WATERSHED EDUCATION

Led by Oregon Sea Grant and Its Partners

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(Illustrations are omitted from this plain-text version.)

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EXECUTIVE SUMMARY

It has become increasingly obvious that to restore and protect the beleaguered Pacific salmon, regulators, governments, landowners, and local communities must shift their management approaches. And they must do this at the watershed level.

In response to this need, the state of Oregon has created a watershed-based program, the Oregon Plan for Salmon and Watersheds, that focuses resources, coordinates agency efforts, and prioritizes restoration actions in a ridgetop-to-

ridgetop fashion. The Oregon Watershed Enhancement Board, which manages the Oregon Plan, has developed a multidisciplinary strategy to address the habitat needs of salmon, including the protection and restoration of water quality, the management and restoration of riparian areas, and the management of uplands and metropolitan "built" environments.

Oregon State University's Watershed Extension Program has also taken a multidisciplinary approach to the strategic and technical needs of the communities, constituencies, and watersheds it serves. Staff are funded by Sea Grant Extension, Forestry Extension, and Extension Agriculture programs at OSU. This unique, multiprogram approach encourages collaboration among people involved in the two major uses of Oregon land: agriculture and forestry.

The Watershed Extension Program contributes to Oregon's salmon and watershed restoration efforts not only through well-placed and competent staff, but also through programmatic efforts such as the Watershed Stewardship Educational Program. This training program is used by state agencies, watershed council members, interested landowners, and other members of the public as a primer in watershed functions, an organizational development tool, and a monitoring and strategic planning guide. The program has been well received in Oregon and is a model for similar programs in New York, Louisiana, Georgia, Arizona, and Texas.

Another Extension program, Watershed Weeks, is a grassroots, family-oriented program designed to raise the awareness of the general public about watershed issues and about the local, community-based groups that are working to restore Oregon's watersheds. Between 1999 and 2003, when Sea Grant administered the program, the number of sponsored events rose from 55 to 175 statewide.

However, the strength of the program lies in the expertise of county-based staff and the relationships they have developed with local communities, landowners, and watershed councils. Many of these faculty positions are split between Sea Grant Extension, Extension Agriculture, and Forestry Extension, reflecting a collaborative, landscape-based approach. Faculty include agents in six counties of western Oregon, as well as staff at OSU's campus in Corvallis and in Salem, the state capital. These faculty have assumed leadership roles in their respective communities as chairs of local watershed councils, experts on restoration projects, and technical advisors to landowners, watershed councils, and local communities about watershed and habitat issues.

The Watershed Extension Program currently faces serious challenges, partly because of funding cuts and partly because of a change in funding methods for all Extension programs. With budget cuts, some county staff have been laid off and

others are required to serve larger territories, raising questions about their continued effectiveness, since much of their success has developed through building relationships with local landowners and community members. In addition, the collaborative nature of the program leaves the Watershed Extension Program more vulnerable to budget cuts than other Extension programs that have stronger sponsorship in the bureaucratic environment of a large, public, land-grant university. How the program resolves these issues may influence how Oregonians continue to learn about, and support, the watersheds on which they, and Pacific salmon, depend.

INTRODUCTION

Shortly after Frank Burris was hired in 2000 as the Extension watershed management educator for Curry County, the South Coast Watershed Council asked him to look at an off-channel stock-watering project it had designed. The project was on a private ranch north of Gold Beach, Oregon. When Burris visited the site, he saw a local watershed group's good intentions: to prevent cattle from using Euchre Creek as their source of drinking water: undermined by a poor design. The watering project had failed, and both the watershed council and the landowner were searching for someone with enough technical expertise to successfully redesign it. Burris rebuilt the off channel watering system, and today the landowner's cows no longer use Euchre Creek for their drinking water. Instead, the Burris-designed system provides the cattle with a consistent water source approximately 800 feet away from the creek. As the cows drink from a trough, the water level drops, opening a check valve attached to a flotation device. When the water fills to a certain level in the trough, the check valve closes. Hence, the four troughs, which are spread across the ranch, never dry up, nor do they overflow and wastewater. Because of the dependability of these off-channel water sources, the cattle now rely on the troughs as their sole source for drinking water. Since that time, in addition to his duties as the watershed management educator for Sea Grant Extension in Curry County, Frank Burris has become local engineer, ranch manager, applied researcher, and wetlands ecologist to a host of local landowners, watershed councils, and other agency personnel.

Burris' involvement in the Euchre Creek project is emblematic of the way Oregon State University's Watershed Extension Program has developed as a significant resource in the state's experiment in landscape-based, ecosystem approaches to watershed restoration and management. What began as an off-channel stock watering project on a cattle ranch has since turned into a three-year, multistaged, floodplain management project. It includes intermittent fencing around a seasonal wetland to prevent cattle from entering the area for drinking water during critical bird nesting times and to minimize trampling of the area; conservation easements

on the entire property, supported by the landowner; and the acquisition of 57 acres that the landowner converted to pastureland from what was once a rare Sitka Spruce estuarine wetland. While the land acquisition phase of the project is still in negotiation, the South Coast Watershed Council and OSU Extension are proceeding with plans to use this estuarine area for conservation and educational uses.1

In a similarly practical fashion, the Watershed Extension Program has turned previous projects into opportunities with a greater impact on the land and on communities.

Both Oregon's approach to watershed restoration and management and the Watershed Extension Program itself require agencies and institutions to rethink how to adapt to the migratory life cycle and habitat needs of Pacific salmon. As noted in other publications, Pacific salmon, because of their anadramy, pose unique challenges to the regulatory and administrative capacities of governments, agencies, and the general public.2 These fish breed in the rivers and headwaters of the region's watersheds, migrate to the ocean for one to five years, and then return to spawn and die in their natal streams. This regionwide use of the landscape by all Pacific salmon species requires regulators, governments, and local communities to shift management approaches in order to protect and recover these fish and their habitats. They need to approach natural resource and land use management from a landscape, or ecosystem, context, as well.

As a result, the state of Oregon has created a watershed-based program that focuses resources, coordinates agency efforts, and prioritizes restoration activities in a ridgetop-to-ridgetop fashion. The Oregon Plan for Salmon and Watersheds is the state's flagship response, and the Oregon Watershed Enhancement Board: the state agency charged with managing the Oregon Plan: has approached this task through a multidisciplinary strategy that addresses the habitat needs of salmon, including the protection and restoration of water quality and the management and restoration of riparian areas. The Oregon Plan is also tackling changes to management of uplands and metropolitan "built" environments.

