00	Water Quality Advisory Committee time
$1000.00	Siskiyou National Forest purchase of water quality supplies
$11,330.00	DEQ 319, Garrison Lake water quality sampling
$48,000.00	BLM, water quality sampling and supplies
$10,000.00	DEQ 319, Riparian Trial Plots
$25,972.00	DEQ 319, Riparian Specialist and GIS
$5625.00	Siskiyou RAC, Riparian Specialist and GIS
$107,057.00	Total

Strengths and Weaknesses

Road Inventory

Over the past 6 seasons adjustments to the protocol and prioritization process have been made. The greatest strength of the protocol is that it captures all of the data needed to effectively analyze the sediment issues on forest roads. Where it is somewhat less efficient is on roads that were not constructed to meet forestry standards, such as ranch and cranberry roads. We have learned to deal with this by abbreviating the survey, and focusing on known types of problems (i.e. native surface low water fords used regularly for livestock and vehicles).

The greatest strength of program is that a high percentage of the information being collected is turning into on-the-ground projects, because there is considerable support from the landowners, and from funders.

Water Quality Sampling

The start date in the original plan was delayed from Fall 2001 to May 2002. During the additional time period, the following necessary preparations were completed:

- Located a suitable vehicle to serve as a mobile lab, and equipped it to safely secure reagents and equipment
- Developed standard operating procedures, and drafted Quality Assurance Project Plan (QAPP)
- Established and met with Water Quality Monitoring Advisory Committee.
- Modified the original scope of work to focus on those parameters that are included in the Oregon Water Quality Index.
- Added E.coli to the original scope of work after funding was received from BLM
- Entered into an agreement with the Siskiyou National Forest to share a water quality intern
- Established safety plan, summarized procedures for handling chemicals
- Purchased additional lab equipment and reagents

We discovered that developing a broad water quality program is more complex than simply converting a recipe from Standard Methods into a testing procedure for smaller batches. It is critical to draft and get DEQ review of a QAPP that includes Quality Assurance/Quality Control procedures and Standard Operating Procedures. Critical elements in the QAPP include calibration schedules for meters, regularly scheduled duplicates, field blanks, flagging out-of-compliance results to be reanalyzed or trigger recalibrations, and regularly scheduled split samples with DEQ.

We were fortunate in having a very capable intern, who had laboratory experience, funded by EPA Rural Sustainability, Coos Bay District BLM, and Siskiyou National Forest. We learned that it is difficult for two people to handle all of the associated tasks in addition to the sampling and lab testing. Future budgets will allow for time to maintain

and clean the field lab vehicle, wash, sterilize and acid-wash bottles, filter deionized water, restock reagents/spare batteries in field lab, and maintain inventory, purchasing, and unpacking of reagents. Additional time is also needed to establish method reporting limits and method detection limits for nutrient testing.

We were able to conduct relatively economical lab tests due to the donation of lab equipment and space from City of Gold Beach. We received reasonable prices on reagents due to our affiliation with the wastewater treatment facility. Additional used lab equipment was purchased through the internet. The reagent budget did not anticipate high shipping costs, especially extra charges for ODOT hazardous materials.

The value of having a dedicated volunteer monitoring coordinator at DEQ cannot be overstated. Services are provided such as training (data management workshops), meter calibration, email reminders, posting discussion on frequently asked questions, scheduling and providing timely access to results of split samples, assistance with assigning data quality levels, and obtaining bulk rates on some reagents and equipment. Unfortunately, the volunteer monitoring coordinator position was vacant for a period following the June, 2002 data management seminar, and during the time when we implemented the more difficult nutrient tests.

One of the greatest challenges we faced was in adapting the spectrophotometer for use in the total phosphorus test. Although the instrument had an adaptor for long-path test tubes, successive measurements showed that it did not hold the tubes in a stable configuration. We also struggled with the use of a hot plate for boiling the samples, rather than an autoclave, which was beyond our budget. Experimentation was necessary to determine the optimum boiling times, hot plate settings, and use of boiling beads (found to be unnecessary). Nearly 100 samples exceeded their recommended holding periods while we tried to determine how to conduct the test.

It was extremely helpful to receive a tour of a local private laboratory, and in retrospect, it would have been worthwhile to visit the Portland DEQ lab facility earlier in the program. After visiting the DEQ nitrate analyst, we determined that one of the steps in our procedure was unnecessary, and learned some other time-saving tips.

Early in our program, a split sample with DEQ indicated that the titrant cartridges used with a digital titrator for the dissolved oxygen test, could concentrate over time and yield low readings. We obtained cartridges from the volunteer monitoring coordinator (presumably fresh) and compared them with standard titrant from a buret (as used by DEQ). The digital titrator read approximately 1 mg/L lower than the standard titrant. We immediately discontinued use of the digital titrator and informed the new volunteer monitoring coordinator. This method is still recommended in the Oregon Plan Water Quality Technical Guidebook. The volunteer monitoring coordinator advised us to consider using powder pillows for dissolved oxygen, because DEQ could provide them. When the coordinator position was vacant, and the pillows were unavailable, we switched to liquid chemicals due to the expense. We discovered that the liquid chemicals are also faster and more accurate for the dissolved oxygen and BOD tests.

We learned that sampling for E.coli needs to be relatively frequent, due to the high variability. Few samples provide little information.

While in the midst of sampling, testing, and trying to produce high quality data, it is easy to forget to take the time to communicate the results. Between Phase I and Phase II, the results were compiled and presented to the Water Quality Monitoring Advisory Committee. The group prioritized the sampling to be done in Phase II. The results and recommended priorities were then presented for feedback by the watershed councils, SWCD, and a local forage and animal nutrition group (FANG). Upon completion of reports for Phase I and Phase II (Chetco Boat Basin, Biscuit Fire storm synoptics, New River mainstem and tributaries, estuary diurnal sampling, Lower Rogue tributaries baseline, and nutrient source search), all results are expected to be available at www.currywatersheds.org

Project Effectiveness Monitoring

As mentioned earlier, project effectiveness monitoring has been a challenge because of the number of projects, and the complexity of the natural systems these projects are affecting. When the Councils' Monitoring Program began addressing the issue of effectiveness monitoring in 1998, there weren't established monitoring protocols for most of these project types. Although photo points and narrative were an obvious option, the Councils' interpreted OWEB's call for effectiveness monitoring to mean numerically substantiated results. In every case except road stormproofing, protocols were either developed, or adopted from other sources such as ODFW. At the time the OSU Extension Agent for Curry County had recently purchased the Nikon Total Station transit, and copies of MicroSurvey's CAD software. As a result, surveys using this tool found there way into numerous aspects of the effectiveness monitoring component.

