FEATURE:
FISHERIES RESTORATION

Building Science and Accountability into Community-based Restoration: Can a New Funding Approach Facilitate Effective and Accountable Restoration?

ABSTRACT: In 2004, the Bonneville Environmental Foundation (BEF) reviewed the results of its first five years of watershed restoration funding in the Pacific Northwest states of Montana, Idaho, Oregon, and Washington. We examined completed restoration projects, interviewed watershed managers, and reviewed past project proposals to determine if BEF's conventional one to two-year grants were promoting accountable, scientific, and watershed-scale restoration. Our evaluation indicated that BEF's short-term funding was likely to promote site-specific interventions and discourage rigorous, sustained monitoring and a watershed-scale approach. In an effort to advance accountable and increasingly effective restoration, BEF developed and is now applying an experimental long-term funding approach. We present this new approach in order to stimulate discussion and propose an alternative funding policy that might enhance the region's ability to effect watershed-scale restoation.

Todd Reeve
Jim Lichatowich
William Towey
Angus Duncan

Reeve is the director of Watershed Programs, Bonneville Environmental Foundation, Portland, Oregon and can be contacted at toddreeve@b-e-f.org. Lichatowich is a fisheries biologist at Alder Fork Consulting, Columbia City, Oregon. Towey is a policy analyst, Colville Confederated Tribes, Spokane, Washington. Duncan is president of the Bonneville Environmental Foundation, Portland, Oregon.

INTRODUCTION

Many in the Pacific Northwest regard Pacific salmon as the region's icon. These fish possess an unusual life history and once entered the region's rivers in prodigious numbers. Yet, for the last 100 years Pacific Northwest salmon have been in decline. They are now extinct in 40% of their historical range, and many remaining populations are currently under the protection of the federal Endangered Species Act (NRC 1996).

The region is spending hundreds of millions of dollars a year on watershed restoration programs aimed at recovering depressed populations of native salmon and trout; in the Columbia River basin alone, over $3 billion in federal funding has been spent on salmon recovery efforts (GAO 2002). Although there has been strong public support for such expenditures (Brinkman 1997), there is little conclusive evidence that restoration spending is producing tangible improvements in native salmonid populations (GAO 2002).

The Independent Science Advisory Board (ISAB) for the Columbia River has reviewed the efficacy of past watershed and biological recovery strategies and has called for changes in the region's approach to the recovery of depleted salmonid populations. The ISAB has recommended a whole watershed approach to restoration—an approach that addresses ecological processes and the biological requirements of salmon and trout across entire watershed ecosystems (ISG 2000). The Bonneville Environmental Foundation (BEF) is among those institutions that have adopted a watershed perspective.

Scientists who receive research funds write most of the papers on watershed restoration. This article is unique in that it is a discussion of this subject from the perspective of a funding institution. In an attempt to present a novel perspective, we detail lessons learned through BEF's first five years of watershed program funding, and we present a new and experimental approach to watershed restoration. We submit this review to stimulate discussion and propose alternative funding policies that might enhance the region's ability to recover depressed populations of native salmonids.

BEF: THE FIRST FIVE YEARS

Since the early 1990s, institutions charged with improving watershed conditions and recovering salmonid populations have worked to develop watershed-scale restoration initiatives (Reeves and Sedell 1992; NPPC 1994; ISAB 2001). The success of these initiatives is largely dependent on stakeholder support, and a proliferation of locally-based watershed groups has capitalized upon wide-ranging community and financial backing for watershed restoration (Dombeck et. al. 1997). Today, over 400 community-based watershed groups are listed as active in the states of Washington, Oregon, and California (Ecotrust 2005).