What once started out as a state-sponsored salmon restoration effort has evolved beyond its salmon-centric roots. Today, OWEB has expanded its mission to "help create and maintain healthy watersheds and natural habitats that support thriving communities and strong economies." And to achieve this mission, OWEB has engaged in an interdisciplinary, grassroots, and landscape-based effort.

Oregon State University's Watershed Extension Program has, likewise, taken a multidisciplinary approach to addressing the strategic and technical abilities of

communities and constituencies. Staff are funded through a collaboration of the Sea Grant Extension, Forestry Extension, and Extension Agriculture programs at Oregon State University. This multiprogrammed approach is unique in Extension and provides an opportunity for cooperation among those land management uses that affect the greatest percentage of the landscape in Oregon, namely forestry and agriculture. Forestry and agriculture uses together take up approximately 75 percent of Oregon's land area.3

Bob Malouf, director of Oregon Sea Grant, noted that the issue of watersheds cuts across not only the landscape, but all university boundaries, including colleges, departments, and programs. "That's why [Oregon] Sea Grant is pleased to partner with the [OSU] colleges of Forestry and Agricultural Sciences, as well as the [OSU] Extension Service. Together, our programs and people are making a difference along the coast and across the state."

From its beginnings in the late 1990s, the Watershed Extension Program has grown to include 12 full-time staff (as of 2004), with field agents in six counties of western Oregon and staff at OSU's campus in Corvallis and in Salem, the state capital. A number of current staff have been hired since 2000, mirroring the expansion of the Oregon Plan. In addition to Burris, those hired since 2000 are Beth Lambert, watershed management educator in Tillamook County, and Sam Chan, aquatic ecosystem health specialist in Clackamas County.

The job descriptions of many of these watershed faculty are defined in percentages of time that they work for Sea Grant Extension, Extension Agriculture, and Forestry Extension. Yet, from a programmatic standpoint, the lines between how much time each faculty allocates to the various disciplines are "blurry" as Scott Reed, then executive associate dean and Forestry Extension leader in the Department of Forestry, noted.

As a result, Reed, who was one of the Extension administrators who initially advocated making the Watershed Extension Program a joint program, does not expect monthly reports to itemize how much time each faculty has allocated to meet his or her fractional funding allocations. Instead, he supports the overall intent of the program, which is for the faculty to work in a landscape-based, ecosystem context "on projects that they identify as helping the resource, the landowners, and local communities restore and manage these watersheds" for the benefit of Pacific salmon, healthy watersheds, and local constituencies.

According to Sea Grant's Malouf, "Understanding and communicating what is learned about watersheds requires all three elements of the mission of the state's system of higher education: research, education, and outreach."

Other programs developed by the watershed faculty have added to the effectiveness of both Extension's program and the Or-

egon Plan. They have also helped further the mission of higher education. Two Extension programs are particularly noteworthy: the Watershed Stewardship Education Program (WSEP), a curriculum developed and taught by Watershed Extension faculty, and Watershed Weeks, a statewide, month-long program that supports and promotes watershed-based activities for the general public. These programs have raised the awareness of Oregon's residents about watersheds and aquatic ecosystems.

WATERSHED STEWARDSHIP EDUCATION PROGRAM

Administrators of Oregon State University's Extension programs have been strategic in their support of Oregon's watershed restoration efforts. For instance, when then Governor Kitzhaber attended a salmon summit on the OSU campus in 1998, the university's president at the time, Paul Risser, immediately grasped the significance of the challenge and the state's approach. He asked Extension administrators Scott Reed, Jay Rasmussen from Sea Grant Extension, and Kelvin Koong from Agriculture Extension to take the lead in developing the university's role in the newly created statewide approach to salmon recovery.

Three Extension faculty, Mike Cloughesy, Flaxen Conway, and Derek Godwin, became the core team to develop Extension's response. The team soon realized that if this new statewide experiment were to succeed, it would be necessary to develop a core curriculum about how watersheds function and how land use decisions affect those functions. Extension's experience with foresters, agriculturalists, fishers, and others involved in the working landscapes of Oregon underscored the need for teaching a broad base of the public how these watersheds function on a systemic level.

There was a precedent for such an integrated curriculum. Derek Godwin had developed a curriculum on the importance of riparian zones in supporting healthy salmonid populations for landowners and a local watershed council on the south coast near Gold Beach. Godwin had previously grasped that to help these constituencies understand how their land management decisions could affect salmon populations, they needed a scientific background in the role these fragile and fecund areas play in supporting water quality and salmonid habitat, and they needed information on ways to protect and nurture them.

That initial curriculum has grown into a statewide educational program for understanding the role of watersheds. The WSEP is used today by state agencies,

watershed council members, interested landowners, and other members of the public. Extension field staff are frequently asked to give workshops based on the eight modules of Watershed Stewardship: A Learning Guide to high school students, watershed councils, soil and conservation districts, agency staff, and others interested in learning about watersheds or about specific resources such as wetlands, water quality, or instream habitat for salmonids and other species.

According to Ken Bierly, deputy director of the Oregon Watershed Enhancement Board, his agency strongly recommends that newly hired watershed council coordinators and new council board members enroll in the WSEP because "Sea Grant has pulled together all of the Extension entities into a cooperative that provides well-informed watershed training." Through the WSEP program, Bierly said, "They are helping to develop a common understanding and a common language of how folks see the basins they live in."

Bierly noted that since the WSEP is so well designed, OWEB is "happy to use it as an existing resource to train watershed councils, as well as train our own support staff." OWEB's commitment to the program is reflected in the fact that the board has funded WSEP annually, despite shrinking

budgets and growing demands for budget allocations in other areas. The table below shows OWEB's grant allocations to the WSEP for the past few years:

The WSEP is now called the Master Watershed Stewards Program (MWSP), a change that reflects the shift Extension sees in the constituencies served by this program. Whereas the original intent was to help support watershed council members and staff, now Extension teaches these modules to any group interested in watershed dynamics and functions. Part organizational development trainer (reflecting its roots as a tool for fostering community-based watershed councils), part conservation biology primer, and part monitoring guide, the MSWP Learning Guide is useful to people of diverse interests who want a comprehensive course in watersheds and grassroots approaches to stewardship. Extension's intent is to update the Learning Guide periodically to stay current with the evolving scientific principles and expanding understanding inherent in this dynamic field. The last update occurred in 2002.

