V(A). Planned Program (Summary)

Program # 2

1. Name of the Planned Program

Climate Change

V(B). Program Knowledge Area(s)

1. Program Knowledge Areas and Percentage

KA Code	Knowledge Area	%1862 Extension	%1890 Extension	%1862 Research	%1890 Research
101	Appraisal of Soil Resources			5%	
102	Soil, Plant, Water, Nutrient Relationships			5%	
103	Management of Saline and Sodic Soils and Salinity			5%	
112	Watershed Protection and Management			5%	
121	Management of Range Resources			5%	
125	Agroforestry			5%	
135	Aquatic and Terrestrial Wildlife			10%	
136	Conservation of Biological Diversity			10%	
201	Plant Genome, Genetics, and Genetic Mechanisms			5%	
212	Pathogens and Nematodes Affecting Plants			5%	
215	Biological Control of Pests Affecting Plants			5%	
302	Nutrient Utilization in Animals			5%	
303	Genetic Improvement of Animals			5%	
311	Animal Diseases			5%	
604	Marketing and Distribution Practices			5%	
605	Natural Resource and Environmental Economics			5%	
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins			5%	
723	Hazards to Human Health and Safety			5%	
	Total			100%	

V(C). Planned Program (Inputs)

1. Actual amount of FTE/SYs expended this Program

Year: 2011	Extension		Research	
	1862	1890	1862	1890

Plan	0.5	0.0	15.0	0.0
Actual Paid Professional	0.0	0.0	71.8	0.0
Actual Volunteer	0.0	0.0	0.0	0.0

2. Actual dollars expended in this Program (includes Carryover Funds from previous years)

Extension		Research	
Smith-Lever 3b & 3c	**1890 Extension**	**Hatch**	**Evans-Allen**
0	0	704736	0
1862 Matching	**1890 Matching**	**1862 Matching**	**1890 Matching**
0	0	5732480	0
1862 All Other	**1890 All Other**	**1862 All Other**	**1890 All Other**
0	0	7084319	0

V(D). Planned Program (Activity)

1. Brief description of the Activity

The program includes studies that focus on development of models of community-level responses to perturbations, population dynamics and habitat management for individual aquatic and terrestrial species, and development of methods for monitoring ecosystem changes.The research approaches that will be used to meet the specific objectives of these subprograms include a) field studies in the Oregon, the Pacific Northwest, the U.S., and abroad; b) controlled laboratory experiments; and c) database/model development. Theoretical and empirical models will be developed to examine land-use policies and impacts on water quality, wildlife habitat, watershed health, and other ecological indicators, while models will be used to examine how resource and agricultural policy affects major land use and cropping patterns, and how these may affect water quality.

In summary:

- conduct research experiments
- collect data
- conduct assessments
- develop monitoring protocols
- develop products, curriculum resources
- conduct workshops & meetings
- present seminars and professional talks
- provide training
- deliver services
- provide counseling
- partnering
- facilitating

2. Brief description of the target audience

- The general public and those in natural resource-based communities, including ranchers and fishermen
- The research community including scientists working in governmental, industrial, and academic sectors, including biomedical researchers, oceanographers, climatographers, virologists.
- Growers, crop consultants, extension faculty and researchers in the fruit and wheat industry;

and ecologists, economists, and managers concerned with invasive species.Salmonid industry
-
- State and federal natural resources management and regulatory agencies, including land managers
- policy makers.

3. How was eXtension used?

eXtension was not used in this program

V(E). Planned Program (Outputs)

1. Standard output measures

2011	Direct Contacts Adults	Indirect Contacts Adults	Direct Contacts Youth	Indirect Contacts Youth
Actual	1300	2500	0	0

2. Number of Patent Applications Submitted (Standard Research Output)
Patent Applications Submitted

Year: 2011
Actual: 1

Patents listed

3. Publications (Standard General Output Measure)

Number of Peer Reviewed Publications

2011	Extension	Research	Total
Actual	10	139	0

V(F). State Defined Outputs

Output Target

Output #1

Output Measure

- EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY - Indicator 1a (natural history) - evaluate fish life history variations and migration behaviors, compare information gained through life history information synthesis, molecular genetic laboratory analyses, otolith elemental and isotopic analyses (Miller) - characterize seasonal distributions of endangered great whales and characterize their year-round critical habitats (Mate)

Year	Actual
2011	2

Output #2

Output Measure

- PROVIDE ADDITIONAL UNDERSTANDING FOR PLANT AND ANIMAL PROTECTION FROM DISEASES AND PESTS - Indicator 1a (biology and control of diseases-plants): - control of fire blight of pear and apple with the use of avirulent pathogens, including whether they induce defense responses in the host - risk of movement of the fire blight pathogen with mature symptomless pear fruit. - rust spores timing released in spring and the minimum environmental requirements for infection of leaves. - potential impact of the introduced pathogen, blackberry rust, in the Pacific Northwest region and evaluate chemical control programs for susceptible cultivars. - host abundance, heterogeneity, and spatial structure influence on the spatiotemporal spread of disease. - factors that speed the onset of velocity increase over time. - disease spread and effects of landscape variables are similar at different spatial scales. - genetic mechanisms of plant pathogens

Year	Actual
2011	1

Output #3

Output Measure

- STUDIES TO DECIPHER GENOMES, GENETICS AND MECHANISMS OF PLANTS AND ANIMALS - Indicator 1 (life history strategies) - use emerging statistical and molecular genetic techniques to determine distinctions among alternate life history strategies and separate breeding units among fishery components, particularly in salmon, groundfish, and oysters. (Banks)

Year	Actual
2011	1

Output #4

Output Measure

- DEVELOP IMPROVED ANIMAL AND PLANT PRODUCTION SYSTEMS - develop microparticulate diets for marine fish larvae(Langdon)for aquaculture and restoration projects

Year	Actual
2011	1

Output #5

Output Measure

- PROVIDE TECHNICAL, ECONOMIC AND MARKETING MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS...Indicator 1 - develop models for water resources. - assess changes in policies that influence supply and cost of water in agricultural and non-agricultural uses - assess market mechanisms governing water and private land-use decisions - riparian zones that incorporate different ecological processes than upland

models (state-and-transition models)

Year	Actual
2011	1

Output #6

Output Measure

- DEVELOP EDUCATIONAL STRATEGIES AND DISTANCE EDUCATION OUTLETS TO FURTHER REACH CLIENTELE. - Approximately 8,000 adults and 2,500 youth per year will have increased awareness and knowledge of ecosystem processes and functions and methods for restoring degraded habitats.

Year	Actual
2011	2

Output #7

Output Measure

- OTHER SCHOLARLY EXCELLENCE: participation on professional society panels and boards, as well as science panels, and receipt of awards or recognition

Year	Actual
2011	22

Output #8

Output Measure

- EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY - Indicator 1b (invertebrates) - floral components and landscape features that contribute to insect biodiversity - conservation efforts evaluated through long-term trends in population dynamics of insects - species previously unknown are described

Year	Actual
2011	1

Output #9

Output Measure

- EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY - Indicator 1c (riparian) - functional groups and a functional group key for meadow riparian systems - riparian relationships and issues associated with livestock grazing

Year	Actual
2011	1

Output #10

Output Measure

- EFFECTS ON AND PROTECTION OF ENVIRONMENTAL HEALTH AND ECOLOGY - Indicator 1d (soils) - fluxes of energy and mass in soils - influence of abiotic and biotic factors on size and composition of microbial communities in soil and how microorganisms affect key soil and plant processes - soil-landscape evolution in Oregon and partition soil respiration measurements on the landscape scale

Year	Actual
2011	1

Output #11

Output Measure

- PROVIDE ADDITIONAL UNDERSTANDING FOR PLANT AND ANIMAL PROTECTION FROM DISEASES AND PESTS - Indicator 1b (control of diseases-animals): - characteristics of and changes due to zebrafish and salmonid diseases

Year	Actual
2011	2

Output #12

Output Measure

- PROVIDE ADDITIONAL UNDERSTANDING FOR PLANT AND ANIMAL PROTECTION FROM DISEASES AND PESTS - Indicator 2 (control of invasive pests): - Biological controls

Year	Actual
2011	1

Output #13

Output Measure

- PROVIDE ADDITIONAL UNDERSTANDING FOR PLANT AND ANIMAL PROTECTION FROM DISEASES AND PESTS - Indicator 3 (modeling and variables): - host variables (abundance, heterogeneity, or spatial structure) to be included in models to make predictions about disease risks, and to determine the relative importance of each to disease spread.

Year	Actual
2011	1

Output #14

Output Measure

- STUDIES TO DECIPHER GENOMES, GENETICS AND MECHANISMS OF PLANTS AND ANIMALS - Indicator 2 (breeding) - develop selective breeding program, repository, and resource center for various desirable traits of Pacific oysters (Langdon)

Year	Actual
2011	10

Output #15

Output Measure

- STUDIES TO DECIPHER GENOMES, GENETICS AND MECHANISMS OF PLANTS AND ANIMALS - Indicator 3 (human system) - identify aspects of biology and biotechnology of viruses and bacteria that affect human health - identify characteristics of food and water systems

Year	Actual
2011	2

Output #16

Output Measure

- PROVIDE TECHNICAL, ECONOMIC AND MARKETING MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS...Indicator 2 - develop models habitat. - characterize sagegrouse habitat, e.g., a new and simplier global positioning system as well as techniques integrating infrared wavelengths of light for more accurate classification algorithms, and on the landscape modeling side, a kinetic resource and environmental spatial systems modeler (KRESS modeler 3.0) developed in 2006 will allow predictions of the suitability of locations on landscapes for either plants or animals.