The Bonneville Environmental Foundation set out in 1999 to develop a watershed grant program to bolster community-based efforts to restore Pacific Northwest watersheds. At the outset, BEF worked to design a funding approach that would support watershed-scale restoration and integrate the adaptive management and accountability measures deemed essential to regional watershed restoration and species recovery (Currens et. al. 2000; Ralph and Pool 2002, etc.). To this end, BEF sought to establish a funding program that would measure success by evaluating the ecological outcomes of restoration actions against pre-set and quantifiable restoration objectives. This approach was intended to allow BEF and its grantees to demonstrate accountability and improve

long-term restoration strategies by adjusting methods and actions according to measured results. The following prerequisites were initially developed to guide the review and selection of watershed funding recipients:

- *Scientific basis*—applicants were required to develop and use watershed assessments to identify limiting ecological conditions, guide restoration planning, and assign priorities to specific restoration and conservation actions;
- *Community support*—BEF required that applicants demonstrate the landowner and community support necessary to implement a science-based restoration plan across jurisdictional and land ownership boundaries;
- *Long-term monitoring and evaluation*—Applicants were required to establish monitoring and evaluation systems that would track restoration progress and facilitate adaptive management; and
- *Watershed*—scale approach-BEF required that applicants demonstrate the capacity and willingness to address watershed function and habitat forming processes at the watershed scale.

Between 1998 and 2002, BEF solicited and reviewed project proposals and made annual grant awards in support of individual watershed restoration, monitoring, and assessment projects that appeared consistent with the four program prerequisites listed above.

RESULTS

In 2003, five years after initiating its watershed program, BEF evaluated the results of its restoration funding approach. We reviewed all previously submitted proposals (N=120), and we assessed the results of 19 funded projects. BEF staff incorporated information from site visits, written reports, and interviews with project sponsors, tribal representatives, agency biologists, and watershed council staff.

Our review confirmed that none of the programs surveyed had established a long-term (>10 year) restoration plan that integrated (a) specific and quantifiable restoration objectives; (b) priority measures necessary to achieve stated objectives; and (c) the monitoring and evaluation mechanisms necessary to track restoration results and improve future restoration strategies. Of the 120 community-based watershed restoration programs that submitted project proposals, BEF concluded that the overwhelming majority did not demonstrate the sustained resources and institutional capacity necessary to implement a watershed-scale and performance-based restoration program.

