FISH HABITAT IMPROVEMENT PROJECTS IN THE FIFTEENMILE CREEK AND TROUT CREEK BASINS OF CENTRAL OREGON: FIELD REVIEW AND MANAGEMENT RECOMMENDATIONS

Prepared by:

J. Boone Kauffman, Ph.D.
Robert L. Beschta, Ph.D.
William S. Platts, Ph.D.

Prepared for:

U. S. Department of Energy
Bonneville Power Administration
Division of Fish and Wildlife
P.O. Box 3621
Portland, OR 97283-362 1

Project Numbers: 86-079; 84-062
Contract Number DE-BI79-84BP 18955
Contract Number DE-BI79-9 1BP 148 12

JULY 1993

TABLE OF CONTENTS

FISH HABITAT IMPROVEMENT PROJECTS IN THE FIFTEENMILE CREEK AND TROUT CREEK BASINS OF CENTRAL OREGON: FIELD REVIEW AND MANAGEMENT RECOMMENDATIONS

INTRODUCTION

In mid-June of 1992, a field review was undertaken of stream habitat improvement project sites in the lower Deschutes River Basin. The review team, representing riparian ecology, fisheries, and hydrology disciplines, visited a variety of projects associated with a wide range of habitat types. Habitat management objectives, limiting factors, project implementation, land use history, and other factors were discussed at each site. This information, in conjunction with the reviewer's field inspections of portions of a particular habitat project, provided the basis for the following report.

The observed stream reaches represented a wide range of reach types, geology, channel gradients, stream sizes, vegetation communities, and land management in the Trout Creek and Fifteenmile Creek Basins. We had the opportunity to visit low elevation streams with watersheds dominated by farmlands, and by sagebrush, grasslands, or western juniper. Land use activities influencing streams included farming, irrigation withdrawal and livestock grazing. We also visited forested reaches in the lower elevations of the Cascade and Ochoco Mountains where land use activities centered around timber harvest and livestock grazing.

Steelhead trout were a common thread connecting these diverse riparian/stream ecosystems. Solutions to the restoration of this degraded habitat are neither simple nor inexpensive, and will involve the efforts of state, federal, and private organizations and individuals. While progress has been made toward habitat restoration and population enhancement, there is still much to accomplish. This report outlines the authors' observations and recommendations for the recovery of anadromous fish in these basins.

The report is divided into four sections: (1) Objectives, (2) Recommendations, (3) Discussion and Conclusions, and (4) Site Comments. The recommendations section represents a synthesis of major recommendations that were developed during this review. The remaining sections provide more detailed information and comments related to specific aspects of the field review. Although discussions, comments, and observations of field personnel were often important in the formulation of recommendations and conclusions, the review team assumes full responsibility for the contents of this report.

REVIEW OBJECTIVES

Few would argue that there are a multiplicity of human-induced factors affecting reductions in resident and anadromous fish populations of the Pacific Northwest. The cumulative effects of degraded riverine habitats, irrigation withdrawals, excessive ocean harvests, hatchery competition, and hydropower development and operation have resulted in precipitous declines in the Columbia Basin anadromous fish populations. While it is recognized that all of these factors are important, the objective of this report was to review only the habitat conditions and enhancement programs of salmonid riverine/riparian environments.

The Pacific Northwest Electric Power Planning and Conservation Act of 1980 states: "The council shall properly develop and adopt . . . a program to protect, mitigate, and enhance fish and wildlife, including related spawning grounds and habitat on the Columbia River and its tributaries." As a result, the Bonneville Power Administration (BPA) has funded various projects throughout the Columbia Basin with the goal of increasing system-wide production of anadromous fisheries through a combination of habitat restoration and enhancement measures. The streams and projects reviewed for this report are included in Section 1400 of the Five-Year Action Plan (1987-1991) of the 1987 Columbia River Basin Fish and Wildlife Program, pursuant to Section 4(h) of the Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L. 96-501).

The objective of this review a outlined in BPA's request to the contractors was: "... (to) conduct a field review of stream habitat restoration and related projects with project personnel. Factors limiting wild and natural fish production will be evaluated along with the effectiveness of previous projects in addressing limiting factors. Recommendations will be made on the direction and scope of future projects." While other resource benefits or effects may accrue from these projects, we focused primarily on salmonid habitat response and needs. Included in this report is an assessment of the selected habitat alteration projects. Also included are managerial and research recommendations for improving habitat management activities in the future.

RECOMMENDATIONS

(1) Fish habitat improvement projects should first focus on removing or reducing those human impacts that are causing habitat degradation — abusive livestock grazing, excessive irrigation withdrawals, logging in riparian zones, agricultural activities at the streambank edge, etc.

(2) Although natural resource managers recognized the linkages between the terrestrial uplands, riparian ecosystems, and the aquatic ecosystem, enhancement projects rarely reflected this recognition (i.e., an ecosystem approach was not being implemented). This was particularly true in the case where projects relied heavily on the use of instream structures and streambank rip-rap. These manipulations were often found to have severed linkages between the aquatic and riparian ecosystems. Activities that prevent the maintenance or reconnection of hydrologic and ecosystem linkages or that limit ecosystem functions should be discontinued.

(3) It is ironic that attempts to enhance wild or native salmonids and coming through the creation of artificial or unnatural stream habitats. The installation of instream structures that are out of context with a naturally functioning system should be halted. These structures are not sustainable, can degrade biological diversity, and are of questionable value in the long-term sustainability of salmonid fish populations. Often structures were simple in structure and form, and bore litte resemblance to complex, naturally formed pools. Examples of “out of context” channel alterations include boulder placements in fine-textured meadow systems, instream structures that convert unconstrained reaches into constrained reaches, log and boulder placements that eliminate overhanging banks, as well as secondary channels, structures that result in additional channel downcutting or increases in streambank widths, and structural

additions to streams in good ecological condition. Instream structure should be complex, accelerate riparian recovery and initiate natural processes and functions. Rarely did instream structures accomplish these goals.

(4) Factors affecting the decline of salmonid populations extend far beyond the riparian/stream ecotone. Restoration activities that focus only on instream manipulation are severely limited in their effectiveness and may ultimately fail unless alternative approaches to salmonid habitat recovery and management are implemented. In critical areas of concern, the BPA and the Oregon Department of Fish and Wildlife (ODFW) should consider more comprehensive measures of habitat restoration such as upland restoration and lease or purchase of local floodplains to ensure vegetation recovery.

(5) Restoration of riparian vegetation is fundamental for the successful restoration and perpetuation of salmonid populations. Control of livestock via fencing was observed to consistently result in the greatest rate of vegetation recovery, the greatest improvement in riparian functions (e.g., recovery of shade, allocthonous inputs, streambank recovery, water storage in the riparian zone, water quality, increased channel diversity, and hiding cover), and hence, the greatest opportunity for salmonid habitat recovery.

(6) Exclosure fences must be properly constructed to protect the entire riparian zone. Unless the dynamic and interactive processes between the riparian floodplain and the stream channel are allowed to function, the potential for salmonid habitat recovery is limited. Fence maintenance to perpetuate livestock control must be given a high priority to protect the public investment in salmonid recovery.

(7) Access roads that are no longer needed (i.e., those that were utilized to construct enhancement structures, old logging roads, etc.) should be ripped, seeded to native species, and generally blocked to vehicular use.

(8) In forested reaches, the multiple functions of standing vegetation and the recruitment of fine and coarse woody debris play important roles in the maintenance of salmonid habitats. No harvest buffers of at least 100 feet (30 M) on each side of the stream should be implemented to insure the sustainability of intact salmonid habitats.

(9) The dewatering of streams due to irrigation withdrawal is an issue of utmost concern regarding salmonid populations. The significant negative impact of stream dewatering has not been addressed adequately in completed fish habitat enhancement projects. In semiarid watersheds, dewatering can prevent the recovery and sustainability of salmonid populations. Restoration projects must include provisions for maintaining sufficient instream flows of a quality necessary to maintain or restore high quality fish habitat. In areas of critical concern, it may be necessary and economically efficient for BPA and ODFW to initiate the purchase or lease of water rights for conversion to instream flows.

(10) Although salmonid habitat enhancement projects have been ongoing for approximately 10 years, their level of success and value have been largely unquantified. Monitoring and evaluation activities must be accelerated to quantify the effectiveness of various restoration efforts.

(11) Where monitoring and evaluation are to be undertaken, monitoring and evaluation plans need to be completed prior to project implementation. Control reaches (nearby reaches that will not be altered by the project, adjacent tributaries, reference sites of relatively high quality habitat, etc.) should be part of any project that is monitored. When habitat restoration is begun on new basins, monitoring and evaluation must be sufficient to quantitatively determine the value of the project.

(12) The current 15-year lease common to most enhancement projects on private lands may not provide long-term habitat improvement if the original land use practices return when the lease period has ended. To achieve sustainable fish habitat, land owners must continue to protect and properly manage the stream and riparian resources beyond the 15-year lease period.

(13) The cumulative effects of human activities in a drainage must be considered in fisheries enhancement. Projects should not be implemented when beneficial gain is negated or overpowered by offsite (upland or downstream) land use practices. If the perturbation causing habitat decline or preventing recovery cannot be eliminated or ameliorated the project should not be implemented.

(14) In its desire to improve fisheries habitat, ODFW has accepted responsibilities that extend beyond the mandate for anadromous fish restoration. We temper this statement by the realization that salmonids are a good indicator species of the ecological "health" of the entire watershed. To prevent the extinction of salmonid populations, multidisciplinary efforts between state and federal agencies and private landowners will be necessary. We encourage the Soil Conservation Service (SCS), Soil and Water Conservation Districts (SWCDs), and private landowners to become fully involved and exert a strong leadership role in the implementation of ecologically sound riparian and upland management practices and the minimization or elimination of activities that degrade salmonid habitats (e.g., gully headcuts, soil erosion, non-sustainable agricultural practices, etc.).

(15) Federal and state employees (e.g., ODFW, SCS, SWCDs, Oregon State University Extension Service, etc.) and private landowners need to become thoroughly familiar with riparian functions, stream ecology principles, and fluvial geomorphology concepts. Workshops and short courses covering these subjects are desperately needed and recommended for interested parties of central and eastern Oregon.

DISCUSSION AND CONCLUSIONS

The ODFW stream habitat improvement program objective is to maximize wild winter steelhead production in the Fifteenmile Creek Basin and summer steelhead in the Trout Creek Basin. Current plans indicate this will be accomplished by corridor and riparian area fencing, removing fish passage barriers, installing log berms and drops, constructing channel rock berms, rip-rapping streambanks and installing channel rock revetments. The project cost is estimated to be over two million dollars. Unfortunately, of all projects visited, we saw none where significant improvements in fish runs had been quantitatively demonstrated.