After six years we are still sorting out the pros and cons of the original protocols, making some adjustments to those protocols, and in some cases adopting new protocols. The **fish passage** monitoring has been an effective and efficient means of determining adult passage, but it is less capable of accurately depicting juvenile passage. When spawning surveys extend through the migration season, or juvenile sampling occurs in the spring, we can also assess the magnitude of re-colonization. The **road stormproofing** monitoring is quick and simple, and is effective in determining the project's status. Where this process falters is that it does not actually monitor sediment in the system, so we cannot determine the significance of the projects – individually or cumulatively. To step up to this level, though, would be very difficult, and beyond the scope of the Councils' existing Program. The effectiveness of our **large wood monitoring** is difficult to assess. On the one hand we have the Aquatic Habitat Protocol, which was developed and utilized by ODFW, but not for the purpose of quantitatively depicting habitat change associated with specific logs. Can the survey capture that change when it occurs? Most likely, if it is significant, but at what point does the large margin of error inherent to the protocol began to mask, or synthesize, the habitat changes we are looking for? What we haven't done is to focus on reach level changes instead of changes at the specific log

placement sites. In part this is because our only round of comparison was working with surveys separated by one winter, which is a short time period to expect significant changes to channel morphology. It is also in part because we did not survey control reaches upstream that could be used to separate out change caused by other factors. Our use of the Total Station for large wood monitoring has also been a mixed bag. Comparing plan views is a relatively easy CAD operation, and it is good at displaying changes in sinuosity and channel length. On the other hand, comparing longitudinal profile views of thalweg surveys is more difficult because changes in channel length effect how the surveys overlap, and vertically exaggerated scales are often difficult for people to understand. We haven't resurveyed any of the Schematic Drawing sites, so we cannot tell if they will be more effective. Although we completed topographic surveys of 2 meander lengths downstream of **bank stabilization** structures, we haven't successfully resurveyed either of the two sites. What we have learned, though, is that the level of detail we hoped to capture is highly impossible because of variability associated with where a surveyor takes points, and because of variability associated with the CAD operator's interpolation of the ground between those points. With this said, simplifying the surveys to cross sections and thalweg profiles would make the process much more efficient and accurate, but there is still the dilemma of isolating the changes in channel morphology associated with the project from the changes that are happening "naturally" all the time. For this reason, photo points and narrative is probably the most reasonable approach. However, using thalweg surveys and cross sections for **in-stream habitat rock structures** has merit, and is more closely associated with the pros and cons described for large wood monitoring. It is too early to tell how many more bugs we will need to work out of our modified version of the extensive **riparian monitoring** protocol, but in general it seems to be a good evolution in our efforts to monitor riparian plantings. Through this protocol we are increasing the quantity and quality of numerical data, developing the ability to rate segments, and creating a process for prescribing treatments on a segment by segment basis. The fear associated with this protocol is that we will produce more data than we can effectively process, and turn into improvements on the ground.

In general, one more thing should be said about the Total Station surveys. The MicroSurvey CAD software we are using is sophisticated enough that you need to work with it fairly regularly to be proficient, and because it is distinct enough from AutoCAD, it is nearly impossible to find someone in the County to work-up these surveys. As a result, a fair bit of time has been spent by the Program Manager under this grant, as well as the first two OWEB grants, trying to learn the software. If the Manager was proficient with the software, though, there are numerous uses for the Total Station transit with both the Monitoring Program and the Councils' project development efforts.