Year	Actual
2011	2

Output #17

Output Measure

- PROVIDE TECHNICAL, ECONOMIC AND MARKETING MODELS AND ANALYSES THAT INFORM DECISION-MAKERS, INDUSTRY, AND PEERS...Indicator 3 - develop models for stock assessment and management. - stock assessments to evaluate stock status, harvest management policies, and areas of misunderstanding or disagreement between fishery scientists and fishing industry (Sampson) - drivers of fishing change plus incentive-based and other management tools, their applicability to Oregon fishery problems and fishing community sustainability (Hanna) - fisheries management and marketing in Oregon and the Pacific Northwest (Sylvia)

Year	Actual
2011	3

V(G). State Defined Outcomes

V. State Defined Outcomes Table of Content

O. No.	OUTCOME NAME
1	Knowledge Indicator 1a - New tools, models for irrigation and water management - new set of tools to help farm operators make better irrigation scheduling decisions, e.g., deficit irrigation, models and web-based tools to schedule irrigation applications to reduce water use and maximize farm profit
2	Knowledge Indicator 2 - Understand impacts - of land use change on water quality and ecosystems by examining land-use policies at the national scale, using land cover and land use maps, and spatially-explicit policy simulations. - of land use change on populations of different wildlife species.
3	Knowledge Indicator 3 - Economic feasibility, best practices - chemical control programs for susceptible cultivars - biological control to combat invasive plant species - stock assessments can be used to evaluate stock status, harvest management policies, and areas of misunderstanding or disagreement between fishery scientists and fishing industry - incentive-based fishery management tools, spatial ocean management approaches, community-based management, and ecosystem-based management. - new approaches for managing the fishery to increase economic benefits. - market-based tools for managing the environmental impacts of fishing
4	Knowledge Indicator 4a - Environmental and ecological management (life history, migration) - critical life history and migratory issues, e.g., whether there is genetic variation associated with the variations in juvenile migratory behavior of Chinook and coho salmon within coastal watersheds, if stream-estuary ecotone is important to the survival of coastal coho in Oregon, and larval dispersal and juvenile and adult movement patterns in Pacific rockfish and Pacific herring - location and migration patterns of whales
5	Knowledge Indicator 5a - Basic information on ecosystem (habitats) - Understand threshold concepts within riparian systems as they relate to channel morphology, water table and plant community dynamics - Greater awareness of watersheds/invasive species/animal behaviors/watershed conditions.
6	Knowledge Indicator 6 - Genetic information - susceptibility of blackberry germplasm - genotypes of P. violaceum present in the Pacific Northwest as compared to the genotypes in other regions - structure, function and regulation of the VV G1L proteinase and the role that it plays during the assembly and maturation of infectious progeny virions - role a number of critical proteins play in baculovirus genome replication and processing. - molecular mechanisms of quorum sensing function and consequences of these distinct properties, which will have important implications for the development of antivirulence strategies as well as for the particular role of each signaling system in P. aeruginosa group behavior and pathogenesis. - molecular biology of RNA viruses affecting corps, animals and humans, e.g., early stages of viral infection, Trojan horse model, translational enhancer sequences, dicistronic expression. - how the GALLS protein participates in gene transfer to plants and its role in plant transformation - new microorganisms and the mechanisms by which microorganisms acquire and utilize foreign DNA
7	Action Indicator 1a - Better decision-making, behaviors, and policies (water and land use). - Researchers investigate, compare, and integrate the environmental and economic impacts of various land-use policies - Research on soil-landscape evolution will allow for use of remote-sensing and modeling techniques to predict the affects of human, biotic and abiotic forces on soil formation and to use this information in soil mapping, land use planning and other activities. - Farmers learn how to use water more efficiently

8	Action Indicator 2a - Improved technologies and practices (for control of pests and pathogens) - U.S pear and apple industry suppress disease through economical chemical control programs for susceptible cultivars - Novel control approaches to other diseases of plants. - Epidemic modeling at large scales - application of baculovirus technology to a variety of investigations dependent upon the use of this remarkable group of viruses. - assay development and biochemical details of proteolysis
9	Action Indicator 3 - Improved safety - new assays and technology help combat viruses - potential antiviral drugs from rational drug design and high throughput screening efforts designed to develop G1L inhibitors - information about molecular biology of RNA viruses used in designing new approaches for combating pathogenesis by these viruses.
10	Economic Changes in food systems - Risk management of fire blight pathogen could lead to larger export markets for U.S. grown pears. - Enhanced fish, shellfish, and whale populations will be of economic value in coastal tourism - Ocean resource management approaches that integrate ecological and economic components and promote sustained economic productivity for the Oregon seafood industry. - Traceability will increase marketing success and generate higher ex-vessel prices and profits for fishermen, processors, and retailers; Traceability will also be used to collect science information to improve science and management. - The adoption of rights based approaches for managing the environmental effects of fishing will improve economic performance of the industry while also protecting marine species, habitats, and ecosystems. - Improvements in marine fish nutrition will result in expansion of marine aquaculture to meet the increased global demand for fish. - The Pacific oyster breeding program will provide significant benefits to this $3.7 billion dollar industry as well as provide global benefits through its approach to oyster breeding.
11	Environmental Changes 1 - food systems - Provide more sustainable approaches for managing plant disease - Restored health and stability to marine food webs - Adoption of rights based approaches for managing the environmental effects of fishing will improve economic performance of the industry while also protecting marine species, habitats, and ecosystems - The pacific oyster breeding program will provide significant benefits to this $3.7 billion dollar industry as well as provide global benefits through its approach to oyster breeding - Reduce impact of disease on wild and cultured salmonids
12	Societal Changes - more enlightened populace with regard to the value of habitats and conservation.
13	Knowledge Indicator 1b - New tools, models for crop production - Simplified, realistic crop growth models easily applied to variety of soils, climates and irrigation technologies which also help make decisions regarding economic tradeoffs between various decisions or competing goals - weather-based models that indicate when spores are first released in spring and the minimum environmental requirements for infection of leaves. - know which host variables (abundance, heterogeneity, or spatial structure) need to be included in models to make predictions about disease risks, and to determine the relative importance of each to disease spread.
14	Knowledge Indicator 1c - New tools, models for land-use decisions - regional econometric models that reveal the importance of localized factors such as climate and access to commodity markets on private land-use decisions, and incorporate these results into the national model to increase the accuracy of land-use change predictions. - GIS-based, spatially explicit model to predict development patterns and land prices that would have existed when one or more land use regulation had been removed in the southern part of the Willamette Valley. - spatially explicit model to examine the causes of sprawl and its socioeconomic consequences.
15	Knowledge Indicator 1d - New tools, models for seafood - traceability and case studies for seafood

16	Knowledge Indicator 4b - Environmental and ecological management (habitat) - awareness of potential problems associated with riparian grazing. - Improved monitoring and management of rangelands and forest lands, including modeling for preservation and expansion of native ungulates in North America and Asia.
17	Knowledge Indicator 4c - Environmental and ecological management (monitoring of pathogens) - chromatophore cells for their use as a living sensor for rapid detection of food- and water- associated pathogenic bacteria and their toxins. - host and geographic range, pathogenesis, taxonomy, modes of transmission, and treatment of infectious and toxicological diseases of importance to wild and cultured fishes, particularly those afflicting fishes in the Pacific Northwest region and how to minimize the impact of these diseases.
18	Knowledge Indicator 5b - Basic information on ecosystem (species assemblages) - ecology of a variety of insect species and the dynamics of multi-hundred species assemblages in forested habitats - SAR11 for investigations aimed at understanding how plankton cells use light dependent proton pumps, and impact the efficiency of carbon cycling in the ocean surface.
19	Knowledge Indicator 5c - Basic information on ecosystem (soils) - fluid movement though soils, - biogeochemical recycling in soils, - carbon and nitrogen cycling in soils, - microbial diversity in soils, - soil-landscape evolution.
20	Action Indicator 1b - Better decision-making, behaviors, and policies (soil management). - Research on carbon and nitrogen cycling will lead to better regional and national nutrient sequestration plans as partial solutions for nutrient contamination and global warming concerns. - Research on microbial diversity will lead to better understandings of changes that occur in soils under different management regimes, of inherent differences in soil microbe diversity, and of the ability of soils to recover from events that affect microbial populations.
21	Action Indicator 1c - Better decision-making, behaviors, and policies (natural resources and ecosystems). - better conservation practices reduce mortalities and promote population recovery of whales - individuals will modify behaviors and practices so that ecosystem functions and processes can be restored. - Policy makers will develop incentives, rules and regulations that prevent further resource damage or encourage ecosystem restoration - the knowledge about atmospheric carbon and carbon sequestered in oceanic waters will enable more accurate models for the global carbon cycle - ecosystem restoration policy decisions based upon the theoretical understanding of processes affecting aquatic and terrestrial organisms and ecosystem function.
22	Action Indicator 1d - Better decision-making, behaviors, and policies (fisheries & seafood). - establish management and conservation/restoration efforts for salmonids, Pacific rockfish, Pacific herring, and shellfish - Better fishery management and ocean policies that are compatible with issues of economics, incentives, communities and ecosystems. - approaches for managing the pink shrimp fishery and the environmental effects of fishing
23	Action Indicator 2b - Improved technologies and practices (seafood and fisheries) - traceability systems for marketing and science research (electronic logbooks). - principles of seafood marketing and trade - fisheries management strategies to encompass detailed knowledge of the dispersal/disease process - Performance of complex microparticle types that provide nutrients to marine larval fish
24	Action Indicator 2c - Improved technologies and practices (ecosystem services) - Research on fluid flows in soils will allow for better waste material containment facility design. - new ecosystem service industries in Oregon that deliver products or manage plant based systems designed for specific environmental problems. - Improved indicators of environmental health as described in the Oregon State of the Environment report.
25	Environmental Changes 2 - ecosystems - Global warming will be addressed in part by carbon sequestration strategies - Soil microbial health will be maintained or improved - Changes in policies will result in sustainable natural resource use or ecosystems restoration