Conclusion 1

Fish habitat improvement projects should first focus on (1) removing human impacts that are causing habitat degradation, (2) reestablishing riparian vegetation, and (3) restoring natural ecosystem processes. These objectives should be the focal point for fish habitat improvement projects as they usually produce the highest benefits for the amount of money spent. ODFW is generally using this approach as they work down the basin from the headwaters. Our concern is the narrowness of these riparian corridors in agricultural areas and how the resultant conditions will respond to future flood events. Whenever possible, corridor fencing should be wide enough to allow for stream channel adjustments and changes in morphology.

The planned project cost of the lower Fifteenmile Creek Basin is estimated to exceed two million dollars. ODFW's justifications for the large expenditure are the projected increases in annual smolt production of 22,000 to 47,000 and the increase in steelhead adult returns by 1,560 to 3,340 within 10 years. Our primary concern is that major off-site factors that cannot be controlled via only project channel modifications and narrow corridor fencing may completely negate the projected benefits.

Conclusion 2

The current programs of monitoring and evaluation will not allow a determination of whether projected benefits will be attained. If increased fish populations occur, there will be no valid determination if the projects had any influence in gaining these benefits. Conversely, if steelhead runs decrease over the lo-year period there will be no documentation or understanding of the cause of this decline. The BPA should identify projects where monitoring and evaluation will improve the predictability and improvement of stream repair projects. The BPA should also support the efforts of cooperating agencies (ODFW, USFS, etc.) to ensure that funds and commitments are available to fulfill monitoring needs. The Fifteenmile and Trout Creek Basins appear to be deserving projects for intensive monitoring and evaluation programs.

The lower Fifteenmile Creek, Trout Creek, and Buck Hollow Creek Basins will continue to periodically experience large flood events that could cause channel and streambank damage as long as the riparian vegetation remains in a degraded condition. Current land uses will continue to increase the frequency and severity of high flood events, turbid stream flows, and large volumes of transported sediment. Unless riparian zones are allowed to recover to such a degree that they can buffer the effects of floods as they did for millennia prior to Euroamerican settlement, fish habitat will not be restored.

Conclusion 3

Based on the large influence of basin-wide limiting factors (e.g., extensive areas of plowed fields in the Fifteenmile Creek Basin and degraded rangelands in the Trout Creek Basin which are subject to high erosion rates) the projected fisheries benefits are not likely attainable. Furthermore, in some channel reaches habitat improvement projects may have negative effects over the long term (e.g., channel modifications and rip-rap in the very upper reaches of Fifteenmile, Ramsey Creek, and upper Trout Creek).

Factors such as large irrigation diversions and withdrawals will continue to greatly reduce or completely eliminate summer flows. Current summer stream temperatures, as reported by ODFW are often too high in the lower basins for steelhead rearing requirements; stream temperatures as high as 85 degrees F have been reported.

Conclusion 4

Other rehabilitation methods, such as purchase of water-rights to augment in-channel flows during critical summertime periods, **should be part of project efforts. For** example, construction of alternative water supplies for the City of Dufur and purchase of the Fifteenmile Creek water right may be feasible to gain added streamflows in this system.

Under current conditions land owners will likely continue land practices that degrade or maintain the stream channel in its present condition. This will occur even if it means a continuation of channel and bank hardening and it will negatively affect salmonid habitats.

Conclusion 5

All habitat improvement projects should recognize and plan for the fact that stream channels and riparian zones are dynamic both spatially and temporally. Future proposed hard structures, as well as those already installed, should be critically evaluated as to their effectiveness for salmonids. This analysis should receive special consideration where private landowners require controlled streams that remain in place. Hard structures that prevent local channel adjustments, limit sinuosity, and simplify streams or limit riparian\aquatic interactions should be carefully analyzed for the benefits and negative influences before being implemented.

Fifteenmile and lower Trout Creeks will never again be pristine streams. Rehabilitation projects can only attempt to gain certain habitat conditions more favorable to steelhead trout. Obtaining this gain is our concern. We do not anticipate that current or projected instream work will acquire this influence unless good natural resource management and agricultural best management practices (BMPs) implemented in these basins. Again the human disturbances that are causing the decline in habitats or preventing their recovery must be recognized and addressed.

Conclusion 6

The present 15year sunset limitation on project agreements (in some project areas only 5 to 10 years remain) may not be a suffkient time-frame for recovery. In addition, a return to abusive land management after the agreement expires may negate any gains in habitat condition. Contingency plans should be formulated for the time when the obligations of landowners in the projects are completed. Efforts and incentives should be made to extend the 15-year cooperative agreements. The process to assign obligations and maintenance costs over at least the next five decades should be determined. To wait until the 15-year sunset arrives may result in insurmountable conflicts and problems. Only through immediate planning will any values that have been acquired through the large expenditure of funds be protected.

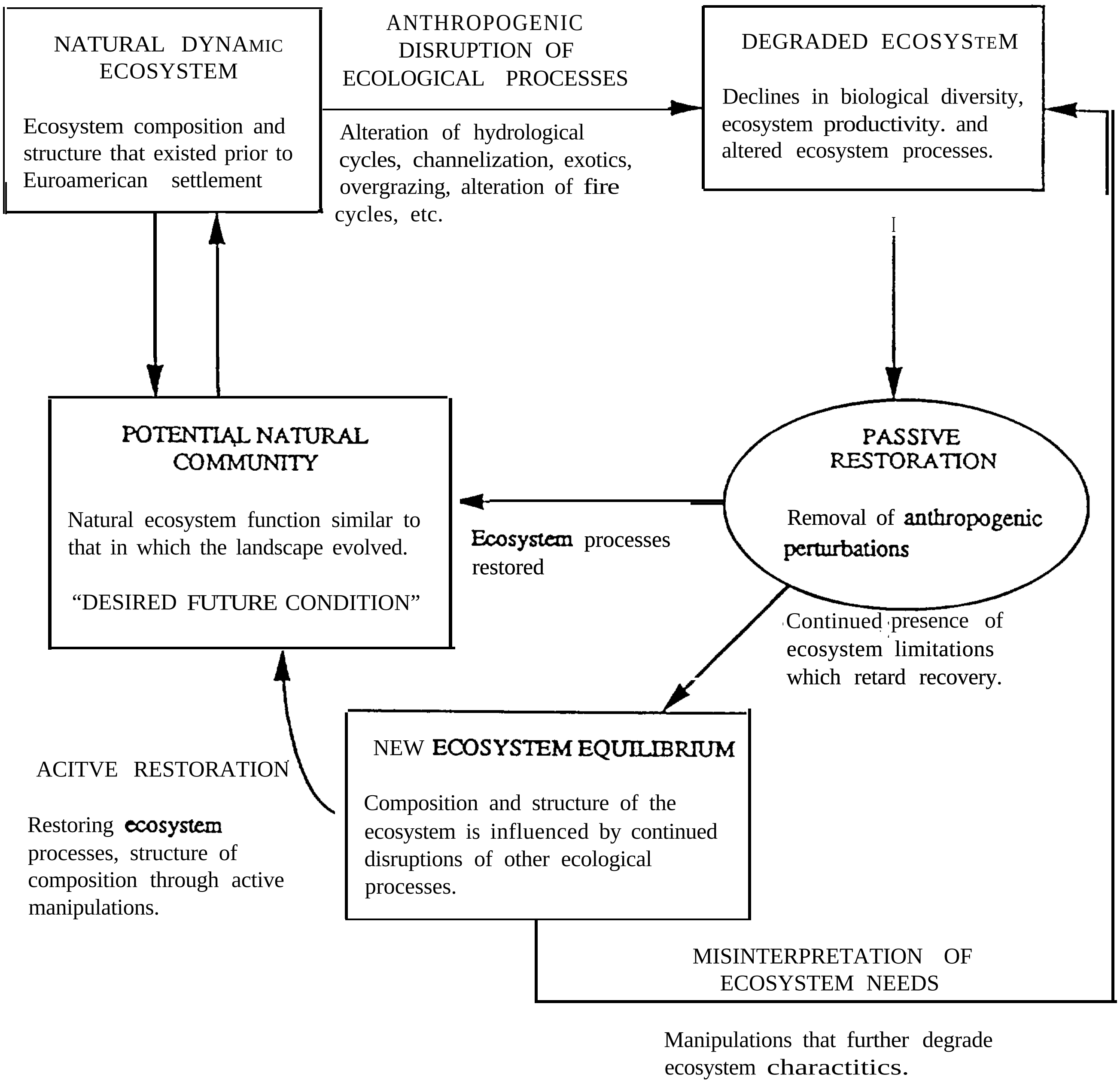
ODFW has done an excellent job of developing cooperation with private landowners. ODFW not only successfully worked with landowners to improve their riparian lands, but educated landowners on the benefits accrued from maintaining streams and riparian zones in good condition. This interaction will result in long-lasting benefits.

Conclusion 7

We commend ODFW for taking on such a large problem and making headway in providing solutions. We emphasize the need for the other land management assisting agencies, such as the SCS and SWCD, to assist in implementing sustainable agricultural practices that are also compatible with instream fisheries and water quality needs. ODFW's current approach is commendable, but it will have limited potential for success unless landowners become aware of the need for riparian protection and implement practices that accomplish this. The needs of future generations of Americans to have productive farmlands as well as healthy salmonid populations should receive a high level of consideration when implementing land use practices and restoration activities.

A CONCEPTUAL APPROACH TO THE RESTORATION OF SALMONID HABITATS

Few would argue that anadromous fish habitat in the Columbia Basin is in a degraded state and in need of restoration. Considerable efforts have gone into the restoration and enhancement of salmonid habitats, yet populations show little evidence of improving. Clearly, a problem exists with these current efforts. Scientists, natural resource managers, commodity-user groups, and those in charge of establishing policy need to reconsider current restoration strategies. However, considerable controversy



Conceptual Pathways of Ecological Restoration exists among these interested groups on how best to proceed with restoration. We provide a conceptual model (Figure 1) based upon the ecological processes of riparian stream ecosystems that may guide the ODFW, BPA, and others in future restoration efforts.

Prior to Euroamerican settlement, historical evidence suggests that salmonids were abundant in most major tributaries of the Columbia Basin. In terms of habitat composition, diversity and structure, the historic natural dynamic ecosystems bear little resemblance to most present riverine systems. With the settlement of the Columbia Basin came dramatic effects on riparian/stream ecosystems through beaver trapping, livestock grazing, dam construction, logging, mining, the introduction of exotic species, channelization, urbanization, road construction, irrigation withdrawals, etc. Few examples exist where land use has not resulted in significant influences on the associated riparian/stream ecosystem. A degraded ecosystem (Figure 1) characterized by declines in biological diversity and ecosystem productivity (including salmonids) is the focus of interest for restoration.