Example Watershed Restoration Projects

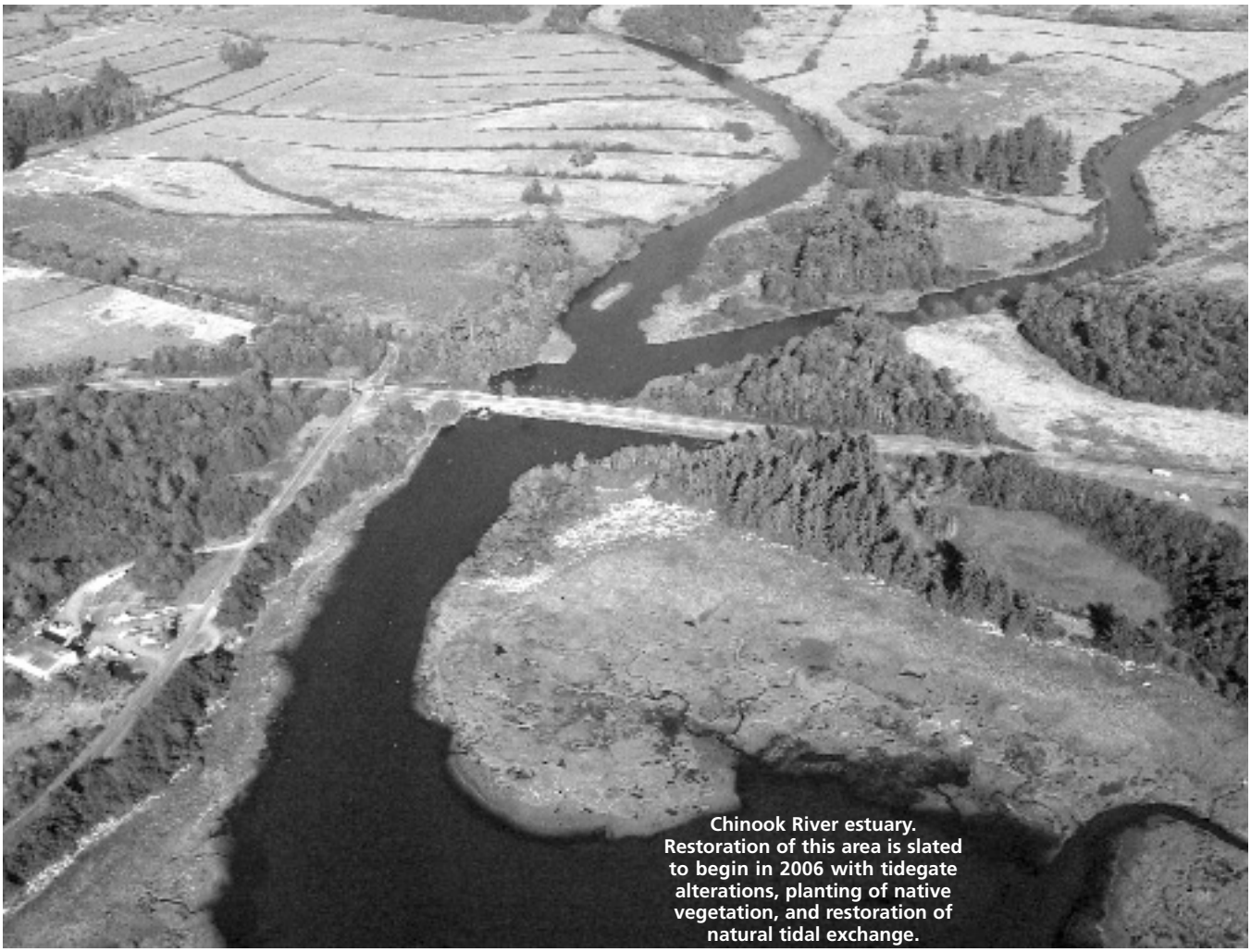
The following project summaries illustrate shortcomings apparent in projects funded by BEF between 1999-2002. The (a) limited monitoring and evaluation capacity, (b) focus on site and reach-specific restoration, and (c) ambiguous objectives are representative of a majority of projects reviewed by BEF.

Upper Columbia Basin, Washington—A local group in the upper Columbia basin, Washington, proposed that BEF provide funding to establish four off-stream livestock watering sites in an effort to reduce streamside grazing impacts and improve degraded riparian conditions. The group's proposal demonstrated consistency with established program criteria, and although there was no monitoring and evaluation program in place, the group pledged to evaluate project results. BEF approved funding for the project in 2000 and reviewed the completed project in 2002. Our review revealed that an explicit monitoring component for the project had not been developed, and staff members responsible for project design and implementation were no longer involved with the group. As a result, local knowledge pertaining to pre-project conditions and subsequent riparian improvement was not readily obtainable, and there was little consensus regarding whether the project was likely to mitigate factors limiting to native salmonids. BEF surmised that the lack of a predetermined and institutionalized monitoring and evaluation program allowed staff turnover and other management changes to disrupt program continuity. This undermined the potential to enhance institutional learning with measured results.

Clark Fork River, Montana—A local organization proposed that BEF provide funding to restore riparian conditions on a tributary to the Clark Fork River, Montana. The group demonstrated consistency with BEF criteria and provided biological assessments suggesting that the proposed project was likely to mitigate limiting conditions for native trout. BEF approved project funding in 2000 and evaluated the completed project in 2002. Our review revealed that there was limited technical assistance available to guide the group's efforts to monitor project results. Project sponsors reported that protocols for various past monitoring activities were inconsistent and that specific comparisons necessary to evaluate the effectiveness of ongoing restoration actions were unfeasible. Further, project grants had been allocated over a 12-month period, and no funding had been earmarked to support post project evaluations. BEF surmised that without technical support, a pre-established monitoring infrastructure, and multi-year funding, there was little potential for the small, grant-funded group to evaluate results.