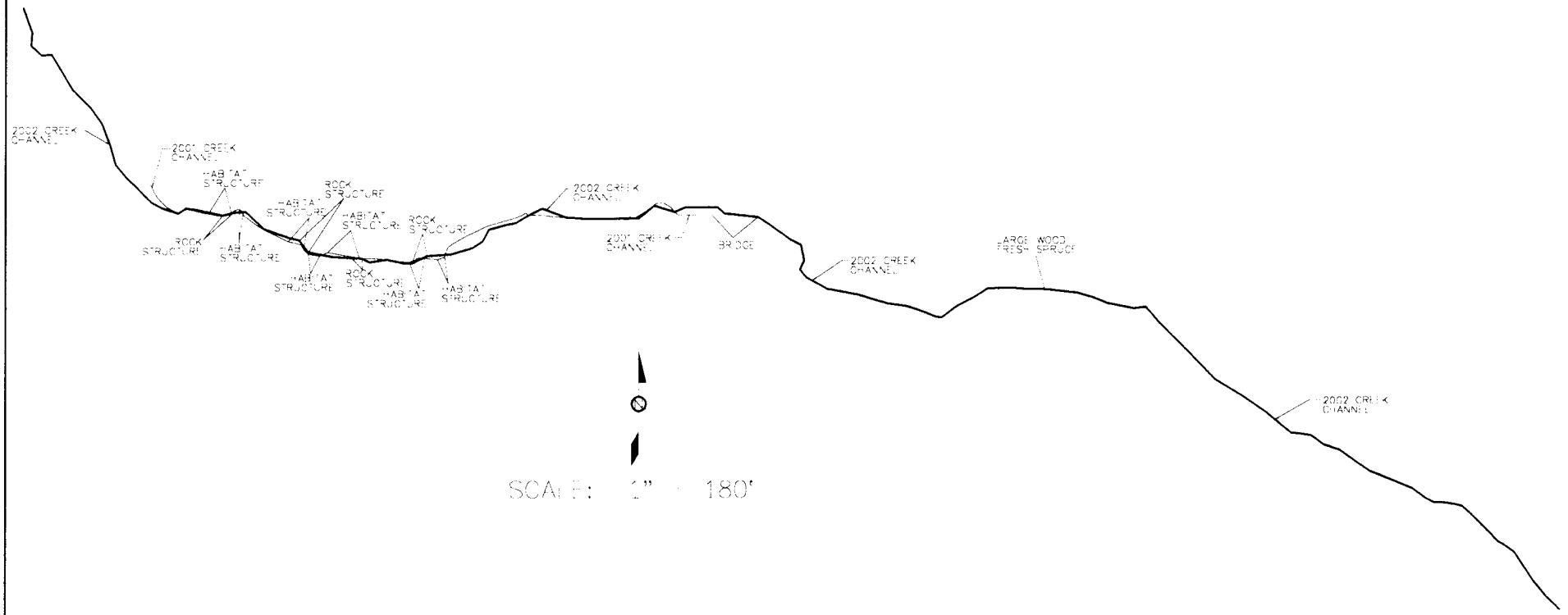
Appendix

Brown's Willow Creek In-stream Habitat Structure Surveys

Lang's Willow Creek In-stream Habitat Structure Surveys

Bethel Creek Total Station Plan View

Water Quality Power Point Presentation



SCALE: 1" = 180'

PLAN VIEW
2001 AND 2002

NOTE:

1. INFORMATION BASED ON SO. COAST WATERSHED COUNCIL SURVEY DATED AUGUST 4, 2001 AND JUNE 18, 2002

2. ELEVATIONS ARE FOR REFERENCE PURPOSES ONLY AND DO NOT REFLECT ACTUAL ELEVATIONS.

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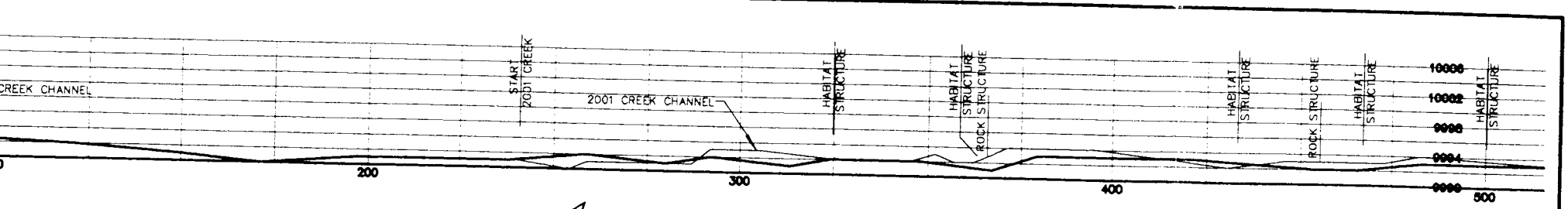
DESIGNED BY: MS/KB	DATE: 04/04/03
SOUTH COAST WATERSHED COUNCIL GOLD BEACH, OR (541)247-2755	PLAN SHEET 1 OF 5



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2002 CREEK CHANNEL

PLAN VIEW
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2002 CREEK CHANNEL

ROCK STRUCTURE

ROCK STRUCTURE

2001 CREEK CHANNEL

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HABITAT STRUCTURE

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PLAN VIEW
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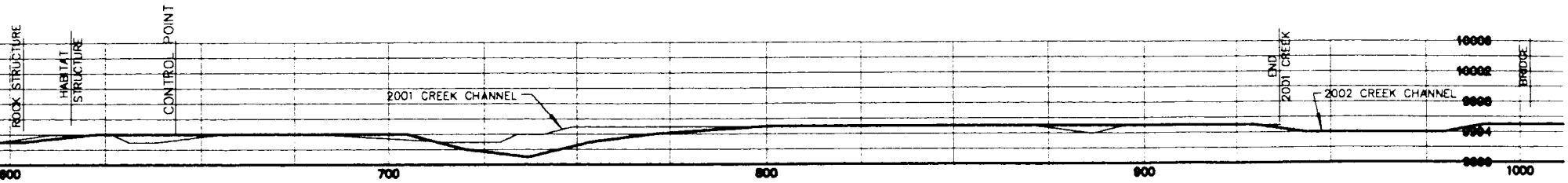
CREEK SURVEYS 01/02

FLX NAME	BROWNS'WILLOW02'_PROFILE
DESIGNED BY MS/KB	DATE 04/04/03
SOUTH COAST WATERSHED COUNCIL GOLD BEACH, OR (541)247-2755	PROFILE SHEET 2 OF 6



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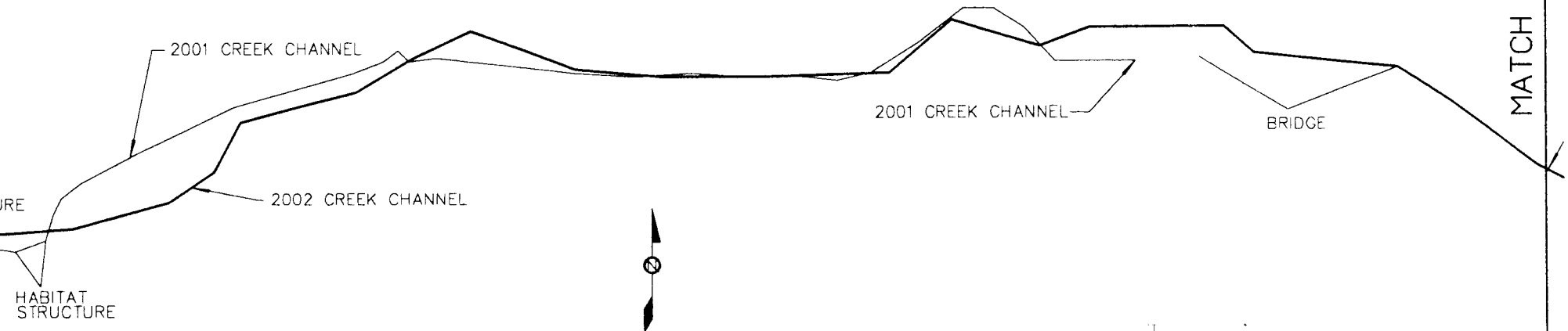