Once a decision has been made to restore a degraded stream reach, those with the responsibility of directing restoration efforts must first define the “desired future condition” – the ultimate goal of a restoration effort. This should include not only composition, but also ecological processes, ecosystem function, and structure. Because many features of the Pacific Northwest landscape have been irreparably altered, it is not realistic to assume we can return to a system identical to that of pre-Columbian times. In Figure 1 we define the “desired future condition” as being equivalent to the potential natural community; biological productivity and diversity at the landscape level is at site potential. This concept can be described as a situation where natural ecosystem functions are similar to those in which the landscape developed and its component parts (plants, salmon, and all other living organisms) evolved, but with the recognition that a number of human-caused factors will preclude a complete return to the historical condition. These human-caused factors include the introduction of exotic species, losses in soil productivity through erosion, species extirpations, pollution, and permanent cultural features on the landscape (roads, cities, farms, etc.). However, ecological processes (succession, natural disturbances, competition, evolution, etc.) and hydrological processes (sediment transport and deposition, flood plain storage and subsurface recharge, nutrient cycling, etc.) function in such a manner as to ensure a sustainable intact ecosystem.

The first logical step in any restoration effort is the removal of those anthropogenic perturbations that are the principal causes of decline in ecosystem function and salmonid populations. A number of examples exist where removal of the primary human disturbances have resulted in dramatic improvements in salmonid habitats. We define this as “passive restoration.” Often this is the least expensive and only activity necessary to successfully achieve salmonid habitat restoration.

For example, in rangelands, the cessation of livestock grazing often results in a rapid recovery of riparian vegetation and channel diversity. Frequently this is the only barrier to habitat restoration. Human perturbations are variable depending upon the ecosystem. Other examples of “passive restoration” include the cessation of excessive irrigation withdrawals, no-harvest buffers of an ecologically sufficient size, cessation of farming within riparian zones, and the cessation of chemical pollution of a riverine system.

There are also scenarios where the removal of anthropogenic perturbations may not result in the desired condition. In many degraded stream reaches, the removal of the primary disturbances may achieve some success, but a continued presence of ecosystem limitations may prevent a complete recovery. This scenario is represented by the box labeled “new ecosystem equilibrium” in Figure 1. It is at this point that an “active restoration” program will need to be implemented. Of paramount importance is that active restoration programs should <u>not</u> be implemented until the removal of anthropogenic perturbations (or passive restoration) has proven inadequate for recovery. The most common cause of project failure in stream restoration is the implementation of active restoration activities before primary anthropogenic activities have been stopped.

Active restoration is defined as those activities that encompass mechanical, chemical, or biological manipulations of the ecosystem in order to achieve the desired future condition. This includes the reintroduction of native species, structural habitat additions, the removal of existing impediments to recovery (roads, dams, migration barriers, or rip-rap), vegetation manipulations (such as juniper removal), the use of prescribed fire, and chemical manipulations (such as the use of fertilizers and herbicides). Hence, active restoration may involve stream, riparian or upland watershed manipulations.

Among the greatest dangers in active restoration programs is the misinterpretation of ecosystem needs. This includes manipulations designed to restore habitats or ecosystems that instead result in a further degradation of the ecosystem. Failures in instream fish habitat restoration projects commonly occur when resource managers fail to recognize the linkages between the aquatic biota, riparian zones, uplands, and hydrological and climatic properties of the ecosystem. These misinterpretations of ecosystem needs most commonly occur when restoration activities focus on physical changes of instream habitat (structural approaches) rather than the promotion of biological or ecological functions. For active restoration programs to be successful, they: (1) must be sustainable; (2) they must facilitate the functioning of natural ecosystem processes; and (3) they must reconnect the linkages between the aquatic, riparian, and upland environments. Physical additions and structural approaches to stream restoration rarely achieve these goals.

Misinterpretation of ecosystem needs can result in restoration activities that permanently sever linkages between the aquatic and riparian systems and hinder other ecosystem functions. For example, the placement of rip-rap or hard structures frequently results in the conversion of potentially productive unconstrained reaches into greatly simplified constrained reaches. Because of their influences on local channel hydrodynamics, channel morphology and streambank surface cover, these activities can dramatically limit vegetation recovery in both the treated and downstream areas. Therefore, this activity results in a reduced vegetation recovery that will have long-term detrimental influences on riparian/aquatic interactions such as reduced shade, nutrient inputs and coarse woody debris inputs. Ecosystem productivity will then be limited. Other common misinterpretations include the addition of unnatural features, such as boulders or wood structures in meadow/ stream systems, or the introduction of exotic plants and fish (e.g., non-native plants, small mouth bass, brook trout, etc.). If the restoration of native fish populations remains a high priority in the Columbia Basin, future restoration and enhancement projects must consider ecosystem needs and functions in the design of these projects. It is no longer appropriate to simply identify and implement structural targets. Instead, anthropogenic impacts causing degradation need to be removed followed by the restoration of biological, chemical, physical and hydrological functions.

SITE COMMENTS

At each field site agency personnel familiar with the area briefly described the site and management history for the review team. Factors considered limiting to fisheries productivity were identified and discussed, and a brief period for inspection and observation followed. The short length of time typically spent at each site resulted in only a portion of each treated reach being reviewed. Hence, the specific observations, interpretations, and comments reported here pertain only to those sections we observed and are not necessarily representative of entire stream reaches.

Fifteenmile Creek Basin

Fifteenmile Creek (Dufur City Property)
June 15, 1992

Site Description

We viewed a forested reach of Fifteenmile Creek above the intake for the Dufur City water supply. Overstory trees consisted of black cottonwood, ponderosa pine, Douglas-fir, western red cedar, alder, willows, and others; these provided good shade protection along most of the Creek. More than 12 species of shrubs were identified in the understory. Large organic debris was present and beaver activity was evident in this reach; both contributed to stream and channel diversity. Overall, vegetation and structural diversity were among the highest observed during the field review. As such allocthonous inputs (both fine and coarse debris) and shade were not limiting. Historically, the Dufur City water intake has limited fish passage; this was corrected in 1988.

The fish enhancement objectives on this reach was to improve pool/riffle ratios. ODFW records indicate that stream alterations included four rock weirs, 11 log weirs, 1 V-log weir, 4 rock jetties, 11 boulders, and 2 rootwads. There was no livestock grazing on this reach nor on upstream reaches managed by the US Forest Service.

Observations/InterDretations/Comments

We observed high levels of diversity in the natural pools due to the presence of tree roots, large woody debris, and beaver dams. This complexity was much different than that of pools downstream of the instream structures. However, it is this sort of complexity that managers should attempt to mimic with the installation of instream structure. Vegetation cover was usually lower and habitats simpler around the instream structures. No structures were observed that provided the same habitat characteristics as natural pools or undercuts. In some areas, boulders and rock were used to block the entrances to side channels and to fill underneath overhanging banks, decreasing channel diversity and pool habitat associated with streambank undercuts. Such activities tend to sever linkages between the water column and the riparian zone. ODFW field personnel have recognized this concern and have discontinued such activities.

The riparian system along this reach was relatively intact. Furthermore, the channel was geomorphically complex as indicated by overhanging banks, pools, assortment of bed material sizes, side channels, high sinuosity, etc. We noted a number of streambank undercuts and pools associated with coarse wood debris and beaver dams. Furthermore, given the presence of a healthy tree layer (comprised of various species and age classes), shrub layer, and ungrazed herbaceous layer, one must ask what is limiting here? In general, no habitat alterations (structures) were needed in this reach, only continued protection. With the exception of fish passage around the water intake, few problems were observed.

Based upon our observations, this was a diverse stream reach in terms of riparian and channel diversity. Monitoring on a reach basis, rather than a pool by pool basis, would likely substantiate these observations.

A deficiency of inchannel large woody debris was suggested as a reason for adding structural materials to this reach. If wood was depauperate, the addition of more wood in naturally occurring configurations seem reasonable. However, the types of wood structures (full spanning log weirs) constructed in the channel and the general use of large rock were not appropriate.

We recommend no harvest buffers be retained along streamsides such as this. To encourage natural riparian functions, there should be no logging in the zone of influence surrounding the riparian zone. Grazing should be prohibited in this area to protect water quality, facilitate shrub (willow) reproduction, and maintain the healthy herbaceous strata.

Fifteenmile Creek (downstream site - 2)
June 15, 1992

Description

The reach included 3.5 miles of fenced stream with approximately 10 acres inside the exclosure. The exclosure was established in 1989, although trespass grazing has occurred. Since construction of the fence, a rapid recovery and establishment of willows, cottonwood, and alder is occurring. We observed numerous streamside areas with large numbers of small cottonwood seedlings. There is no lack of seed source in this area, as there are numerous locations dominated by large gallery cottonwood forests. The shrub component is also diverse.

Although the stream bisects a large unconstrained valley bottom, the channel has a simplified morphology and is largely entrenched onto bedrock along much of the reach. The general character of the stream would indicate that it was channelized in the past, perhaps after the 1964 flood. According to ODFW records, instream structures along this reach include 54 rock weirs, 2 V-rock weirs, 2 V-log weirs, 29 rock jetties. 5

rootwads, 73 boulders, and 90 yards of rip-rap. Some of the boulders are relatively large with dimensions in excess of 2 ft x 2 ft x 4 ft. No logs were placed, possibly because of concern that they might move during a high flow event.

Observations/Intepretations/Comments

Fencing this reach was an excellent restoration activity by the ODFW. There is a rapid recovery of vegetation with at least 10 species of trees and tall shrubs increasing in abundance. The fence was located to help protect existing residual cottonwood forests and associated species, a highly desirable practice. In the future, this activity will facilitate improvements in stream structure and channel diversity through the formation of streambank undercuts and inputs of wood debris. Shade and organic matter production will continue to improve along this reach, to the benefit of fish as well as wildlife. A small wetland with great habitat potential was observed just outside of the exclosure. If possible, an extension of the fence should be constructed to include this wetland.

There was some Russian knapweed within the exclosure. As the vegetation recovers inside the exclosure, the abundance of this noxious weed should decrease or disappear. Russian knapweed is not shade tolerant and will ultimately succumb to competition from shrub and tree species. Spraying of herbicides within the exclosure can kill or severely damage willows, cottonwood seedlings, other shrubs, and native forbs. Thus, herbicide spraying is likely to cause a continued presence of knapweed on this site through a decrease in natural species diversity, and by retarding succession to a woody species dominance.