One notable aspect of the Learning Guide is its reliance on principles based in conservation biology. Approaches such as enhancing or protecting those intact, highly functioning areas that currently provide valuable processes and habitats for water quality and aquatic-dependent species are normally the province of the environmental and scientific communities. Such approaches can be controversial in Pacific Northwest rural communities that traditionally depend on resource

extraction or resource use of the land. Yet Watershed Extension faculty have been successful in teaching these concepts to local constituents and working with landowners who have taken the training program and want to engage in restoration projects on their own property.

In response to a question about why Extension has been so successful in incorporating these principles of conservation biology into the training modules, and subsequently into watershed restoration projects on private lands, Derek Godwin said, "The goal is to make a difference with the landowner in terms of helping them to improve their management for the targeted values."

Godwin further noted that Sea Grant and Extension's approach "starts with community co-learning. We see it as solving problems together and working with community members and landowners. No other agency does that: learning together what they [the property owners] can initially do to make a change on their property."

A key part of the job responsibilities for county-based Watershed Extension faculty is to provide training in their respective areas of expertise. For instance, Frank Burris teaches the wetlands module all around the state, and Beth Lambert teaches the water-quality monitoring module to groups in the Northwest region and statewide.

The effectiveness of the WSEP/MSWP teaching program can be inferred by its popularity. Over 1,000 people have enrolled in the WSEP or MSWP since the year 2000, when Sea Grant began keeping such data. Six hundred and ten of these participants enrolled in the MWSP and have participated in, or will have completed, a watershed restoration project by 2006. The MWSP, according to Sea Grant data, has generated over 24,000 volunteer hours of watershed restoration activities throughout Oregon since the year 2000.

While enrollment requests from constituencies around Oregon continue, other states have also used the Learning Guide as a template to develop a teaching program focused on watershed functions and grassroots approaches. The Learning Guide has been requested in New York, Louisiana, Georgia, Arizona, and Texas for the purpose of creating similar programs. Pat Corcoran, an Extension agent involved in writing the organizational development sections of the Learning Guide, worked with Louisiana and New York on creating their programs. He also helped create a national version of the Learning Guide, the National Coastal Ecosystem Restoration Manual, published by Oregon Sea Grant. In 2002, the entire WSEP was reviewed for adoption in Texas.

WATERSHED WEEKS

Although many Watershed Extension faculty are located in rural areas, the program also focuses resources in the metropolitan areas of the state. For instance, a number of watershed restoration projects are in the larger metro areas of Portland, Salem, and Eugene, and Extension staff are involved in many of these projects. Derek Godwin has worked with the local Pringle Creek Watershed Council in the Salem area to develop restoration projects for Pringle Creek, an urban creek. But the program that exemplifies Extension's commitment, and approach, to leveraging funds to gain significant effect in Oregon's metro areas is the Watershed Weeks program.

Watershed Weeks proved to be exceptionally successful during Sea Grant Extension's sponsorship from 1999 to 2003. Paul Heimowitz, former Watershed Extension Program faculty for the Portland Metropolitan area, joined Extension in 1998. One of Heimowitz' immediate tasks was to increase awareness of watersheds and their significance in the media-savvy Portland metro environment, where approximately 1.5 million Oregonians live. Heimowitz had limited resources to achieve his goal, so he looked for innovative ways to increase awareness about watersheds and salmon habitat issues among the metropolitan area's residents.

One model that impressed him was the Watershed Weeks program in Washington State, and so he used it as a model to create a similar program in Oregon. Heimowitz wanted to tap into what he termed "the spectrum from awareness to action" and bring the word watershed to public awareness.

Heimowitz knew that Sea Grant Extension couldn't do all of the work involved in launching such a program. "I took a typical Sea Grant and Extension approach. I wanted Extension to be a catalyst [for the program] but not to be the long-term owner of the program."

To help implement the program, he tapped into the networks that local watershed councils were beginning to establish. "We had two primary goals for Watershed Weeks," Heimowitz said. "One, we wanted to raise the public's awareness about watersheds. And two, we hoped to help watershed councils improve their outreach process." Heimowitz said that at the time (1999), many watershed councils were still developing their outreach strategies to the broader public, and he wanted Watershed Weeks to assist them in this goal.

"We started with no funding for this program," Heimowitz said. Because of that limited budget, Heimowitz focused on activities that included either watershed stewardship types of activities or projects that targeted families who may not have

been aware of, or engaged in, watershed activities. Heimowitz also looked for different media to "get the word out about watersheds." Examples of the types of activities that Heimowitz solicited included recreational activities related to water and library art shows that had watershed or water-related themes.

Despite the limited resources and time put into it, Watershed Weeks created a significant splash, not just in the Portland metro area, but statewide. Watershed Weeks' popularity grew, and the program received OWEB funding from 2001 to 2003. That funding, coupled with some of the statistics included in the final report for OWEB's grant written in 2003, underscores the program's efficacy and popularity. Watershed Weeks established a Web site in 2002, and the total hits on the Web site grew from 2,952 in 2002, to 10,517 in 2003. Visitor sessions grew from 797 to 3,694 during the same period. Likewise, the number of events sponsored during Watershed Weeks grew from 75 in 1999, to 155 events statewide in 2003, the last year the program was offered.

As of this writing (April 2005), a grant proposal is ready for submission to OWEB for funding the next phase of Watershed Weeks. Although the appropriate organizational home for the program is uncertain because of the recent closing of For the Sake of the Salmon: a nonprofit and multistakeholder group that had been designated as the next organizer of the program: interest is high among a network of watershed councils, nonprofit organizations, and others actively involved in the Oregon Plan. Although Heimowitz' goal of finding a more permanent organizational home for Watershed Weeks has not been realized, as a Watershed Extension program, its four-year tenure under Extension achieved the initial goals of improving public awareness of watersheds and of the intricate relationships between humans, salmonid populations, and watersheds.