PLAN VIEW
SCALE: 1"=40'

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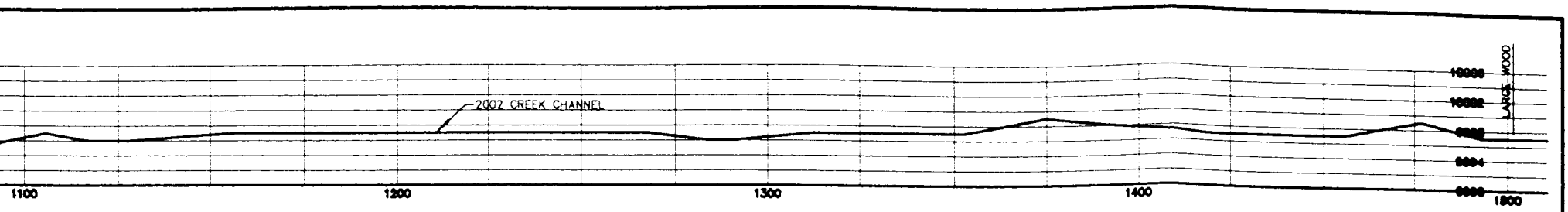
OT REFLECT ACTUAL ELEVATIONS.

BROWNS 'WILLOW' CREEK
CREEK SURVEYS 01/02

FLX NAME	BROWNS'WILLOW02'_PROFILE
DESIGNED BY MS/KB	DATE 04/04/03
SOUTH COAST WATERSHED COUNCIL GOLD BEACH, OR (541)247-2755	PROFILE SHEET 3 OF 6



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PLAN VIEW
SCALE: 1"=20

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RENCE PURPOSES ONLY AND
NOT REFLECT ACTUAL ELEVATIONS.

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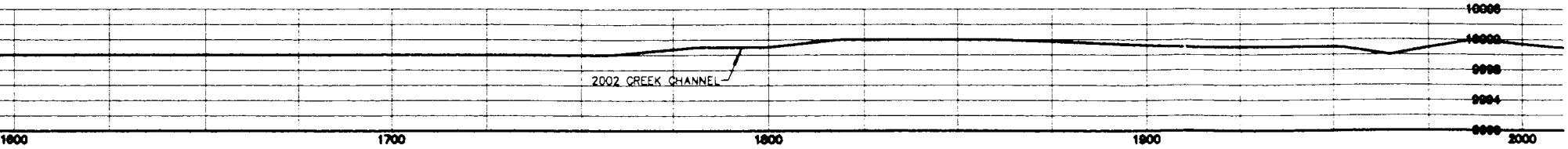
CREEK SURVEYS 01/02

FLX NAME	BROWNS'WILLOW02'_PROFILE
DESIGNED BY MS/KB	DATE 04/04/03
SOUTH COAST WATERSHED COUNCIL GOLD BEACH, OR (541)247-2755	PROFILE SHEET 4 OF 6



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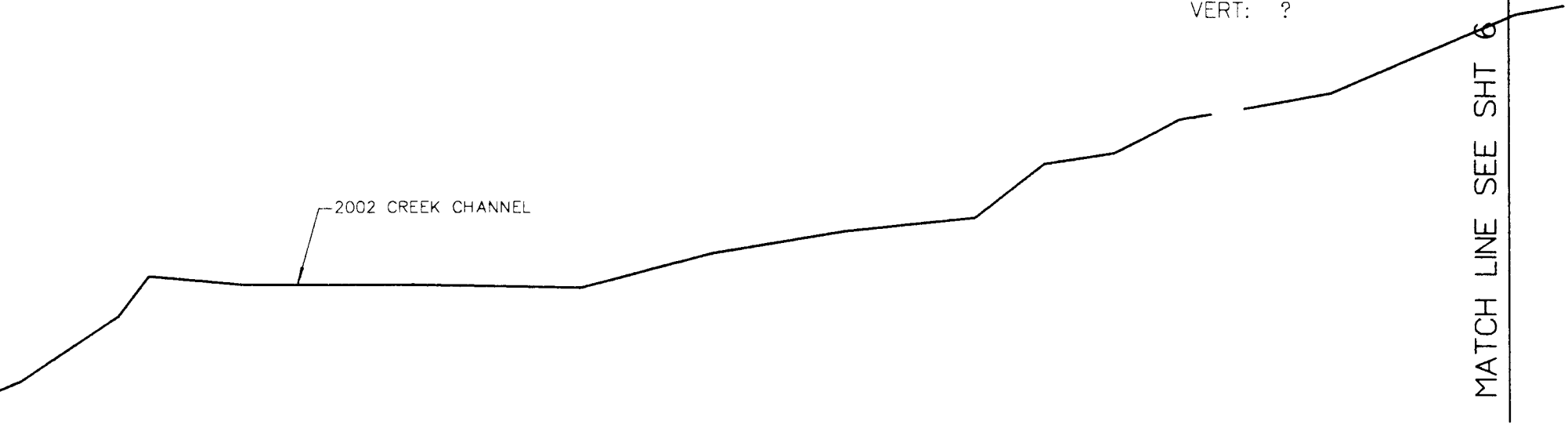

PLAN VIEW
SCALE: 1"=40'

NOTE:
1. INFORMATION BASED ON SO. COAST WATERSHED COUNCIL SURVEY DATED AUGUST 4, 2001 AND JUNE 18, 2002
2. ELEVATIONS ARE FOR REFERENCE PURPOSES ONLY AND DO NOT REFLECT ACTUAL ELEVATIONS.