The reestablishment of a young-aged class of cottonwood, alder, and other woody species is encouraging for the restoration of long-term quality steelhead habitat. Prior to exclosure fencing, there was little if any cottonwood regeneration. Had this exclosure not been constructed, it is likely that this valuable species eventually would have been extirpated from this site. An important question that remains is whether or not the B-year lease period will be an adequate time period for recovery. While vegetation recovery over a 15-year time period is likely to be significant, the recovery of channel diversity, bank development, and the restoration of other geomorphic features may require more time.

To alter the relatively simplified channel morphology of this stream, a variety of instream structures were constructed. In retrospect, we would recommend a lighter-handed approach than the use of large rock weirs, large boulder placement, and rip-rap. The utilization of less rigid and smaller structures, such as wood debris or rootwads, would still enhance structure and deflect flows, provide diversity in local hydraulics, and initiate increased channel sinuosity. In contrast, large rock weirs (or similar structures) can negatively influence vegetation establishment, are out of context with the natural geomorphic setting, and will tend to maintain a straight channel. The short and small plunge pools associated with full-spanning structures may not compensate for the relatively large simplified fills that occur upstream of them.

To qualitatively follow the influences of instream structures and fencing, permanent photopoints are recommended. More importantly, quantitative monitoring should be implemented to track changes in fish, riparian vegetation, and channel morphology. Permanent stream surveys and vegetation transects should be established throughout the basin. A weir facility on the lower end of Fifteenmile Creek could enumerate adult and smolt populations and would facilitate monitoring.

Ramsey Creek
June 15, 1992

Descrirdion

Ramsey Creek is a major tributary of Fifteenmile Creek. Uplands are primarily conifer forest and oak woodland. The reach of Ramsey Creek observed was within an exclosure constructed in 1988. After five years of grazing absence, the rate of vegetation recovery was remarkable. In some areas, we observed dense stands of established alder that were 9-12 feet in height. At least 9 species of trees or shrubs were increasing in density or height inside the exclosures. Herbaceous recovery (particularly bulrushes and sedges) was locally occurring on streambanks. These were greatly facilitating bank-building processes (i.e., sediment deposition). In places more than 4 inches of fine sediments were incorporated onto newly forming streambanks.

In addition to installing the exclosure, a number of instream structures had been constructed. ODFW records indicate 58 rock weirs, 36 rock jetties, 50 boulder placements, and 98 feet of rip-rap had been added to this reach.

Observations/Interpretations/Comments

The recovery of riparian vegetation is greatly enhancing fish habitat. Shade, allocthonous inputs, bank-building processes, and channel diversity are increasing. The vegetation recovery and streambank development provide evidence of pronounced effects of exclosure construction.

Although the installation of instream structures implicitly assumes habitat will improve, we question the basis of that assumption. For example, at the site of a permanent photopoint, a relatively large instream structure was observed with a vertical step of approximately 2.5 feet – is this now a migration barrier? At this site, rip-rap and boulders had been placed. The rip-rap, in particular, will have few benefits for fish. We noted that the boulder placements resulted in decreased channel sinuosity and additional channel incision. The downcutting further severs linkages between the riparian zone and the aquatic biota. Activities that cause stream downcutting should be discontinued. ODFW should determine how many of their hard structures have increased the amount of channel downcutting. Although channel aggradation and bank-building processes associated with vegetation recovery are reversing some of the negative influences of the downcutting, structural additions may well prolong or limit riparian recovery.

Given the rapidity of vegetation recovery and the variable influences of structures on this site, the question arises whether or not structures should be added to the channel. Although project scheduling might become more complicated, instream resources would be better protected if five years of vegetation recovery were required before attempting to determine where and what kind of (if any) structural additions are necessary.

The amount of money spent on instream structures along this reach was substantial. Had it been an option, we suspect that this money would have been better spent purchasing easements on floodplain lands along this stream and controlling grazing. BPA and ODFW need to seriously consider the strategic benefits of land purchases in certain situations.

Fifteenmile Creek (above Dufur City)
June 15, 1992

Descrirption

This section of Fifteenmile Creek covers four brief stops that are referred to as the Underhill diversion dam, Underhill electro-fishing site, Ashbrook's electro-fishing site, and the Dufur Bridge electro-fishing site. Uplands and floodplains along these reaches are used predominantly for agricultural crops. These reaches represent areas that were either fenced from livestock grazing or areas where grazing did not occur. This section of Fifteenmile Creek had been channelized following the 1964 flood. Sinuosity and channel diversity was extremely low. The Underhill diversion dam was constructed to facilitate fish passage and minimize the negative influences associated with the annual construction of gravel berms by bulldozers.

While there has been good vegetation recovery along much of Fifteenmile Creek following fencing, the stream channel was generally shallow and lacking diversity in channel morphology. In this section of Fifteenmile Creek, 34 rock weirs, 2 V-rock weirs, 29 rock jetties, 82 boulder placements, and 75 feet of rip-rap had been constructed. It was stated that boulders were the preferred material for structures because they cost less than wood and that there was less risk that they might be transported downstream by high flows.

Three reaches were utilized to compare the efficiency of instream additions on increasing fish numbers. in the treated areas there were higher numbers of fish.

However, there were strong doubts expressed on the scientific merit of this study because of inherent differences in the three reaches: channel width to depth ratios varied as did degrees of vegetation-streambank interactions and habitat diversity. Site 2 (Ashbrook) was inherently more of a depauperate site than either Site 1 or 2. It was also wider and shallower with less vegetation diversity. Site 3 had higher vegetation diversity and exposed bedrock plates. We did not have access to the experimental design to evaluate if design met the required assumptions for appropriate analysis.

Observations/Interpretation/Comments

The Underhill diversion dam and associated fish ladder appeared to be working well. At this site, ODFW activities to place fish screens at all irrigation sites was also discussed. At Fifteenmile Creek and other stream systems that are not completely dewatered, this is likely a beneficial activity.

While the reported numbers of fish in the treated area may be correct, the monitoring system is inadequate to determine the efficacy of current management practices. We recommend monitoring studies be conducted at the stream or reach level rather than the 200-foot sampling lengths that were conducted here, a practice closer to a segment analysis. At this segment level we would expect to find more 1+ salmonids in the excavated pools. However, this does not indicate an overall improvement at larger scales of analysis. The lack of experimental replication and small length of sampled reaches provide 22 inconclusive results. A higher level of monitoring and a more efficient design is recommended to evaluate fisheries benefits. The cost of monitoring should be an integral part of BPA fish habitat mitigation activities. Until monitoring is implemented, managers and the public will never be sure if any benefits are received.

ODFW faces many difficulties in their efforts to restore fish habitat in this reach. Some of the limitations (i.e., difficulties, obstacles, hindrances) include the need to minimize channel sinuosity and channel adjustments because of landowner concerns, the high level of soil erosion from croplands, the lack of incentives for land use changes by private landowners, and the fears of damage during high water resulting from placement of large wood in channels. The limitations imposed on efforts to restore fish need to be elucidated to county residents. If society has determined that salmonids are of little importance in this basin relative to other economic goals, then such a goal should be clearly stated by state and county officials, ODFW, and BPA.

Undoubtedly, fish habitat could be improved by structural additions in areas such as Site 2. Again, we recommend treatments utilizing complex pieces of organic (wood) materials rather than boulders. The retention of complex pieces of wood is high in streams of this size and would pose few problems during floods. The rock weirs limit the potential for vegetation recovery because they are not the substrates on which cottonwood or alder can be established. However, the valuable wildlife species, red-osier dogwood will establish on jetties and keyed-in areas or rock weirs. Investigations should be undertaken on planting this species in areas where riparian zones have been influenced by boulders.

Upper Eightmile Creek
June 16,1992

Description

Two reaches of Eightmile Creek were observed by the review team. Uplands were dominated by coniferous forest (ponderosa pine) and oak woodland; the riparian area was also forested. A diverse overstory of more than 12 species of trees and shrubs comprised the riparian forests, although the existence of several large stumps indicated that the area had been selectively logged in the past. Nevertheless, there was an almost complete stream cover of vegetation. We noted that the channel morphology was very diverse with numerous pools formed around undercuts and large woody debris. These reaches and those downstream are considered important areas for steelhead spawning and rearing.

The area was not originally fenced for livestock exclusion because the landowner indicated no desire to graze the area. However, the iandowner is currently grazing the area and streambank impacts were apparent. ODFW would like to fence the site.

ODFW records indicate instream construction of 1 rock weir, 14 log weirs, 2 V-rock weirs, 3 rock jetties, 3 cull logs, 32 boulder placements, and 60 yards of rip-rap along these reaches.

Observations/Interpretations/Comments

Channel diversity and vegetation structure were among the best conditions observed during the entire review. We noted a number of areas with complex pools (deep water, organic debris, hiding cover, etc.). Natural pools, associated with live vegetation or wood debris, were usually in a narrow channel with overhanging banks, and usually provided a considerable amount of hiding and feeding cover. These natural pools had few similarities in relation to those associated with instream structures. Structural additions typically widened the channel and increased solar radiation inputs into the stream because of vegetation destruction. This could result in higher summer stream temperatures and lower winter stream temperatures, although the magnitude of change may not be great. Based on the natural complexity of this site, we saw little need for the types of channel modifications that had been constructed.

Where rock structures are deemed absolutely necessary, efforts are needed to improve their design and placement. Currently, banks are damaged, vegetation destroyed, and excessively large vertical steps in water elevations are often created. Even if a structural approach had significant merit, the use of large woody debris (with branches and/or rootwads attached) in non-spanning structures would be more desirable than the extensive reliance on rock and boulders.

The unexpected introduction of cattle on this reach is a major concern. Their influences on the understory vegetation and streambank trampling were apparent after one season. Losses in woody species seedlings, accelerated bank erosion, and declines in herbaceous productivity are likely. Fencing this reach of Eightmile Creek should be a high priority for BPA and ODFW. Also, protecting this reach from future forest harvesting along both sides of the stream would provide for future large woody debris recruitment and would ensure the perpetuation of the diverse riparian and stream ecosystem important to the steelhead population.

Soil Erosion Viewpoint
June 16, 1992

Observations/Interpretations/Comments

We made a brief stop to discuss factors affecting steelhead habitat losses and restoration from a landscape perspective. There was a consensus that this discussion was important because it is difficult to restore the l-2% of the land area occupied by riparian zones if much of the remaining 98% upland area is not receiving adequate management to facilitate salmonid recovery. Clearly, an important barrier to anadromous and resident fish habitat restoration, as well as water quality, is the rates of soil erosion that originates from fallow wheatlands.