CASE STUDIES

One of the clear strengths of the Watershed Extension Program is the caliber of its faculty, who blend solid technical expertise with good people and process skills. While this combination is a hallmark of Extension agents generally, the complex and contentious issues that Watershed Program faculty confront, coupled with the fact that these agents do not specifically help landowners and local communities improve commodity production, or commodity processing and distribution, make their success at the local level noteworthy. Also noteworthy is the support they have generated with landowners and the surrounding communities.

Following are case studies of three Watershed Extension Program faculty. Beth Lambert, Frank Burris, and Guillermo Giannico all work with local groups and landowners in their respective regions. A fourth member of the faculty, Derek

Godwin, is based in Salem and has been responsible for statewide programs and activities of the Watershed Extension Program. Although Godwin is not profiled in this section, his input and knowledge were helpful because of his long tenure with the program and his statewide perspective.

Beth Lambert

Tillamook, Oregon, is famous for its cheese and other dairy products. The area is also endowed with coastal rivers and streams that have supported productive anadromous fish populations, and its bays and estuaries have propagated prodigious shellfish populations that supported the local economy. Today, however, those fish and shellfish populations are a shadow of their former robustness. Most of the rivers flowing into Tillamook Bay are currently identified on Oregon's 303(d) list for water quality impaired streams, primarily for fecal coliform contamination, underscoring the watershed and water-quality challenges the area's successful dairy operations have helped to create.4

When Beth Lambert first arrived in Tillamook County, she noted that no local community organization played a leadership role in addressing the complex watershed and water-quality issues the area faced. Although the Tillamook Watershed Council had completed a watershed assessment, it did not function as a forum to provide the kind of local leadership needed to address the complex issues the basin had. Since the council had already completed a watershed assessment, and its council members represented a diverse and well-connected cross section of the community, Lambert decided to try to work with the council instead of creating a competing organization.

As one of her first community outreach acts, Lambert volunteered to be a part of the watershed council's administrative committee. Her skill as a strong technical advisor, as well as a good facilitator and negotiator, was quickly noted, and a year and a half ago she became chair of the Tillamook Watershed Council. Before Lambert became chair, the group was so fragmented that it could not agree on implementing any restoration projects. Since her tenure began, the council has restored two miles of riparian habitat on nine different properties. Three fish passage barrier culverts were removed and replaced with bridges. And in the past year, the council raised more than $100,000 for habitat restoration projects. An additional $60,000 has been raised for future work to restore fish passage to a creek that has lacked fish for more than 50 years.

Lambert's master's degree in physical geography has provided her with the strong technical skills she needs for the Watershed Extension Program. Her major duties include providing research-based watershed management education to

landowners, citizens, nonprofits, agencies, and others in Tillamook County and assessing community needs, developing programs, and evaluating results. She is also expected to support the efforts of local watershed councils and collaborate with other community groups and agencies to help deliver programs.

Despite her strong technical expertise, Lambert characterizes her approach to working in the coastal communities of Tillamook, Clatsop, and Lincoln Counties as "process first, technical information second."

"So much of this job is about the human interactions," Lambert noted. "A relationship has to be developed before people can hear about the technical information."

In her four-year tenure in the Tillamook area, Lambert has crossed that initial process threshold and moved onto acting as a technical resource for a number of groups, agencies, and landowners in the area. She works with eight watershed councils, two soil and water conservation districts, the dairy industry, three land trusts, several municipalities, numerous landowners, and state and federal agencies.

One of the local projects that demonstrates Lambert's technical work, as well as her ability to integrate with the needs of the local community, is one called Exploring Local Ecology. She helped develop this project in partnership with the Lower Nehalem Community Trust. Members of the trust's board purchased Alder Creek Farm, a 55-acre former dairy farm, in 2003. This property is one of the few remaining large, open spaces in the area and is connected to the Tillamook estuary. Alder Creek runs through the property. Exploring Local Ecology combines community education with wetland monitoring. The goal of the program is to train volunteers to collect information that the trust can use to design its wetland restoration project and then track the progress of the wetlands once they are restored. Through Exploring Local Ecology, community members are learning to monitor subsurface water levels, wetland vegetation, amphibians, soils, and migratory birds. During the first six months of the program, 50 volunteers contributed more than 500 hours to the project.

Lambert is working with the trust to help restore a tidal marsh and six acres of freshwater wetlands for resident and migrating birds and other conservation values. The group also intends to maintain the grassland/savanna on the property for wildlife habitat and restore the stream habitat of Alder Creek to support native salmon populations. In addition, the group wants Alder Creek Farm to become an education and monitoring center.

Lambert is currently working with the trust on a groundwater monitoring project on the Alder Creek Farm site. She has placed 15 monitoring probes in areas where wetlands may be restored and is monitoring the water table under the grassland to determine how water moves through the subsurface and where wetland restoration would be most effective. The project is also monitoring other conservation values, including birds, amphibians, soils, and vegetation. As of this writing, the data collected from these probes show several areas where the water table is consistently high and wetland restoration would be most effective.

Lambert's involvement in the local communities on the north coast is not limited to her leadership role as the chair of the Tillamook Watershed Council. She has made over 30 presentations about water quality to watershed councils, schools, soil and water conservation districts, and other public groups interested in water quality. She has also made half a dozen statewide presentations and one national presentation on water quality monitoring issues. The fact that her technical expertise is in water-quality monitoring in the Tillamook Basin: an area that has experienced significant water quality degradation: is not lost on other agency personnel and community leaders.

However, it's her involvement with the Tillamook Watershed Council that has generated the most interest and attention from colleagues, agency personnel, and local residents. One testament to her leadership in helping the Tillamook and surrounding communities address watershed restoration issues is her nomination for the Oregon governor's Spirit of the Oregon Plan Award for her work with the Tillamook Watershed Council in 2004. She received the award at the biannual Oregon Watershed Enhancement Board Conference in November 2004. Tom Shafer, OWEB's regional coordinator for the north coast, nominated Beth for the award.

"I'm particularly impressed with her role as the chair of the Tillamook Watershed Council," Shafer said. "She has turned that watershed council around 180 degrees from where it was before she got involved." Shafer attributes Lambert's success to the fact that "she's not threatening and has worked with all the diverse groups and constituents: and done it smoothly."

Shafer also characterized Lambert as "thoughtful, a good listener." He said she "works well with other councils that are satellites to the Tillamook Council. She has led the Tillamook Council [members] to a more functional stage where they are now not only doing projects on the ground, they are developing a strategy for how to approach restoration."