Outcome #1

1. Outcome Measures

Knowledge Indicator 1a - New tools, models for irrigation and water management - new set of tools to help farm operators make better irrigation scheduling decisions, e.g., deficit irrigation, models and web-based tools to schedule irrigation applications to reduce water use and maximize farm profit

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	0

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Water resources are becoming more limiting as multiple demands increasing compete for finite and decreasing fresh water resources. Microirrigation has the potential to help growers conserve water.

What has been done
Drip, sprinkler, and furrow irrigation systems are being compared and various irrigation criteria are being tested for their effects on onion yield and grade. Results are being communicated to growers by means of field days, workshops, grower meetings, written and "on line" reports, and published and "on line" extension brochures.

Results
Irrigation scheduling by soil water tension allows growers to use water more precisely. Calibration of soil moisture instruments promotes improved irrigation scheduling with greater precision and confidence. Better use of irrigation systems and irrigation criteria for onions are increasing onion yields and reducing environmental consequences of onion irrigation. Environmental consequences of onion production are less because water and nutrient applications are very close to the actual needs of onion.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources

102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants
311	Animal Diseases
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #2

1. Outcome Measures

Knowledge Indicator 2 - Understand impacts - of land use change on water quality and ecosystems by examining land-use policies at the national scale, using land cover and land use maps, and spatially-explicit policy simulations. - of land use change on populations of different wildlife species.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Urbanization presents both opportunities and challenges for farmers and farm supporting sectors on the urban fringe. The emergence of a new customer base has provided farmers new opportunities for higher value crops. Urbanization also presents challenges to farmers. Negative externalities associated with urbanization increase the cost of farming and threaten the viability of the agricultural economy. Conflicts with non-farm neighbors and vandalism, such as destruction of crops and damage to farm equipment, are major concerns of farmers at the urban fringe. Conversely, being part of a large farming community (a cluster) can offer many benefits. It allows a farm to operate more productively in sourcing inputs, and in accessing information, technology, and needed institutions. With urbanization farmers may no longer be able to take advantage of economies of scale in production that come from information sharing and formal and informal

business relationships between neighboring farms. An important question is how urbanization affects the viability of agricultural economies.

What has been done
This study evaluates the effect of urbanization on the viability of farm supporting sectors (i.e., input suppliers, output processors) and on the cost and profitability of agriculture. To achieve this objective, we first develop a theoretical model to analyze the interrelationship between agriculture and its supporting sectors and then examine how the relationship is affected by urbanization. We then conduct an empirical analysis to evaluate the effect of urbanization on local agricultural economies using county-level data from four western states of the United States (Oregon, Washington, Idaho, and California), focusing on the influence on 1) the number of input suppliers, 2) the number of output processors, 3) farmers? production costs, and 4) net farm income.

Results
This study attempts to fill the gaps in the literature by examining the effects of urbanization on the viability of input suppliers and output processors and on the cost and profitability of farming. Urbanization is found to be associated with higher farm production cost, which is consistent with the negative externalities that are posited to accompany urbanization. But, the higher costs of production in urban versus rural localities are outweighed by higher prices for agricultural output and increased off-farm job opportunities. As a result, net farm income is found to increase with urbanization. Our results have an important implication. Urbanization is not necessarily a bad thing for struggling rural communities, particularly when the objective is to increase net farm income. Urbanization may increase farmers? production costs, but it also creates new opportunities for farmers (growing high-value crops, off-farm employment opportunities, etc.). Our results suggest that the benefits of urbanization outweigh the costs, and net farm income increases with urbanization. However, in rural communities that have already experienced a high degree of urbanization, continuing urban sprawl may indeed threaten agriculture as a viable way of living.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
121	Management of Range Resources
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
605	Natural Resource and Environmental Economics

Outcome #3

1. Outcome Measures

Knowledge Indicator 3 - Economic feasibility, best practices - chemical control programs for susceptible cultivars - biological control to combat invasive plant species - stock assessments can be used to evaluate stock status, harvest management policies, and areas of misunderstanding or disagreement between fishery scientists and fishing industry - incentive-based fishery management tools, spatial ocean management approaches, community-based management, and ecosystem-based management. - new approaches for managing the fishery to increase economic benefits. - market-based tools for managing the environmental impacts of fishing

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A number of the same traits that make nursery crops successful also allow some of these species to become naturalized or even invasive. Some states have begun banning some species in an attempt to limit the negative ecological impact that they pose. Common cherry laurel (P. laurocerasus) and Portugese cherry laurel (P. lusitanica) are rugged plants that fill a number of roles in modern landscapes. Unfortunately, they have both become naturalized in Western Oregon and Washington to the point that they are receiving attention as potentially invasive. Breeding for sterility offers an opportunity to benefit growers by allowing them to continue growing and marketing profitable plants, while also benefiting the environment by reducing the potential of these species to displace native flora.

What has been done
The PI has successfully developed polyploids of common cherry laurel but they have all reverted. Treatments were repeated in larger numbers in 2011. When polyploids are identified they will be grown to reproductive maturity and used in strategic backcrossing to develop sterile forms. Large population of the odd-ploidy progeny will be grown with collaborating growers in order to provide the best opportunity of recovering improved landscape forms. Seed was recovered from interspecific crosses and will be sown following stratification. Findings of some studies were shared with growers in 2010.

Results
Findings are still preliminary.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants
604	Marketing and Distribution Practices

605 Natural Resource and Environmental Economics

Outcome #4

1. Outcome Measures

Knowledge Indicator 4a - Environmental and ecological management (life history, migration) - critical life history and migratory issues, e.g., whether there is genetic variation associated with the variations in juvenile migratory behavior of Chinook and coho salmon within coastal watersheds, if stream-estuary ecotone is important to the survival of coastal coho in Oregon, and larval dispersal and juvenile and adult movement patterns in Pacific rockfish and Pacific herring - location and migration patterns of whales

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Conservation planning often occurs only after a species has been extirpated from portions of its historical range and limited information is available on life history variation prior to extensive development. Inadequate information on a species' migration patterns before and after extensive physical modification of their habitat limits our ability to conserve and manage those species. To address this gap, we provided novel information on the migration behavior of Chinook salmon (Oncorhynchus tshawytscha) before and after extirpation of a local population in the upper Columbia River. We provided detailed information on life history variation in this commercially, recreationally, and culturally important species before and after the development of an extensive hydropower system that can aid future management and conservation efforts.

What has been done
We examined ancient otoliths (ear bones) of Chinook salmon to determine the home stream, or natal river, of those individuals and reconstruct aspects of their migration patterns in the upper Columbia River prior to the construction of a large mainstem dam, the Chief Joseph Dam. We also obtained otoliths from modern populations of Chinook salmon immediately downstream of the extirpated population to determine if we can reconstruct aspects of this species' life history before and after extensive hydropower modification of the species' habitat. The direct comparison of individuals from the same geographic region before and after non-indigenous human settlement and hydropower modification provided empirical evidence on life histories prior to widespread human impacts. We based our approach on otolith chemical (87Sr:86Sr, Sr:Ca) and

structural analyses because otoliths provide a chemical record adequate to differentiate between fresh and marine waters and among freshwater systems and growth structures amenable to robust estimation of individual body size. Our primary study objectives were to (i) estimate the number of and similarity among natal environments and (ii) reconstruct aspects of the life history, including determination of size at freshwater emigration, life history type, and adult body size upon return to fresh water. Additionally, we assessed the archaeological otoliths for evidence of diagenesis, which refers to any chemical or physical change after initial deposition. There can be partial to complete exchange of the original elemental constituents with locally derived sources; extensive diagenesis could remove the original Sr record and lead to an un-interpretable pattern of strontium within the otolith.

We also provided two very well-received presentations (an oral and a poster presentation) to members of the Confederated Tribes of the Colville regarding the use of their tribal artifacts, ancient fish ear bones in this case, to provide historical information on local salmon populations. A peer-reviewed manuscript was published in the Canadian Journal of Fisheries and Aquatic Sciences in 2011.