BROWNS 'WILLOW' CREEK
CREEK SURVEYS 01/02

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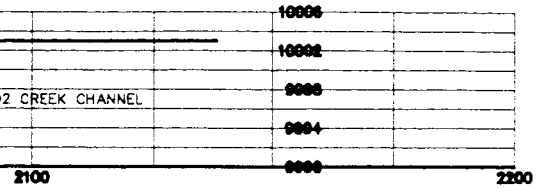
DESIGNED BY MS/KB	DATE 04/04/03
SOUTH COAST WATERSHED COUNCIL GOLD BEACH, OR (541)247-2755	PROFILE SHEET 5 OF 6



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PLAN VIEW

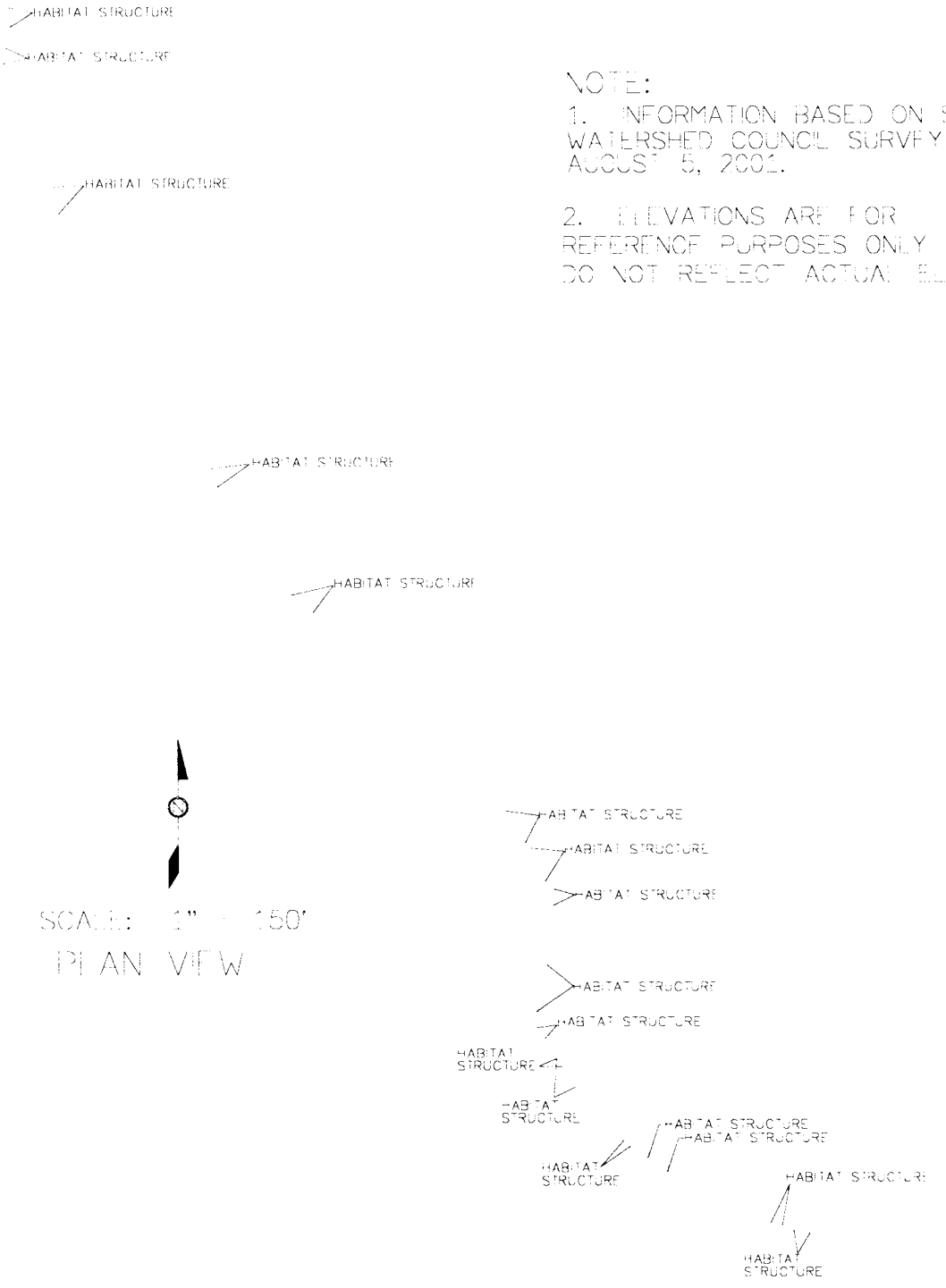
SCALE: 1"=40'

ELEVATIONS ARE FOR
RENCE PURPOSES ONLY AND
OT REFLECT ACTUAL ELEVATIONS.

BROWNS 'WILLOW' CREEK

CREEK SURVEYS 01/02

FLX NAME	BROWNS'WILLOW02'_PROFILE
DESIGNED BY MS/KB	DATE 04/04/03
SOUTH COAST WATERSHED COUNCIL GOLD BEACH, OR (541)247-2755	PROFILE SHEET 6 OF 6



NOTE:

1. INFORMATION BASED ON SO. COAST WATERSHED COUNCIL SURVEY DATED AUGUST 5, 2001.

2. ELEVATIONS ARE FOR REFERENCE PURPOSES ONLY AND DO NOT REFLECT ACTUAL ELEVATIONS.

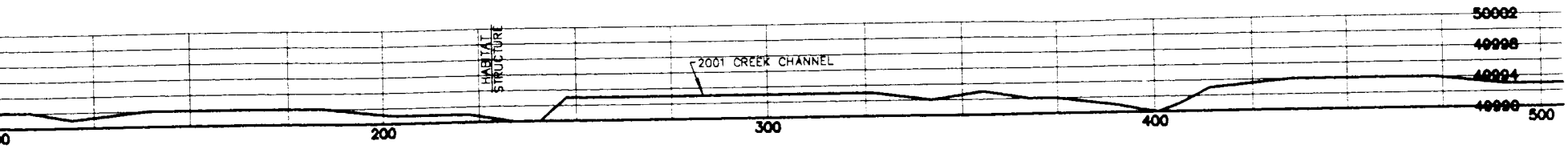
SCALE: 1" = 150'