"The amount of time she has spent working to change the direction of that

watershed council is far beyond whatever she is getting paid by Sea Grant," Shafer concluded.

Frank Burris

While Beth Lambert's approach to working with local partners on technical restoration projects is to engage in the process first, Frank Burris' approach has been to develop applied research techniques that help solve watershed and habitat problems on private lands and act as educational tools for other landowner and community interests in the area.

One of Burris' responsibilities as the watershed Extension agent in Curry County is to teach private and public managers ways to improve salmonid habitat, water quality and water conservation, and ecosystem health through watershed management. Burris has also embarked on a number of applied research projects in Curry County. In addition to the floodplain management project on Euchre Creek, he is also working with one of the largest cranberry-growing operations on the West Coast to address water-quality and water-reuse issues, and he's involved with a landowner to reclaim one of the few remaining perched wetlands in Curry County.5 Burris carries out these applied research projects in addition to the educational activities he undertakes at the local high school, with local watershed councils, and with other agencies and groups.

The water-quality project on the cranberry farm is typical of how Burris has used the results of earlier projects to launch subsequent efforts. Sea Wind Farms, near Sixes, Oregon, north of Gold Beach, is a corporate cranberry farm on approximately 2,000 contiguous acres, making it the largest cranberry farm on the West Coast. Knute Andersson, Sea Wind's farm manager, has an inherent interest in the flora and fauna of the area, partly from his training as a biologist with a master's degree in wildlife management and partly as a result of his own curiosity about the area. This interest has led him to sponsor a number of water quality and water-"recapture" experiments with Burris.

Cranberry farms are frequently criticized by environmentalists and other resource advocates for the amount of water they consume as a function of their farming methods (the word bogs refers to the diked fields that are flooded during harvest). They are also of concern to the Department of Environmental Quality and others because of the potential impacts to birds, beneficial insects, and algal growth associated with the use of pesticides and chemicals. Floras Lake, the surface water body that receives water from the creeks that flow across Sea Wind's property, is currently listed with the Department of Environmental Quality's 303(d) list for water-quality impaired streams because of excessive aquatic weeds and algae.6

Andersson approached Burris after the Extension agent gave a presentation on how to use constructed wetlands to improve water quality at a South Coast Watershed Council meeting in 2001. Andersson wanted to respond to criticism about Sea Wind Farms' cranberry operation and the potential impacts to Floras Lake's water quality. Andersson and Burris have developed a constructed wetlands design to address water quality, and eventually, tail-water recapture. The intent of the project is to reduce nutrients flowing off the cranberry operation into Floras Lake and thereby reduce the aquatic weeds and algal growth in the lake.

The constructed wetland is planned on a seven-acre site on the north side of the property (where the creek flows off-site toward Floras Lake). This constructed wetland will treat the farm's tail water using three diked channels with different treatment methods in each channel. One channel will be constructed as an open water/pool riffle site to remove nitrogen. The second channel will be built as a subsurface sand trap to capture phosphates. And the third channel will be constructed with a subsurface of wood chips to remove nitrates, phosphates, and organic compounds.

The design for this constructed wetland was influenced by work that Burris had completed with a local high school biology student for a science fair project. Burris mentored the student because of her interest in water-quality improvement methods. Her research project used wood chips in a confined chamber on Sea Wind Farms to test their ability to filter out different compounds that affect water quality, including phosphates, nitrates, and organic compounds. Burris was sufficiently impressed with the success that wood chips had in removing nitrates and organic compounds during the three-month research project that he included wood chips as a part of his design for the constructed wetlands project on Sea Wind Farms. Sea Wind's manager, Andersson, was also impressed with the results and authorized the seven acre site as a constructed wetlands project.

While the initial phase of this project is to improve the quality of the tail water leaving the farm, the ultimate goal is to create a tail-water recapture system that recycles the water back into reservoirs for reuse on the cranberry bogs. If successful, this will address not only the water-quality challenges the farm is concerned about, but also one of the other major criticisms of cranberry farms: the enormous amount of water required to cultivate and harvest cranberries. This year's exceptional drought conditions may provide a dry period sufficiently long enough to allow the heavy equipment needed to construct the wetlands to enter the sandy marsh area. Plans to construct the site this summer are proceeding.

As of this writing, Burris has applied for funding for this project (including a grant request from OWEB) to address the intensive human and material resources

needed to construct the wetlands during the drought months from late August through mid-September.

As Burris has become more known in the area, other landowners have asked for his assistance in restoring habitat, wetlands, and stream areas on their property. Blending Extension's modus operandi of working alongside willing landowners with a strategic approach to choosing projects that address different challenges in various strata of the watersheds has allowed Burris to avoid undertaking multiple projects that are simply replicates of one another. While the two projects already mentioned are located in the lower portions of their respective watersheds, a third project Burris has designed is located in the headwaters of the Floras Creek basin.

Approximately a decade ago, George Fleming, the property owner, converted a .75 acre perched wetlands area to pastureland for farm animals. That changed the hydrology of the system and resulted in accelerated erosion along the created ditch (as a function of increased water-flow velocities). The ditch quickly cut through the substrate, forming an incised channel six feet deep. The erosion was so pronounced that nearby upland areas were being affected as the stream continued to down cut during winter storms.

Fleming met Burris at a local watershed council meeting and mentioned the erosion problems he was facing on his property. Burris characterized the landowner as experiencing "ditcher's guilt."

"Once George began to understand how ditching the area led to his erosion problems, he wanted to know if there was a way to undo the damage," Burris said. Burris surveyed the area, then worked with the landowner to design and develop a wetlands reclamation project on the property. First, Burris filled in the eroded ditch. Then he worked with a heavy-equipment operator to sculpt a stream meander across the converted wetland. He has had monitors on the property testing the local water table in the wetland area for two years: one year prior to initiating the reclamation project, and a year after treatment.

Fleming, the landowner, said that ditching that area and seeing the resulting "change in the color of the water to an ugly brown" was a watershed event in terms of his thinking about the kind of relationship he wanted to have not only with his property, but with the local area.

"You know how when you learn about a new car, and then you see them everywhere on the road?" Fleming said, "Well, that experience with our property changed the way I looked at the land. All of a sudden, I could see manmade erosion problems everywhere around here."