Results

We generated increased knowledge of juvenile Chinook salmon migration behavior prior to construction of extensive hydropower system on the Columbia River. Specifically, we determined that the ancient individuals displayed life history traits, including size at ocean entrance and adult size at return to fresh water, most similar to the modern population of summer-fall run Chinook salmon. All of the ancient individuals displayed a juvenile migration pattern that is currently evident in only a small proportion of the modern population, which suggests that a reduction of life history diversity is occurring. Overall, our study indicated that there is the potential to maintain aspects of predevelopment Chinook salmon life histories in the Columbia River, and strategies that promote maintenance of that life history diversity may be warranted. Furthermore, we demonstrated the potential of using archaeological collections to provide information relevant to current conservation and management of an important fish species. Such information is integral to ensuring the long-term availability of fisheries resources as well as understanding potential impacts of climate change.

Associated with this project, we trained two academic researchers from Portland State University in the preparation and structural and chemical analysis of biological specimens, including fish otoliths and bone. Both of these researchers are continuing important work on modern and ancient salmon populations in the Pacific Northwest that are relevant to conservation and restoration activities.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
311	Animal Diseases
605	Natural Resource and Environmental Economics

Outcome #5

1. Outcome Measures

Knowledge Indicator 5a - Basic information on ecosystem (habitats) - Understand threshold concepts within riparian systems as they relate to channel morphology, water table and plant community dynamics - Greater awareness of watersheds/invasive species/animal behaviors/watershed conditions.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Medusahead is predominant on millions of acres of semi-arid rangeland in the Pacific Northwest. It is extremely competitive, crowding out all other vegetation on infested rangeland, including such undesirable species as cheatgrass or downy brome. Another species, Ventedata, has spread over large areas of rangeland as well. It is particularly difficult to control, appears to thrive in wetter area and is present on the Warm Spring Indian Reservation. Medusahead, ventenata and cheatgrass often out-compete bunch grasses that stabilize the soil and provide feed for cattle and other herbivores. These annual weedy grasses dramatically increase the fuel load creating hotter, more destructive range and forest fires. They also allow soil structure to deteriorate, setting the stage for increased soil erosion.

What has been done
Plots were established during 2008 on the Warm Springs Indian Reservation and near Ashwood, Oregon. Each location included two sites, one where bunchgrasses were still present despite high populations of ventenata (Warm Springs) and medusahead (near Ashwood). A second nearby site was located where few to no bunchgrasses remain due to domination by ventenata and medusahead. These plots are similar to those established in 2007 at South Junction.

Results
At the Warm Springs location residual efficacy for the four herbicides on ventenata the second season following application ranged from 95 percent for Landmark and 90 percent for Matrix, to 60 percent for Journey and Plateau. Stand establishment following the 2009 fall planting of the Landmark and Matrix plots was highest for Sandberg's bluegrass followed by Sherman big bluegrass, smooth brome and intermediate wheatgrass. Very few bluebunch wheatgrass or squirreltail plants were observed.

Bunchgrass stands appeared to be significantly reduced in the Journey and Plateau treated plots from 2009 to 2010. Cattle remained in the plot area from the fall of 2009 until mid summer of 2010. The plot area saw a high level of activity that degraded the site and appeared to significantly reduce the number of established plants from the fall 2008 planting. Bunchgrasses planted in the Landmark and Matrix plots in the fall of 2009 appeared to be largely unaffected by the cattle. This may have been due to their small size during the time the cattle were present, making them inaccessible as feed.

It appears from informal observations at the Warm Springs site that the population of ventenata has spread significantly since plots were established in the fall of 2008. Ventenata was largely in the wetter areas along a draw that drains seasonal water. It is along the edge of this drainage area that the herbicide plus planting plots were placed. Ventenata appears to have spread up into the scabland areas that surround the draw where medusahead has been dominant. It is unclear whether this was an opportunistic expansion due to two wet springs, or a more methodical progression as ventenata expands into areas previously dominated by medusahead or cheatgrass.

4. Associated Knowledge Areas

KA Code	Knowledge Area
102	Soil, Plant, Water, Nutrient Relationships
112	Watershed Protection and Management
121	Management of Range Resources
125	Agroforestry
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #6

1. Outcome Measures

Knowledge Indicator 6 - Genetic information - susceptibility of blackberry germplasm - genotypes of P. violaceum present in the Pacific Northwest as compared to the genotypes in other regions - structure, function and regulation of the VV G1L proteinase and the role that it plays during the assembly and maturation of infectious progeny virions - role a number of critical proteins play in baculovirus genome replication and processing. - molecular mechanisms of quorum sensing function and consequences of these distinct properties, which will have important implications for the development of antivirulence strategies as well as for the particular role of each signaling system in P. aeruginosa group behavior and pathogenesis. - molecular biology of RNA viruses affecting corps, animals and humans, e.g., early stages of viral infection, Trojan horse model, translational enhancer sequences, dicistronic expression. - how the GALLS protein participates in gene transfer to plants and its role in plant transformation - new microorganisms and the mechanisms by which microorganisms acquire and utilize foreign DNA

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Barley is facing a crisis. Acreage has declined to historically low levels and the US is in danger of conceding domestic and world markets for barley, and its value-added products, to competitors from Australia, Canada, and Europe. This will have a substantial negative impact on the US economy and federal, state, and local tax revenue. Acreage decline is due to several factors. In some traditional barley production areas, corn and soybean have become dominant crops due to favorable farm policy, biotechnology, and high levels of investment by the private sector. This has pushed barley acreage into more marginal areas, where drought and heat stress are major production restraints. Throughout the US, climate change is resulting in increased abiotic e.g., drought, cold) and biotic (e.g., disease, insect) stresses on all crops. Barley is among the most stress tolerant crops, and judicious investment in biotechnology will allow scientists to enhance this innate tolerance in order to maximize productivity, quality, and economic returns.

What has been done
The barley research community used the knowledge gained, and tools developed by, the Regional Barley Gene Mapping Project. The Regional Barley Gene Mapping Project, which supported a directed competitive grant program, funded individual projects throughout the US that provided for significant advances in genomic science, but did not provide a coordinated approach to meet this crisis. Advances in genomic research provided by a previous special grant, and other efforts, provide a unique opportunity to address this crisis through a new research grant. Researchers in Minnesota, North Dakota, Oregon, Washington, and Wisconsin developed a coordinated research plan to apply genomics tools to four research areas that have the greatest potential for success to increase barley production - winter hardiness; drought tolerance; disease resistance; and quality. This research was accomplished by a tight and coordinated network of Land Grant University and ARS scientists with linkages to the private sector.

Results
A vigorous public sector research community, in cooperation with the private sector, has developed a robust set of genomics and molecular breeding tools. These discoveries in basic biology can be extended to practical applications and to other crops. The Regional Barley Gene Mapping Project provided funding to every barley researcher in the United States. These funds, in turn, leveraged nearly every competitive grant awarded for barley research. Most recently, these leveraged grants include the prestigious Barley CAP and Triticeae CAP.

4. Associated Knowledge Areas

KA Code	Knowledge Area
136	Conservation of Biological Diversity
201	Plant Genome, Genetics, and Genetic Mechanisms
311	Animal Diseases
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #7

1. Outcome Measures

Action Indicator 1a - Better decision-making, behaviors, and policies (water and land use). - Researchers investigate, compare, and integrate the environmental and economic impacts of various land-use policies - Research on soil-landscape evolution will allow for use of remote-sensing and modeling techniques to predict the affects of human, biotic and abiotic forces on soil formation and to use this information in soil mapping, land use planning and other activities. - Farmers learn how to use water more efficiently

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Camelina is a short-season annual oil-seed crop in the Brassicaceae family. Camelina may have potential as a rotation crop for crops in the grass family including the cool-season grass seed crops and the small grain cereals. In the Willamette Valley, camelina has an advantage over other potential bioenergy crops in that it does not cross with Brassica spp. vegetable seed crops that are widely grown.

What has been done
Field trials were conducted on stand establishment (date and method of planting), cultivar performance, and nitrogen rate for camelina in the Willamette Valley as part of a regional research effort. Seed yield and oil content of the crops from the management treatments were measured.

Results

Camelina is an unusual crop in that seed yields were symmetrically distributed by planting date with the greatest yields centered about January 1, and lowest seed yields were attained when the planting was done earliest in autumn or latest in the spring. By plotting seed yield data against planting dates, and fitting the combined data to a 2nd order regression function, a symmetrical distribution of camelina seed yields across planting dates was identified. There were no differences in seed yield among planting by drill or broadcast planting methods, nor was there an interaction of planting date and planting method. This means that growers can further reduce the cost of production by broadcasting the seed rather than drilling the crop with a planter, and makes planting in wet weather a better prospect. Several cultivars appeared to be adapted to Willamette Valley conditions and would likely produce economic yields when planted within the suggested planting window and fertilized with at least 60 lbs N/acre.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
112	Watershed Protection and Management
121	Management of Range Resources
125	Agroforestry
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
605	Natural Resource and Environmental Economics

Outcome #8

1. Outcome Measures

Action Indicator 2a - Improved technologies and practices (for control of pests and pathogens) - U.S pear and apple industry suppress disease through economical chemical control programs for susceptible cultivars - Novel control approaches to other diseases of plants. - Epidemic modeling at large scales - application of baculovirus technology to a variety of investigations dependent upon the use of this remarkable group of viruses. - assay development and biochemical details of proteolysis

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual

2011 1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There has been considerable recent progress regarding genetic recombination by chlamydiae. Our laboratory has participated in this process, and we continue to explore the actual mechanisms of lateral gene transfer in this system.
We are also working to elucidate novel antimicrobial compounds, through interactions with a local biotechnology company.