Hood Canal, Washington—A locally based organization requested funding from BEF to complete a biological assessment of a Hood Canal, Washington, watershed and develop a watershed-scale restoration and monitoring approach. BEF approved funding for the project in 2002. Two years later, the grantee reported that matching funds to sustain assessment and monitoring work could not be obtained. Based on other experiences and reviews (Kondolf 1995; Kershner 1997), BEF and the grantee concluded that limited funding was available to support watershed monitoring and assessment. As a result, efforts to establish a long-term monitoring program were postponed. Meanwhile, funding to support on-the-ground restoration projects was readily available: the grantee successfully raised funds to replace culverts, establish conservation easements, and undertake instream and riparian restoration projects. BEF's review indicated that the grantee had succeeded in evaluating baseline conditions and was periodically successful in applying funding from project-specific grants to conduct limited-duration project effectiveness monitoring. However, piecemeal and short-term funding prevented the sponsor from establishing a systematic and sustained program that would evaluate restoration outcomes and ensure that future actions could be improved based on measured results.

Despite growing recognition that adequate and sustained monitoring is critical to the success of watershed restoration (Currens et. al. 2000; Ralph and Poole 2002), a majority of the programs reviewed by BEF failed to track project results and establish feedback loops to improve watershed restoration strategies based on measured outcomes.



Chinook River estuary. Restoration of this area is slated to begin in 2006 with tidegate alterations, planting of native vegetation, and restoration of natural tidal exchange.

After nearly five years of working to identify, develop, and implement science and results-based restoration programs, we concluded that (a) funding biases for short-term and site-specific restoration, (b) a lack of long-term watershed-scale planning, and (c) the prevalence of unsystematic and piecemeal monitoring programs prevented BEF's grantees from applying a scientific and watershed-scale restoration approach. BEF's Board of Directors determined that these shortcomings undermined the intended outcome of BEF's investments in every restoration project funded by the foundation.

A LEGACY OF INSUFFICIENT MONITORING AND EVALUATION

The Pacific Northwest has a long history of restoration and management actions aimed at sustaining or improving populations of native salmon and trout. While many past actions likely have produced positive ecological outcomes, the following examples from the mid-twentieth century through the present day suggest that inadequate monitoring and evaluation and biases towards site or issue-specific management and funding may have repeatedly prevented the region from maximizing the effectiveness of management actions and investments.

Between the late 1940s and the early 1960s, the states of Oregon, Washington, and California implemented extensive log and debris jam removal programs intended to improve habitat access for anadromous salmon. While 90% of the funds allocated for fish habitat enhancement were invested in debris jam removal during this period, the role of woody debris in stream ecosystems and the potential negative effects of wood removal were neither investigated nor considered (Sedell and Luchessa 1981). Later evaluations determined that large woody debris contributes substantially to both structural and biological stream functions and is fundamental to creating and maintaining productive salmonid habitat (Hicks et. al 1991). Had restoration managers acknowledged the inherent uncertainty in this new management technique and systematically evaluated the effects of removing large wood from stream systems prior to undertaking region-wide stream cleaning efforts, it is likely that degradation to salmonid habitat might have been avoided, and financial resources could have been reserved for management actions with improved likelihood of success.

During the 1980s and early 1990s federal and state agencies began modifying degraded stream channels with artificial instream structures (such as log weirs and gabions) with the intention of increasing specific habitat parameters such as pool frequency (Frissell and Nawa 1992). In several cases managers assumed, without supporting evidence, that the installation of artificial habitat structures would produce a net increase in salmonids, and millions of dollars were invested in untested habitat enhancement methods (Frissell and Nawa 1992; Wissmar et al. 1994). Examples from both eastern and