PLAN VIEW

WILLOW "ANOS" CREEK

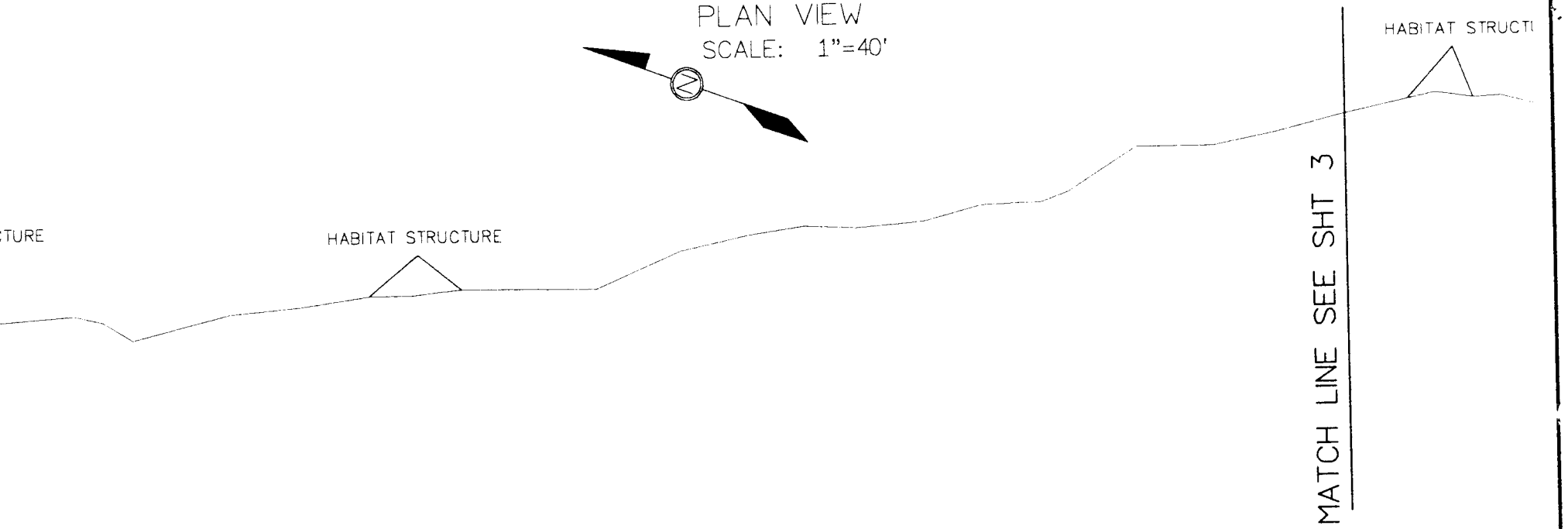
CREEK SURVEY 2001

FILE NAME	01WILLOWUPPER PROFILE
DESIGNED BY: MS/KB	DATE: 04/04/03
SOUTH COAST WATERSHED COUNCIL GOLD BEACH, OR (541)247 2755	PLAN VIEW SHEET 1 OF X



PROFILE VIEW
PROFILE SCALE:
HORZ: 1"=40'
VERT: ?

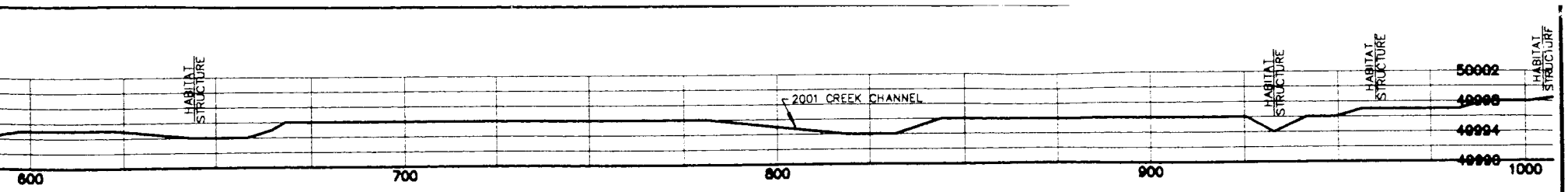
PLAN VIEW
SCALE: 1"=40'



LEVATIONS ARE FOR
RENCE PURPOSES ONLY AND
OT REFLECT ACTUAL ELEVATIONS.

WILLOW 'LANGS' CREEK
CREEK SURVEY 2001

FLX NAME	01WILLOWUPPER_PROFILE
DESIGNED BY MS/KB	DATE 04/04/03
SOUTH COAST WATERSHED COUNCIL GOLD BEACH, OR (541)247-2755	PROFILE SHEET 2 OF 4