According to SCS personnel, cumulative soil losses from upland sites of the Eightmile Creek drainage may average as high as 30-70 tons/acre. Some sites have reported losses as high as 100 tons/acre. These figures indicate upwards of 150,000 tons of soil lost annually from the Fifteenmile Creek Basin. Such losses should be as alarming to the agricultural community as they are to those concerned with fisheries habitat, water quality, and general land stewardship. We would question whether losses of this magnitude represent sustainable agriculture or good watershed management.

Options for decreasing surface erosion losses include the Conservation Reserve Program, construction of terraces, strip cropping, contour farming practices, grass buffers, alternative crops, and others. Given the cumulative adverse effects of high erosion rates on channel stability during high flows and the general degradation of water quality, BPA should attempt to develop an aggressive information and education program that would address better farming practices, the benefits of such practices, and farming alternatives that could be used to reduce the current high erosion rates. Future generations of farmers would benefit (as would the fishery) from the implementation of farming practices that conserve rather than deplete Oregon's soil resources.

In a similar vein, we would suggest that the streamside herbicide spraying of broadleafed vegetation be curtailed. Willows, cottonwoods, alders, birch, and many other important broadleafed species are naturally adapted to riparian systems in the Fifteenmile watershed. The loss of these plant species greatly diminishes the natural diversity of these systems and presents a major obstacle to the restoration of productive and sustainable fish habitat.

Dry Creek (Confluence with Mays Canyon)
June 16, 1992

Site Description

A livestock exclosure was constructed along this portion of Dry Creek and its confluence with May's Canyon. Dry Creek ultimately flows into Fifteenmile Creek. The exclosure, constructed in 1988, was approximately 1.25 miles long. Since the construction of the exclosure fence, willows, cottonwoods, and choke cherry appear to have increased. The objective of the exclosure was to increase vegetation cover in order to decrease sediment loads.

Both Dry Creek and May's Canyon Creek showed evidence of having downcut to a bedrock, rubble, or coarse gravel substrate in the recent past. Although Dry Creek and May's Canyon Creek are presently intermittent streams (they were both dry at the time of the site visit), ODFW records indicate that spawning and rearing of steelhead had occurred in the past along this reach of Dry Creek.

Observations/Interpretations/Comments

Soil characteristics of the cutbanks along the incised channels indicate that saturated (hydric) soils existed prior to downcutting. It is likely that wet meadow vegetation, cottonwoods, and willows were more abundant historically. A few large black cottonwoods were rooted 12 feet above the downcut channel. Because cottonwood have precise requirements for establishment, typically at the moist soils of a streambank edge, their elevation is an indication of the degree of degradation that has occurred since they established.

The fencing treatment for this reach represents an excellent approach for providing habitat for wildlife species that are dependant upon vegetation associated with recovering riparian zones. In order to maintain the wildlife benefits that will accrue from this exclosure, annual fence maintenance is necessary.

The headwaters of this confluence are approximately 10 miles farther upstream, much of which is in heavily utilized agriculture lands. From a sediment trapping perspective, it is unknown to what degree such an exclosure can reduce sediment production in Fifteenmile Creek. In order to potentially enhance steelhead runs, a much larger proportion of the watershed's riparian zones associated with intermittent streams should be treated and upslope sediment yield reduced. However, before totally dismissing the treatment at this site as unimportant for fisheries, it needs to be noted that fish habitat degradation in this basin (and others) occurred historically from the cumulative effect of various land practices. Thus, while direct fisheries benefits appear insignificant, the fencing treatment represents a small, but necessary, requirement for cumulatively restoring the aquatic and riparian systems of this basin.

Dry Creek (Confluence with Fifteenmile Creek)
June 16, 1992

Site Description

Two exclosures were visited at this site; a more recent exclosure was fenced in 1989 immediately upstream of a much older one (date of fencing not known). The upstream reach is intermittent, although the flow becomes permanent within the older exclosure. The older exclosure is located immediately above the Dry Creek confluence with Fifteenmile Creek. The purpose of these exclosures was to primarily trap sediment, thus reducing potential impacts to fish habitat in Fifteenmile Creek. The upslope areas surrounding these exclosures are dominated by agriculture and rangelands. Numerous willow species of cottonwoods are establishing, albeit slowly.

Observations/Interpretations/Comments

A shallow, dish-shaped channel prevails along the uppermost exclosure in a generally unconstrained valley bottom. Channel mobility (lateral channel adjustments) and high bedload transport are common during periods of high flow. A 1939 photograph indicates that the valley bottom and streamside areas associated with this upstream exclosure were highly degraded (no vegetation) at that time; little improvement has occurred during the past half-century. The scattered presence of dead cottonwoods and old logs provide evidence that this area historically had gallery forests. These indicators of historical vegetation composition, in conjunction with an examination of local soil characteristics, points to the desertification of this basin. The current riparian zone is very poorly developed and remains in a degraded condition. No streamflow was present during the site review.

The older downstream exclosure has experienced considerably more development of riparian vegetation. Numbers of whiplash willow, Scouler's willow, Mackenzie willow, and cottonwood were slowly increasing. Most of the channel was devoid of water even though the influx of subsurface flow is sufficient to cause permanent flow in the lower portion of this exclosure. The stream (with an active channel approximately 3-6 feet across) is resetting a small floodplain within a much larger active channel that is approximately 20 feet across and 6-8 feet lower than a terrace that exists on both sides of the channel. Although the recovering riparian vegetation is providing an important improvement to the functional "status" of this reach, the quantity of sediment deposited in this reach is likely only a minuscule percentage of the total sediment load transported by Dry Creek. These exclosures will provide excellent opportunities for the enhancement of wildlife populations, and funding should be developed to maintain them for that purpose.

Lower Fifteenmile Creek (Emerson Property)
June 16, 1992

Site Description

Following the 1964 high flows, SCS constructed a series of rock jetties and channel revetments to prevent additional erosion of alluvial soils along the valley bottom upstream of the bridge. In 1992 ODFW fenced this reach and added instream structures consisting of 69 rock jetties, 74 boulders, and 300 feet of rip-rap. Downstream of the bridge an exclosure was constructed in the 1970s.

Channel incision has occurred in both the upstream and downstream reaches. However, currently little cover exists upstream of the bridge, a marked contrast to the downstream reach which has a good cover of riparian vegetation shading the stream.

Observations/Interpretations/Comments

The older downstream exclosure provides an important perspective related to fish habitat programs. Within this reach, riparian vegetation was well developed, as indicated by the presence of at least 12 species of trees and shrubs, including cottonwood, alders, birch, and 4 species of willows. Beavers are also active. This exclosure should be maintained because of its important benefits to fish and wildlife habitat. It is also an excellent example of the recovery potential for lower Fifteenmile Creek riparian areas.

In the new exclosure upstream of the bridge, numerous young willow sprouts and seedlings were already establishing. Single boulder placements had not provided significant habitat nor thermal protection to the stream. However, with increased establishment of riparian vegetation in this large stream, its possible that the boulders may provide some opportunities for snagging floatable debris, thus causing the deposition of sediment. If local sediment deposition does occur and become revegetated, it is possible that midchannel bars may develop, providing additional geomorphic diversity to a channel that is almost totally devoid of such diversity.

As changes in the upstream exclosure occur, a careful monitoring of fisheries resources in both the upstream and downstream reaches needs to be conducted. Because of the contrasting conditions upstream and downstream of the bridge, this is an excellent demonstration site for field tours.

Buck Hollow Watershed Enhancement Project
June 17, 1992

Site Description

The Buck Hollow Watershed Enhancement Project is sponsored by the Sherman and Wasco Soil and Water Conservation Districts with technical assistance from the USDA-Soil Conservation Service. During the field review, we had the opportunity to observe current activities associated with only a portion of the project that was selected for us to see. Funding sources for the Buck Hollow Project include the Governor's Watershed Enhancement Board, Oregon Department of Agriculture, the USDA and others. Although this project is not a funded project of the BPA, our comments were requested. Out observations and recommendations are primarily from a fisheries and habitat perspective. We considered the value of these approaches, their ecological soundness, benefits to watershed management and whether this or similar projects should receive funding from BPA. The tour made brief stops at the mouth of Buck Hollow Creek, Twin Lakes area, retention dams, guzzlers and Conservation Reserve Program landds, Spears Canyon, and riparian meadows of the headwaters.

Buck Hollow is a large basin (=144,000 acres) that forms a tributary to the Deschutes River. Uplands are dominated by rangelands (52%) croplands (19%), Conservation Reserve Program (CRP) lands (26%), and roads and urban areas (3%). Rangeland condition was estimated to be 15% excellent, 30% good, and 55% fair or poor condition. Croplands with a wheat/summer-fallow rotation have average soil losses of 3-5 tons per acre per year. These data are markedly lower than figures given to us for the Eightmile Creek Basin (see page 24). From a basin perspective, annual soil loss from croplands are an estimated 76,000-126,000 tons per year. If CRP lands were also in cultivation, annual soil erosion losses could be as high as 207,000-346,000 tons per year (data are from Buck Hollow 2000 Handout, June 17, 1992, Sherman and Wasco County Soil and Water Conservation Districts).

The high rates of soil erosion and the concurrent declines in riparian habitats and rangelands likely represent contributing factors in the decline of salmonid populations. The cumulative and synergistic effects of overgrazing and poor agricultural practices, in combination with historical floods, were suggested as having created the current degraded conditions. The objective of the Buck Hollow Project is to "restore desirable watershed features to the Buck Hollow tributary and enhance the watershed's ability to capture, store, and safely release water over the entire year." To date the work has entailed construction of water and sediment control basins, terraces, upland seedings and plantings, fencing, juniper rip-rap, riparian plantings, juniper and brush control, and development of conservation and grazing management plans.

Observations/Interpretations/Comments

Given the remarkably high rates of erosion from many agricultural areas, it would appear that the best land use practice for fisheries protection is the CRP. In addition, improved grazing management is especially needed within riparian zones to assist in watershed recovery. Emphasis should be placed on the establishment of exclosures, riparian pastures, or grazing plans that promote the establishment, growth, and succession of riparian dependent plant species. We were not taken to any site where improvements were apparent. The various management constraints voiced by field trip attendees (difficulties in modifying land use practices to reduce erosion, and difficulties in increasing ecological condition of riparian zones) indicates the probability for large improvements in the fishery is extremely limited. Foremost among these limitations is the rate of the riparian vegetation recovery and the decrease in soil erosion.