western Oregon watersheds suggest that little or no funding was available to systematically monitor or evaluate the effectiveness of instream restoration actions (Fontaine 1988; Wissmar et al. 1994). In Camp Creek, Oregon, for example, more than 280 log weirs were installed without first evaluating the capacity for log weirs to effectively mitigate conditions limiting to salmonid rearing. Later reviews revealed that structures did not mitigate primary limiting factors for salmonids in Camp Creek, and corresponding increases in salmonids were judged insignificant (Wissmar et. al 1994). In Deep Creek, Oregon, structures were installed with little apparent consideration of landscape processes affecting stream geomorphology. As a result, sediment pulses originating from landslides in clear-cut areas contributed to complete failures of instream structures (Frissell and Nawa 1992). Had systematic evaluation occurred in both the Camp Creek and Deep Creek examples prior to widespread installation of instream structures, institutional learning might have allowed managers to invest limited resources in projects that addressed causal conditions affecting stream habitat or limiting biological productivity.

Today, community-based efforts form the focus of watershed restoration and fisheries conservation in much of the Pacific Northwest. Yet, in a review of 14 watershed groups in Oregon, Washington, Idaho, and California, Huntington and Sommarstrom (2000) determined that monitoring and evaluation of project effectiveness was the least developed aspect of watershed restoration. Consistent with the examples listed above, Huntington and Sommarstrom established that many groups are at present incapable of evaluating the effects of past actions and managing restoration in an adaptive manner. In the Umpqua River, Oregon, for example, Habron (2000) found that bank stabilization and riparian planting projects offered potential to compare rival restoration techniques and improve future restoration effectiveness based on comparative results. However, Habron (2000) reported that projects were routinely completed without pre-project monitoring or a systematic means to promote institutional learning. Without evaluations of effectiveness, Sommarstrom (2001) confirmed that many contemporary community-based programs fail to address causes underlying watershed degradation and fisheries declines.

While the past two decades of community-based restoration have spawned new approaches to recover depressed fish populations, recent reviews indicate that the region remains ill prepared to verify the effectiveness of contemporary watershed restoration methods (Bayley 2002; Bernhardt 2005). Current reviews suggest that even today uncertainty and untested methods remain at the core of watershed management (WDAFS 2005), and without sustained monitoring and evaluation we risk expending limited resources on ineffective restoration (Roni et. al. 2002a, 2002b).

SOLUTIONS

After an extended period of soliciting and reviewing proposals, BEF acknowledged that its own short-term approach to funding watershed restoration projects was a fundamental part of the problem. The process encouraged piecemeal, site-specific projects and discouraged adequate, sustained monitoring and a watershed-scale approach (Kondolf 1995; Doppelt et al. 2002). Further, without specific and previously agreed upon ecological restoration objectives and sustained funding for monitoring, there was little motivation for grantees to track and report progress (Palmer et al. 2005).

Consequently, in 2003 BEF initiated an experiment to determine whether an alternate funding approach might enhance the capacity for grantees to employ a watershed-scale strategy and evaluate restoration outcomes and cumulative ecological improvement. Accordingly, BEF changed the process it used to fund projects. Instead of soliciting individual projects for a one or two-year commitment of funds, BEF sought out strong community-based restoration groups and proposed a long-term partnership in a results-based Model Watershed program. BEF proposed a 10-year commitment that would provide funding for monitoring and evaluation, scientific consultation and oversight, and independent peer review to a select few watershed restoration groups willing to meet our criteria.

This strategy required that, in addition to meeting pre-existing Watershed Program criteria, each Model Watershed partner work with BEF to implement the following steps:

1. Develop and commit to a minimum 10-year restoration and monitoring plan that:
   (a) Identifies limiting ecological conditions;
   (b) Sets specific and measurable ecological restoration objectives and interim benchmarks at the outset;
   (c) Designs and establishes a minimum 10-year monitoring system to track restoration results and evaluate progress towards meeting specified restoration objectives; and
   (d) Identifies specific restoration actions intended to restore ecological processes limiting biological recovery.
2. Establish a timetable that (a) schedules periodic review of progress towards meeting both interim restoration benchmarks and longer-term restoration objectives and (b) allows for adjustments and improvements to restoration strategies based on periodic review of monitoring results and quantified outcomes.
3. Memorialize long-term monitoring plans—including specific protocols, measurable restoration objectives, monitoring parameters, data collection schedules, and reporting deadlines—into binding contractual language that ties long-term funding to satisfactory performance of specific monitoring and evaluation actions listed in the 10-year timetable and work plan.
4. Incorporate regular feedback from an independent scientific team into ongoing restoration and monitoring methods and actions.