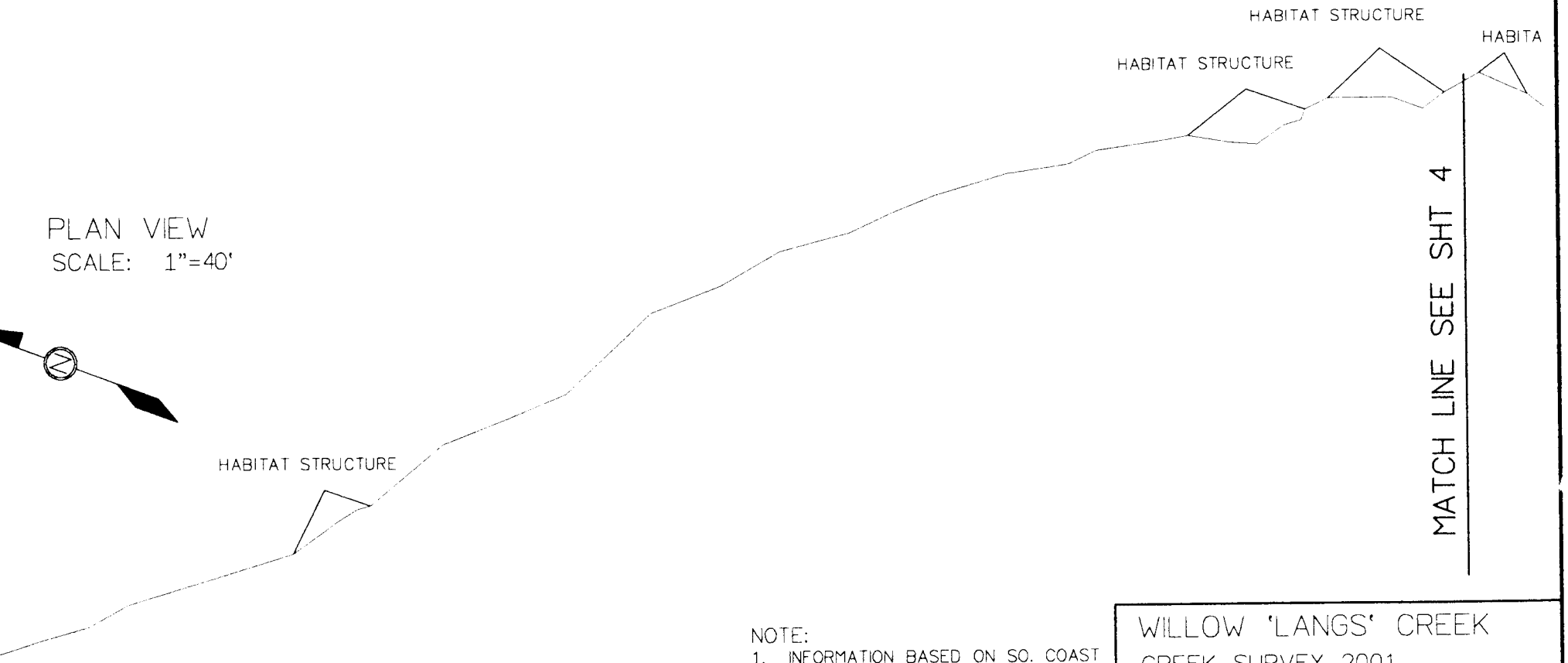


PROFILE VIEW

PROFILE SCALE:
HORZ: 1"=40'
VERT: ?

PLAN VIEW

SCALE: 1"=40'



NOTE:

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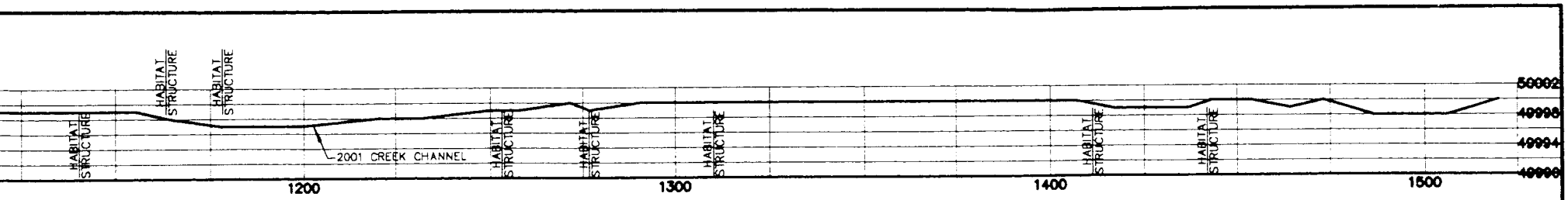
WILLOW 'LANGS' CREEK

CREEK SURVEY 2001

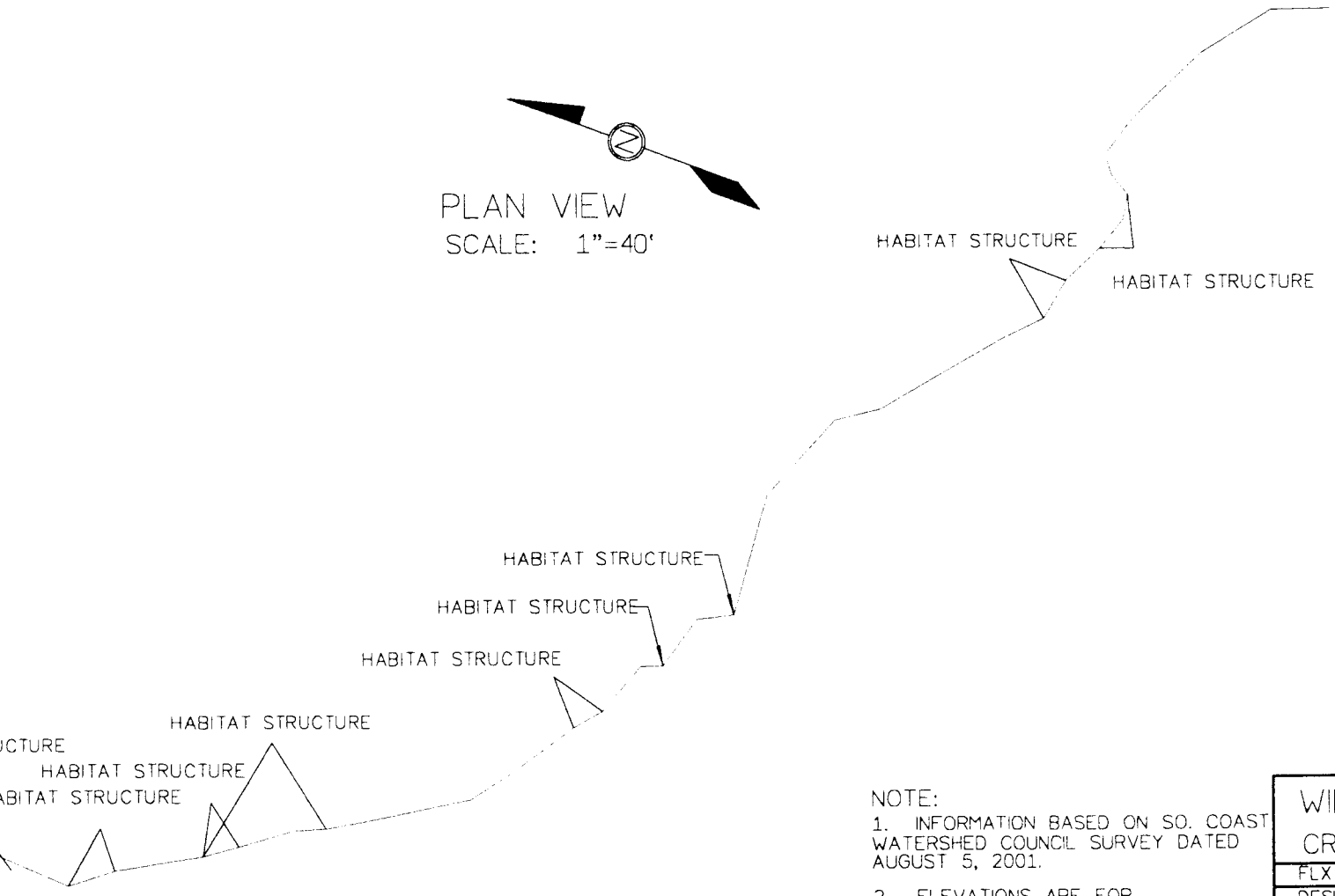
FLX NAME	01WILLOWUPPER_PROFILE
DESIGNED BY MS/KB	DATE 04/04/03
SOUTH COAST WATERSHED COUNCIL GOLD BEACH, OR (541)247-2755	PROFILE SHEET 3 OF 4