What has been done
We have spent considerable effort and time exploring how chlamydiae might recombine, and the genomic results of such exchanges. We created a large family of recombinants between different Chlamydia strains, and genome sequenced twelve of these strains. We are currently using these strains to explore phenotypic differences among clinically distinct human pathogenic chlamydiae. We have identified genetic regions of the chlamydial chromosome that correspond to phenotypic differences among these strains. These projects are ongoing, with a variety of possible phenotypes that we can continue to examine.
We have also recently used a high throughput screening procedure to identify and characterize novel antimicrobial agents against Chlamydia and other bacteria. This is exciting work that has been fruitful, as a set of six unique families of antimicrobials have been identified. These projects are being conducted with Siga Research Laboratories and the compounds are currently the property of that company. But, this work has led to the demonstration of a novel mechanism of laboratory-generated antimicrobial resistance in the chlamydial system, via mutation sin a protein important in the bacterial general secretory pathway.

Results
Our recent work has been considered the best examples that chlamydial recombination actually occurs in the laboratory. This has been a part of the very recent explosion in mindset change in the chlamydial field, with this historically genetically intractable organism suddenly becoming more and more manipulable. This will lead to major progress with regards to our understanding of how chlamydiae lead to disease in humans and animals.
We anticipate that our antimicrobial discovery work will allow people to examine chlamydial differently in the research laboratory, and hopefully, add tools to the clinical arsenal of antibiotic options for clinicians dealing with the challenge of antimicrobial resistance in bacterial disease.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #9

1. Outcome Measures

Action Indicator 3 - Improved safety - new assays and technology help combat viruses - potential antiviral drugs from rational drug design and high throughput screening efforts designed to develop G1L inhibitors - information about molecular biology of RNA viruses used in designing new approaches for combating pathogenesis by these viruses.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
There are many aspects of microbiology that affect the health of humans, the food supply, the environment and natural resources. One is continually reminded of the involvement of bacterial, viral and parasitic agents in both health and disease from articles in both the popular press (reflecting issues of broad societal importance) and in many scientific journals.

What has been done
Our faculty continues to focus on the production of information, as well as the dissemination of knowledge through conferences and peer-reviewed articles and extension activities related to environmental health issues. One particular effort that relates to climate change involves investigations by the Stephen Giovannoni group into the genome evolution and metabolism of the marine bacterium SAR11 and marine carbon cycle as explained by understanding marine bacteria , based on high throughput microbial culturing, proteomics, and metabolomics.
The other important focus is student training in research. During this year, our microbiology faculty generated 33 peer-reviewed publications and is training 26 graduate students and 15 undergraduate students in research.

Results
The Giovannoni laboratory has established pure cultures and determined the genomic DNA sequence for several open ocean bacteria. They use metagenomics and oceanographic field work to link laboratory discoveries to natural processes. The team obtained information from phylogenomic comparisons that the SAR11 clade of ubiquitous marine bacteria are closely related to mitochondria and may have been the progenitor of these organelles. These cultures and the information from the genome sequences are allowing widespread research on these bacteria to proceed in laboratories around the world, which are attempting to determine a more

accurate understanding of biological activities in the oceans and under various conditions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
201	Plant Genome, Genetics, and Genetic Mechanisms
212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants
303	Genetic Improvement of Animals
311	Animal Diseases
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #10

1. Outcome Measures

Economic Changes in food systems - Risk management of fire blight pathogen could lead to larger export markets for U.S. grown pears. - Enhanced fish, shellfish, and whale populations will be of economic value in coastal tourism - Ocean resource management approaches that integrate ecological and economic components and promote sustained economic productivity for the Oregon seafood industry. - Traceability will increase marketing success and generate higher ex-vessel prices and profits for fishermen, processors, and retailers; Traceability will also be used to collect science information to improve science and management. - The adoption of rights based approaches for managing the environmental effects of fishing will improve economic performance of the industry while also protecting marine species, habitats, and ecosystems. - Improvements in marine fish nutrition will result in expansion of marine aquaculture to meet the increased global demand for fish. - The Pacific oyster breeding program will provide significant benefits to this $3.7 billion dollar industry as well as provide global benefits through its approach to oyster breeding.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)

This research activity seeks to improve the quality, accuracy, and understanding of the stock assessment procedures and results used in the management of Oregon's fisheries for groundfish so that these fisheries can achieve greater economic benefits. Marine fish resources are an important source of good quality protein that is highly valued by consumers. Furthermore, fishing activities, both recreational and commercial, are vital economic activities for many coastal communities. Recreational anglers in Oregon are estimated to have made 77 thousand fishing trips directed at groundfish species during 2010. Although the value of these trips is not easily quantified, expenditures by anglers in Oregon during 2006 for charter boat fees, travel, meals, and accommodations were estimated to be about $100 per fishing trip. Hence the expenditures on recreational fishing for groundfish in Oregon, not including expenditures on fishing equipment, would be estimated at almost $8 million annually. Commercial fishing activities are more easily measured. The economic value of Oregon's commercial landings of groundfish during 2010 was $31.0 million, with considerable value added during the production of processed fish products. The landed value of all groundfish caught from US West Coast waters during 2010 was $85 million. To maintain fish harvests that are sustainable in the long term requires careful monitoring of the fish stocks, fishing activities and ocean conditions. These data are used in stock assessments to evaluate the balance between fishery removals and natural stock growth. Stock assessments are technically challenging to conduct and the results can be difficult to explain.

What has been done

During development of a spatially explicit model for simulating multi-species fisheries a previously unreported aspect of the phenomenon known as fishery selectivity was discovered, explored and described in a series of three published journal articles. Fishing activities that are not uniformly distributed in space will, under a broad range of conditions, result in fishery selection that is domed, meaning that older fish are caught less frequently than slightly younger fish. This has important consequences for how stock assessment models are configured and for our understanding of certain reference points used routinely in fishery management for West Coast stocks of groundfish. Other activities during 2011 included publication of a study on the accuracy of data in Oregon trawl logbooks, participation in the activities of the Scientific and Statistical Committee of the on the Pacific Fishery Management Council (PFMC), including the review of new stock assessments for two key groundfish stocks, and providing stock assessment training for Oregon?s members of the PFMC.

Results

The results from the research on fishery selectivity have broad implications for the construction of age-structured stock assessments, which typically assume, without verification, that the effects of age-specific fishing mortality can be modeled using simple curves that are time-invariant. The study results provide a theoretical basis for questioning the validity of this conventional assumption. The full consequences of using overly simple models for fishery selectivity have not yet been fully determined but the results from the study of Oregon trawl logbook data indicate gross inconsistencies in some of the data, implying that logbook data may require careful screening to avoid the use of inaccurate and potentially misleading information. The review of the new stock assessments for Dover sole and sablefish resulted in acceptance by the PFMC of these assessments as providing the best available scientific information for the purpose of setting annual catch quotas for the 2013 and 2014 fishing seasons. The catch quota recommended for Dover sole for 2013 remains unchanged from the 25 thousand metric ton catch quota that will be in effect for 2012. However, the catch quota recommended for sablefish for 2013 will decrease by almost 18% from the 6.6 thousand metric ton catch quota that will be in effect for 2012. Stock assessment estimates of current stock status and predictions of future prospects, which are generally conducted on a biennial or less frequent cycle, often exhibit considerable volatility from one cycle to the next. Variability in the ocean environment and in the strength of incoming year-classes of fish, compounded by the extreme uncertainty surrounding estimates of fish abundance,

makes fishery management extremely challenging. The training workshop with Oregon's members of the PFMC provided them with an understanding of some of the potentially confusing technical aspects of groundfish stock assessments, i.e., if stock assessments underestimate the health or productivity of an exploited fish stock, then fishery management agencies may inadvertently set overly restrictive regulations that result in lost fishing opportunities and spill-over of displaced fishing activities, and conversely, if assessments are overly optimistic, harvests may be unsustainably large and result in stock declines and reduced long-term productivity.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
201	Plant Genome, Genetics, and Genetic Mechanisms
212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #11

1. Outcome Measures

Environmental Changes 1 - food systems - Provide more sustainable approaches for managing plant disease - Restored health and stability to marine food webs - Adoption of rights based approaches for managing the environmental effects of fishing will improve economic performance of the industry while also protecting marine species, habitats, and ecosystems - The pacific oyster breeding program will provide significant benefits to this $3.7 billion dollar industry as well as provide global benefits through its approach to oyster breeding - Reduce impact of disease on wild and cultured salmonids

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Condition Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The West Coast oyster industry, whose total economic worth is approximately $207 million, is facing a serious problem in maintaining a supply of seed from both wild spawns in Willapa Bay and from two of the three major hatcheries. The full cause(s) of high larval mortalities is unknown but appears to be correlated with poor quality seawater supplied from depth, either through upwelling or via hatchery pumping, leading to increased disease pressure and poor shell formation.

What has been done
In 2011, two cohorts of about 100 families each were produced for the oyster selection program (the Molluscan Broodstock Program; MBP). These were planted at commercial test sites in Washington and Oregon. In addition, four "pods" of elite families were produced for industry to use in the future for commercial-scale production of seed.