"That one experience changed us [Fleming and his wife] from being users of the land, to being stewards of the land," Fleming concluded.

As of this writing, Burris' preliminary data analysis shows an increase of approximately 0.6 meters in the height of the water table of the area. That means that the area is beginning to function again as a wetland. This area now has the capacity to retain an additional 1.5 acre-feet of high-quality, cool water in the headwaters of Gallagher Creek. The rising water table also means the area is beginning to return to its historic capacity as a natural reservoir in the upper watershed. This additional water will help support winter steelhead (a federal "species of concern") and coho salmon (currently protected under the federal Endangered Species Act) that are indigenous to the watershed: especially during the low-flow months of August and September.

When asked about his ability to find these diverse projects on the south coast, Burris said, "To me, that's what Extension is all about: having people living in the place so that they can take advantage of opportunities as they come up." Burris understands that as these projects move forward and he continues to build the trust of the landowners and the community, the landowners will act as ambassadors and help leverage existing projects toward future projects and goals.

Discussing the off-stream watering system at Euchre Creek, Burris noted that "We not only moved cattle away from the riparian areas by providing them a better water source away from the creek, but . . . [we] induced them to spend more time in greatly underutilized portions of a paddock that then provided them [with] better nutrition."7

Burris' records show that in the season following installation of the off-stream watering system, the landowner's cattle gained approximately 10 percent more weight in the equivalent time period than had previously been observed on that ranch.

Yet a similar weight gain was not experienced by the cattle of other ranchers in the area: signifying that this was not a seasonal trend.

That gain in weight from the off-channel watering system helped induce the landowner to relinquish other marginal grazing lands in the Euchre Creek estuary, and this led to the purchase of the 57 acres for conservation zoning.

Discussing the potential land acquisition project on Euchre Creek, Burris said, "I have a relationship now with Wilbur [the landowner]. He knows I'll be a good steward of his land because I've been a good steward of his off-channel watering

system. That's the advantage of having a local Sea Grant agent based in the county. You get to build relationships with these folks."

Guillermo Giannico

Much of the success of the Watershed Program is based on the fact that faculty work closely with Oregon's watershed councils and other community groups involved in the Oregon Plan. Although most of the program's faculty have had some involvement with local, community based groups, Guillermo Giannico, an Extension fisheries specialist, comes to his position with years of experience working with watershed councils in British Columbia.

While in graduate school at the University of British Columbia, Giannico worked as a technical advisor for the Salmon River Watershed Management Partnership, a watershed council in British Columbia. After receiving his doctorate, he became the watershed council coordinator for the partnership, which is a community-based group focused on management and restoration of the Salmon River, a tributary of the Fraser River.

When the Oregon State University Watershed Extension position became available, with its emphasis on ecological resource management, watershed council support, research, and publication, Giannico felt that the job described his own professional interests, experience, and career goals.

The responsibilities of the OSU Extension position include providing technical consulting services to local watershed councils. After Giannico was hired, he visited with a number of watershed councils in western Oregon, partly to introduce himself to these groups as a technical resource in the area, but also to learn about some of the projects and challenges these groups were facing in Oregon. One of the watershed council coordinators, Jon Souder, from the Coos Watershed Association (CWA), has a doctorate in wildland resource science and came prepared to advocate for specific projects that the new Extension agent could help support.

Souder's efforts paid off. Giannico is the principal investigator of a research project, in collaboration with the CWA, that is funded through the national Sea Grant Extension Program. The overall objective of this project is to investigate new approaches that community-based groups can use to establish watershed restoration priorities at a 5th-field HUC (hydrologic unit code) scale. This is a timely topic, since requests for funding of restoration projects increase annually, whereas the funds available for the work are, at best, maintained at current levels.

Giannico is also working with the Mary's River Watershed Council on a prioritization process. The prioritization project takes a different model than the typical stakeholder, consensus-based approach, Giannico said. He is working with "like-minded" landowners, meeting in homes in what he calls "coffee klatches," where the landowners host gatherings and bring in neighbors and other landowners who have similar concerns and issues. In these small, informal sessions, the landowners work together to create what Giannico calls a "matrix of issues" to identify their major concerns about managing their lands, not only for commodity production, but for other values they

identify as important. Through these small get-togethers, Giannico builds support and begins to establish ideas for projects and strategies that he and the watershed council can test with larger groups of stakeholders. In this way, he and they discover where challenges and barriers to the landowners' ideas exist. They then return to the landowners and use the smaller, more informal forums to refine these projects. Giannico contends that this approach avoids the large, public meetings at which diverse interests and contentiousness can stifle creativity and opportunity in discussions of natural resource problems.

Giannico's professional involvement with the CWA has also led to research into the role and design of tide gates in coastal estuarine areas: an issue that has been controversial in areas that provide habitat to Pacific salmon.

Jon Souder of the CWA noted that "tide gates were our [CWA's] number one priority: understanding how they work, what their effects truly are in the ecosystem. Working with Guillermo on this has been a good, collaborative relationship."

According to Souder, research into tide gate designs and their impacts on watershed functions has been deficient. "The work that Sea Grant and Guillermo are doing has generated a level of specificity on the types of tide gates and their effects. This has set the stage for developing performance measures for the various types of tide gates."

Souder noted that the CWA is doing "a lot of applied research, assessment, and monitoring." However, his group did not have the resources to provide much assistance in research design or effectiveness monitoring on salmonid use, or the impacts on salmonids, in tide-gated stream systems. Now, with the help of Giannico, the CWA has applied for OWEB funding to investigate what Souder called "the whole stream system in order to make decisions about the role or function of tide gates in the entire system."

The OWEB proposal focuses on two specific areas of study: salmon population dynamics in tide-gated systems (to determine whether tide gates affect those dynamics and if so, how) and fish behavior in tide gated and nongated systems (to better understand whether salmonids in tide-gated streams behave differently than salmonids in nongated streams, and if so, how). Although these sound like basic questions, according to Souder, nobody has attempted to answer them before.

"One of the outcomes from our work on tide gates is we're getting more people asking us for advice on tide gates," Souder said. "The tide gate project has really increased our credibility with our own board. Additionally, what CWA has been asked to do through the applied research on tide gates has also gained us a huge amount of credibility with the ag community in the Coos Watershed."

Instead of tide gate discussions' being heavily value laden and contentious, Souder says, now the CWA can talk directly with landowners with "a more reasoned, science based approach."