The essence of "capture, store, and safely release" is best exemplified by uplands with good vegetation and litter cover so that incoming precipitation infiltrates locally, is stored in the soil profile for onsite plant use, and slowly percolates towards topographic depressions as subsurface flow. Watersheds in a degraded condition will not function in the same capacity as those with a continuous cover of vegetation; therefore it is important to improve degraded systems. A major component of the "capture, store, and safely release" philosophy of this project involves the construction of earth dams. This concept was never intended to be utilized to justify an engineering approach. We question whether a strict engineering approach to land use problems can ever be successful. Clearly, this approach does not closely match the "capture, store, and safely release" processes of a watershed in good ecological condition. It appears that a fresh perspective is needed regarding how existing arid land watersheds are managed, including both riparian and upslope practices. Improved grazing management of riparian zones, restoration of uplands, and prevention of soil erosion would be major focal points for accomplishing such objectives.

We observed a reservoir under construction that was designed to hold back 75% of the 10 year 24 hour runoff. Undoubtedly, the stored water behind the impoundment would be beneficial to livestock and wildlife that could use this as an upland water source. However, a review of the literature would show that these sediment basins (impoundments) may limit recovery of riparian vegetation downstream. Numerous studies have found that cottonwood and willow development occurs in fluvially deposited sediments following 2-5 year flood events. The influences of storms of this magnitude are likely to be eliminated by these impoundments and hence riparian development will be retarded. In contrast, the inevitable large storm events that will overwhelm the impoundments will likely result in degradation of the poorly developed riparian zones downstream. An improved familiarity of the current understanding of riparian ecology and development would be beneficial for planners of the Buck Hollow project. Consultation in the field of riparian/stream ecology for project development is recommended.

In theory, the dam was supposed to slowly leak any stored water which would assist in sustaining downstream flows. While some subsurface leakage will occur below dams, the rates of subsurface flow would be expected to be small. Through time, as fine sediments fill the bottom of such reservoirs, their ability to "leak" will likely decrease.

Furthermore, no mention was made of the quantity of impounded water that would be lost by evaporation in comparison to subsurface flows (recent data provided by the SCS puts rates of evaporation at 4 ft. per year). Although SCS personnel provided anecdotal comments that such a system works well, we are unaware of any documented studies that show the long-term benefits of small dam construction in arid environments and their ability to sustain baseflows.

With regard to channels downstream of proposed impoundments, it must be noted that the riparian vegetation evolved to establish and survive along riverine environments where natural disturbances were common (i.e., spring flooding, low base flows, and ice events). Anthropogenic activities have dramatically altered the riparian vegetation and riparian ecosystems through grazing, channelization, agricultural use, road construction, and alteration of base flows. The construction of reservoirs for trapping water and sediment represents yet another modification to the hydrologic regime of these systems. This, in turn, will limit riparian ecosystem structure and function.

Trout Creek Basin

Ward Creek (Sheep Barns)
June 17, 1992

Site Descrirption

Ward Creek is a tributary of Antelope Creek, which in turn flows into Trout Creek. This reach of Ward Creek was approximately 19 miles upstream from its confluence with the Deschutes River. The majority of the upland areas are dominated by invading junipers or annual exotic grasses, particularly medusahead and cheatgrass.

The area we viewed was a large exclosure where grazing had been excluded since 1989. In approximately three years, the area will be placed in a management plan that will include livestock grazing. In addition to fence construction, rock weirs with excavated pools, some boulder placement, and juniper rip-rap were present.

Steelhead utilized this reach in the past, although in recent years none have been observed. Redband trout were also native to this-reach. The Creek had downcut leaving a terrace (formerly a wet meadow) dominated by baltic rush, meadow foxtail, and sedges. These plant communities are likely more xeric than those that existed on site prior to channel incision.

The channel was predominantly a boulder-controlled reach. Some vegetation and shrub recovery was apparent with alder, Scouler's willow, Lewis mock orange, red-osier dogwood, and whiplash willow (and others) present. Sedges were increasing within the channel and associated mesic depressions.

Observations/Interpretations/Comments

The need to upgrade the condition of uplands along this section of Ward Creek was striking. There were few areas where the rangeland was in good condition or had appreciable native bunchgrasses. Given the inextricable linkages between uplands, riparian, and aquatic ecosystems, the condition of this landscape presents a significant challenge to the recovery of riparian systems and fisheries habitat.

Although vegetation recovery was occurring at this site, boulder substrates comprising the channel bed and the degraded upslope conditions will slow, geomorphic recovery of streambanks, channel aggradation, and increases in floodplain water storage (i.e., recovery of water tables). Furthermore, the establishment of riparian plants (particularly the woody species) appears to be impaired by elk; significant browsing of young willows was apparent. Because of the elk damage, a three-year rest period before the reintroduction of livestock may not provide a sufficiently long period of rest. After livestock grazing is resumed, careful monitoring will be required to ensure that riparian vegetation and geomorphic recovery continue.

The constructed pools were of little direct benefit to steelhead, given that adult fish are currently unable to access this reach because of low flows. The excavated depressions below rock structures were wide, completely exposed to the sun, and thus contribute to the undesirable thermal regime of this stream.

The anchoring of juniper and rootwads in this area appeared to be excessive and largely unnecessary. In general, we anticipate that recovery of this channel will be slow, with little change after 15 years.

Ward Creek (Cabin Site)
June 17, 1992

Site Description

This reach of upper Ward Creek is characterized as having intermittent flows. The project area was an impressive combination of exclosures, riparian pastures and instream manipulations including 525 feet of juniper rip-rap, 165 boulder placements, 10 rock weirs, and 5 V-rock weirs. However, the treated area was well upstream from the current upper limits of anadromous fish utilization in Ward Creek. The major objective of utilizing extensive amounts of rock weirs, boulder emplacements, and other aspects of the treatment was to slow or reduce erosion from this severely eroded reach.

There is a large unconstrained meadow system immediately upstream of the project area. Upland rangelands were dominated by juniper, cheatgrass, and medusahead.

Observations/Interpretations/Comments

This system was one of the most critical areas visited because it represents a site where immediate changes must be made before high rates of erosion occurs in the large meadow complex above the ODFW project area. Current vegetation and channel conditions are such that additional and severe downcutting is likely to occur under future major flow event(s). Not only would such downcutting cause major impacts to water quality, but water tables, soils, and the productivity potential of the meadow system for fisheries may be lost forever.

In the large meadow complex above the exclosure, there were a series of headcuts ranging in depth from 2.5-4 feet. Further levels of downcutting are possible unless measures to reverse the current degradation are implemented. Throughout the exposed banks of existing headcuts in the meadow complex, soil indicators of past hydric conditions (gleying and mottling) indicate this was previously a wet meadow. The current levels of channel incision have already lowered subsurface water levels and hence meadow productivity. The meadow is currently dominated by meadow foxtail, timothy, Iris spp. and numerous forbs. Incredibly, in some areas, medusahead is becoming established where wetlands once existed. Unfortunately, this situation exemplifies the types of processes that have occurred (and are obviously continuing to occur) throughout the American West.

Structures will not solve the problems that exist in this meadow. We recommend implementation of an improved grazing management program, starting with a period of extended rest. The resource losses associated with downcutting in this meadow system will be immeasurable to both society and the landowner. Further downcutting will result in the conversion of this potentially productive meadow to a degraded ecosystem dominated by medusahead, annual foxtail (Hordeum), and cheatgrass. Losses in grazing productivity should provide incentive for the landowner to take corrective actions. The potential recovery of floodplain water-holding capacity wildlife and fish habitat should provide incentives for federal and state agencies to provide expertise and funds for restoration. The landowner, SCS, and SWCD should be alerted to this problem and take appropriate action to insure that irreparable damage does not occur.

Downstream of the meadow, ODFW has constructed exclosures and rock weirs in an attempt to halt headcutting. Even if successful, this will do nothing to halt the headcutting currently occurring in the meadow above the uppermost structure. An exclosure was constructed around the most severely eroded portions of the valley, particularly where the valley bottom narrows and gradient increases. Even so, inside the exclosure channel downcutting has widened to 50 feet. The depth of incision varied from 6 to 12 feet.

Downstream of the exclosure and below the road where the valley bottom increases in width, the management strategy is to establish a riparian pasture. A stand of willows is present in this pasture and there is potential for additional recovery. This "riparian pasture" had been heavily utilized by cattle. This area has a much higher potential for riparian recovery than the area within the exclosure upstream and warrants consideration for improvement.

Among the greatest needs in this system is the cessation of further channel downcutting in the meadow system and, hopefully, the restoration of water storage in associated floodplains. While the exclosures and riparian pasture fence construction are a step in the right direction, additional protection of the meadow above the exclosure is crucial. Immediate steps need to be taken to halt further degradation and to promote recovery.

The large rock weirs within the exclosure will form small wetland ponds, providing good wildlife habitat. While beneficial to wildlife, these wetlands are of little value to downstream anadromous fish. One nesting teal was observed in. the exclosure. In areas above the limits of anadromous fish habitat, restoration strategies should focus on improving base flows and water quality. This would have been best accomplished by the construction of riparian fences for improved livestock management in the upstream meadow; the vast majority of rock additions were unnecessary.

Additional monitoring of the riparian pasture operation and utilization should be undertaken to identify whether or not management modifications are needed. The spring grazing that occurred in 1992 has retarded recovery of many important riparian species. Fencing a riparian pasture, without proper monitoring, will likely result in a failure to achieve desired restoration targets.

Shanty Creek
June 17, 1992

Site Description

Shanty Creek is an intermittent stream that is a tributary of Ward Creek. A brief stop was made to view a small exclosure with rock weirs and water gaps. Vegetation was typical of a wet meadow complex. Some small aspens and whiplash willows had been planted. The aspen is an offsite (non-native) species for this stream reach.

At the upper end of the exclosure, there is a 6-8 feet headcut. At the top of this headcut, a large whiplash willow and Douglas hawthorn were present. These provide an indication of vegetation composition prior to downcutting. Soils approximately 8 inches below the surface showed historical signs of hydric conditions.

Observations/Interpretation/Comments

The system within the exclosure is recovering. An additional upstream exclosure would be desirable, as much of the riparian meadow complex upstream was in poor condition with incised channels. There was some discussion as to what to do with the pronounced headcut. With an exclosure fence now in place, filling the headcut with loose rock may dissipate energy and prevent additional erosion.

Sagebrush Creek
(also called Mud Springs Creek)
June 18, 1992

Site Description

This visit included observations along a l-2 mile reach of Sagebrush Creek above the confluence with Trout Creek. A migration barrier to fish occurs approximately 2.5 miles upstream. Three narrow corridor exclosures had been constructed (1988- 1989) along with boulder placements and rock weirs. According to ODFW records, stream manipulations included 1 rock jetty, 153 feet of rock rip-rap, 79 boulders, and 16 rock weirs. Boulder clusters and rock weirs were designed to provide l-l.5 foot energy drops along the stream. If and when these structures reach their sediment retention capacity, it is anticipated that another treatment of weirs will be added to the stream. As part of the overall treatment, a few willows and Russian olive had been planted.