Results
The oyster broodstock improvement project has resulted in production of large quantities of selected broodstock that are currently being used by commercial hatcheries. Hatcheries and growers that have handled improved oysters report good results. Due to elimination of special research grants from the Federal budget, MBP research funding has been decimated which will greatly impact expansion of this program. The program is currently trying to facilitate the transfer of MBP to industry. However, loss of this research program will reduce the ability of the industry to adapt to future changes in seawater conditions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
201	Plant Genome, Genetics, and Genetic Mechanisms
212	Pathogens and Nematodes Affecting Plants
215	Biological Control of Pests Affecting Plants
302	Nutrient Utilization in Animals
303	Genetic Improvement of Animals
311	Animal Diseases
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
723	Hazards to Human Health and Safety

Outcome #12

1. Outcome Measures

Societal Changes - more enlightened populace with regard to the value of habitats and conservation.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Urban horticulture is redefining the relationship of people and landscapes. Landscapes provide us with a number of goods and services whose value has not been fully accounted for in land use planning or in our broader market economy. Also, until recently our cities have largely developed alienated from ecological function. As a consequence ecological functions are often degraded in urban environments causing a suite of problems such as urban heat islands, water and air pollution, and diminished biodiversity. There is a growing recognition that re-integrating ecological processes into the built environment can provide cost effective solutions to improving the health and vitality of cities and properly accounting for landscape goods and services may provide powerful incentives to engage in conservation practices. There is, however, a great need for applied research to develop and assess innovative technologies to create societal changes. In addition, limits in our understanding of the functional importance of biological diversity and of the link between biodiversity and ecosystem functions may diminish our ability to design more sustainable horticultural and agricultural food systems.

What has been done
Experiments tested a variety of vegetated rooftop, using elevated platforms without the buildings underneath, to investigate the suitability of plants that might be grown atop city buildings; vegetated roofs can moderate storm water, provide cooling in cities, refresh the air and provide habitat for pollinators and other beneficial insects, says John Lambrinos, a landscape ecologist at OSU. Students in Lambrinos' ecological restoration class created a restoration plan to remove invasive plants and replant native varieties in a number of urban settings. Further, OSU's new Oak Creek Center for Urban Horticulture is helping prepare students for the growing market for landscape design and study. As head of OSU's horticulture department, Anita Azarenko envisioned a place where students could kneel on the ground, get their hands dirty, and satisfy their desire to grow their own food and manage their landscapes.

Results
"The classical view of urban horticulture has been only the aesthetic value of plants, in isolation from nature," Lambrinos said. "But we've come to realize that horticulture is an interaction between plants and people, and many feel that gardening provides spiritual relief. There has been a disconnect in urban areas, and people recognize that it's important to reconnect our everyday lives with nature." More than 40 community gardens have sprouted in Portland, where vegetables grown on large lots help feed the community, and edible landscapes are replacing suburban lawns.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
112	Watershed Protection and Management
121	Management of Range Resources
125	Agroforestry
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
605	Natural Resource and Environmental Economics

Outcome #13

1. Outcome Measures

Knowledge Indicator 1b - New tools, models for crop production - Simplified, realistic crop growth models easily applied to variety of soils, climates and irrigation technologies which also help make decisions regarding economic tradeoffs between various decisions or competing goals - weather-based models that indicate when spores are first released in spring and the minimum environmental requirements for infection of leaves. - know which host variables (abundance, heterogeneity, or spatial structure) need to be included in models to make predictions about disease risks, and to determine the relative importance of each to disease spread.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Creating crop suitability maps with GIS/web-based tools can assist land managers to match land use with appropriate crops and cropping/livestock systems and policy makers to develop rational plans for food and energy security. Biological capacity is determined by climate, soil and plant resources and management practices. This capacity can be determined in a highly detailed manner (through high resolution modeling and mapping on a landscape level) and communicated through fundamental education and development of management tools to match use with capacity. Such systems allow growers to manage according to the land's ability to produce (its biological capacity), not according to unsustainable exploitation driven by short-term needs.

What has been done
Traditional approaches to plant species suitability mapping have been based on hand-drawn maps involving a graphic artist and a plant specialist to define general zones of adaptation, using minimum temperature as the primary criterion. Thus, maps have been general representations rather than specific decision-making tools.
A new method based on eco-physiology is being developed with this research project to accurately identify suitability zones for various forage, food, and energy crops and cropping/livestock systems. This method, involving modern spatial analysis modeling and mapping techniques, delineates the environmental limits that define suitability zones. Initial work on this approach addressed mapping grass species suitability zones in the US and PRC.
Work in 2011 addressed expanding the crop suitability mapping work from the initial 3 cool-season grass species to additional species including alfalfa and switchgrass. Quantitative tolerance values and functions were developed describing the response of these species to climatic and edaphic conditions in the US and PRC. Team members were expanded to include energy crop and economics expertise.

Results
Agronomic approaches to evaluating the potential for new crop species or cultivars has traditionally involved species and variety trials in various locations, often selected based on convenience of research facilities rather than agro-ecological zones. This project's approach has inverted the traditional process to one that develops detailed spatial maps of crop suitability based on previous research found in research and extension documents and local expert knowledge. Draft suitability maps then provide the basis for validation experiments in zones identified as having different yield and persistence potential. Thus, the problem of extrapolation of research information to areas not covered by research sites is addressed providing greater efficiency of research resource use.

Recent interest in biofuel/energy crops is being addressed with this ecophysiological/spatial mapping approach to more accurately predict the suitability of various species and crop types in meeting US renewable energy goals. The approach is also being used as part of revamping the USDA-RMA crop insurance program.

Alfalfa plantings in China have increased dramatically in an attempt to provide high quality feed for dairy cows. Interest has been expressed by the PRC National Alfalfa Research Program to utilize this approach for selecting alfalfa types and cultivars. If funded and alfalfa fall dormancy types are mapped for their appropriate use areas, this will assist US alfalfa seed producers in marketing their product to the appropriate agro-ecological zones in the US and PRC, since spatial data layers for climate and soils are available for both countries.

4. Associated Knowledge Areas

KA Code	Knowledge Area
215	Biological Control of Pests Affecting Plants

Outcome #14

1. Outcome Measures

Knowledge Indicator 1c - New tools, models for land-use decisions - regional econometric models that reveal the importance of localized factors such as climate and access to commodity markets on private land-use decisions, and incorporate these results into the national model to increase the accuracy of land-use change predictions. - GIS-based, spatially explicit model to predict development patterns and land prices that would have existed when one or more land use regulation had been removed in the southern part of the Willamette Valley. - spatially explicit model to examine the causes of sprawl and its socioeconomic consequences.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Regulation to address the environmental impacts of agriculture could significantly impact the prosperity of small and medium-sized farms and rural communities. Hence, it is necessary to balance the needs of farm families with environmental conservation. We examine an innovative approach that can enhance farm viability and promote conservation on agricultural lands. In this approach farmers incorporate wetlands into their crop rotations by flooding fields for a limited time, draining them, and planting again.

What has been done
Chrisian Langlap, agricultural and resource economist developed a dynamic optimization model and simulation framework which related conservation activities and land use changes to farm profits and water bird habitat to rigorously evaluate wetland rotation programs. The model also allowed comparison of outcomes from wetland rotation programs and traditional agri-environmental programs along various dimensions, including farm profits, wildlife habitat, and cost-effectiveness.

Results

Results will result in:
(i) Developing an integrated economic-biophysical model of conservation practice and the facilitating its adoption through improved understanding of its effects on farm economic viability; (ii) Enhancing understanding of how participation increases market opportunities; (iii) Providing insight into the program?s impact on the cost of meeting farm prosperity and habitat conservation goals, thus enhancing the efficiency of investment in programs to maintain rural vitality and promote environmental quality; (iv) Identificating the allocation of land between crops and wetlands that minimizes agency costs while enhancing farm profitability and wildlife conservation, thereby promoting rural economic development and enhancing rural quality of life.

4. Associated Knowledge Areas

KA Code	Knowledge Area
605	Natural Resource and Environmental Economics

Outcome #15

1. Outcome Measures

Knowledge Indicator 1d - New tools, models for seafood - traceability and case studies for seafood

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
This effort seeks to address concerns about hatchery operations and their potential impacts on wild fish stocks. There are numerous and long-standing concerns regarding hatchery operations. These concerns include the spread of disease from hatchery to wild fish, to genetic contamination of local wild stocks by fish released from hatcheries, to direct behavioral competition between wild and hatchery fish for food or habitat, to indirect effects such as attraction of predators and alterations of aquatic communities by hatchery fish.

What has been done
We have conducted a series of experiments at the Oregon Hatchery Research Center using both tank systems and experimental stream systems. Parameters of interest include behavior, genetic, physiology and reproductive performance. We have also conducted a series of radio-telemetry studies of wild and hatchery fish in natural environments where survival, movements

and behavior are the biological traits that are collected.

Results

First, a project, jointly funded by the Pacific Ocean Shelf Tracking Network, showed that as many as 50% of downstream migrating steelhead smolts do not survive to the Pacific Ocean. Virtually all that mortality occurs in the very short estuarine section of coastal rivers. Our data lead to the Oregon Legislature and ODFW allocating funds and hiring personnel to consider predator harassment techniques to reduce this mortality. Our data also showed that there are no significant differences between hatchery and wild steelhead smolts in this regard.