THE FIRST TWO MODEL WATERSHEDS

In 2003 BEF signed 10-year agreements with the Kootenai Tribe of Idaho (KTOI) and Sea Resources (a community-based watershed group, located in Chinook, Washington) to undertake monitoring-intensive, watershed-scale restoration efforts in Idaho's lower Kootenai River and the Chinook River in southwest Washington.

Chinook River, Washington

The Chinook River is a small (12 mi^2) watershed that drains directly into the Columbia River estuary, just a few miles upriver from the mouth of the Columbia River. Natural runs of Chinook

Trout Creek in the lower Kootenai River Valley. Grazing management, exclusionary fencing, and extensive planning of native woody vegetation has allowed this reach to begin recovering. This is another focus watershed for monitoring, evaluation, and restoration.

(*Oncorhynchus tshawytscha*), coho (*O. kisutch*), and chum (*O. keta*) salmon were likely extirpated from the watershed by the middle of the twentieth century due to overfishing and habitat alteration (Dewberry1997). From 1968–1996 Sea Resources employed a hatchery supplementation strategy in the Chinook River in an attempt to restore large numbers of adult salmon to the watershed, but by 1997 biologists determined that hatchery supplementation alone was unlikely to restore viable, self-sustaining populations of salmon (Dewberry 1997). As a result, Sea Resources adjusted its strategy to include a whole watershed restoration approach.

The new approach focuses on restoring watershed processes in order to maintain a habitat template that will provide for broadening the life history diversity of naturally spawning fish. To this end, six primary management objectives were developed to guide watershed restoration (Dewberry 1997):

1. Establish refuges to protect critical habitat.
2. Repair and stabilize forest roads.
3. Protect and restore valley bottomlands.
4. Restore the lower river estuary.
5. Use the hatchery to restore a diverse suite of life history strategies.
6. Evaluate the results.

Lower Kootenai River, Idaho

Originating in the Rocky Mountains of British Columbia, the Kootenai River flows through northwestern Montana and northern Idaho before it reenters Canada and drains into Kootenay Lake. Historically, the lower Kootenai River supported self-sustaining populations of white sturgeon (*Acipenser transmontanus*), burbot (*Lota lota*), kokanee (*O. nerka*), bull trout (*Salvelinus confluentus*), Westslope cutthroat (*O. clarki lewisi*), and red-band trout (*O. mykiss gairdneri*). Presently these species are in decline and most have either been listed or petitioned for listing under the Endangered Species Act (KTOI and MFWP 2004).

As the Kootenai Tribe of Idaho worked to develop an effective watershed restoration approach and evaluate the myriad causes contributing to the decline of native fisheries, biological assessments and consensus from community stakeholders (KVRI 2001) led the Tribe to conclude that only a long-term and community-based effort would succeed in addressing watershed-scale issues and reestablishing the ecosystem processes required to recover native fish populations (Marotz 2001; KTOI and MFWP 2004).

As a result, the KTOI joined with local groups and state, federal, and provincial agencies to coordinate fisheries management and watershed restoration at scales transcending jurisdictional and land ownership boundaries (KTOI and MFWP 2004). In addition, the Tribe elected early on to focus much of its work on evaluating management outcomes to ensure that its actions produce expected ecological improvements (Ireland et. al. 2002; Kruse 2004).

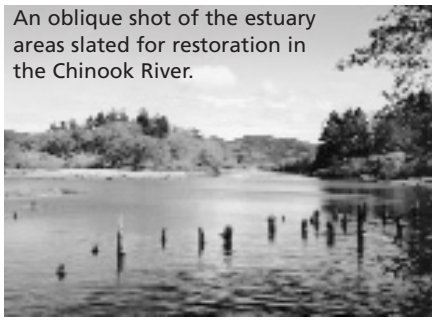
MODEL WATERSHED SELECTION AND DESIGN

The selection process for BEF's first two Model Watershed programs occurred throughout 2003. Prior to this period, KTOI and Sea Resources received periodic grants from BEF to assess physical and biological watershed conditions and design restoration and monitoring strategies.