PROFILE VIEW

PROFILE SCALE:
HORZ: 1"=40'
VERT: ?

PLAN VIEW
SCALE: 1"=40'



NOTE:
1. INFORMATION BASED ON SO. COAST WATERSHED COUNCIL SURVEY DATED AUGUST 5, 2001.

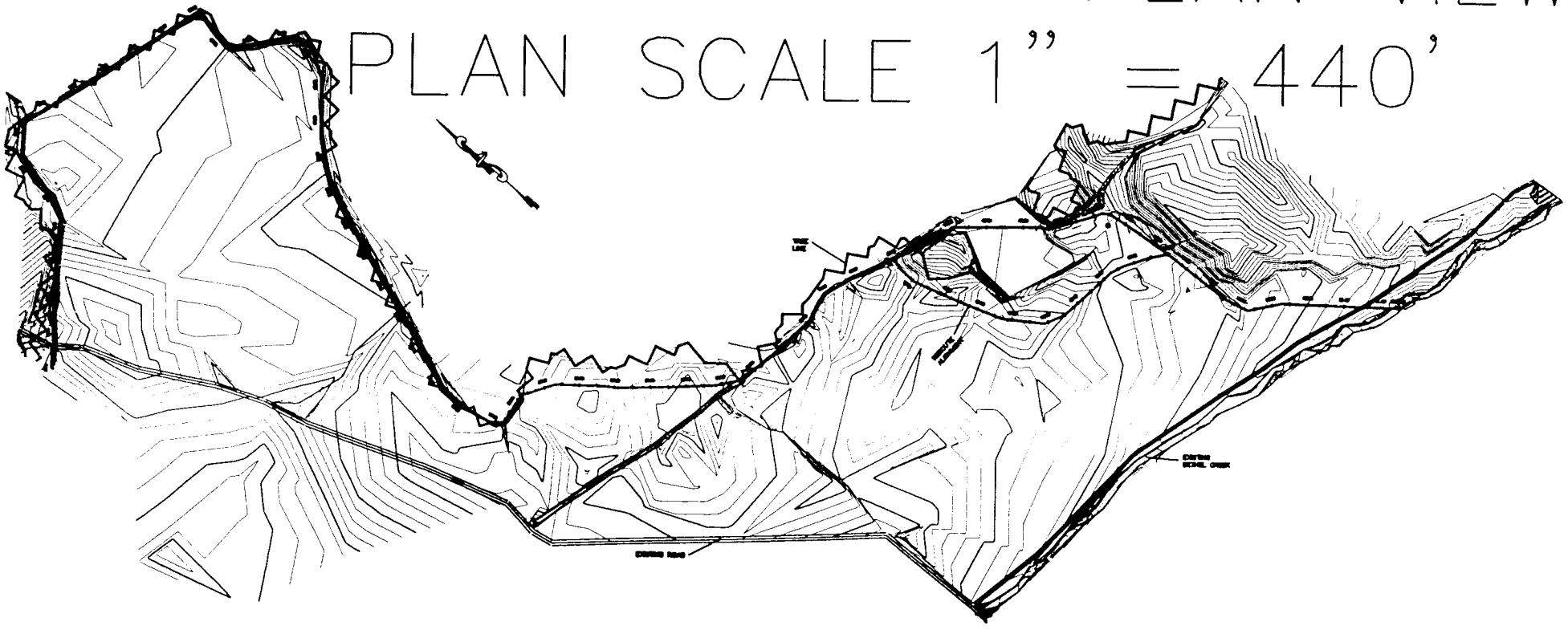
2. ELEVATIONS ARE FOR REFERENCE PURPOSES ONLY AND DO NOT REFLECT ACTUAL ELEVATIONS.

WILLOW 'LANGS' CREEK
CREEK SURVEY 2001

FLX NAME	01WILLOWUPPER_PROFILE
DESIGNED BY MS/KB	DATE 04/04/03
SOUTH COAST WATERSHED COUNCIL GOLD BEACH, OR (541)247-2755	PROFILE SHEET 4 OF 4

BETHEL CREEK PLAN VIEW

PLAN SCALE 1" = 440'



Shoalwater Enterprises & Associates, LLC

Job Name: BETHEL CREEK

Sheet PLAN VIEW BETHEL CREEK REROUTE

Sheet 1 of 8