Second, as a result of our studies of population genetics of steelhead in the Alsea River we know that wild stocks persist in the basin, despite extensive stocking of hatchery fish over many years. This has changed the management policy for stocking of hatchery fish and use of wild broodstock. Our results have also influenced management decisions for acclimation and out-planting steelhead in the Alsea River, including extended efforts at the OHRC to monitor returns of hatchery fish.

Third, we showed, among other things, that initial egg size determines growth rate and size for at least 1 year after hatching. This effect will almost certainly extend to life history differences (e.g., steelhead vs rainbow). Egg size varies predictably between hatchery and wild fish (smaller in hatchery fish) and so may account for a number of important differences between hatchery and wild fish.

Fourth, there is considerable pressure from angler groups, local politicians and those interested in restoration of salmon in southern Oregon to use ?egg planting? techniques, based on equipment aggressively marketed by a company in Alaska. We have begun testing of the alternative techniques for such procedures, including involvement in a designated study coming from the Speaker of the Oregon Legislature (via ODFW management). We have shown already that direct gravel planting may not be the best procedure in these cases. We are currently involved in planning a multi-year study to address concerns about restoration of southern Oregon coho populations to enhance commercial and recreational angling.

Finally, we have used the experimental stream channels at the OHRC to compare the spawning behavior of Chinook, coho and steelhead. Those studies have allowed us to define the spawning site characteristics of each species, and furthermore to demonstrate that wild and hatchery steelhead do not differ significantly in the characteristics or success of their spawning behavior under those conditions.

4. Associated Knowledge Areas

KA Code	Knowledge Area
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
723	Hazards to Human Health and Safety

Outcome #16

1. Outcome Measures

Knowledge Indicator 4b - Environmental and ecological management (habitat) - awareness of potential problems associated with riparian grazing. - Improved monitoring and management of rangelands and forest lands, including modeling for preservation and expansion of native ungulates in North America and Asia.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Agricultural production systems that employ domestic animals are economically important to rural economies that have been hard hit by recent economic events. Unregulated livestock grazing has been implicated in land and stream degradation across the western United States impacting water resources, wildlife resources, and natural ecosystems. Fortunately, managerial strategies can be developed that reduce the negative impacts of grazing while promoting positive effects. We have developed grazing systems that target invasive, exotic plant species such as Russian knapweed, Himalayan blackberry, English ivy, and cheatgrass and shift the competitive advantage back to native plants. These grazing systems simultaneously increase biological diversity and slow the spread of noxious weeds. In order to develop and test these grazing systems, our research employs collaborative planning with stock-growers and ranchers, on-the-ground application of ecological theory, and advanced electronic monitoring technologies. The goal of our research is to work closely with commercial ranching enterprises to develop economically profitable livestock production strategies that are not only sustainable be can improve environmental conditions.

What has been done
We have developed grazing strategies that have been effective in controlling Russian knapweed in meadow ecosystems of eastern Oregon, as well as Himalayan blackberry and English ivy on in western Oregon valleys and foothill systems. Grazing systems developed on our project are being employed by landowners, ranchers, and municipalities to control these weeds. The value of grazing strategies that target biological weakness of invasive plants were recognized by the broader scientific community and we have begun collaborative studies with state and federal researchers in Oregon and other states. This project is also developing monitoring protocols that employ optical and laser technologies to quantify changes in plant composition, cover and density

on rangelands. These techniques are employed to evaluate impacts on target weeds under applied grazing strategies.

Results
This project has greatly expanded our understanding of ecological aspects of targeted grazing by cattle, goats, and sheep. We have found that combinations of grazing treatments applied at specific phenological stages of weeds, or repetitive targeted grazing can effectively control weeds. These strategies reduce the use of herbicides and simultaneously provide forage for domestic animals.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
121	Management of Range Resources
136	Conservation of Biological Diversity

Outcome #17

1. Outcome Measures

Knowledge Indicator 4c - Environmental and ecological management (monitoring of pathogens) - chromatophore cells for their use as a living sensor for rapid detection of food- and water-associated pathogenic bacteria and their toxins. - host and geographic range, pathogenesis, taxonomy, modes of transmission, and treatment of infectious and toxicological diseases of importance to wild and cultured fishes, particularly those afflicting fishes in the Pacific Northwest region and how to minimize the impact of these diseases.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Sod webworms have been observed in low numbers scattered throughout the Kentucky bluegrass seed production area of central Oregon for several years. There has been concern that this and other insects found in Kentucky bluegrass could become more serious pests over time. The grass seed industry has asked that OSU monitor fields to track changes in the insect pest populations over time.

What has been done
More recently this project has focused on sod webworm populations and distribution during since 2005. The strategy has been to use pheromone traps that emit a scent to attract males in order to track the number of the sod webworm moths. This has been followed by sod-sampling to determine the correlation between moth and larval populations. The objective of this research is to determine if pheromone traps can be used as an indicator of which fields will have high populations of larvae in the fall, when control measures are applicable. The number of cutworms collected in pheromone traps has been tracked as well.

Results
Sod webworm numbers and flight timings in central Oregon Kentucky bluegrass fields have been similar over the last three seasons, 2008-2010. In general, sod webworm moths appear in late June and steadily increase in numbers until peak flight in mid to late July, with a significant decline in population the first of August as fields dry down in preparation for open field burning. Cutworm moths peak a few weeks prior to sod webworm peak, generally in early July.
There is an option for control of sod webworm by treating adults at peak flight prior to egg-laying, rather than targeting larvae in the fall as has been done historically. If this approach were used, pheromone traps would have a direct influence on the need for treatment rather than being an indicator of potential larvae populations in the fall. There has not been a strong correlation between adult populations in early summer and larval number in the fall. Control of adults is complicated by harvest operations, while application of insecticides in the fall is effective against multiple insect pests.

4. Associated Knowledge Areas

KA Code	Knowledge Area
311	Animal Diseases
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins
723	Hazards to Human Health and Safety

Outcome #18

1. Outcome Measures

Knowledge Indicator 5b - Basic information on ecosystem (species assemblages) - ecology of a variety of insect species and the dynamics of multi-hundred species assemblages in forested habitats - SAR11 for investigations aimed at understanding how plankton cells use light dependent proton pumps, and impact the efficiency of carbon cycling in the ocean surface.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
The overall objective of the research program is to investigate the interaction between life history and management strategies and to evaluate realized and potential fish restoration efforts using individual physiology, population viability, and community structure as response variables.

What has been done
We conducted field studies in three locations, made behavioral observations of fish in natural environments and fish collections, and collected physiological and reproductive data in the laboratory. In the last year this work has led to the co-authoring a book chapter on the species and the acceptance of one manuscript.

Results
The Nassau grouper project has vastly improved our knowledge of the importance of spawning aggregations to the reproductive success of this species, and is changing actions, conditions, and policies in the public, scientific, and management areas. The results of our work has been made into two short public service announcements, a brochure being used for distribution through Cayman Islands tourist outlets, published in a public consumption SCUBA magazine, is the subject of an upcoming documentary, and is being used by the Cayman Islands Department of Environment to make a decision (required by December 31, 2011) as to the future protection of this species and its spawning aggregations.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity

Outcome #19

1. Outcome Measures

Knowledge Indicator 5c - Basic information on ecosystem (soils) - fluid movement though soils, - biogeochemical recycling in soils, - carbon and nitrogen cycling in soils, - microbial diversity in soils, - soil-landscape evolution.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Knowledge about physical transformations occurring in the vadose zone is crucial for understanding and managing biotic and abiotic processes occurring in Earth's terrestrial critical zones. Because it forms an interface with the atmosphere and sustains plants with water and essential microbiological communities, good stewardship of vadose zone functions should be among the highest priorities of our society. Meanwhile, changing societal food and energy demands, land use and climatic conditions, and introduction of man-made substances are imposing ever greater stresses on the vadose zone. The protection and sustainability of this crucial resource can only be assured through a better understanding of vadose zone processes at different spatio-temporal scales. This requires improvement in instrumentation, numerical modeling, and fundamental understanding of critical processes. Expected outcomes include improved protection of soil and water resources and sustainability in use associated with energy production, water/irrigation management and mineral extraction activities.

What has been done
Conducted fieldwork to investigate salt deposition morphology in naturally cracking soil; conducted laboratory work to investigate the effect of soil heterogeneity on the spatial distribution of salt deposition within a porous media; and mentored three graduate students in laboratory methods, theory and professional development. Events: Presented this year's work to colleagues at the American Geophysical Union (AGU) National Conference. Dissemination: Project work was disseminated to the research community via conference presentations and manuscript publication.

Results
The investigation has led to an advance in the understanding of the temporal evolution of evaporation from a porous media. The first stage of evaporation, which is traditionally understood to consist of a constant evaporation rate driven by atmospheric conditions, was shown instead to exhibit a consistently decreasing evaporation rate when the media is heterogeneous. Heterogeneity was also shown to control the distribution of salt precipitates, with precipitates favoring deposition in the smaller pores, while the coarse pores remained salt free and provided an avenue for vapor transport. During the second stage of evaporation, precipitation internal to the porous media occurs in well-defined bands parallel to the evaporation surface.