Some of the rock weirs occur upstream of a bedrock exposure (exposed due to stream incision). Here the channel is relatively wide, unconstrained, and appears to be of lower gradient. The constructed rock weirs are interspersed by relatively low gradient reaches that are currently accumulating sand sized sediments.

Sagebrush Creek is currently an incised channel flowing through a terrace of agriculture land/pasture. This terrace was a former floodplain/wet meadow prior to downcutting, as evidenced by the soil mottling within one foot of the old terrace surface. Today this meadow is dominated by annual exotic grasses (Hordeum spp.) and weeds. Uplands are dominated by sagebrush; however, the majority of the watershed has been converted to agricultural uses.

Summertime streamflows are generally high and largely controlled by irrigation return flows from water originally diverted from the Deschutes River. However, when irrigation demand ceases in mid-October, streamflow in Sagebrush Creek also drops. Biologists expressed concerns about the quality of summertime flows with regard to potential concentrations of agricultural chemicals. Although some measurements of pH and alkalinity have been made (results were not available to the review team), agricultural chemical contamination has not been evaluated to determine the potential suitability of this water for salmonids.

Because of the continuous flows from irrigation returns, this stream was unique in that base flows are higher than they were historically. This continuously altered hydroperiod was influencing vegetation establishment within the exclosures. A strong dominance of reed canarygrass (Phalaris) occurred on streambanks. On stream channel edges, watercress (Rorippa) and other semi-aquatic plants, such as speedwell (Veronica spp.), were pioneering species. These plants were trapping remarkable quantities of sediments; up to 6 inches (15 cm) of sediments had accumulated along many areas of streambank. Because of the altered flows, absence of coarse substrates, and possible competition from the canarygrass, few willows were establishing.

Observations/Interpretations/Comments

The areas behind the rock weirs were filling in with fine sediments, building a stair-stepped stream. It was suggested that the next treatment may be to add more weirs along the stream or raise the existing ones as they reach their sediment retention capacity. This engineering approach has several shortcomings that may affect its utility.

First, it is expensive. Second, without the establishment and maintenance of healthy riparian plant communities, the structures are likely to fail during a major flow event. Thus, the success or failure of these structures hinges on the long-term establishment and maintenance of healthy riparian plant communities.

The efficacy of instream structures for sediment retention should be contrasted to the construction of the exclosures that remove the effects of livestock grazing. A continuous vegetation cover along the entire reach will likely trap far more sediments and enhance riparian and stream diversity to a greater degree than engineering approaches, and it would eliminate the costly need for instream structures. Furthermore, such an approach would allow long-term channel adjustment to occur in response to varying flows and sediment loads from upstream areas. Ultimately and at a much reduced cost, beaver might be introduced to this site to meet local “engineering” needs.

A pattern of streambank recovery and sediment retention in this system has begun with watercress and other semi-aquatic forbs establishing in the incised channel; some narrowing of the active channel is occurring. As sediment deposition occurs, this vegetation will be replaced by sedges or grasses and eventually small wet meadows will form. Although reed canarygrass is currently performing this important function, this species is also suppressing the establishment of many native sedges and grasses along the stream.

With the occurrence of relatively high summertime flows and the deposition of sediments along vegetated streambanks within the exclosure, impressive vegetation recovery has occurred since exclusion in 1988/1989. Unfortunately, unauthorized cattle had entered and heavily utilized the middle exclosure. This brief, but severe influence, reversed the short-term gains toward recovery in this exclosure. Areas occupied by the semi-aquatic plants had been trampled and grazed to the point where sediments were lost and the channel width was greatly increased. This scene was a graphic representation of not only the rapidity of recovery that can occur, but also the susceptibility of recovering streams to degradation by improper livestock grazing. The ability of short-term livestock grazing to significantly and adversely impact recovering vegetation and channel morphology demonstrates the necessity for continued inspections and the need to maintain the integrity of exclosures.

Some concern was voiced about cost of this project relative to the value of the surrounding lands. Given the amount of money utilized for structural work in this channel, it may have been considerably less expensive (and certainly of greater long-term benefit to fish habitat improvement) if the surrounding (degraded) terrace and meadow had been leased or purchased and fenced. Additional concerns were voiced regarding potential water quality contamination from agricultural chemicals. Both concerns should have been explored prior to project implementation.

Upper Tenmile Creek
June 18, 1992

Site Descrption

We viewed approximately four miles of a reach that was included as part of a large riparian pasture management strategy. Western jumper was in an advanced state of invasion in the uplands and was likely influencing erosion and runoff patterns. The stream has generally entrenched to bedrock; in places, channel incision was 30-40 feet. Along an old terrace, decomposing logs and residual and decadent stands of black cottonwood were present. In some areas, western juniper has formed a dense stand where the riparian forests once stood. On one set of terraces, 90-120 year old junipers were prevalent, indicating that the erosional process along this portion of the stream began approximately a century ago.

Along the incised bank a variety of woody plant species exist: whiplash willow, Scoulers willow, black cottonwood, red-osier dogwood, birch, woods rose, chokecherry, etc. The area will be rested for five years prior to the reimplementation of livestock grazing. It is not known if this will provide an adequate time period for the reestablishment of willows and other woody species.

At the headcut, the steep eroding banks had been sloped and rock and junipers had been added for stabilization. Some juniper rip-rap had been placed in dry intermittent channels. Boulders and a rock weir had been established at the lower end of the reach. A water development that consisted of a watering trough out of the riparian zone had been constructed. In the permanent exclosure at the lower end of the reach, a few cottonwood seedlings were establishing. Overall, streamside vegetation was increasing throughout the length of the stream reach. ODFW personnel indicated that because of a downstream barrier and prevailing low flows over the past few years steelhead have been generally unable to get into this reach.

Observations/Interpretations/Comments

In general, the overall ecological condition of the riparian ecosystem was poor. Examination of the channel incision features along this stream provided a dramatic display of the level of resource loss that had occurred in this drainage. Along the edge of the incised channel, soils were typically gleyed, brilliantly mottled, and iron precipitates in root canals were distinct. This situation graphically indicates that the current terrace occupied by cheatgrass, medusahead, juniper and other xeric plants was once a productive wet meadow complex, and that subsurface storage of water was an important function of these former alluvial deposits. There were a few remnant and very decadent black cottonwoods with a dense understory of juniper. It may take decades to reverse the desertification processes that have been initiated and that continue along this system; the loss of subsurface storage can never be reversed.

It would be important to consider a broader perspective regarding the effect of management activities and the importance of such activities to riparian and aquatic systems. For example, a watershed-level approach should include restoration activities in the uplands. This especially includes juniper removal, the natural reestablishment of perennial bunchgrasses, and the reintroduction of periodic fire in this area. Restoration of the uplands to a mosaic of juniper and bunchgrass communities would decrease sedimentation rates, decrease water losses associated with canopy interception and transpiration by junipers, and may change instream hydroperiods to help sustain baseflows. This may represent the most beneficial and cost-effective restoration approach for these uplands.

Several areas of high soil moisture content (even in the midst of an extremely dry summer) were evident within the lower portion of the riparian pasture on the left side (looking downstream) of the stream. The occurrence of green grasses on these sites would indicate subsurface seepage of water at several locations along these toeslopes. Removal of upslope jumper may accentuate the amount of water available at these seeps, potentially resulting in small, but important, additional cold water contributions to summertime baseflow.

Several attributes of this project would suggest that the benefit-cost may not be very favorable for fish habitat improvement. For example, few adult steelhead are able to return to this riparian pasture. Furthermore, the extremely degraded stream reach immediately downstream of the riparian pasture indicates that this project is relatively "isolated" from other downstream habitat. A lack of connectivity would seemingly indicate a decreased probability of successfully augmenting fish runs.

Although riparian and watershed scale projects are important for effectively managing this watershed, the boulder and backhoe work at the headcut may represent a relatively ineffective treatment for steelhead populations. Upland rehabilitation, as mentioned above, may have been of greater benefit and ecologically more valuable than relatively costly spot treatments such as rip-rap.

The riparian pasture approach is an admirable management alternative that the landowner is implementing in this ecosystem. If successful, we can hope to see riparian improvements for the benefit of salmonid habitat, wildlife habitat, and livestock productivity. However, the marginal value of restored fish habitat in this reach may not be economically justifiable in comparison to other important habitat improvement needs in the basin.

Lower Trout Creek
June 18,1992

Site Description

Following the 1964 flood, this reach had been channelized and large berms built along the stream. The diking and berming were widely spread (setback some distance from the immediate channel), thus creating a relatively unconstrained reach. Additional channel instability and bank erosion occurred during high flows in 1983.

This reach of Trout Creek is an impressive display of the positive benefits that accrue when landowners take the initiative to improve the ecological condition of their riparian zones. Prior to the implementation of restoration measures this reach was characterized as being devoid of vegetation and farmed to the streambank edge which was rapidly eroding. The treatments to halt erosion included juniper rip-rap and backfill with gravels and cobbles. These juniper have trapped considerable amounts of fine sediments in some areas. The riparian zone has also been fenced to exclude livestock grazing, greatly facilitating willow and alder recovery. All of these activities were enthusiastically supported by the landowner.

Along this reach, willow and alder recovery was impressive. In the drier portions of the stream, Coyote willow (Salix exigua) was very abundant. Alder was the dominant shrub, providing some stream cover, wildlife habitat, and nutrient inputs. At least six other species of shrubs were present in this area. With the current revegetation of streambanks now well underway, a high flow event would assist in creating an increasing habitat diversity for aquatic organisms.

A few beaver dams provided added diversity to this section of Trout Creek. Areas around the beaver ponds also represented some of the wetter portions of the overall reach. However, the lower segment of the stream reach was completely dewatered. Except for the localized effects of the single beaver pond, much of the stream reach was entirely dewatered as a result of upstream diversions.

Observations/Interpretations/Comments

In many respects, this reach has extremely high potential for habitat restoration and improvement, particularly if summertime flow problems can be overcome. For example, this reach represented one of the few low gradient, albeit heavily impacted, unconstrained reaches seen during the field review where the existing channel was not deeply incised. Although channel incision, to some degree, may well have occurred during the 1964 and 1983 high flow events, the wide spacing between the gravel berms (in comparison to the width of the active stream channel) has provided an opportunity for the channel to adjust and develop a sinuosity that is in balance with flow, sediment, and vegetation constraints. Although future high flows may cause additional channel adjustments, the continued vegetation recovery between these setback berms should insure the long-term restoration of riparian vegetation and instream habitat, and the development of floodplain conditions. Recovery of riverine/riparian vegetation along this reach will also have important benefits for terrestrial wildlife species dependent upon healthy riparian vegetation.