BEF staff and board members reviewed written proposals, interviewed project sponsors, and toured the proposed Model Watersheds. Based on responses provided during this review, BEF confirmed the desire and intent of KTOI and Sea Resources to address watershed-scale constraints and implement a results-based restoration program. BEF coordinated with both groups to develop 10-year Model Watershed restoration and monitoring work plans that addressed the four Model Watershed steps outlined above.

With the signing of a memorandum of understanding in 2003, BEF committed to provide funding for monitoring and evaluation, professional scientific support, and the services of an independent peer-review team over the full 10-year term of the projects.

To ensure that essential monitoring tasks are implemented regardless of staff turnover or other management changes, BEF memorialized annual monitoring and evaluation tasks into binding contractual language. As such, annual funding from BEF remains contingent upon each Model Watershed partner's compliance with the annually-scheduled monitoring and reporting actions defined in the jointly adopted 10-year plan.



An oblique shot of the estuary areas slated for restoration in the Chinook River.

Now in their second year, the Kootenai and Chinook Model Watershed programs exhibit several important differences from a majority of watershed projects and proposals previously funded or reviewed by BEF:

1. Instead of focusing on achieving steady state conditions on a project-by-project basis, these programs have developed a 10-year approach that attempts to address constraints to natural watershed process and function;
2. Instead of relying on vague measures of success, both groups have established specific and measurable restoration objectives;
3. Instead of allowing annual funding, shifting institutional priorities, or a bias for on the ground actions to drive the selection of restoration projects, both groups seek to address the long-term actions hypothesized as necessary to achieve stated objectives;
4. Rather than measuring success based on outputs (i.e., money spent, trees planted, etc.), both programs are attempting to evaluate success based on quantified ecological improvement;
5. Instead of relying on sporadic and inconsistent monitoring and evaluation, a systematic 10-year monitoring system was designed up front, and BEF has pledged to provide funding that will support monitoring and evaluation over a 10-year period; and
6. Rather than relying on untested methods, the potential now exists to facilitate institutional learning and improve future actions based on measured results.

BEF seeks to test this new funding model at scales and locations broadly representative of the varying watershed ecosystems found across the region. As we expand the number and distribution of experimental Model Watershed programs, we intend to document the results of this approach. Because BEF's geographic scope of funding is limited, we hope that results will demonstrate a scientifically defensible and effective restoration and funding strategy that may be duplicated and applied by watershed managers, funders, and communities at a wide range of scales and locations across the Pacific Northwest.

Disadvantages of Long-term Funding

One obvious disadvantage of a focused, long-term approach is that BEF will not be able to provide numerous short-term, project-specific grants to a wide range of watershed programs. Nevertheless, the BEF Board of Directors has determined that the risks of expending limited resources without adequate monitoring, evaluation, and adaptive capacity outweigh the benefits associated with supporting a broad range of limited duration, site-specific projects. With short-term grants spread widely across the region BEF risks:

(a) Not being able to demonstrate measured results to ratepayers, communities, funders, and other stakeholders;
(b) Losing public support for stream and fisheries restoration due to a lack of accountability;
(c) Expending limited resources on projects that may produce little ecological improvement; and
(d) Not being able to improve the effectiveness of restoration action and investment based on measured results.

Another potential disadvantage of long-term funding hinges on the fact that BEF's commitment of Model Watershed support provides only a small portion of the funding necessary to implement a comprehensive restoration and monitoring program. As such, the ultimate success of each Model Watershed remains contingent upon the availability and procurement of complementary grant funding. Because matching grants are typically awarded on an annual, project-specific basis—with no certainty that resources will be available to support critical actions over the long-term—funding vagaries may dictate that BEF's long-term approach and commitment will produce only marginal changes in practice.