4. Associated Knowledge Areas

KA Code	Knowledge Area

101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
136	Conservation of Biological Diversity

Outcome #20

1. **Outcome Measures**

   Action Indicator 1b - Better decision-making, behaviors, and policies (soil management). - Research on carbon and nitrogen cycling will lead to better regional and national nutrient sequestration plans as partial solutions for nutrient contamination and global warming concerns. - Research on microbial diversity will lead to better understandings of changes that occur in soils under different management regimes, of inherent differences in soil microbe diversity, and of the ability of soils to recover from events that affect microbial populations.

   Not Reporting on this Outcome Measure

Outcome #21

1. **Outcome Measures**

   Action Indicator 1c - Better decision-making, behaviors, and policies (natural resources and ecosystems). - better conservation practices reduce mortalities and promote population recovery of whales - individuals will modify behaviors and practices so that ecosystem functions and processes can be restored. - Policy makers will develop incentives, rules and regulations that prevent further resource damage or encourage ecosystem restoration - the knowledge about atmospheric carbon and carbon sequestered in oceanic waters will enable more accurate models for the global carbon cycle - ecosystem restoration policy decisions based upon the theoretical understanding of processes affecting aquatic and terrestrial organisms and ecosystem function.

   Not Reporting on this Outcome Measure

Outcome #22

1. **Outcome Measures**

   Action Indicator 1d - Better decision-making, behaviors, and policies (fisheries & seafood). - establish management and conservation/restoration efforts for salmonids, Pacific rockfish, Pacific herring, and shellfish - Better fishery management and ocean policies that are compatible with issues of economics, incentives, communities and ecosystems. - approaches for managing the pink shrimp fishery and the environmental effects of fishing

2. **Associated Institution Types**

   - 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Columbia River spring-run Chinook salmon (Oncorhynchus tshawytscha) abundance has declined dramatically since the early 1900s. Although early marine residence is considered a critical period for juvenile salmon, specific survival mechanisms are often unidentified and may vary by species or life stage. A greater understanding of the mechanisms regulating survival is important for conservation and management of this species. For example, we cannot determine the appropriate management or restoration actions if we do not understand the mechanisms of mortality. Therefore, to elucidate mechanisms of early marine survival, we tested key hypotheses regulating early marine survival. We evaluated the "bigger-is-better" and the "growth-mortality" hypothesis, which posits that size and growth rate are important for future abundance. We also tested the "match-mismatch" hypothesis to determine whether early marine growth was related to indices related to regional productivity, including spring transition timing and copepod community composition.

What has been done
We evaluated these hypotheses using data on an important stock of Chinook salmon in the Columbia River, i.e., the mid-upper Columbia River spring run. We generated estimates of individual size at ocean entry and capture, marine growth rate, early marine migration rate, and emigration timing across eight years by combining data from ocean cruises and genetic stock assignments with chemical and structural analyses of otoliths (fish ear bones). Using data from ocean surveys completed between 1998 and 2008, we determined that juvenile body size after ~30 d marine residence and early marine growth rate were strongly and positively related to future adult returns whereas size at marine entry was not. Furthermore, we determined that juvenile body size after initial marine residence was greater when a certain prey community was dominant (i.e., lipid-rich copepods). Although future adult abundance was not related to the timing of juvenile entry into marine waters, we determined that juveniles migrated more slowly when their growth rates were higher, potentially altering their migration behavior based on foraging conditions. Overall, processes during early ocean residence appear to play a larger role in determining future population size than those at marine entry.
A peer-reviewed manuscript was accepted for publication in the Marine Ecology Progress Series in 2011 (to be published in 2012). We also provided several oral presentations of this work to state and federal scientists as well as managers.

Results
We generated increased knowledge of factors regulating survival of juvenile Chinook salmon during early marine residence. We were able to separate two key periods in the life history of an important Chinook salmon stock (marine entry and one month after marine entry). This allowed us to quantitatively evaluate the concept that size and timing at marine entry are key determinants of

early marine survival. We found little evidence to support this long-standing concept. We found only weak evidence that the size and timing of marine entry influenced subsequent survival. Rather, we found the ocean conditions and growth rate during early marine residence were strong predictors of future survival and adult returns. This information is integral to establishing realistic recovery and management plans for Columbia River stocks, several of which are listed under the Endangered Species Act. The full recovery of salmon, and other endangered fish species, is necessary if any sustainable harvest is to occur in the future. Furthermore, a greater understanding of the mechanisms that regulate survival and productivity of these culturally and economically important species is needed to predict the impact of projected changes in local and regional climate.

Associated with this project, we trained two federal scientists at the USFWS based in Washington State in the chemical analysis of fish otoliths. These researchers are working on several species of managed fishes within Washington State and are using these techniques to address important management questions associated with migration history and habitat use.

4. Associated Knowledge Areas

KA Code	Knowledge Area
112	Watershed Protection and Management
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
605	Natural Resource and Environmental Economics

Outcome #23

1. Outcome Measures

Action Indicator 2b - Improved technologies and practices (seafood and fisheries) - traceability systems for marketing and science research (electronic logbooks). - principles of seafood marketing and trade - fisheries management strategies to encompass detailed knowledge of the dispersal/disease process - Performance of complex microparticle types that provide nutrients to marine larval fish

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Knowledge Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
A hindrance to the development marine fish aquaculture is the lack of adequate diets for the larval marine fish. One strategy for overcoming this obstacle is the development of microparticulate diets for marine fish larvae.

What has been done
Digestion of wax beads by rotifers has been demonstrated using fluorescent stains. Feeding studies have been carried out in which rotifers have been fed on encapsulated vitamins and then the enriched rotifers have been fed to larvae of Pacific cod and Sheepshead minnow (our lab?s experimental species). No beneficial effects have been observed by feeding fish larvae on vitamin-enriched rotifers but other types of enrichment are planned.

Results
Development of microparticulate diets for enriching prey species or for directly feeding to marine fish larvae is still at a research-scale. We are collaborating with the Alaskan NMFS group at HMSC and Hubbs SeaWorld, California, on projects to expand the scope of this approach.

4. Associated Knowledge Areas

KA Code	Knowledge Area
135	Aquatic and Terrestrial Wildlife
136	Conservation of Biological Diversity
302	Nutrient Utilization in Animals
311	Animal Diseases
604	Marketing and Distribution Practices
605	Natural Resource and Environmental Economics
712	Protect Food from Contamination by Pathogenic Microorganisms, Parasites, and Naturally Occurring Toxins

Outcome #24

1. Outcome Measures

Action Indicator 2c - Improved technologies and practices (ecosystem services) - Research on fluid flows in soils will allow for better waste material containment facility design. - new ecosystem service industries in Oregon that deliver products or manage plant based systems designed for specific environmental problems. - Improved indicators of environmental health as described in the Oregon State of the Environment report.

2. Associated Institution Types

- 1862 Research

3a. Outcome Type:

Change in Action Outcome Measure

3b. Quantitative Outcome

Year	Actual
2011	1

3c. Qualitative Outcome or Impact Statement

Issue (Who cares and Why)
Influence of habitat changes on animal populations is a focus of wildlife management and conservation biology. Study of habitat affinities of species, dynamics of populations in natural and manipulated habitats, and reproductive success of populations across landscapes help natural resource managers understand consequences of habitat management.

What has been done
We measured abundances of birds with several techniques, including point counts, spotmapping, and radiotracking to measure home ranges. We also collected invertebrates under different agricultural practices. Ecosystem condition was assessed in several ways under this subprogram. First, we collected population size, survival, reproductive success and other demographic parameters for species of interest. The parameters served as surrogates for terrestrial vertebrates within ecosystem types. Second, we measured changes in landscape metrics (patch size, patch distribution, etc.) and vegetation condition at the ecological unit level over time.

Results
Our research on the effect of livestock grazing intensity's effect on biodiversity and ecosystem function has expanded our knowledge of the consequences of different grazing regimes on diversity and community composition of plants, invertebrates, birds, food web dynamics, and pollinations services. This information is directly useful to livestock producers and resource managers in developing sustainable grazing practices that minimize negative ecological effects and maximize economic return to the producers. Producers, managers and environmental nonprofit groups are now collaborating to modify grazing and habitat management tactics for the benefit of livestock and wildlife productivity in the Zumwalt Prairie of northeastern Oregon.

4. Associated Knowledge Areas

KA Code	Knowledge Area
101	Appraisal of Soil Resources
102	Soil, Plant, Water, Nutrient Relationships
103	Management of Saline and Sodic Soils and Salinity
112	Watershed Protection and Management

Outcome #25

1. **Outcome Measures**

Environmental Changes 2 - ecosystems - Global warming will be addressed in part by carbon sequestration strategies - Soil microbial health will be maintained or improved - Changes in policies will result in sustainable natural resource use or ecosystems restoration

Not Reporting on this Outcome Measure

V(H). Planned Program (External Factors)

External factors which affected outcomes

- Natural Disasters (drought, weather extremes, etc.)
- Economy
- Appropriations changes
- Public Policy changes
- Government Regulations
- Competing Public priorities
- Competing Programmatic Challenges
- Populations changes (immigration, new cultural groupings, etc.)
- Other (climatic or environmental condit)

Brief Explanation

{No Data Entered}

V(I). Planned Program (Evaluation Studies)

Evaluation Results

{No Data Entered}

Key Items of Evaluation

{No Data Entered}