"We say to the landowners who want to work with us, ÔLet's try and figure out how to make these gates more functional,'" Souder said. These applied research projects on tide gates have also increased support among landowners. Souder believes that landowners now know that the CWA doesn't have an agenda about what should be done with these often contentious structures.

Recently, Souder and Giannico published two technical documents through Sea Grant, titled The Effects of Tide Gates on Estuarine Habitats and Migratory Fish and Tide Gates in the Pacific Northwest: Operation, Types, and Environmental Effects.

"All of Guillermo's research work on tide gates is a function of his involvement with the Coos Watershed Association," Souder said. The CWA's tide gate research has been controversial with other agencies. Agency staff, according to Souder, are not as open minded about tide gates and their impacts on watershed health and salmon.

Giannico's position is funded at 40 percent Sea Grant Extension, 35 percent Extension Agriculture, and 25 percent research. However, the diversity of his work and the services he provides to various entities mean that at times he can be heavily invested in Sea Grant work, and at other times he is more involved with agriculture or research. Currently, in addition to the work in the Coos Bay area, Giannico has research projects in four other regions of Oregon: (1) a project investigating Lahontan cutthroat trout in the McDermitt Basin (Malheur County,

eastern Oregon); (2) a study on fish habitat in seasonal waterways that drain grass seed fields in the Upper Willamette Basin; (3) a project examining the effects of summer stream temperatures on steelhead productivity in the John Day River (northeastern Oregon); and (4) a smaller project in the Metolius River (central Oregon), looking at the effects of kokanee salmon spawning on bull trout egg survival and fry emergence.

In the Willamette Valley project, Giannico and a team of collaborators have been studying whether seasonally wet drainages in agricultural lands, which are primarily used for grass seed production, are used by fish and wildlife. The results indicate that these small, intermittent waterways provide winter habitat for 10 different species of native fish, 4 species of amphibians, and western pond turtles. These aquatic-dependent species inhabit small channels that, in some cases, are located 12 kilometers (approximately 7.5 miles) from the nearest permanent water body, in what are normally dry, cultivated fields. Giannico is collaborating on this project with Judy Li, an associate professor in the Department of Fisheries and Wildlife at Oregon State University, who was already researching aquatic invertebrates in these intermittent stream channels. She brought in Giannico to study the other aquatic dependent species she suspected could be using the insects as food.

When asked whether these landowners were concerned about having fisheries biologists inventorying the channels running through their grass seed farms for aquatic species, Giannico said, "OSU Extension and USDA researchers had already established a good working relationship with the farming community, and when some of the farmers had been approached about having researchers look at their lands for benthic community and aquatic species, the response was very positive." Giannico noted that these farmers understood that if researchers found fish and other wildlife on their lands, it would be interpreted as a sign that grass seed agriculture was compatible with maintaining what he called "key ecosystem services" (that is, providing high quality water, wildlife habitat, and so on). In addition, Giannico said that if farmers found that their lands were providing fish and wildlife habitat, it would open the possibility of implementing conservation practices that could benefit both the farmers and other watershed stakeholders.

Giannico believes this project may help identify what he calls "key agricultural practices that maximize economic benefits and sustain ecological integrity."

"The information derived from this project will be useful in land use planning processes that aim to optimize agricultural production in a manner that enhances or maintains natural resource quality," Giannico said.

Giannico's contributions to watershed and aquatic ecosystem research in Oregon were evidenced at a recent conference held by the Oregon Chapter of the American Fisheries Society. Giannico gave a presentation about the steelhead trout ecology research he is involved with in the John Day Basin in cooperation with Hiram Li, a professor in the Department of Fisheries and Wildlife at Oregon State University; Oregon's Department of Fish and Wildlife; NOAA Fisheries; the Northwest Fisheries Science Center; and the Bureau of Reclamation, which is funding the project.

One of the issues the project is examining is the efficacy of using remote sensing as an initial monitoring method over large spatial areas. Giannico and his co-researchers are testing the hypothesis "that Oncorhynchus mykiss [steelhead] smolt production is greater in colder rather than in warmer stream reaches."8

Giannico's preliminary conclusion at the AFS conference was that once salmonid habitat data obtained through remote monitoring are corroborated through field work in the John Day Basin, it will be possible to use this methodology to help identify habitat conditions and limiting factors that inhibit recovery of stream systems and native salmonid populations elsewhere.

In another project, Giannico and a graduate student are trying to help the endangered Odell Lake bull trout. Only 14 pairs of these trout bred last year. Giannico's project looks at bull trout in the nearby Metolius River to see if their rates of egg survival and fry emergence are being affected by kokanee salmon that spawn on the same gravel beds a few weeks after the trout.

CONCLUSIONS

The consensus among landowners and other stakeholders interviewed by this writer is that the OSU Watershed Extension Program has been successful. A number of factors appear to contribute to this success. That many Watershed Program faculty live in the communities in which they work has been an important part of the program's effectiveness. As George Fleming, the landowner working with

Extension agent Frank Burris in Curry County noted, "Frank is the biggest resource we have here locally for watershed restoration."

Tom Shafer said, "Every place I've seen these folks work, they're furthering watershed education and the Oregon Plan far more than any of the other agency reps that are involved."

Shafer, who is a former commercial fisher, pointed to another explanation for the success of the Watershed Program: the legacy of other Extension programs. "The Watershed Program is playing off the credibility of past work with the commercial fishing industry: and that past also includes Forestry and Ag Extension in the coastal communities." These Extension programs have provided concrete help in commodities production, distribution, and processing, and Shafer and other observers think that more traditional Extension work has gone a long way to help the Watershed Extension faculty gain the credibility, trust, and support of locals involved in watershed and habitat restoration.

"They're educators, not regulators," Shafer concluded. "That's part of why they're so effective."

Other factors in the program's effectiveness may have to do with the organization's culture and the types of individuals it attracts as faculty. Whether the program has encouraged the faculty to be self-initiators and to be effective in working with diverse groups, or whether the program's design attracts people who have the right combination of technical expertise, self-initiative, and an ability to work with diverse members of the public, or whether it's a combination of all of these forces, is hard to discern. Probably the program attracts innovative, congenial, self-starters who, once they settle in, take advantage of the latitude given them by Extension to solve problems within communities and watersheds at the local level.