PROGRAM EVALUATION

There is no systematic program in place to compare the results of BEF's earlier short-term grant investments to the results produced through BEF's current long-term funding experiment. The short-term, site-specific projects funded between 1999–2002 are only capable of reporting project outputs (i.e., number of trees planted, money spent). At best, BEF's grant investments from 1999–2002 will produce unconfirmed ecological improvements but will provide no indication as to how to increase the effectiveness of ongoing efforts.

Our current approach is predicated on the hypothesis that accountability for actions and investments, institutional learning, and the application of lessons learned will lead to increasingly efficient use of funding and greater ecological results produced through investment of limited resources. Hence, we propose to evaluate the ultimate success of our funding experiment by rigorously assessing whether Model Watershed sponsors effectively:

- Measure the cumulative ecological outcomes produced through restoration action and investment,
- Enhance institutional learning with measured results,
- Establish and use information feedback loops that allow restoration strategies to be adjusted and improved, and
- Demonstrate accountability, in the form of quantified ecological improvements, for investments of time and money.

To facilitate this evaluation, BEF requires Model Watershed grantees to annually develop a report that (a) restates physical and biological restoration objectives for the project, (b) reviews the effectiveness of ongoing monitoring and evaluation systems, and (c) uses cumulative data to track, quantify, or forecast restoration outcomes. Grantees are then required to document lessons learned during the course of the year and state how restoration and monitoring methods will be adjusted based on previous years' data and experience.

In an attempt to assure consistent implementation and oversight and avoid funding shortfalls that could compromise program continuity, BEF secures 10-year funding for each project prior to Model Watershed selection and implementation. This policy is intended to ensure that critical monitoring, evaluation, and review functions occur over a 10-year period regardless of other funding dependencies or shortfalls.

CONCLUSION

Based on the Bonneville Environmental Foundation's experience reviewing, evaluating, and funding watershed programs from 1999–2003, we conclude that the lack of a long-term watershed-scale approach, emphasis on short-term and site-specific restoration actions, and the prevalence of unsystem-

atic and piecemeal monitoring comprise several primary issues limiting the effectiveness of community-based watershed and fisheries recovery efforts in the Pacific Northwest.

Our review of restoration proposals and previously funded projects suggests that many regional watershed programs do not establish specific and quantifiable restoration objectives, priority measures to achieve those objectives, or the monitoring and evaluation mechanisms necessary to track restoration effectiveness and improve ongoing strategies. Furthermore, we conclude that the majority of watershed restoration programs reviewed by BEF do not possess the sustained and unencumbered resources necessary to carry out science-based, watershed-scale, and results-driven restoration. This observation is supported by other reviews (Kershner 1997; Huntington and Sommarstrom 2000; ISAB and ISRP 2004) and may suggest that our results are indicative of both agency and community watershed restoration programs across the region.

BEF and others (Currens et al. 2000; ISAB 2001; Ralph and Poole 2002, etc.) assert that long-term, scientifically valid monitoring systems and a watershed-scale restoration approach are essential to Pacific Northwest salmon recovery and aquatic restoration. Yet monitoring deficiencies identified in our evaluation of 120 proposed watershed projects suggest that—at best—a majority of the programs reviewed by BEF will fail to implement fully effective restoration actions and investments. Where results cannot be verified and techniques cannot be improved based on measured results, well-intended efforts may do little to improve stream ecosystems (Frissell and Nawa 1992; Lichatowich et al. 1995; Ebersole et al. 1997).

To exploit the strong community support for watershed restoration in the Pacific Northwest and overcome obstacles to accountable and effective restoration, BEF developed and is now testing an approach that provides funding, scientific oversight, and independent peer review to select program partners over a minimum 10-year period. This strategy strives to ensure that the watershed restoration programs funded by BEF employ a watershed-scale approach and apply monitoring-intensive and adaptive restoration strategies over a minimum 10-year period.

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