The presence of beaver is a good indicator of a recovering system. Their occurrence is expected to accelerate stream and habitat recovery. However, the primary limiting factor in this portion of Trout Creek is related to water quantity. For example, although a few trout were seen in the beaver dam, these trout may not survive through the summer because of low water availability and associated low water temperatures. It was apparent that these fish were greatly stressed by high water temperatures.

The dewatering of Trout Creek poses an extremely difficult problem to the restoration of steelhead populations in this basin. Because of the lack of a sustainable baseflow, the installation of instream structures (juniper rip-rap, etc.) will have little direct benefit to fisheries. The need for sustainable instream flows is of paramount importance for many streams in eastern Oregon. This factor was the greatest barrier limiting the potential for improving or restoring salmonid habitat at this site.

Fish screens were briefly discussed at this site. Such screens are apparently needed in the spring during smolt outmigration. If irrigation withdrawals occur during the period of outmigration, fish screens may reduce potential losses.

Foley Creek
June 19, 1992

Site Description

Foley Creek is a major tributary of Trout Creek. Uplands along the observed reaches are dominated by ponderosa pine and mixed conifers. Forest die-off due to insects was common. Most of the area consisted of unconstrained reaches with wet and moist meadows.

We made a total of four stops along a 6-7 mile reach of Foley Creek. According to ODFW records, habitat manipulations along this reach included the 1990 installations of a corridor fence, 6 V-log weirs, 29 rock weirs, 79 cut logs, 194 boulders, 11 rock weirs, 31 rootwads, and 155 feet of western juniper rip-rap. The instream structures were installed to increase the number of deep pools. Anchor ice was also mentioned as a potential problem. In some areas, instream structures were constructed with the objective to halt erosional downcutting and headcuts.

We also visited a large wet meadow/willow mosaic with a high density of beaver. The riparian/stream ecosystem was extremely complex. No structures or other manipulations were placed in this reach. Other reaches were in a more degraded state, with problems such as downcutting, headcuts, etc.

Observations/Interpretations/Comments

In many areas where structural additions were undertaken, we did not observe a shortage of pools. Undercuts, small natural pools and other areas of pocket water were relatively common, particularly where there were live trees along the streambank. These natural pools were often comparatively complex with overhanging banks, overhanging vegetation, large wood debris, and narrow channels. The most complex pools generally were found where there were both standing (live) trees and large wood. In contrast, structural additions typically widened the channel and their simple structure and form bore little resemblance to the complex naturally pools in this ecosystem.

The addition of structures to meadow systems represents an important management issue. The placement of hard structures and boulders in meadow systems is often done in such a manner that an “unconstrained” reach is effectively converted into a “constrained” reach. The ability of the stream to adjust stream sinuosity and channel diversity to changing riparian conditions (such as improved riparian vegetation) is greatly retarded. In addition, structures of boulders and rock jetties are entirely out of context with the natural patterns of landform development. It seems ironic, that, in an attempt to save wild fish runs in the Columbia River Basin, so much of the current restoration strategy is based on the addition of boulder and cobble sized rocks with different size distributions than are found naturally. We are in effect creating an artificial environment ostensibly to save a native species. In addition, boulders are added to channels with fine-textured streambanks lacking sufficient vegetation to withstand the local erosive forces created by the structures. Although the widespread use of structures provides a convenient action program for inchannel work, serious questions regarding their utility for improving fish habitat needs to be addressed by intensive monitoring of BPA and ODFW habitat projects.

An area was visited with controlled livestock grazing or nonuse during the last 15 years had channels that were deep and narrow. Beaver ponds were scattered throughout the site. Structures had not been added and were definitely not needed in this area. This area also indicates that intensive and ecological management of both livestock and beaver may provide the most cost-effective means of long-term steelhead restoration for many degraded meadow systems. This site could serve as a good illustration of the desired future conditions for other reaches of this Creek. The BPA, with the assistance of ODFW, should consider the purchase of critical wetlands-riparian areas such as this relatively pristine meadow as a high priority. These areas are invaluable for steelhead and purchase may be the cheapest and most effective strategy for guaranteeing the long-term sustainability of these habitats for fisheries production.

Dutchman Creek
June 18, 1992

Site Description

Dutchman Creek is a first order tributary that flows into Foley Creek. Its headwaters are in the Ochoco National Forest. The surrounding upland vegetation is dominated by ponderosa pine and mixed conifer. Forest health problems (insect-induced die-offs) also exist in this watershed. Dutchman Creek is a slightly incised, steep gradient channel comprised largely of cobble-sized materials. Along approximately a two-mile reach, ODFW records indicate that the following changes were made: 382 boulder placements, 96 cull logs, 32 log weirs, 3 rock weirs, and 6 rootwads. A fence had been constructed to exclude livestock. A road occurs parallel to the stream channel. In addition, we viewed one area where spawning gravels had been added to the stream.

As of yet, there has not been a high flow event to determine the response of this stream to the aforementioned heavy equipment activities. In one area, a series of boulders had been placed in the channel in extremely high densities. This activity occurred in the absence of an ODFW representative.

Observations/Interpretations/Comments

The road which parallels Dutchman Creek may be adding significant amounts of fine sediment during runoff periods. If so, the road should be abandoned and/or rehabilitated to facilitate a reduction in sedimentation.

Due to contractor error, a reach of Dutchman Creek was heavily structured, especially with boulder placements. Structural additions should seldom be undertaken by a contractor unless an ODFW representative is present. This would avoid such mistakes and also help decrease the amount of damage to riparian zones by heavy equipment.

The Dutchman Creek channel had a high proportion of cobble-sized material comprising the steam bed and banks. Instream productivity of this reach is likely to be significantly lower than Foley Creek and restoration activities may not have warranted the magnitude of effort expended.

Although a goal of these structural enhancements were to “replicate nature,” the overabundance of large roughness elements added to this Creek far surpasses that of the natural stream system. The next high flow event may result in significant channel changes or large increases in streambank width with a potential for further decline in habitat suitability.

As in other sites visited, the potential for the structures in Dutchman Creek to bolster or repress the restoration of fisheries habitat may never be known because of a lack of monitoring. Without monitoring, the potentially widespread effects (either positive or negative) of structural treatments are indeterminate.

Upper Trout Creek (Ochoco National Forest)
June 19, 1992

Site Descritpion

This was only a brief stop along a reach that parallels the forest road. Uplands were dominated by ponderosa pine and mixed conifer. Forest harvesting had occurred in the uplands and riparian zone. In some areas decadent or dead black cottonwood were present in the riparian zones. Few, if any, cottonwoods are reproducing and unless management changes, the loss of cottonwood stands is eminent. Some alder stands were present. This reach was part of a long-term exclosure. However, BPA funds had also been used to construct “rock jetties” to protect the toe of a fill along a short section of road. During original road construction (many years ago), the fill apparently impinged upon the active channel. Farther upstream, large woody debris had been added to a reach that had experienced some harvesting of the riparian forest.

Observations/Interpretations/Comments

This relatively short section of stream impacted by the road fill is probably of limited value for steelhead. BPA funds had been spent to deflect flows away from the road system by stabilizing toe-slopes of the roadfill with a modified rip-rap jetty construction of boulders. In addition, these structures limited vegetation recovery. Although these toe-slope treatments are important to the maintenance of the road system, they do not have a significantly positive direct or indirect effect upon fisheries. Such projects should be paid for with USDA Forest Service road maintenance funds and not by funds directly earmarked for fish habitat improvement.

Farther upstream of the road project, we observed that coarse wood debris had been added to the stream where timber harvesting had previously occurred. Forested streamside zones should not always be managed with timber production as their primary goal. Historically, such management has resulted in the loss of coarse wood debris, shade, nutrient inputs, bank stability, and the related terrestrial and aquatic biological diversity associated with intact riparian/stream ecosystems. The continued harvest of trees in riparian zones only to be followed by the placement of large woody debris in the Creek is not a desirable management practice. Riparian stands should instead be managed to emphasize their important functions and values so that the long-term restoration and sustainability of quality anadromous fisheries habitat, water quality, wildlife habitat, and other riparian functions are assured.

Upper Cartwright Creek (Ochoco National Forest)
June 19, 1992

Site Description

Only a brief opportunity was afforded for viewing this first-order tributary. Cartwright Creek is part of a large riparian pasture. The area had been rested since 1988 and this is the last year of rest. The principal riparian shrub in this forested reach is thin-leaf alder. Most of the recovering plants are less than 6 feet in height and thus still susceptible to excessive livestock use. A series of log weirs had been constructed in this reach. Numerous trout (probably steelhead) were observed in the upper pool. The streambanks were well vegetated and little evidence of historical timber harvest was evident.

The stream was relatively turbid when visited in the field. The source(s) of such turbidity was not known, however high turbidities would not be expected during baseflow periods unless instream disturbance was occurring.

Observations/Interpretations/Comments

The levels of utilization of the riparian zone should be closely monitored to ensure that vegetation recovery continues – particularly that of shrubs and other plants close to the stream margins. Livestock utilization standards should be based upon the level of herbaceous and woody vegetation in the near-channel environment. Utilization should not exceed 50% of the herbaceous materials and 30% of the current year's growth of shrubs.

Field observations indicated that the streamside forest was adequately stocked and contained a variety of age classes, particularly older age classes. If so, the question needs to be asked: Why is it necessary to add large woody debris to this system? Fish habitat restoration efforts should not focus on manipulating intact or old-growth forest ecosystems.

While trout (possibly l-2 year old steelhead) were abundant in the uppermost constructed weir, they were not abundant below this point. This observation is similar to recent data collected in John Day Basin where nearly 80% of all insect drift was captured in the top pool of a series of constructed weirs. The subsequent downstream pools were little used by salmonids due to a lack of food resources. Such studies indicate the need for fisheries biologists and other specialists involved in habitat alterations to consider fish habitat restoration management as something more than creating pool rearing space.

ACKNOWLEDGEMENTS

The authors would like to express their gratitude to all of the members of the Oregon Department of Fisheries and Wildlife who accompanied and assisted them on the field review. Their assistance, willingness to answer questions, and enthusiasm for the job was admirable and appreciated. We would especially like to thank Larry Brown, Ray Hertlerode, Clair Kunkel, and Steve Springton for their immeasurable contributions during the field review. We would also like to thank Ron Graves, an Alan R. Dale for their invaluable reviews of earlier drafts of this report.