And this ability to be seize opportunities permeates the whole program, not just the field faculty level. One of the advantages that Guillermo Giannico sees in the Watershed Extension Program, and the reason he was attracted to it initially, is its encouragement of staff to take initiative and be opportunistic in the kinds of projects they pursue. This allows staff to respond to opportunities as they arise in the community.

"Jay [Rasmussen] provides leadership and provides contacts for his staff," Giannico noted. "He provides these contacts and other resources, which help to create unusual opportunities for collaboration and increase the impact and effectiveness of staff efforts."

As another long-time observer of Sea Grant and the Watershed Program noted, "Sea Grant has been helpful in watersheds and water-related issues in Oregon because it doesn't service a clientele that has a vested interest, or serve them in ways that create direct economic gain."

The Watershed Extension Program is a notable exception to the more typical

Extension commodities outreach perspective, in which the enhancement of commodity production is the primary focus. This Extension program provides information to local communities about a natural resource that is important to the broader community. Furthermore, the program provides expertise and resources to help the communities learn about ways to restore and sustain these natural resources and watershed functions. These resources and functions are critical not only to salmon populations, but to the sustainability of the local communities as well.

"Sea Grant's clientele is concerned about the long term and about issues of sustainability, and [Sea Grant] has filled a valuable niche in terms of support to the larger community," Giannico noted.

The value of the Watershed Extension Program's work can be seen in Oregon State University's recent decision to focus on sustainability as part of its mission, and its announcement of the new Institute for Water and Watersheds, which will have a multidisciplinary approach to research, education, and outreach to the broader community. According to a number of observers, although this new program is a testament to OSU's commitment to watersheds and ecosystems in the region, the Watershed Extension Program was the first OSU program to address watershed and sustainability issues. In addition, the Extension program took the lead a number of years ago in educating Oregon landowners and local communities about watershed resources, providing direct technical assistance to help restore Oregon's watersheds and engaging in applied research projects that have furthered the understanding of local groups and landowners and their ability to succeed in their restoration goals.

Another variable that contributes to the program's effectiveness is the collaborative approach that Extension Agriculture, Forestry Extension, and Sea Grant Extension have taken in supporting it. As noted earlier, agricultural and forested land make up approximately 75 percent of Oregon's landscape. Consequently, the collaborative expertise represented by the Watershed Program has been a successful model in helping support the Oregon Plan as a landscape-based, ecosystems-focused program. This interdisciplinary approach has also helped support watershed councils, private landowners, and others involved in restoration efforts.

However, real challenges face this program, and a number of people contacted for this review voiced concerns about the ability of Extension to continue to support the Watershed Program at a level where its effectiveness in the future will be as impressive as it has been over the past four to five years. Tom Shafer, at OWEB, had only one complaint when discussing the direction in which Sea Grant and the Watershed Extension Program staffing is headed: "There ought to be more of

'em!"

The Watershed Extension Program experienced a serious threat in 2003 because of funding cuts. Extension Agriculture and Forestry Extension withdrew funding for the Watershed Extension Program, and Sea Grant continued funding the program entirely on its own.

"At that time, Forestry Extension was in a significant scale-back mode," said Scott Reed, the Forestry Extension leader. As a result, Forestry Extension decided to protect the agents in its core program, and additional funding was not available to help support the Watershed Extension Program.

This funding setback in 2003 underscores a potential weakness of the program. In some ways, what is a strength of the program: its collaborative approach to resource management between Sea Grant Extension, Extension Agriculture, and Forestry Extension: is also a weakness in terms of having strong sponsorship in the bureaucratic environment of a large, public, land grant university. Without a core programmatic "home," the Watershed Program runs the risk of being the poor dependent of a number of other programs that, when funds are scarce, will tend to support their core programs and staff before attending to the needs of the dependent. This appears to have been the case in 2003, and there's no guarantee that funding in the next biennium will be much different than in 2002 - 2003.

Another indicator that the program is under duress is the cuts in Watershed Extension Program staff. In 2004, the program had a total of 12 dedicated staff. In 2005, the staff has been reduced by almost 20 percent.

Given the contentiousness and complexity of the issues the Watershed Extension Program is addressing, the newness of the ecosystems-and-landscape approach the program has taken, and the lack of a core constituency based on commodity interests, the funding shortfalls and the associated reduction of field faculty loom as real threats to the future viability of the program.

On the other hand, according to Scott Reed, Extension's approach to funding is moving away from the previous "full-time equivalency" basis to more of a block grant model. In this new funding landscape, how well the Watershed Extension Program can compete for funding with other Extension programs may determine whether the Watershed Program maintains its current level of success, regardless of whether county-based staff are asked to cover larger territories or not.

Notes

1. Ninety acres of wetlands have been identified in the Euchre Creek watershed, mostly in the lower portion, near the estuary. Acquiring the targeted parcel for restoration and conservation values will dedicate the entire Euchre Creek estuary as habitat for a number of avian and aquatic species, including winter steelhead and chinook salmon populations.

2. National Research Council, 2000, Return to the River, Northwest Power and Conservation Council, Publication 2000-12; Jim Lichatowich, 1999, Salmon Without Rivers, Island Press, Washington, D.C.

3. William G. Loy, et al., 2001, Atlas of Oregon, Second Edition, University of Oregon Press, Eugene, Oregon, pp. 92 - 94.

4. Department of Environmental Quality, Water Quality Limited Streams Database: Oregon's final 1998 Water Quality Limited Streams: 303(d) List (www.deq.state.or.us/wq/WQLData/ ListView98.asp).

5. Perched wetlands are located high in the watersheds and have acted historically as water purifiers as well as natural water reservoirs that release water during the late summer and early fall drought months. They have mostly been converted to pasturelands and other domestic uses.

6. Department of Environmental Quality, Water Quality Limited Streams Database: Oregon's final 1998 Water Quality Limited Streams - 303(d) List (http://www.deq.state.or.us/wq/WQLData/ ListView98.asp).

7. According to Burris and other authorities, cows prefer to drink from off-channel containers such as troughs rather than from creeks, which easily become muddy from their movements.

8. Oregon Chapter AFS 41st Annual Meeting, "Multidisciplinary and Innovative Approaches to Aquatic Resource Conservation." Abstracts of Papers, February 16 - 18, 2005.

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